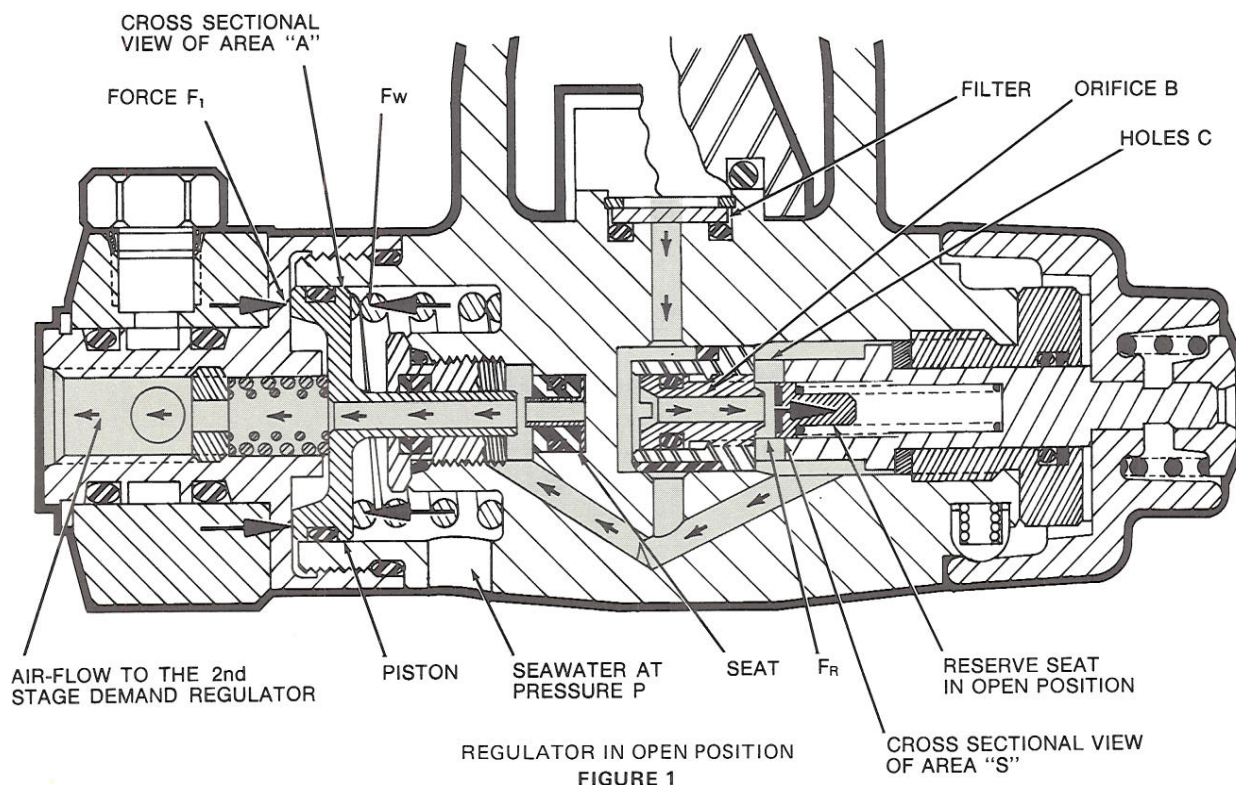




U.S. DIVERS CO.

1083-00 CALYPSO J REGULATOR



The Calypso J Regulator reduces high pressure air to ambient pressure through the action of 1st and 2nd stage regulators. Air at pressures ranging from 3500 PSI to 130 PSI is regulated by the 1st stage to an intermediate pressure of 130 PSI above ambient pressure.* The 2nd stage regulator reduces that pressure to ambient. A yoke secures the 1st stage regulator to the cylinder valve while an O-ring on the valve insures an airtight attachment.

Air coming out of the valve passes through a filter (Figure 1, Item 8) on the regulator. The purpose of the filter is to keep foreign particles out of the regulator. Air then follows the green-colored path in Figure 1 through the regulator and into the intermediate hose. The flow continues through the reserve mechanism section as long as the air supply pressure is above 500 PSI.

Below that limit the reserve mechanism will shut off the flow path until the reserve handle is activated.

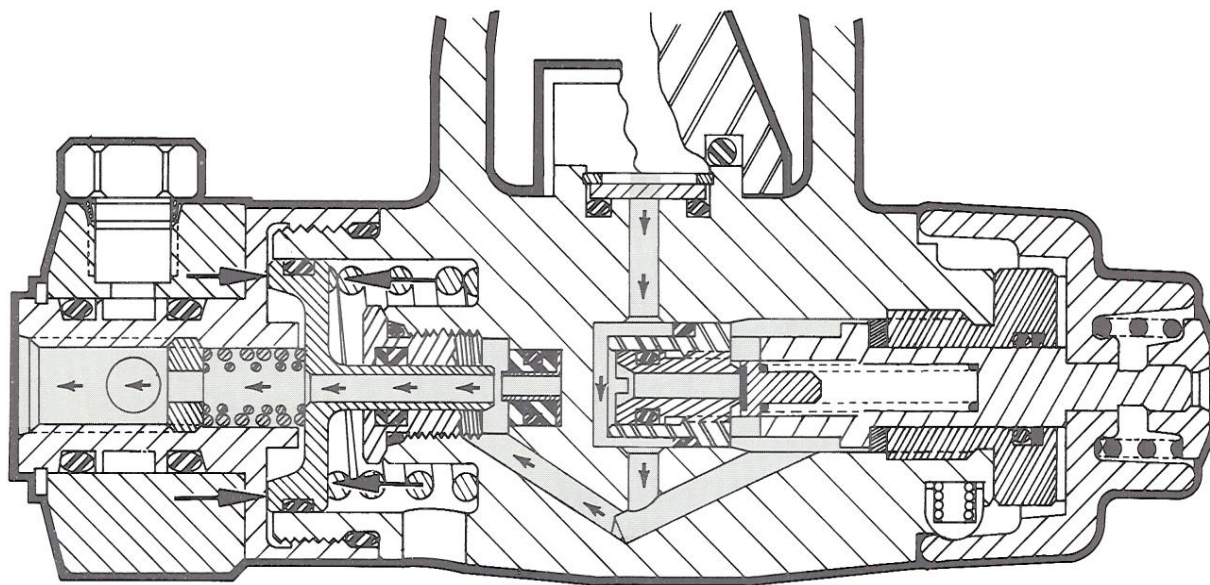
The reserve mechanism works as follows: Air going through the reserve mechanism at pressures

higher than 500 PSI forces the seat disc retainer to move to the right (see Figure 1). With the seat disc retainer in the open position, air then flows out of orifice "B" and through the four holes "C" (Figure 1 shows orifice B and two of the four holes "C"). Air hence flows out of the reserve mechanism and into the regulating section.

Air forces the seat disc retainer into the open position by exerting a force F_R against the surface S (see Figure 1 and the exploded drawing). F_R is large enough to overcome the force of the spring (Item 35) as long as the supply pressure is above approximately 500 PSI. Once the air supply pressure drops below that limit the seat disc retainer remains shut against the orifice. Upon turning the reserve lever (Item 42) downward the whole reserve assembly also rotates. As a result, a rubber indentation on the reserve piston is now oriented so as to allow air flow around the reserve mechanism rather than through it. Air flow hence resumes to the regulating section.

The regulating section works as follows: Air coming out of the reserve section continues to flow through the regulating section as long as the piston (Item 17) is in the open position. The forces that tend to keep the piston open are the spring (Item 16) F_s , force and the force F_w produced by the wa-

*Under water this pressure is maintained at 130 PSI plus the water pressure at that depth.



"RESERVE-ON" POSITION
FIGURE 2

ter pressure acting upon the back surface of the piston (see Figure 1).

The forces that tend to move the piston to the closed position are F_{s2} , exerted by the adjustment springs (Items 19 and 20) and the force F_1 . The force F_1 is produced by the intermediate pressure acting upon the large area of the piston (shown as area "A" in Figure 1).

The regulator is designed so that the piston remains in the open position ($F_s + F_w$ larger than $F_{s2} + F_1$) until the intermediate pressure is 130 PSI above the ambient water pressure. Once that intermediate pressure is reached, F_1 becomes large enough to push the piston into the closed position ($F_1 + F_{s2}$ slightly larger than $F_s + F_w$). At that moment, the piston is forced against the seat (Item 11) and the flow path is hence closed (see Figure 3).

The intermediate pressure of this regulator can be adjusted through the adjustment nut (Item 23). When the adjustment nut is screwed in, F_{s2} increases. As F_{s2} is increased, the force F_1 needed to force the piston against the seat is reduced. By screwing the adjustment nut out, the opposite effect occurs and a higher intermediate pressure is needed to force the piston to close off the flow.

The piston remains in the closed position until the pressure in the hose drops due to demand. This, of course, reduces the force F_1 and enables F_s & F_w to force the piston open. Flow then resumes.

The 1st stage piston is "balanced," meaning that the high pressure air surrounding it exerts no opening or closing force against the piston itself. The purpose of the balanced piston is to maintain

a constant, steady intermediate pressure setting regardless of the cylinder pressure. This permits sensitive automatic adjustment of the regulator for easy breathing at all cylinder pressures.

The 2nd stage regulator reduces the intermediate pressure to ambient breathing pressure. The diaphragm (Item 63) senses water pressure and loads the lever (Item 55) accordingly. As the diver inhales, a negative pressure is created inside the 2nd stage regulator. Subsequently, the diaphragm is drawn inward causing the lever to open the demand valve. The final result is a drop in the intermediate pressure followed by air flow from the 1st stage. The whole cycle is triggered with every breath, or with a change of the diver's depth.

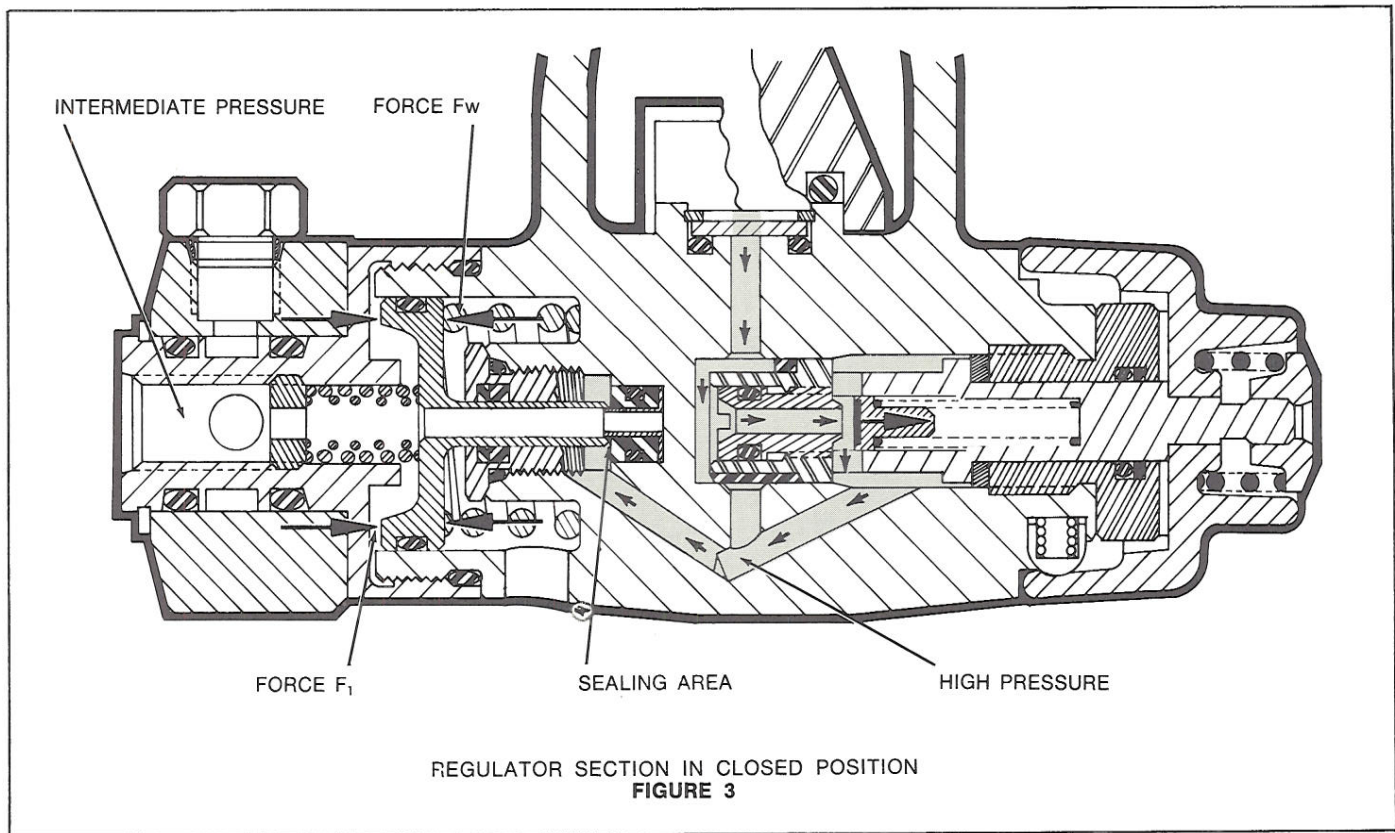
The 2nd stage valve (Item 52) is "fail safe" because of its down-stream design. In case an internal leak develops in the 1st stage, the 2nd stage valve opens up and relieves the excess pressure rather than allow it to build up in the hose. This is an important safety feature.

The Calypso J 1st stage is a "Depth Compensating" regulator. Similar to the 2nd stage diaphragm, the 1st stage piston senses changes in water pressure through the force F_w (see Figure 1) and adjusts the regulator accordingly. This insures that the 2nd stage receives an ample supply of air regardless of changes in depth.

CLEANING

After every dive the following cleaning procedure is recommended:

1. With the protective cap (Item 4) in place, rinse off the entire 1st stage regulator with warm, fresh water. Allow the water to flow



inside the main spring (Item 16) cavity.

2. Rinse off the entire 2nd stage regulator including the inside of the mouthpiece (Item 71), and exhaust tube (Item 68). DO NOT PUSH IN the purge button (Item 57) while rinsing, as this may allow water into the hose and the 1st stage.
3. Flush the inside of the boxtop (Item 59) through the side holes.
4. DRY the unit before storing it.

REGULATOR DISASSEMBLY

Step

1. Using a 9/16 wrench, unscrew and remove end of hose (Item 45) from 1st stage regulator (Item 1).
2. With an 11/16 inch wrench, unscrew and remove opposite end of hose (Item 45) from 2nd stage regulator (Item 49).
3. Unscrew and remove cylinder pressure gauge from 1st stage regulator body (Item 10).

1st STAGE DISASSEMBLY

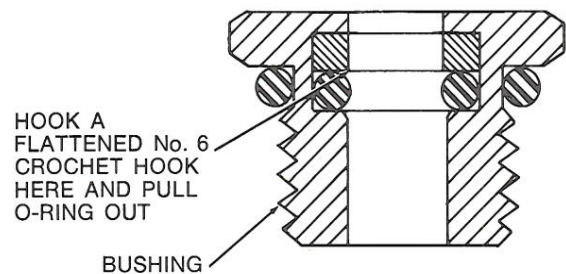
I. Filter Section:

4. Unscrew and remove knob (Item 3) from yoke.
5. Untie and remove protective cap (Item 4) from yoke.
6. With circlip pliers (tool 1111-00), remove retainer ring (Item 7), then lift out filter (Item 8), and O-ring (Item 9).

II. Regulating Section:

7. With expanding Snap Ring pliers, remove the retainer ring (Item 26). This allows the port fitting (Item 25) to slip out.

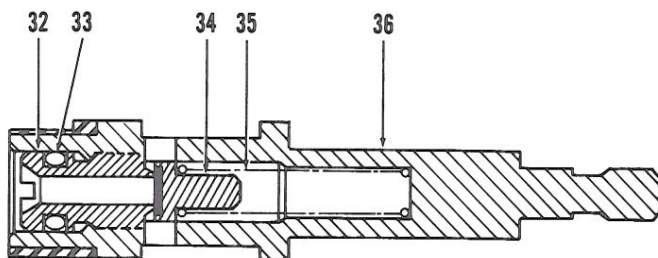
8. Use an 1/8 inch allen wrench to remove the adjusting nut (Item 23).
 9. Tip the regulator over so that the cap (Item 22) is facing downward. The two springs (Items 19 and 20) will fall out readily.
 10. Insert a .150 to .120 diameter shaft (or a standard phillips screwdriver) into the through hole in the cap (Item 22). Grip the regulator by the yoke and rotate the shaft. The cap will come out.
 11. Remove the piston by inserting a screwdriver in hole "D" (see Figure 2) and push out on the spring (Item 16). The small end of the piston must not contact any other surface. Caution must be taken to avoid bending or denting the piston tip through the whole repair operation. The spring (Item 16) will follow.
- Some regulators include a shim (and possibly more than one). Remove the shim(s) (Item 15) before proceeding.



12. Use a 9/16 inch socket wrench to remove the bushing (Item 12). Remove the O-ring according to the instructions in Figure 4.
13. Use an Ezy-Out screw extractor* to remove the seat assembly (Item 11). Insert the object into the seat assembly bore then pull out. Do not scratch or mar the Teflon seat itself unless you are going to replace the whole assembly.

III. Reserve Mechanism:

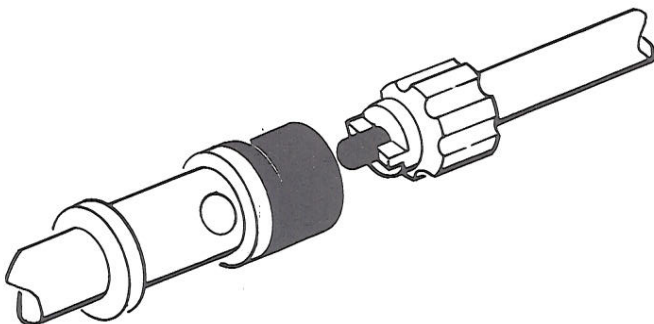
1. Remove the locknut (Item 44) and spring (Item 43). The lever (Item 42) comes loose once the nut and spring are removed.
2. Remove the washer (Item 41).
3. Use a 13/16 wrench to remove the cap. To remove the O-ring and backup O-ring from inside the bonnet follow the instructions in Figure 4.
4. Pull out the reserve mechanism subassembly (Item 31). The washer (Item 37) comes out with the subassembly.



RESERVE SUBASSEMBLY
FIGURE 5-a

5. To disassemble the reserve subassembly (Item 31) use USD Assembly tool 1084-25 to unscrew the reserve seat (Figure 5, Item 32). The seat disc retainer (Item 34) and spring (Item 35) can then be removed by tipping the piston (Item 36) upside down.

CAUTION: AVOID COMPRESSING THE SPRING (ITEM 35) TO ITS SOLID HEIGHT.



RESERVE SEAT DISASSEMBLY PROCEDURE
FIGURE 5-b

2nd STAGE DISASSEMBLY

1. Unscrew (Item 61) and remove rim (Item 60).
2. Lift off box top (Item 59) and remove diaphragm (Item 63).
3. Use circlip pliers (tool 1111-00) to remove the retainer ring (Item 62), purge button (Item 57), and spring (Item 58) from the box top (Item 59).
4. Depress the demand lever (Item 55) to unscrew and remove the inlet fitting (Item 50) and O-ring (Items 51) using a 3/4 inch wrench.
5. Apply special wrench (tool 1100-05) over the seat end of the disc and retainer (Item 52). Use a 1/4 inch open-end wrench to hold the nut; then turn the seat tool.
6. Remove the spacer (Item 64), lever (Item 55), washer (Item 54), spring (Item 53), and disc and retainer (Item 52) from box bottom (Item 66).
7. Snip the plastic clamp (Item 70) with wire cutters and pull off the mouthpiece (Item 71) and strap (Item 69) if used.
8. To remove the exhaust tube (Item 68) from the box bottom (Item 66), place the regulator in an oven at approximately 200°F, or apply hot air or water to the area of the tube. Pry the tube outward until it peels off.
9. Pull the exhaust valve (Item 67) out of the box bottom (Item 66).

INSPECTION OF REGULATOR PARTS

1. Check all O-rings, gaskets, and rubber parts for nicks, cracks, wear, deterioration, etc. and replace if necessary.
2. Replace the filter.
3. Check the seat surface of the 2nd stage valve (Item 50). Note any nicks, wear or lodged foreign particles on the seat face and replace if necessary.

FIRST STAGE REASSEMBLY

1. **Piston Subassembly (Items 17 and 18):**
The piston must be checked according to Figure 6 before the subassembly is carried out. Next, assemble lubricated O-ring (Item 18) to the piston.

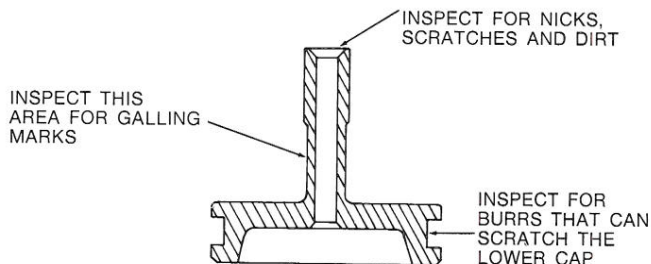


FIGURE 6

*McMaster Part Number 2563A11. A Sears Tap Wrench Part Number 9GT4065 can be very helpful to use with the extractor.

2. Seat Subassembly (Items 11):

A good practice is to replace Item 11 upon overhauling the regulator. Inspect the seat thoroughly for any scratches or foreign material before assembling. Install the seat on the seat assembly tool (USD P/N 1070-67 and 1070-68) as shown in Figure 10.

3. Bushing Subassembly (Items 9, 12, 13 & 14):

Inspect the undercut in the bushing (Item 12) for any chips. Lubricate, then assemble O-ring (Item 13) inside the undercut. The backup O-ring (Item 14) must not be lubricated and is assembled next as in Figure 7. Lubricate and assemble the outside O-ring (Item 9) as per Figure 7.

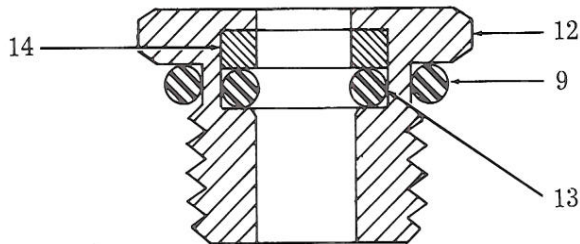


FIGURE 7

4. Low Pressure Cap Subassembly (Items 22 & 24)

Inspect the cap as per Figure 8. If the cap is in good shape, lubricate and slide the upper two O-rings (Item 24) into the O-ring grooves.

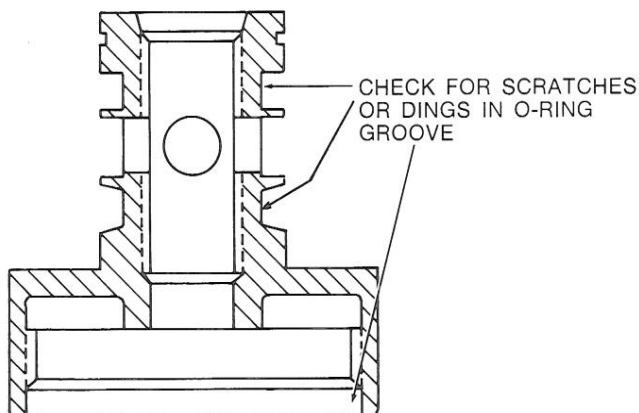


FIGURE 8

5. Port Fitting Subassembly (Items 25, 27 & 28):

Inspect the port fitting for any scratches or dents on the inside diameter. Assemble two lubricated O-rings (Item 27) to two plugs (Item 28); then assemble the plugs to the cap. Tighten the plugs with a wrench.

6. Reserve Mechanism Subassembly (Figure 5):

A. Reserve Piston Subassembly:

Check the molded rubber gasket on the piston (Item 36) for any signs of wear. Replace the whole piston if any deterioration sign is visible on the gasket.

Drop the spring (Item 35) in first, then the seat disc retainer (Item 34). The molded rubber part of the seat disc retainer is to be free of nicks, deep indentations, and foreign material. Replace, if necessary.

Check the reserve seat for any nicks or indentations. Apply a thin layer of lubricant on the O-ring (Item 33); then assemble the O-ring on the reserve seat. Assemble the reserve seat using USD assembly tool P/N 1084-25. Screw in the reserve seat until it is within the limits specified in Figure 5.

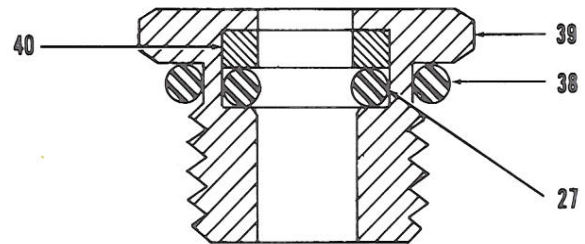


FIGURE 9

B. Reserve Cap Assembly (Figure 9):

Inspect the undercut in the cap (Item 39) for any chips. Lubricate, then assemble O-ring (Item 27) inside the undercut. The backup O-ring (Item 40) must not be lubricated and is assembled next as in Figure 9. Lubricate and assemble the outside O-ring (Item 38) as per figure

7. Final Assembly:

Note: Lubricate all O-rings except for O-rings (Item 6 & 9). Assemble O-ring (Item 9) first. Place the O-ring in the inlet boss and place the filter (Item 8) above the O-ring with the rough side of the filter facing upward. Next, assemble the retainer (Item 7) with the sharper side up. Place the seat subassembly (Item 14) inside the regulator with the flared end facing inward. Use assembly tool P/N 1070-67 and 1060-68 to assemble the seat into the body. (See Fig. 10)

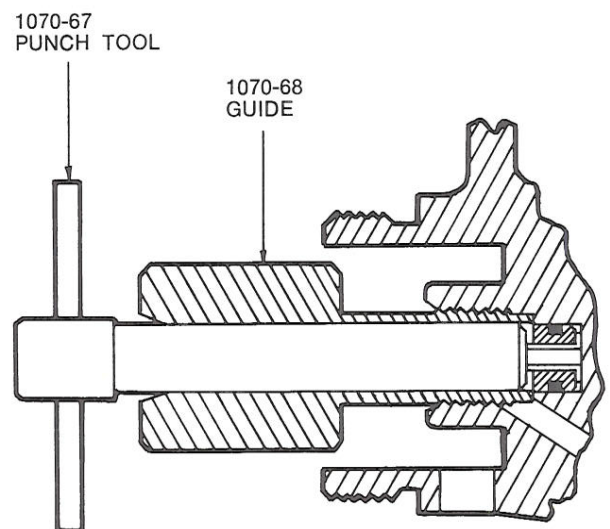


FIGURE 10

Assemble the bushing subassembly according to the following: Inspect the O-ring area. Apply a thin layer of silicone lubricant on the first two threads of the bushing and on the O-ring seat area. Wipe out any excess.

Assemble the high pressure bushing to the body using your fingers first, then a torque wrench. Tighten the bushing to 40 In./Lbs.

Apply a thin layer of the silicone lubricant inside the large bore in the body. The spring (Item 16) and piston (Item 17) are assembled next. Slip in the shim(s) if and as required (see Step 9 under "1st Stage Adjustment") before slipping in the spring and the piston subassembly. Turn in the piston slowly to avoid cutting the backup ring and O-ring inside the bushing.

Assemble the cap according to the following: Assemble O-ring (Item 21) on the body (Item 10). Apply a thin layer of lubricant on the first two threads of the body. Keep the regulator in a vertical position with the threads pointing upward. Assemble the cap using your fingers first then tighten it up using a 3/16 diameter rod (or a standard phillips screwdriver).

Next, assemble the port fitting (Item 25) to the low pressure cap. Snap on the retainer ring (Item 26) with the sharper edge up. Screw on the high pressure plug (Items 27 & 28) into the high pressure port.

Assemble the smaller spring (Item 19) inside the longer spring (Item 20), and place both springs inside the low pressure cap (Item 22). Make sure the springs stay assembled together. Screw in the adjustment nut (Item 23) inside the low pressure cap. Use an allen driver to adjust the nut past the cross holes.

Next, assemble the washer (Item 37) on the reserve subassembly (Item 31); then slip both into the reserve mechanism cavity. Screw in the cap subassembly and tighten it until it bottoms onto the regulator body.

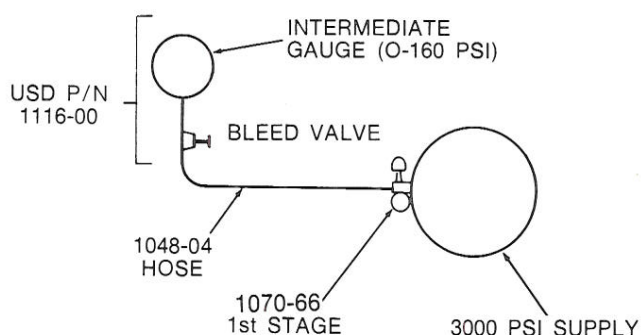
Slip the washer (Item 41) and lever (Item 42) over the stem. The lever will only go on if the stem is in the proper position. Rotate the stem until the lever can be assembled on readily. Assemble the spring (Item 43) and locknut (Item 44) in that order.

1st STAGE ADJUSTMENT

1. With the 1st stage regulator attached to the intermediate hose, secure the 1st stage to an air source.
2. Use a low pressure supply (up to 20 PSI) to flush the regulator and hose.
3. Connect the regulator as shown in Figure 11. Make sure the bleed valve is open prior to application of pressure.
4. Turn on a high pressure supply to the regulator (3000 PSI).
5. Close and open the bleed valve several times.
6. Close the bleed valve and read the intermediate pressure (see Figure 11)*.

*Caution: Avoid the over pressurization of the intermediate pressure gauge.

7. Readjust the 1st stage as required according to the following steps:
 - (a) Shut off the high pressure supply.
 - (b) Open the bleed valve until all the air in the regulator and hose is out.
 - (c) Disconnect the hose from the regulator.
 - (d) Turn the adjustment nut (Item 23) out to increase the intermediate pressure or in to decrease it.
8. Repeat Steps 1 through 6. Repeat Step 7, if necessary.
9. If the intermediate pressure does not reach 125 PSI after turning the adjustment nut all the way out, then disassemble the regulating section as per the disassembly procedure (Steps 7 through 11). Then add a shim (Item 15) below the spring (Item 16); then repeat the whole adjustment procedure. Step 9 might have to be followed more than once in some instances.



INTERMEDIATE PRESSURE ADJUSTMENT
FIGURE 11

RESERVE ADJUSTMENT

If the reserve shutoff limit is not 500 PSI, disassemble the piston as per Section III (Reserve Mechanism—Steps 1 through 4). Using USD Tool 1084-25, screw in the reserve seat to cause the shutoff pressure to go up or out for a lower shutoff. Reassemble according to the instructions for final assembly.

2nd STAGE REASSEMBLY

1. Drop the spring (Item 53) and disc and retainer (Item 52) in place in the box bottom (Item 66).
2. Hold the disc and retainer (Item 52) with special wrench (tool 1100-05) and place the washer (Item 54), spacer (Item 64) and nut (Item 65) on the threaded end.
3. Push inward on the wrench, then insert the lever (Item 55) into its groove between the spacer (Item 54) and washer (Item 64).
4. Hold the nut (Item 65) with a 1/4 inch wrench, and turn the disc and retainer (Item 52) with special wrench (tool 1100-05) until the top of the nut is approximately one thread below the slot at the end of the stem.
5. Depress the lever and screw the inlet fitting (Item 50) with the O-ring (Item 51) into the box bottom. Depress the lever during this step to avoid cutting the seat disc on the inlet fitting orifice.

6. Insert the exhaust valve (Item 67) into the box bottom (Item 66) and pull on the end of the stem until the barb pulls through the hole and into the box bottom.
7. Install the spring (Item 58), purge button (Item 57), and retainer ring (Item 62), into the box top (Item 59).
8. Reheat the exhaust tube (Item 68) and stretch it over the flange of the box bottom (Item 66). Make sure the tab on the exhaust tube aligns with the notch in the flange. Cool in water.
9. Install the neck strap (Item 69) if used.
10. Push the mouthpiece (Item 71) onto the box bottom (Item 66) and fasten it in place with a clamp (Item 70) using pliers to tighten and wire cutters to clip off the extra length. Position the clamp so its lock is on the side of the mouthpiece. The mouthpiece can be moved to its "in" or "out" position after clamping by forcing it to slide inward or outward on the metal tube.

2nd STAGE ADJUSTMENT

11. Connect the intermediate hose to the inlet fitting (Item 50) and turn on the high pressure air supply to the 1st stage regulator. If a sudden leakage through the 2nd stage regulator occurs, turn off the air supply. Hold the disc and retainer stem (Item 52) with a small bent-shank screwdriver and loosen the nut (Item

65) until the air supply can be turned on without a leak.

12. With the air supply turned on and the intermediate pressure set at 130 ± 5 PSIG, hold the disc and retainer (Item 52) with a screwdriver and adjust the nut (Item 65) so that the top of the lever (Item 55) is even with the top surface of the box bottom (Item 66).
13. Place the diaphragm (Item 63) into the box bottom (Item 66) such that both rubber tabs of the diaphragm straddle the lever (Item 55) without interfering with its action.
14. Place the box top on top of the diaphragm (Item 63).
15. Install the clamp rim (Item 60) with its opening facing the inlet fitting (Item 50) so that the screw (Item 61) is pointing downward.
16. Tighten the clamp screw (Item 61) in place.
17. Push in on the purge button and release. If free flow or very little flow occurs, see "Troubleshooting" section of this regulator for a remedy.
18. Test breathe the regulator. If free flow or hard breathing occurs, see "Troubleshooting" section for a remedy.
19. Upon completion of adjustment, turn off the air supply depress the purge button (Item 57), remove the 1st stage (Item 1) from the air source, and clamp the cap (Item 4) in place.

TROUBLESHOOTING

Problem	Probable Cause	Remedy
Free Flow (Won't Shut Off)	a. Purge button (Item 57) jammed open b. Lever (Item 55) set too high c. Lever (Item 55) bent d. 1st stage high pressure seat leakage	a. Remove and clean b. Turn nut (Item 65) outward c. Replace d. Overhaul 1st stage regulator (the piston side)
Weak Purge Flow	a. Lever (Item 55) set too low b. Lever (Item 55) bent	a. Turn nut (Item 65) inward b. Replace
Hard to Breathe	a. Lever (Item 55) set too low b. Intermediate pressure set too low c. Filter (Item 8) clogged d. No O-ring under filter	a. Turn nut (Item 65) inward b. Turn nut (Item 23) outward or add shims (see 1st stage adjustment) c. Clean or replace d. Add O-ring under filter
Hissing Sound from 2nd Stage	a. Lever (Item 55) set too high b. Intermediate pressure set too high c. Disc and retainer (Item 52) dirty, damaged or worn d. Inlet fitting (Item 50) dirty, damaged or worn e. H.P. Leak	a. Turn nut (Item 65) outward b. Turn nut (Item 65) inward c. Clean or replace d. Reface or replace e. Overhaul 1st stage regulator (the piston side)