



**AD - 820**  
**Installation / Owner's**  
**Manual**

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041894

**ADC Part No. 182705**

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**Please fill in the following information for your own records:**

**Date of purchase** \_\_\_\_\_

**Dealer's name** \_\_\_\_\_

**Serial number** \_\_\_\_\_

**Attention: Please also copy the numbers on the door and coin vault keys and place them at a safe location.**

## **SAFETY**

OBSERVE ALL SAFETY PROCEDURES AND HEED ALL WARNINGS IN THIS MANUAL TO PREVENT PERSONAL INJURY OR DAMAGE TO THIS MACHINE.

REFER TO THIS MANUAL BEFORE MAKING ANY REPAIRS OR ADJUSTMENTS, OR DOING ANY MAINTENANCE ON THIS MACHINE.

FOR OWNERS WHO DO NOT PERSONALLY MAINTAIN THE MACHINE, IT IS THEIR RESPONSIBILITY THAT THE OPERATOR HAS BEEN PROPERLY INSTRUCTED AND IS FULLY AWARE OF THE MANUAL CONTENTS. THIS IS IMPORTANT IN THE SAFE HANDLING AND EFFICIENT OPERATION OF THE MACHINE.

THE SYSTEM IS SHIPPED WITH A PRESERVATIVE SOLUTION MADE OF SODIUM BISULFITE AND (IN THE WINTER MONTHS) GLYCERINE. MAKE SURE THE SYSTEM IS THOROUGHLY PURGED BEFORE LETTING ANYONE DRINK THE DISPENSED WATER. SEE SECTION ON INSTALLATION PROCEDURES.

FOLLOW MAINTENANCE SCHEDULE RIGOROUSLY. CARELESS MAINTENANCE MAY LEAD TO COMPONENT FAILURE AND INCREASE OPERATING COSTS SIGNIFICANTLY.

DO NOT MAKE ANY ALTERATION OR MODIFICATION IN THE WIRING OR PLUMBING OF THIS MACHINE. SUCH ALTERATIONS MAY RESULT IN INJURY, ILLNESS, OR DEATH TO MAINTENANCE PERSONNEL, OPERATORS, OR USERS OF THIS MACHINE.

DO NOT ALLOW MACHINE TO FREEZE. FREEZING WILL IRREPARABLY DAMAGE COMPONENTS IN THE MACHINE.

NEVER LOOK DIRECTLY INTO THE UNPROTECTED PARTS OF THE U.V. CHAMBER WHEN THERE IS POWER TO THE STERILIZER. SERIOUS BURNS TO THE EYES AND SKIN MAY RESULT. ALWAYS UNPLUG POWER TO THE STERILIZER BEFORE WORKING ON IT.

## **DISCLAIMER**

The information contained in this document is subject to change without notice.

American Dispensing Company shall not be liable for technical or editorial omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance, or use of this material.

## **RESETTING THE MICROPROCESSOR**

**To reset the microprocessor, enter the following sequence into the keypad. The sequence must be entered within a 3 second period:**

**left 6 gal., right 6 gal., left 5 gal., right 5 gal., left 1/2 gal.**

## SYSTEM DESCRIPTION

Thank you for purchasing the model AD-820 water vending machine. It is made by American Dispensing Company and is one of the most advanced water vending machines on the market today. It is microprocessor-based and programmable. It interacts with the customer and the owner through two LED displays and a membrane keypad. The AD-820 purifies water through a five-step process:

Incoming water first passes through a 10 micron absolute **SEDIMENT FILTER**. This means that suspended solids larger than 0.01 mm (or about forty-thousandths of one inch) such as silt and fine sand are removed.

Water then passes through a **CARBON FILTER**. This removes chlorine, odor and a variety of organic contaminants, such as chloroform and pesticide residue. The AD-820 uses a carbon filter with an extruded carbon core and an inner filtration wrap. This combination ensures that, unlike a conventional granular activated carbon (g.a.c.) filter, there is no channeling or bypassing, and no release of fine carbon particles.

Water is then pumped through a thin film composite **REVERSE OSMOSIS (R.O.) MEMBRANE** at about 160 psi. The R.O. membrane removes over 90% of a variety of salts and inorganic materials found in water, such as dissolved salts of sodium, lead, nitrate; it removes typically over 99% of bacteria and over 90% of the radioactivity, like radon. Actual rejection rate will depend on feed water chemistry, temperature and its total dissolved solid content.

Water is then stored in an atmospheric water tank, sealed except for an air vent which is protected from dust and airborne bacteria by a submicron air filter.

When your customer selects a vend, water will be pumped through a combination sediment/carbon **POLISHING FILTER** which removes any remaining taste and sediment and an **ULTRAVIOLET (U.V.) STERILIZER** which sterilizes the water.

To keep the stored water fresh and sterilized, the water in the storage tank is recirculated through the polishing filter and the U.V. sterilizer every six hours.

Safety is our prime concern and it is designed into the machine. At the inlet and outlet of the R.O. membrane, a comparator reads the total dissolved solid rejection rate, an indicator of the performance of the membrane. If the rejection rate falls below a certain level, the microprocessor will shut the machine down. The same logic applies to the U.V. sterilizer, where a true U.V. sensor continually monitors the disinfecting power of the light and shuts down the machine when the U.V. level is not high enough.

There is also overflow/leakage protection, where sensors on the base of the machine, in the drain tank of the dispensing bay and in the water storage tank detect overflow/leakage and shut off whatever components are necessary.

The machine is approved by the **NATIONAL AUTOMATIC MERCHANDISING ASSOCIATION (NAMA)** in Chicago. In many states, this is a requirement for water vending machine installation.

## **TECHNICAL SPECIFICATIONS**

**DIMENSIONS:** 47 inches wide x 43 inches deep x 73 inches tall

**DRY CABINET SHIPPING WEIGHT:** 1100 lbs

**DRY CABINET WEIGHT:** 1000 lbs

**OPERATING CABINET WET WEIGHT:** 1600 lbs

**REVERSE OSMOSIS (R.O) MEMBRANE CAPACITY:**

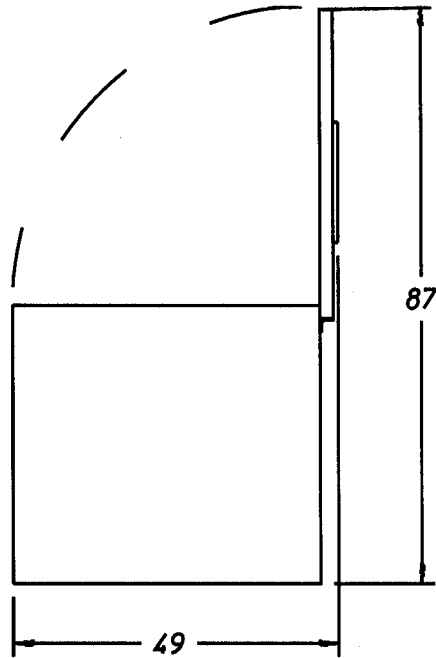
1300 gallons per day, at 1000 ppm total dissolved solid (TDS),  
77 degrees F feed water and 160 psi R.O. pump pressure.

Capacity varies with feed water TDS and temperature and R.O.  
pump pressure.

**WATER STORAGE TANK CAPACITY:** 55 gallons

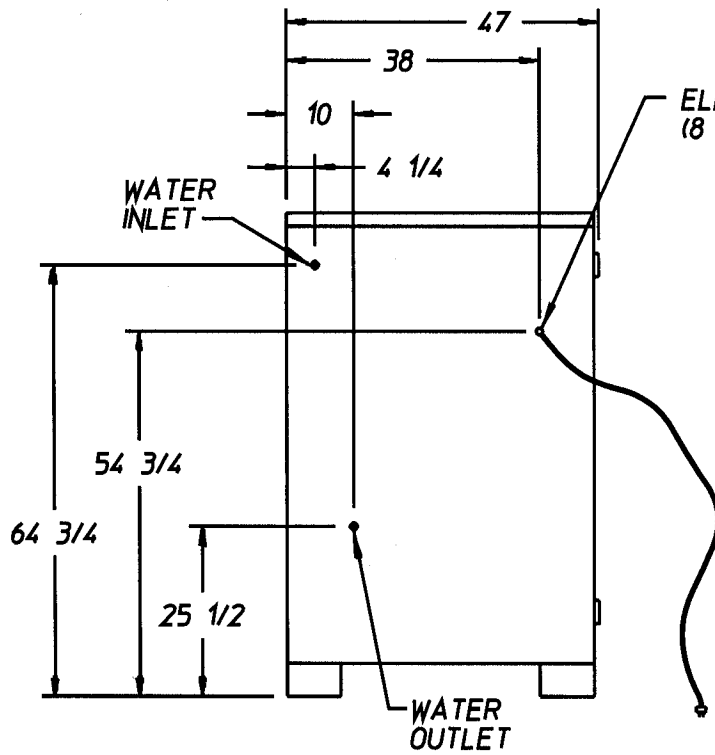
**ATTENTION: SEE "SITE REQUIREMENTS" SECTION REGARDING  
FEED WATER, PLUMBING AND ELECTRICAL SPECIFICATIONS.**



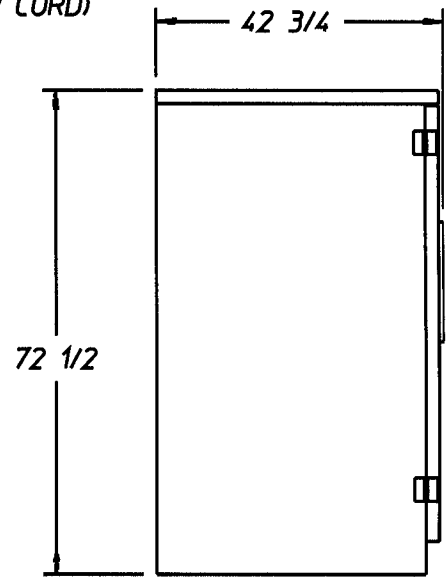


TOP VIEW

MAN1690



BACK VIEW



SIDE VIEW

## SITE REQUIREMENTS

The following conditions are required for optimum performance:

### **FEED WATER:**

**WARNING: FEED WATER MUST COME FROM INSPECTED, APPROVED WATER SYSTEMS ONLY. SOURCE MUST BE MICROBIOLOGICALLY SAFE DRINKING WATER.**

**MINIMUM PRESSURE/INLET FLOW RATE** - four gallons a minute at 35 psi back pressure or the equivalent of nine gallons per minute at a free flowing 1/2" NPT outlet at the intended location of the machine. This test should be conducted with all other equipment connected to the same water line running to reflect true flow.

**MAXIMUM WATER PRESSURE** - 80 psi. Install a pressure regulator if incoming water pressure may exceed this level. High inlet pressure will damage filter housings and cause leaks in the system.

**TEMPERATURE** - 40 to 108 degrees Fahrenheit. Exposing the machine to freezing temperatures will irreparably damage the components.

**MINERAL CONTENT** - pretreatment of incoming water is recommended if hardness exceeds 150 ppm or 9 grains per gallon, or if iron levels exceed .05 ppm. Membrane will still function with high mineral content water, but yield will drop substantially, membrane cleaning is required more frequently, and membrane life will be shortened significantly, increasing overall operating costs.

### **ELECTRICAL:**

120 volts, 15 amperes maximum, 60 Hz, single phase grounded supply.  
Ground fault interrupter recommended.

### **PLUMBING:**

Inlet and outlet of the machine is 1/2" NPT, female threads. Use for connection only sanitary plumbing materials appropriate for drinking water. Drain outlet should have a minimum of two inches air gap at the point of discharge. Follow all applicable plumbing codes when making connections.

## INSTALLATION PROCEDURES

**ATTENTION: CHECK STATE AND LOCAL LAWS REGARDING THE OPERATION OF WATER VENDING MACHINES BEFORE INSTALLATION. SOME STATES REQUIRE VENDORS TO NOTIFY THE DEPARTMENT OF PUBLIC HEALTH AND/OR THE DEPARTMENT OF WEIGHTS AND MEASURES CONCERNING THE INSTALLATION OF THE MACHINE. FOLLOW ALL APPLICABLE FEDERAL, STATE AND LOCAL STANDARDS FOR DRINKING WATER INSTALLATIONS.**

**ATTENTION: BE SURE THE INSTALLATION OF THIS MACHINE COMPLIES WITH ALL LOCAL PLUMBING AND ELECTRICAL CODES.**

**WARNING: DO NOT CONNECT ELECTRICAL POWER TO MACHINE UNTIL REQUESTED.**

1. Remove the wrappings of the vending machine and check for transit damage. Notify carrier if there is damage.
2. Skid can be removed by unscrewing four 5/16" skid bolts at the legs of the machine.
3. Place machine at the intended location and, if required, adjust the 3/4" bolts at the legs until the machine is level and stable.
4. Connect plumbing inlet and outlet lines. Refer to guidelines in the section "SITE REQUIREMENTS."
5. Unlock and open door. Remove the shipping bracket under the big blue filter housing located on the right side wall. Remove the shipping wraps around the two pumps located on the left side wall of the cabinet.
6. Open the main water ball valve (see dia. 2) located inside the cabinet at the water inlet of the machine.
7. Plug machine into the electrical outlet. Refer to guidelines in the section "SITE REQUIREMENTS."

**WARNING: THE MACHINE IS SHIPPED WITH A PRESERVATIVE SOLUTION MADE OF SODIUM BISULFITE AND (IN THE WINTER MONTHS) GLYCERINE. MAKE SURE THE SYSTEM IS THOROUGHLY PURGED BEFORE LETTING ANYONE DRINK THE DISPENSED WATER. SEE STEPS 8 AND 9.**

8. The display should blink the message: "SYSTEM" "PURGE" "DO NOT" "DRINK." Purge cycle starts automatically. Clear the dispensing bay of obstacles as water will come out of the dispensing valves and into the drain basin. Discard all water dispensed until purge cycle is over. Cycle is over when the display blinks "INSERT" and "COIN" or the amount for one gallon.

Several minutes into the purge cycle, check the following:

- a) Pressure gage at the R.O. pump on the base of the cabinet (dia. 10) should read between 140 and 180 psi with the pump running. If it is not within range, adjust back pressure valve to return reading to 160 psi. Back pressure valve is located near the drain outlet. Unscrew cap (dia. 1) and loosen lock nut. Turn adjusting bolt into valve for higher back pressure and vice versa. Tighten lock nut and replace cap.
  - b) Visually note any leaks in the system. At about 55 minutes into the purge cycle, the dispensing valves will open again. Check for leaks on the dispensing side at this time.
9. Take a sample of the dispensed water after the purge cycle is over. Smell the water to ensure no odor is present. If there is, dispense water from both bays until water is free of odor.
10. The water is ready for vending.

**ATTENTION: MEASURE THE INITIAL FLOW RATE OF THE PRODUCT WATER FROM THE REVERSE OSMOSIS MEMBRANE WITHIN 24-48 HOURS OF NEW MACHINE OPERATION. SEE SECTION ON R.O. MEMBRANE FOR PROCEDURE. THIS IS IMPORTANT AS IT DETERMINES WHEN MEMBRANE NEEDS TO BE CLEANED IN THE FUTURE (SEE p. 19).**

**ATTENTION: TO REDUCE BIOFOULING, IT IS RECOMMENDED THAT A MINIMUM OF 12 GALLONS BE VENDED EVERY 72 HOURS. THE LESS THE IDLE TIME BETWEEN VENDS, THE LESS LIKELY BIOFOULING IS TO OCCUR IN THE R.O. MEMBRANE AND THE FILTERS.**

## MAINTENANCE SCHEDULE

Maintenance frequency of the vending machine depends on the use of the machine and the feed water quality. The best way to determine when filters and other components should be changed is to keep a log of tests done and the date and gallon reading at which they are done. For additional information on maintenance of the components, please refer to the appropriate sections in the manual.

**WARNING: REPLACE COMPONENTS ONLY WITH ORIGINAL FACTORY REPLACEMENTS. COMPONENTS OF DIFFERENT BRANDS MAY NOT WORK PROPERLY WITH OTHER PARTS IN THE MACHINE AND MAY CAUSE DAMAGE TO THEM AND TO THE HEALTH OF YOUR CUSTOMERS.**

COMPONENT	TEST	REPLACE/CLEAN FREQUENCY	FAILURE MODE
(1) Sediment filter [A]	Visual, change when dirt penetrates more than 2/3 of the filter or when pressure differential is 10 psi or more, whichever is first. <b>CHECK WEEKLY.</b>	Establish frequency from test, but replace at least once a month.	Clogged, and cause a pressure drop large enough to shut off the R.O. pump, reducing yield of the R.O. membrane to a trickle.
(2) Carbon filter [B]	Use free chlorine test kit. Free chlorine level should be less than .1 ppm. <b>TEST AT 5 GAL 10,000 GAL 15,000 GAL AND 18,000 GAL AFTER EVERY REPLACEMENT.</b>	Replace at any trace of free chlorine (.1 ppm or higher) but no less frequently than once every 20,000 gallons or every three months, whichever comes first.	Any chlorine not contained by the carbon filter will leak to the R.O. membrane and cause irreparable damage to it.  <b>ALWAYS REPLACE THE CARBON FILTER BEFORE ITS TIME. A DAMAGED R.O. MEMBRANE COSTS OVER TEN TIMES MORE TO REPLACE THAN A CARBON FILTER.</b>
	Gallon reading is taken from the water meter located directly after the carbon filter. Collect water sample from valve after the water meter (dia. 5).		

COMPONENT	TEST	REPLACE/CLEAN FREQUENCY	FAILURE MODE
(3) Reverse osmosis (R.O.) membrane [C]	Microprocessor monitors total dissolved solids (TDS) removal capability; owner needs to RECORD FLOW RATE OF PRODUCT WATER 24-48 HOURS INTO NEW MACHINE/NEW MEMBRANE USE. EVERY TWO MONTHS THE FLOW RATE IS TO BE MEASURED and if the rate is lower than the initial rate by at least 15%, temperature compensated, the membrane needs cleaning (see section on R.O. membrane, p.19).	Clean at least once a year. See cleaning procedure in section on R.O. membrane. Replace if both acid and alkaline cleaning do not return flow rate or TDS to normal levels, indicating membrane damage.	Clogged, either through mineral or biofouling, thereby reducing yield, or damaged by chlorine, thereby raising, TDS level in the product water.

**WARNING: FLUSH ALL REPLACEMENT MEMBRANES BEFORE USING. UNPLUG MACHINE AND FOLLOW STEPS 6 TO 10 OF THE INSTALLATION PROCEDURE REGARDING SYSTEM FLUSHING(SEE p.9).**

**ATTENTION: TO REDUCE BIOFOULING, IT IS RECOMMENDED THAT A MINIMUM OF 12 GALLONS BE VENDED EVERY 72 HOURS. THE LESS THE IDLE TIME BETWEEN VENDS, THE LESS LIKELY BIOFOULING IS TO OCCUR IN THE R.O MEMBRANE AND THE FILTERS.**

COMPONENT	TEST	REPLACE/CLEAN FREQUENCY	FAILURE MODE
4) Vent filter [D]	Open cap on filter and visually inspect for dirt accumulation.  CHECK MONTHLY.	Replace as required and at least once a year.  KEEP FILTER DRY. A WET FILTER IS A CLOGGED FILTER.	Clogged, and cause the pump to draw vacuum in the water storage tank, which may collapse and crack tank.
(5) Polishing filter [E]	Check by tasting the vended water; replace when odor is detected in the dispensed water.  CHECK MONTHLY.	Replace as required and at least once every three months.	
(6) Ultra-violet (U.V.) sterilizer	Fully automatic. LED light on side of sterilizer indicates strength, and microprocessor will shut vending machine off if strength of sterilizer light is below the required level.  CHECK LED MONTHLY.	Clean quartz sleeve and U.V. probe when LED turns yellow or red. If LED does not return to green, replace U.V. lamp. Quartz sleeve and U.V. probe should also be cleaned once every four months and the U.V. lamp replaced at least once a year (see ultraviolet sterilizer section for procedure).	

**WARNING: NEVER LOOK DIRECTLY INTO THE UNPROTECTED PARTS OF THE U.V. CHAMBER WHEN THERE IS POWER TO THE STERILIZER. SERIOUS BURNS TO THE SKIN AND EYES MAY RESULT.**

COMPONENT	TEST	REPLACE/CLEAN FREQUENCY	FAILURE MODE
(7) General maintenance  (See section on misc. maintenance techniques)		CLEAN AND DISINFECT CUSTOMER CONTACT SURFACES DAILY (vending bay, nozzle protector, keypad).  CLEAN AND DISINFECT DRAIN BAY ONCE A WEEK.	
	VISUALLY CHECK STRAINERS TO THE DISPENSING PUMP AND DRAIN PUMP EVERY TWO WEEKS and clean as necessary.		
	CHECK FOR LEAKS AFTER THE FIRST DAY OF OPERATION, THEN AFTER THE FIRST WEEK, THEN EVERY MONTH thereafter and reconnect with new teflon tape if necessary.		
	CHECK GENERAL OPERATION OF MACHINE EVERY TWO WEEKS.		
(8) Water quality test	COLIFORM TEST OF INCOMING AND VENDED WATER EVERY SIX MONTHS. Have test done by a certified water testing lab.		



The following is a sample maintenance log that should be kept for this machine:

Maintenance procedure	Test result/ cleaning performed	Date/gal reading	Test result/ cleaning performed	Date/gal reading
1) Sediment filter				
2) Carbon filter				
3) R.O. membrane				
BASE FLOW RATE:				
_____				
4) Vent filter				
5) Polishing filter				
6) U.V. sterilizer				
7) Water quality test				

## MAINTENANCE PARTS

<u>PART</u>	<u>PART NUMBER</u>
SEDIMENT FILTER	182155
CARBON FILTER	182151
POLISHING FILTER	182153
REVERSE OSMOSIS (R.O.) MEMBRANE	182093
MEMBRANE CLEANING START-UP KIT (INCLUDES ONE 20" HOUSING, ONE ALKALINE AND ONE ACID CLEANING CARTRIDGE)	880902
ACID CLEANING CARTRIDGE	182240
ALKALINE CLEANING CARTRIDGE	182241
AIR VENT FILTER	182150
REPLACEMENT ULTRAVIOLET LAMP	182201
QUARTZ SLEEVE	182202
O-RING FOR QUARTZ SLEEVE	182203

## FILTER MAINTENANCE

There are three water filters and one air filter in every machine. Observe the following procedure when changing filters:

### A. WATER FILTER REPLACEMENT

**WARNING: CARBON FILTER HOUSING IS HEAVY. BE CAREFUL AND ANTICIPATE THE WEIGHT WHEN REMOVING IT.**

- 1) Before unscrewing the filter housing to change a filter, shut off water supplied to the filter and relieve line pressure by opening a nearby valve.

FOR SEDIMENT PREFILTER AND CARBON FILTER replacement, shut off main water valve (dia. 2) and relieve pressure by opening either one of the PVC sampling valves near the filters. Close sampling valve after flow stops.

FOR POLISHING FILTER replacement, shut off the water tank PVC ball valve (dia. 3) and relieve pressure by vending 1/2 gal. of water. Unplug dispensing pump from the power outlet (dia. 4) after the vend stops.

- 2) Remove and discard old filter.
- 3) Scrub filter housing clean and rinse with clean water.
- 4) Insert the new cartridge. There are rubber washers on the top and bottom of the carbon filter. Make sure they stay in place.
- 5) Filter housing should be screwed on hand tight only. Make sure cartridge filter is lined up with the top and bottom posts in the housing and the o-ring in the housing is clean, properly seated and lubricated.

**ATTENTION: O-RING SHOULD BE LUBRICATED WITH FOOD GRADE GREASE ONLY.**

- 6) Open the water supply valves previously shut off.

AFTER REPLACING THE POLISHING FILTER, plug the dispensing pump back into the power outlet and reset the computer. Then purge air trapped in the system by vending water at both bays until the amount of water dispensed is what it should be. Air trapped in the tubings during filter replacement will cause machine to vend less than it should.

- 7) Run system and check for leaks around the housing. Perform a free chlorine test if the carbon filter is replaced to check if any leakage around the cartridge is present.

**B. AIR VENT FILTER INSPECTION AND REPLACEMENT**

- 1) Cap on filter housing can be snapped off for maintenance check. Remove the sponge-like coarse filter in the housing and inspect filter paper inside for dirt (dia. 15). Replace filter when the white filter paper turns grayish or when coarse filter is clogged.
- 2) To replace, unscrew the complete housing from the elbow fitting and discard. Wrap teflon tape on the threads of the new housing and screw housing on hand tight.

## **REVERSE OSMOSIS (R.O.) MEMBRANE**

In normal operation, a reverse osmosis membrane can become fouled by microorganisms, suspended solids and minerals in the water. It is time to clean the membrane when these elements cause a 15% drop in the product water flow rate, after compensating for temperature differences. It is important, therefore, to establish a base flow rate of a new membrane so future measurements can be compared.

This base measurement is taken during the first 24-48 hours into the operation of a new membrane. Every two months thereafter, the rate of flow of the product water from the membrane should be measured and compared. It is also important to measure the temperature of the incoming water as the flow rate decreases with temperature decrease. This is normal and should not be confused with membrane fouling.

### **A. PRODUCT WATER FLOW RATE MEASUREMENT**

Tools needed:

thermometer for measuring water temperature  
one gallon container  
stop watch  
calculator

1. We need to establish the incoming water temperature. Check if the R.O. pump on the cabinet base is running. The pressure gage at the pump should indicate about 160 psi. If pump is not running, vend three gallons of water. Wait until pump has run for at least one minute and then take a sample of water from the sampling valve prior to the sediment filter and measure its temperature.
2. Vend three gallons of water to allow the system to charge. During vend, have a stop watch and a gallon jug ready and disconnect the white 3/8" O.D. tubing going into the water storage tank. To disconnect tubing, push down on the ring in the fitting and then pull at the tubing (dia. 9). The water coming out of this tubing is the product water from the R.O. membrane. Start the stop watch and measure the time (in seconds) to fill the gallon container with this water.
3. Replace tubing by pushing it back into the fitting completely.
4. Find the temperature correction factor (TCF) from Table 1 (see p.21).

5. The base flow rate can be calculated as follows:

$$\text{BASE FLOW RATE} = (\text{TIME IN SECONDS TO FILL ONE GALLON}) / (\text{TCF})$$

**EXAMPLE:** if the temperature of the water is 68 degrees F and it takes 71 seconds to fill a gallon,

TCF from Table 1 for 68 deg. F is 1.19,

$$\begin{aligned} \text{base flow rate} &= 71 / 1.19 \\ &= 59.66 \end{aligned}$$

The base flow rate is the flow rate during the first 24-48 hours of the operation of a new membrane/ new machine. It may be different for every membrane. Write down the base flow rate for your particular machine on your maintenance sheet.

6. We recommend that the product water flow rate be checked every two months. Follow steps 1 through 4 and obtain a new TCF and a new time (in seconds) to fill one gallon. With the new TCF find the cleaning limit. The membrane needs cleaning when the new time to fill one gallon exceeds the cleaning limit.

$$\text{CLEANING LIMIT} = (\text{new TCF}) \times (\text{BASE FLOW RATE}) \times 1.17$$

**EXAMPLE:** if the new temperature is 79 degrees F and it now takes 63 seconds to fill a gallon,

TCF from Table 1 for 79 deg. F is 0.97 and from the above example, the base flow rate for our membrane is 59.66,

$$\begin{aligned} \text{cleaning limit} &= 0.97 \times 59.66 \times 1.17 \\ &= 67.71 \end{aligned}$$

Since it only takes 63 seconds to fill our gallon (less than cleaning limit of 67.71), cleaning is not required yet. It would, however, be prudent to order the cleaning kit at this time.

**TABLE 1: TEMPERATURE CORRECTION FACTOR (TCF)**

<b>DEGREES F</b>	<b>TCF</b>	<b>DEGREES F</b>	<b>TCF</b>
40	2.69	76	1.02
41	2.58	77	1.00
42	2.47	78	0.98
43	2.36	79	0.97
44	2.27	80	0.95
45	2.20	81	0.93
46	2.13	82	0.92
47	2.07	83	0.90
48	2.01	84	0.88
49	1.95	85	0.87
50	1.89	86	0.85
51	1.83	87	0.84
52	1.77	88	0.82
53	1.71	89	0.81
54	1.66	90	0.79
55	1.63	91	0.78
56	1.59	92	0.76
57	1.55	93	0.75
58	1.51	94	0.74
59	1.47	95	0.73
60	1.43	96	0.72
61	1.38	97	0.71
62	1.36	98	0.70
63	1.33	99	0.68
64	1.30	100	0.67
65	1.27	101	0.66
66	1.25	102	0.65
67	1.22	103	0.64
68	1.19	104	0.63
69	1.17	105	0.62
70	1.15	106	0.61
71	1.12	107	0.60
72	1.10	108	0.59
73	1.09	109	0.58
74	1.07	110	0.57
75	1.04	111	0.56

**B. MEMBRANE CLEANING**

**WARNING: HANDLE CARTRIDGES WITH CARE. WEAR EYE PROTECTION, GLOVES AND PROTECTIVE CLOTHING WHEN INSTALLING AND REMOVING CLEANING CARTRIDGES.**

**ATTENTION: WHETHER THE R.O. MEMBRANE NEEDS ACID OR ALKALINE CLEANING WILL DEPEND ON THE TYPE OF FOULANT. ACID CLEANING REMOVES MINERAL SCALING AND ALKALINE CLEANING REMOVES ORGANIC FOULING. IT IS RECOMMENDED, HOWEVER, THAT ACID CLEANING BE PERFORMED FIRST EVEN IF ALKALINE CLEANING IS DESIRED. IF SYSTEM PERFORMANCE RECOVERS WITH ACID CLEANING, THEN ALKALINE CLEANING IS NOT NECESSARY.**

**ATTENTION: YOUR DISTRIBUTOR SELLS A CLEANING STARTER KIT, WHICH INCLUDES A 20" HOUSING, TUBINGS, AN ACID CLEANING CARTRIDGE, AND AN ALKALINE CLEANING CARTRIDGE. FOR SUBSEQUENT CLEANINGS, YOU CAN REUSE THE HOUSING AND THE TUBINGS AND ORDER ONLY THE CLEANING CARTRIDGES. ON THE CLEANING CARTRIDGE, THE SIDE WITH THE WASHER IS THE SIDE THAT FACES UP.**

1. Remove the cap on the back pressure valve and loosen the lock nut on the adjusting bolt (dia. 1).
2. Vent 3 gallons of water from either bay.
3. With the R.O. pump (located at the base of the cabinet, dia. 10) running, turn adjusting bolt on the back pressure valve until the pressure shown on the pump gage drops to between 20 and 50 psi. Tighten locknut and replace cap on the back pressure valve.
4. Shut off main water valve (dia. 2) and relieve system pressure by opening the PVC sampling valve after the carbon filter (dia. 5). Close sampling valve after the flow stops.



5. Unplug 1/2" OD tubing at the outlet of the R.O. pump (dia. 10) and plug into the OUTLET of the 20" filter housing. See section D of "Miscellaneous Maintenance Techniques" (p.27) for instructions on tubing removal and assembly. Plug the 1/2" OD tubing at the INLET of the 20" filter housing into the outlet of the pump.
6. Detach the 3/8" OD tubing entering the water storage tank at the sampling valve cluster end only. The tubing is shown in (dia. 9) the cluster end is the opposite end of the tubing shown. Attach the extended length 3/8" OD tubing supplied in the kit to the cluster and direct the other end of this tubing into the drain bay. The easiest way to do that is to remove the drain bay locking pin (dia.13) and insert the outlet end of the tubing into the pin hole.
7. Vend 3 gallons of water from either bay.
8. Open the main water valve and watch the R.O. pump. The pump will start in 30 seconds. Wait another 30 - 40 seconds and shut off the main water valve.
9. Unplug the vending machine and put up a sign for "cleaning, do not use". Let the membrane soak in the solution for 8 to 16 hours.
10. Open the PVC sampling valve after the carbon filter for a few seconds and close it. Remove the 20" housing and reattach the original 1/2" tubing to the outlet of the R.O. pump. Clean and save the 20" housing for the next cleaning and discard the cartridge.
11. Plug vending machine back in and open main water valve. The machine will go through its purge cycle automatically. Wait until the R.O. pump has run for **AT LEAST TEN MINUTES** before removing cap and loosening the locknut on the back pressure valve. With the pump running, adjust the pressure valve until the pressure on the pump gage reads 160 psi. Tighten the locknut and replace the cap on the valve.
12. Shut off main water valve. Remove and save the extended length 3/8" OD tubing for future cleanings. Reattach the original 3/8" OD tubing to the sampling valve cluster. Replace the drain bay locking pin. Open main water valve.
13. Reset the microprocessor.
14. Wait 24-48 hours and measure the base flow rate of the cleaned membrane as detailed in steps 1 through 5 of section A (p.19-p.20). The new base flow rate should be similar to the original one. If not, alkaline cleaning should be performed. The procedure for alkaline cleaning is the same as for acid cleaning except an alkaline cleaning cartridge is used instead.

### C. STORAGE AND SHIPPING OF MEMBRANE

**ATTENTION: IF THE MEMBRANE IS TO BE SHIPPED OR IF THE MACHINE IS TO BE LEFT IDLE FOR FIVE DAYS OR MORE, PRESERVATIVES MUST BE ADDED TO THE R.O. MEMBRANE TO KEEP IT MOIST AND FREE FROM BACTERIAL GROWTH.**

**WARNING: OBSERVE ALL RELEVANT PRECAUTIONS WHEN HANDLING CHEMICALS. WEAR PROTECTIVE CLOTHING, GLOVES AND EYE PROTECTION.**

1. Vent six gallons of water into a container for mixing the preservative solution. Remember this water is going into the R.O. membrane and cannot contain chlorine. Water from the sampling valve **AFTER** the carbon filter is also acceptable.

**WARNING: CHLORINE WILL IRREPARABLY DAMAGE THE R.O. MEMBRANE.**

2. Disconnect electrical power to the machine.
3. Shut off main water valve at the inlet of the machine.
4. Relieve pressure in the system by opening the sampling valve after the carbon filter. Close it after flow stops.
5. Disconnect 1/2" O.D. tubings at the outlet of the R.O. pump (dia. 10) and at the inlet of the back pressure regulator (dia. 1). Disconnect the tubing by depressing the ring on the fitting and then pulling at the tubing (demonstration of technique in dia. 9). Water will begin to flow out from the bottom tubing. Drain the R.O. housing of water.
6. Fill membrane and membrane housing with a 2% by weight of food grade sodium bisulfite solution. In months when there is a possibility of freezing, add 20% by weight of glycerine to the solution. This is the equivalent of 2.7 ounces of sodium bisulfite and 27 fluid oz. of glycerine for every gallon of water. Let membrane soak for a few minutes and drain.
7. Plug all tubings and if shipping, put both membrane and housing into a sealed bag to prevent leakage.

**WARNING: FLUSH ALL PRESERVATIVES IN THE MEMBRANE BEFORE USING MEMBRANE AGAIN. UNPLUG MACHINE AND FOLLOW STEPS 6 TO 10 OF THE INSTALLATION PROCEDURE (p.9-p.10) REGARDING SYSTEM FLUSHING. IT IS IMPERATIVE THAT THE PRESERVATIVES ARE COMPLETELY FLUSHED AND DISCARDED AS SOME INDIVIDUALS MAY BE ALLERGIC TO THEM.**

## ULTRAVIOLET (U.V.) STERILIZER

The U.V. sterilizer contains a true U.V. sensor that continually monitors the sterilization power of the unit. When the LED display of the sensor changes from green to yellow or red, it is time to clean the quartz sleeve and the U.V. probe. If the cleaning does not return the LED display to green, replace the lamp. The average life of a lamp is one year of continuous use. It is also recommended that the quartz sleeve and the U.V. probe be cleaned once every four months.

**WARNING: NEVER LOOK DIRECTLY INTO THE UNPROTECTED PARTS OF THE U.V. CHAMBER WHEN THERE IS POWER TO THE STERILIZER. SERIOUS BURNS TO THE EYE AND SKIN MAY RESULT. ALWAYS UNPLUG POWER TO THE STERILIZER BEFORE WORKING ON IT.**

### **A. ULTRAVIOLET LAMP REPLACEMENT PROCEDURE**

1. Unplug both the sterilizer and the vending machine.
2. Remove one screw at each end on the cover of the sterilizer. Swing cover open and pull it off its hinge.
3. Open the snap lid of the sleeve bolt (black plastic knob at the top of the U.V. cell) by inserting a screwdriver into one of the slots at the side of the bolt and prying the lid open (dia. 11).
4. Carefully ease out the socket from the quartz sleeve with the lamp attached and unplug the socket and pull the lamp out completely.
5. Replace with new lamp. Carefully hold lamp at the ends to avoid touching the lamp glass. Skin oil from contact with fingers will prevent proper U.V. radiation. Wipe off lamp with alcohol if contact occurs.
6. Plug lamp into the socket and gently lower the lamp completely into the quartz sleeve.
7. Replace the snap lid.
8. Slide cover back onto its hinge and swing it close. Replace top and bottom screws.

**ATTENTION: STERILIZER WILL NOT OPERATE CORRECTLY WITHOUT THE COVER PROPERLY CLOSED.**

9. Plug in sterilizer and vending machine and reset the microprocessor. The LED monitor light should show a steady green glow.

## B. QUARTZ SLEEVE AND U.V. PROBE CLEANING PROCEDURE

1. Relieve pressure in the sterilizer by vending 1/2 gallon of water. During vend, shut off water tank PVC ball valve. Unplug vending machine and sterilizer.
2. Unscrew the polishing filter housing and put a container underneath the housing cap to catch water.
3. Remove U.V. lamp as in steps 1 to 4 of lamp replacement procedure.
4. Insert the supplied bolt sleeve removal tool into the notches of the bolt sleeve. Unscrew and remove bolt sleeve. Carefully extract the quartz sleeve and o-ring from the U.V. chamber (dia. 12).

**ATTENTION: IN MANY CASES AFTER THE STERILIZER HAS BEEN IN USE FOR SOME TIME, THE O-RING WILL TEND TO ADHERE TO THE QUARTZ SLEEVE. THIS PRESENTS NO PROBLEM IF LEFT ALONE. HOWEVER, IF THE O-RING IS REMOVED FROM THE SLEEVE, A NEW REPLACEMENT IS STRONGLY RECOMMENDED, AS THE SURFACE OF THE OLD O-RING COULD BE DAMAGED AND BE THE CAUSE OF LEAKAGE.**

5. Clean the quartz sleeve by wiping it with a cloth soaked in a mildly acidic solution such as vinegar or citric acid.
6. The U.V. probe should also be cleaned at this time. The probe is located at the side of the U.V. chamber. Unplug the white plastic connector to the probe and unscrew the probe body from the chamber. Clean it in the same manner as the quartz sleeve. When reassembling the probe, insert the o-ring on the quartz rod, then screw the probe into the port and tighten snugly. Plug the white connector back in.
7. Gently lower the sleeve and the sleeve o-ring back into the U.V. chamber. Secure by replacing and tightening the sleeve bolt.
8. Replace the polishing filter housing and open the water tank valve.
9. Replace the U.V. lamp and cover as in steps 5 through 9 of the lamp replacement procedure (p.25). Wipe lamp with alcohol if there is skin contact with it.
10. Vend water from both bays to check for leaks and to purge the air in the system. System is purged of air when water dispensed is what it should be. Air trapped in the sterilizer and the tubings will cause the machine to vend less than it should.

## **MISCELLANEOUS MAINTENANCE TECHNIQUES**

### **A. DRAIN BAY CLEANING**

1. Unplug power to vending machine.
2. Open vending machine door and unplug the float switches on the side of the drain bay from their connectors (dia. 4).
3. Pull out the 3/8" locking pin that holds the drain bay to the dispensing bay (dia. 13).
4. Slide drain bay away from door to gain access for cleaning.
5. Slide drain bay back and replace locking pin.
6. Plug float switches back into their connectors. Plug power back into vending machine and reset the microprocessor.

### **B. DISPENSING/ DRAIN PUMP STRAINER CLEANING**

1. For dispensing pump strainer cleaning , shut off the water tank ball valve. For drain pump strainer cleaning, proceed directly to step 2.
2. Unplug pump.
3. Twist the transparent housing of the strainer counterclockwise to remove. Do not lose the o-ring on the strainer (dia. 14).
4. Clean strainer and replace the o-ring and the housing. Plug pump back into the socket.
5. For dispensing pump strainer cleaning only, vend water until air introduced into the tubing is purged. This is achieved when the amount vended is what it should be. Air will cause the vend to be less.

### C. VENDING NOZZLE ADJUSTMENT

Dispensing nozzles can be adjusted to direct water into the center of each bay. Nozzles come from the factory already adjusted. If flow is severely off center, it may indicate the machine is not level. Check machine before adjusting nozzles.

1. Determine from the front of the machine which way the nozzle is aiming at. Let's say it is too far right and forward.
2. Open vending machine door and stand behind it. Facing the nozzle adjustment bolts, loosen the left and right mounting bolts (dia. 8). From the back of the door, tap solenoid mounting bracket to **YOUR LEFT** to correct a flow too far to the right (when looking at flow from front of door) and vice versa.
3. Fore and aft adjustments are corrected by loosening and tightening the fore and aft bolts. Loosen the lock nuts on the adjusting bolts. If flow is too far forward, loosen the bolt **FARTHER FROM YOU**. If bolt is already at the end of its adjustment, then tighten the other bolt. Tighten left and right mounting bolts before checking flow. Tighten lock nuts when adjustment is completed.

## D. TUBING AND FITTING REPLACEMENT TECHNIQUE

There are two types of tubing attachment methods used on this vending machine. One is the push-in type and the other is the plastic clamp type.

### ***PUSH-IN TYPE:***

To remove a push-in tubing, push ring on fitting and pull on tubing (dia. 9).

To reattach, firmly push tubing back into fitting. If tubing-fitting joint leaks because of frequent removal, cut 1/2" off the tubing and reattach.

### ***CLAMP TYPE***

To remove the clamp, use a pair of pliers and twist clamp at the side with the taller jaw (dia. 6).

To reattach, line up jaws on clamp and squeeze together tightly with a pair of pliers (dia. 7). Check for leaks.

### ***PIPE JOINTS***

There are pipe threads on a variety of components in the vending machine. The threads on them are sealed with teflon tape to prevent water leakage. If any of these components have been taken out for servicing or if the joint leaks, new teflon pipe thread seal tape will have to be put on.

**ATTENTION: USE A STRAP WRENCH TO TIGHTEN OR LOOSEN PLASTIC FITTINGS. DO NOT USE A PIPE WRENCH AS ITS TEETH MAY DAMAGE THE PART.**

1. Remove old teflon tape from component or fitting. Be careful not to allow any tape fragments to fall into tubings or fittings as they may get caught in solenoids and pumps and cause them to leak.
2. Teflon tape should be wrapped around male threads only. Starting at the second thread from the edge, wrap new teflon tape at a clockwise direction (with the threaded end facing yourself). Overlap half the width of each wrap and circle the threads twice (dia. 16).
3. Screw component or fitting back in their place. For anything plastic, hand tight plus one to 1 1/2 turns is enough. Check for leaks.

## TROUBLE SHOOTING

**NOTE:** WATER STORAGE TANK WILL NOT FILL UP COMPLETELY. THERE ARE SEVERAL INCHES OF SPACE BETWEEN WATER TANK COVER AND "FULL" WATER LEVEL.

**NOTE:** THERE IS A 30 SECOND TIME DELAY BETWEEN THE SIGNAL TO START R.O. PUMP AND THE ACTUAL RUNNING OF THE PUMP. THIS IS TO PROTECT THE PUMP FROM TURNING ITSELF ON AND OFF REPEATEDLY IN A SHORT TIME AND BURNING ITSELF OUT IN SITUATIONS OF LOW INLET PRESSURE OR HIGH OUTLET BACK PRESSURE.

### ***PROBLEM***

1) Water storage tank is not full, and R.O. pump is not running.

### ***CAUSE***

- A) No water supplied to pump.
- B) No power.
- C) Excessive outlet pressure. Pressure gauge at the outlet of the pump will indicate 190 psi or more.

### ***CORRECTION***

- A) Check if there is water going into the machine. Open inlet ball valve if it is shut off. Check operation of inlet solenoid and replace if necessary.
- B) Check to see if the machine is plugged in. Check fuses. Also, machine will not run if any one of the three safety switches is activated indicating overflow:
  - i) at the base next to the water tank,
  - ii) at the top of the drain tank,
  - iii) closest to top in the water tank.

Correct overflow situation.

C) Check for obstructions in line beyond the pump. Check drain line.

**NOTE:** IF SAFETY SWITCH AT THE VERY TOP OF THE WATER TANK IS ACTIVATED, IT INDICATES THE NORMAL "TANK FULL" SWITCH IS NOT FUNCTIONING PROPERLY. REPLACE "TANK FULL" SWITCH (SECOND FROM THE TOP OF THE WATER TANK).

**WARNING: THE R.O. PUMP WILL NOT RUN IF THERE IS MORE THAN 190 PSI IN THE LINES BEYOND IT THIS MEANS THAT BETWEEN THE PUMP AND THE OBSTRUCTION THERE IS AT LEAST 190 PSI IN THE TUBINGS. TAKE ALL PRECAUTIONS AND WEAR EYE PROTECTION WHEN WORKING ON THE PROBLEM.**



**PROBLEM**

- 2) R.O pump turns on, but without completely filling the tank, shuts itself off and 30 seconds or more later turns itself on again, and repeats the cycle. (Check this if machine is constantly running out of water even though not much is dispensed.)
- 3) Drain pump will not stop.
- 4) Drain pump will not run.
- 5) Drain pump runs but will not pump water.

**CAUSE**

- 2 A) Inadequate water inlet pressure if the gauge before sediment filter is 25 psi or less with the R.O. pump running.
  - B) Clogged filters if gauge after sediment filter drops to 20 psi or less after starting at a higher value. Pressure differential between the two gauges at the sediment filter is 10 psi or more.
- 3 A) Failed / jammed float switch at the bottom of the drain tank.
- 4 A) Drain pump needs about 1" of water before it is activated. If there is enough water, check power to pump.
  - B) Failed / disconnected drain tank bottom float switch.
  - C) Failed pump.
- 5 A) Clogged strainer.
  - B) Failed pump.

**CORRECTION**

- 2 A) Unless pressure drop is transient, a bigger pipe may be needed to bring water to the machine. A booster pump capable of 4 gpm at 35 psi supplying water to the machine is also acceptable.
  - B) Replace sediment filter. If problem persists replace carbon filter.
- 3 A) Replace switch / remove obstacle.
- 4 A) Plug pump in.
  - B) Replace / reconnect float switch.
  - C) Replace pump.
- 5 A) Clean strainer.
  - B) Replace pump.

**PROBLEM**

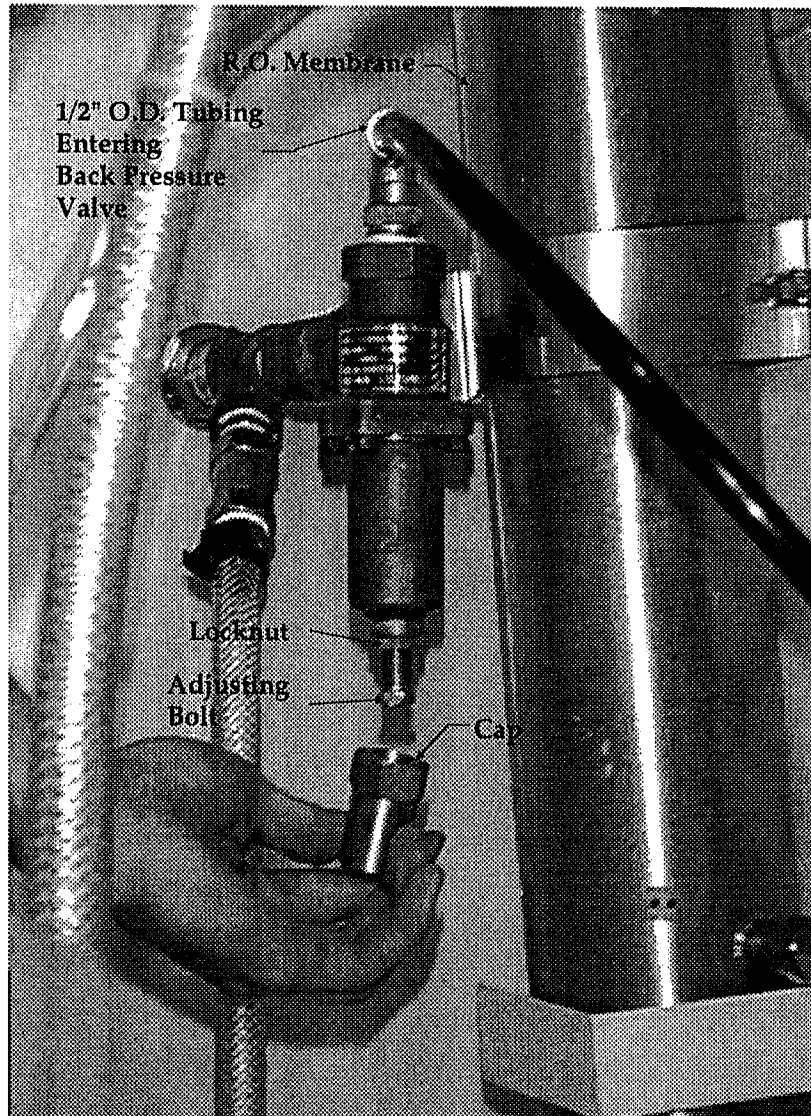
- 6) Dispensing pump runs but will not pump water.
- 7) Dispensing nozzle leak.

**CAUSE**

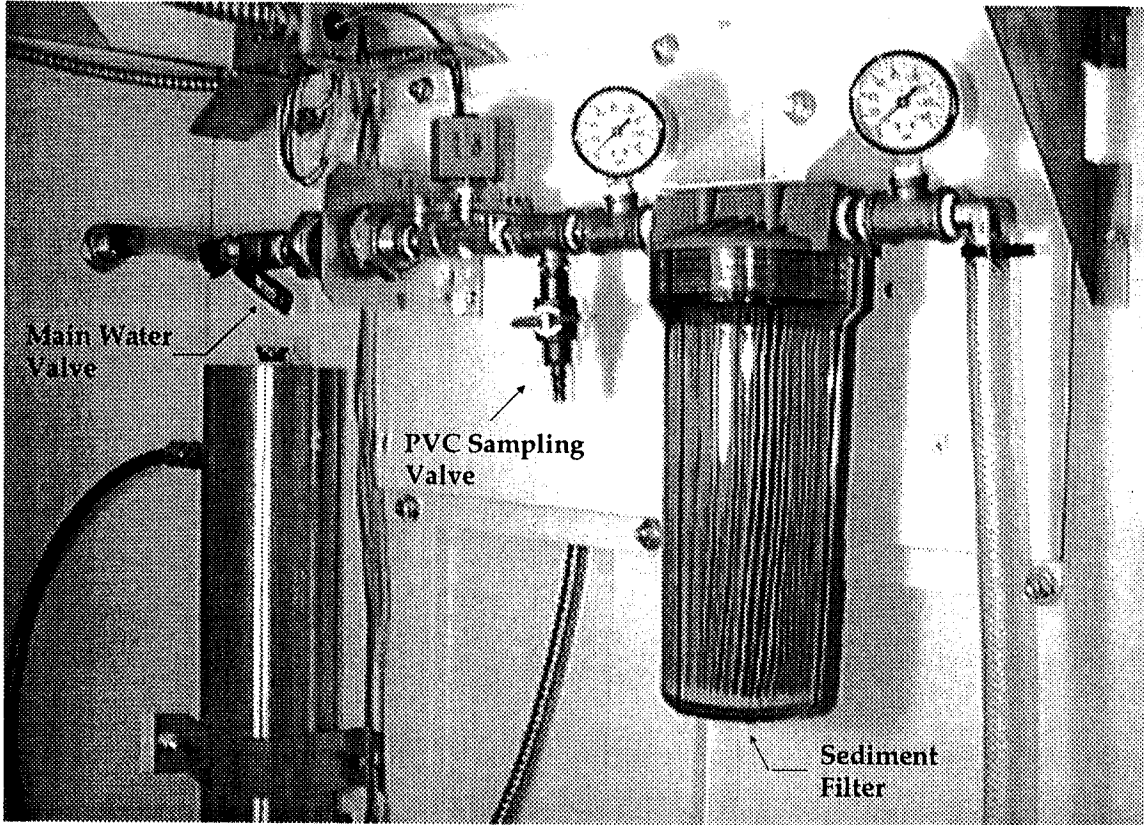
- 6 A) Water tank valve shut off.
- B) Failed pump.
- C) Clogged strainer.
- D) Failed dispensing / recirculation solenoids.
  
- 7 A) Dirt in Solenoid.

**CORRECTION**

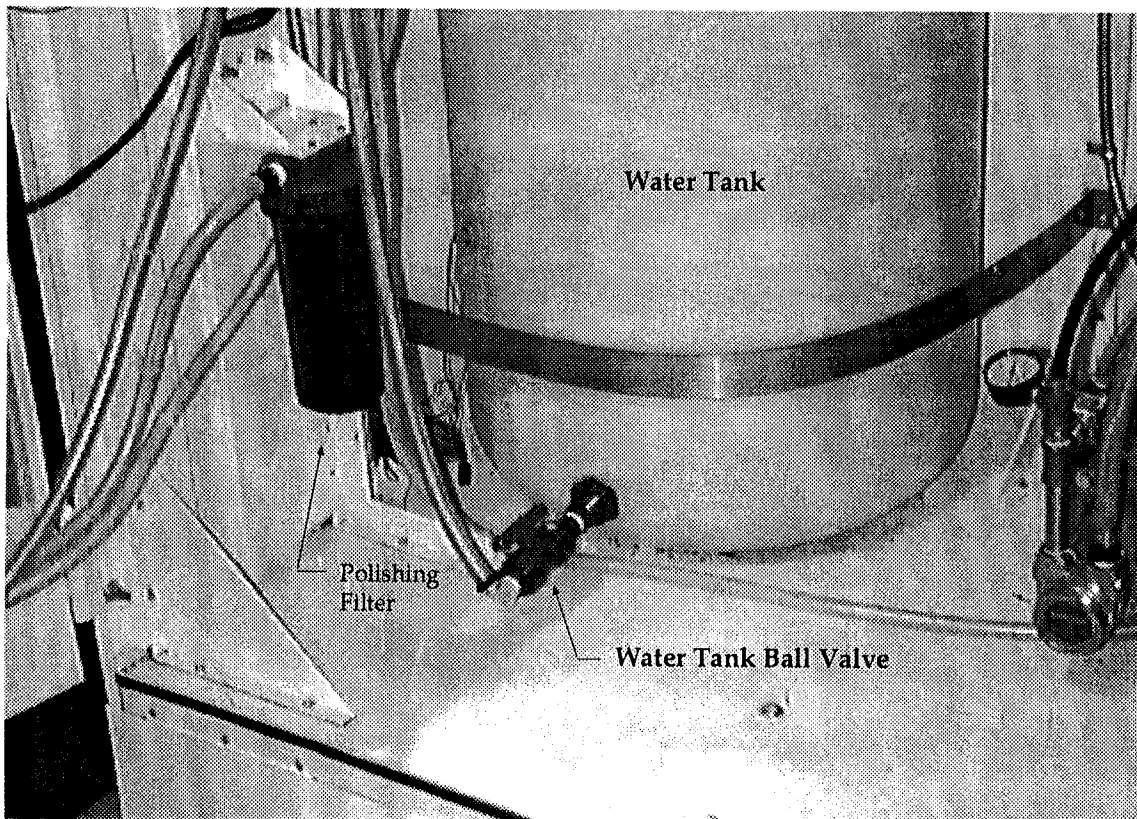
- 6 A) Open valve.
- B) Replace pump.
- C) Clean strainer.
- D) Replace solenoids.
  
- 7 A) Clean solenoid.



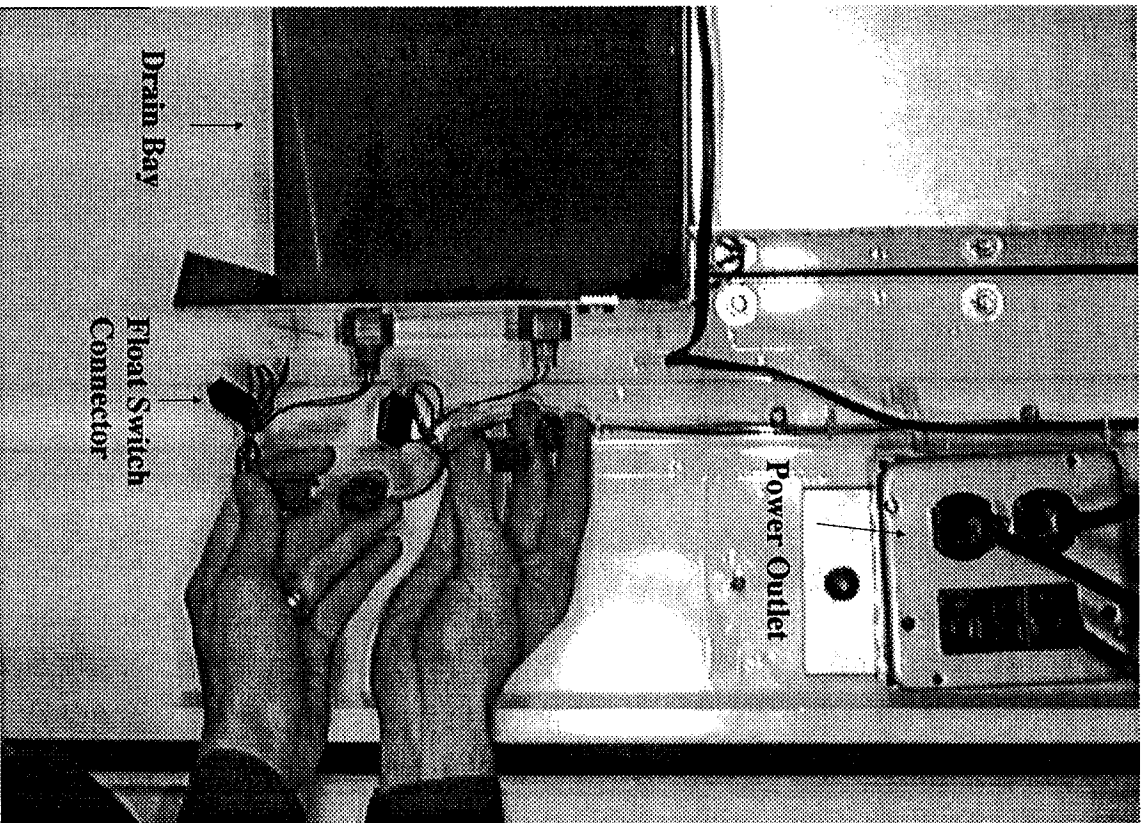
*Dia. 1 Back Pressure Valve and Reverse  
Osmosis Membrane*



*Dia. 2 Inlet Components*



*Dia. 3 Water Tank and Polishing Filter*

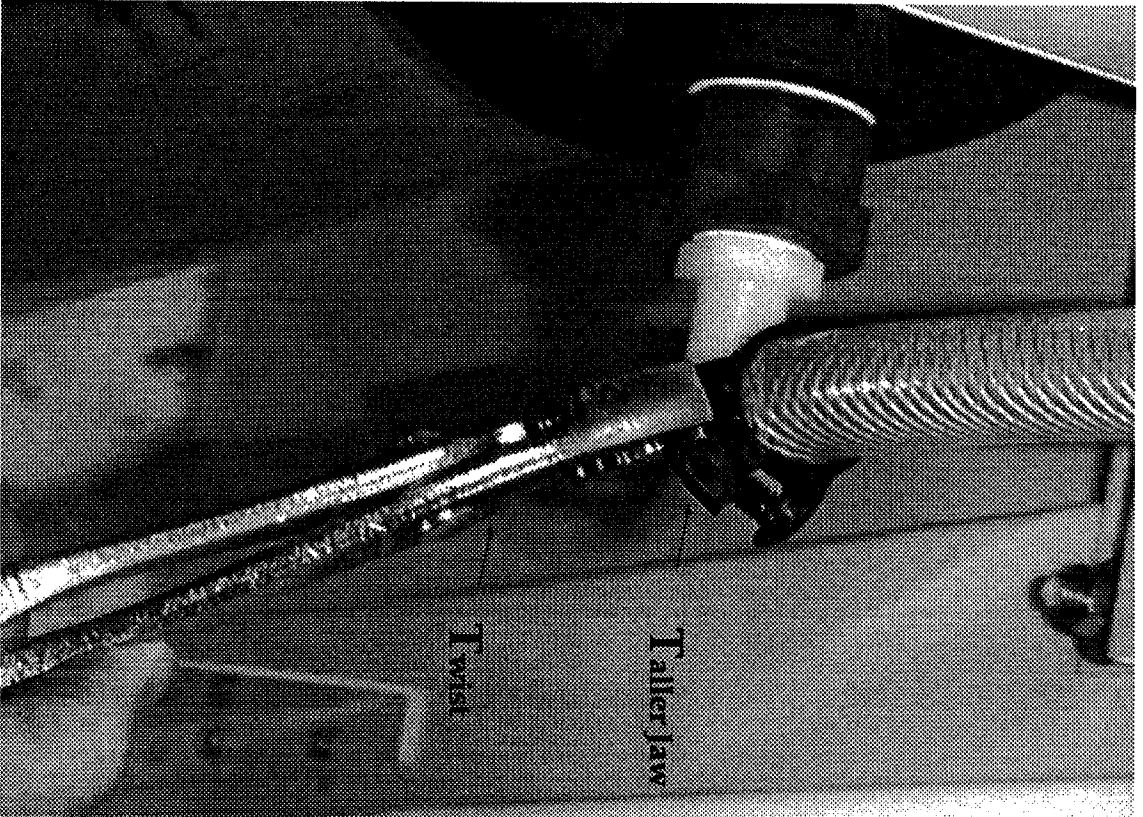


*Dia. 4 Power Outlet and  
Drain Bay Float Switch  
Connectors*

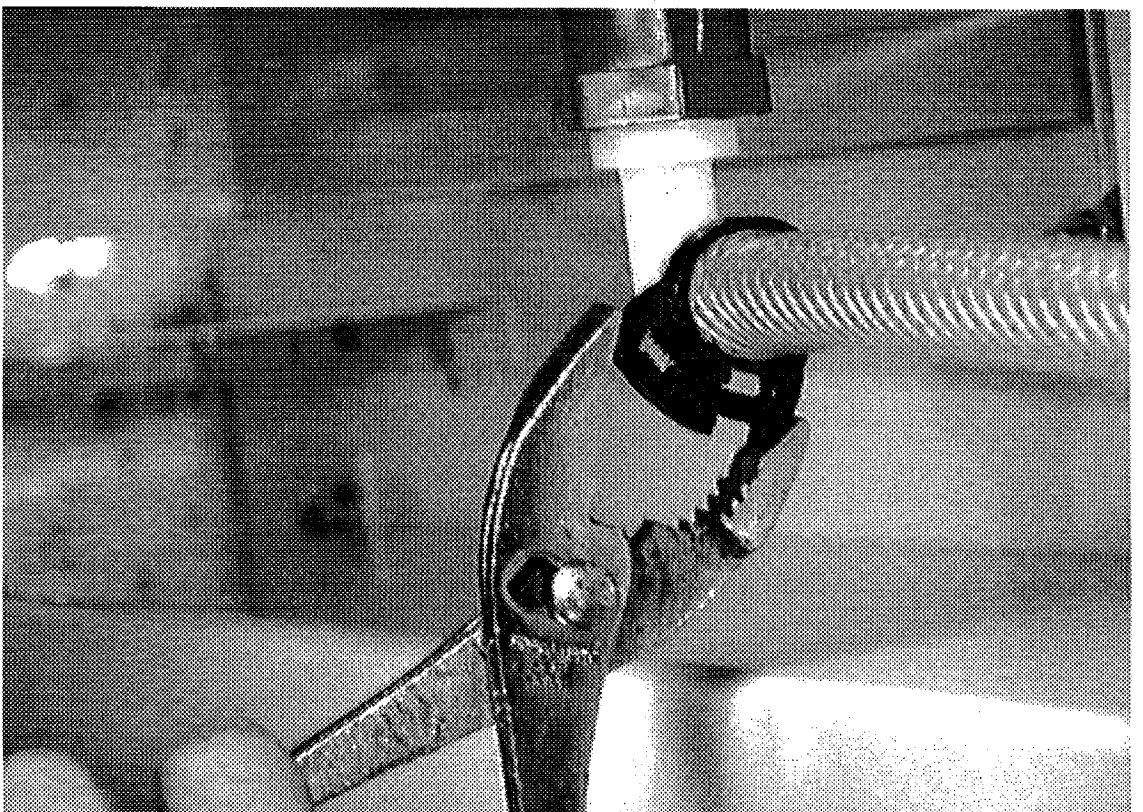


*Dia. 5 Water Meter and  
Carbon Filter Sampling  
Valve*

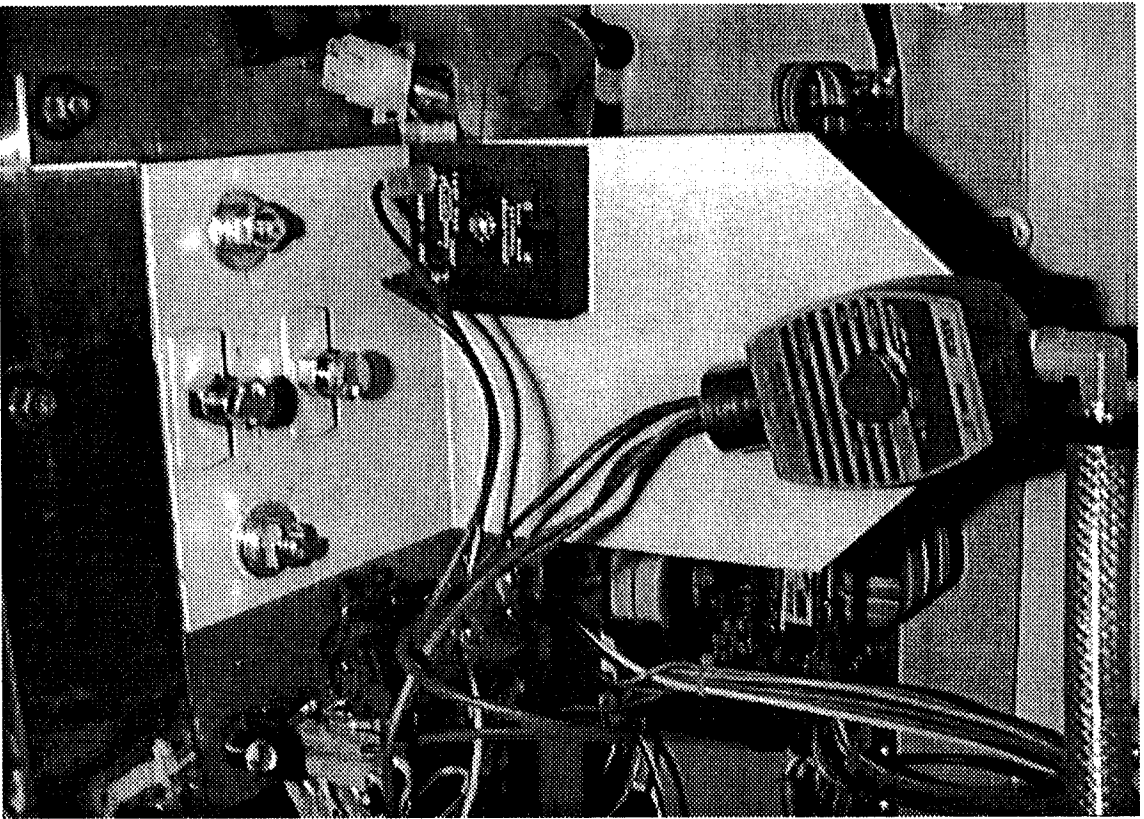




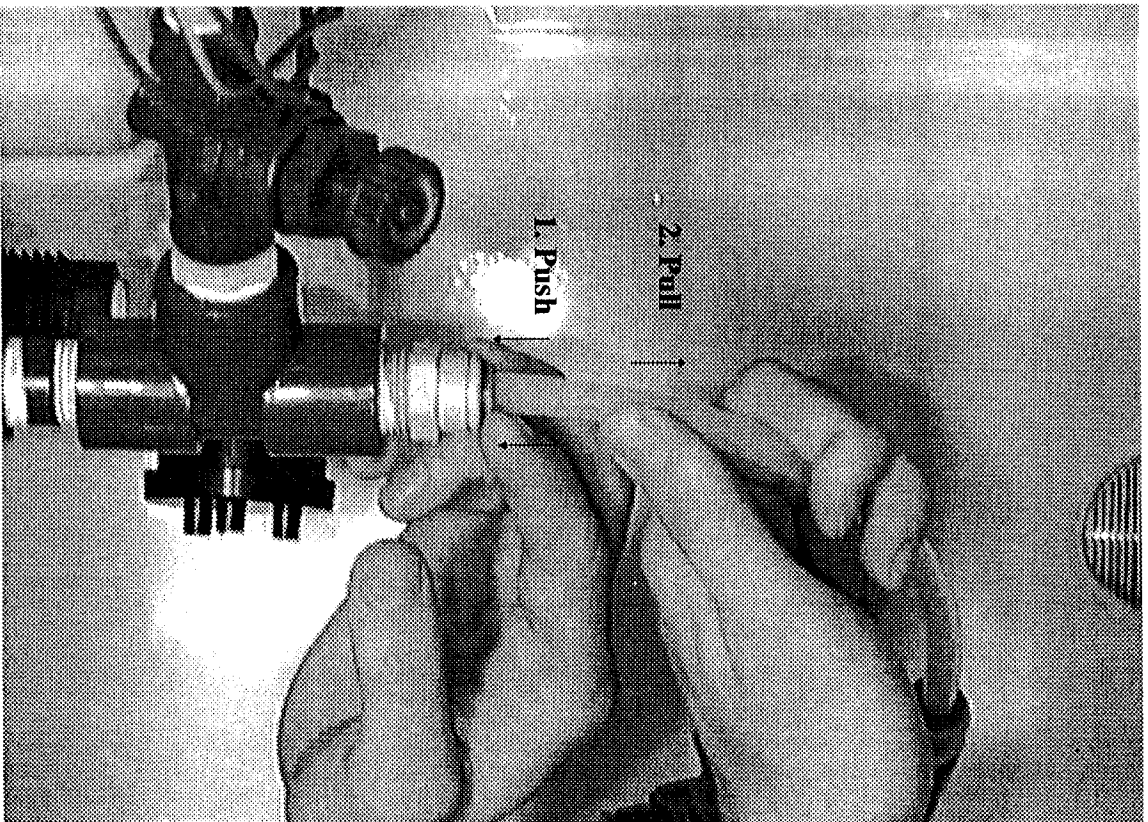
*Dia. 6 Clamp Removal*



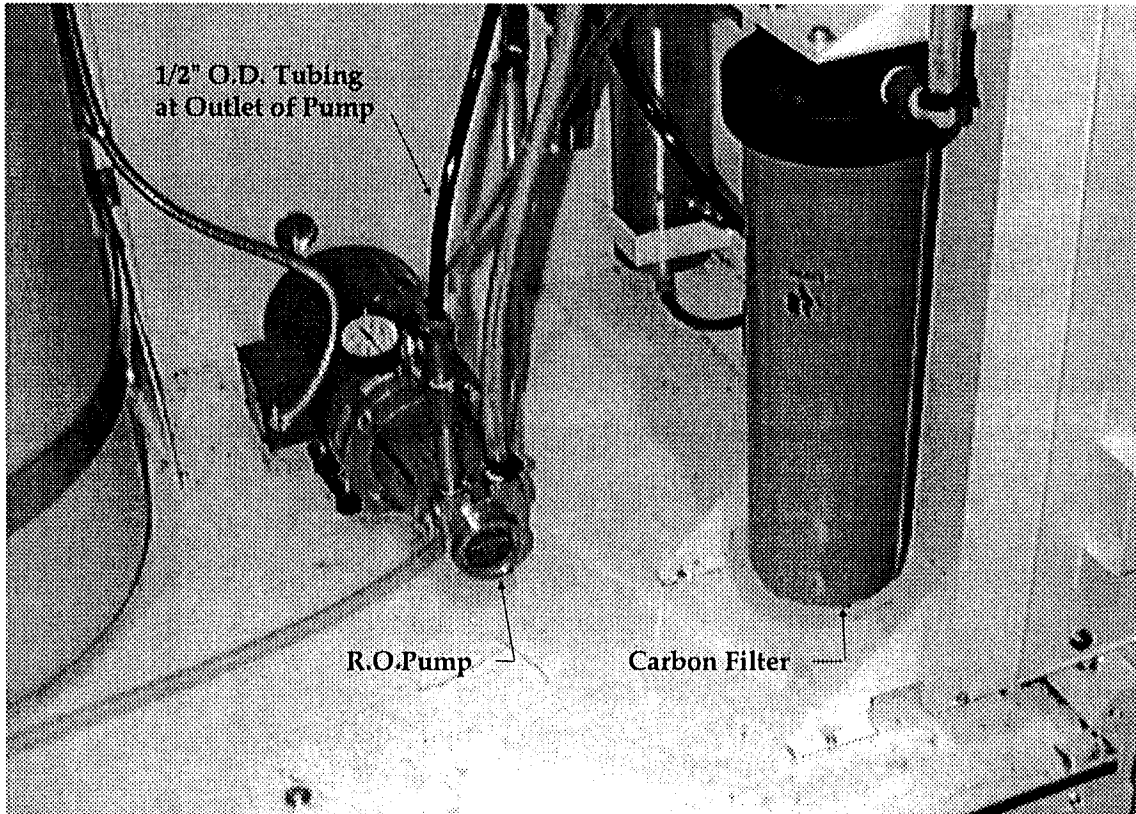
*Dia. 7 Clamp Reattachment*



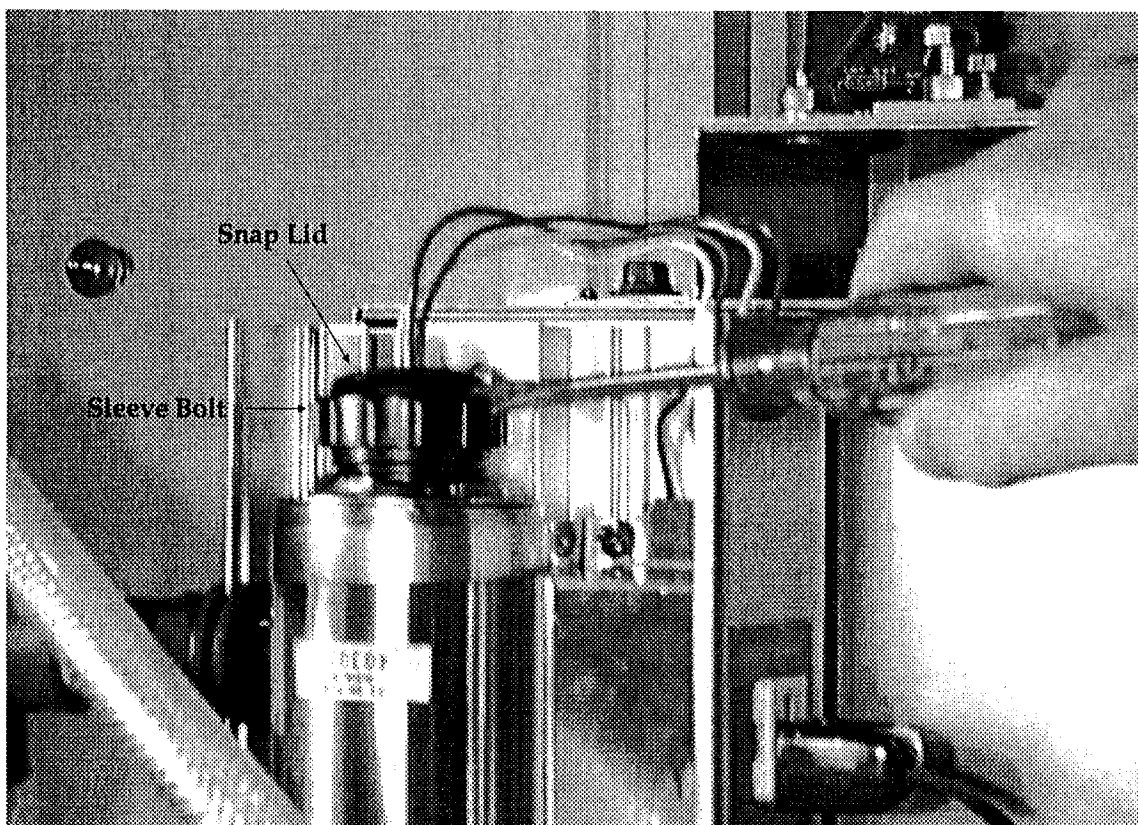
*Dia 8 Vending Nozzle  
Adjusting Bolts*



*Dia . 9 Push - in Tubing  
Removal*

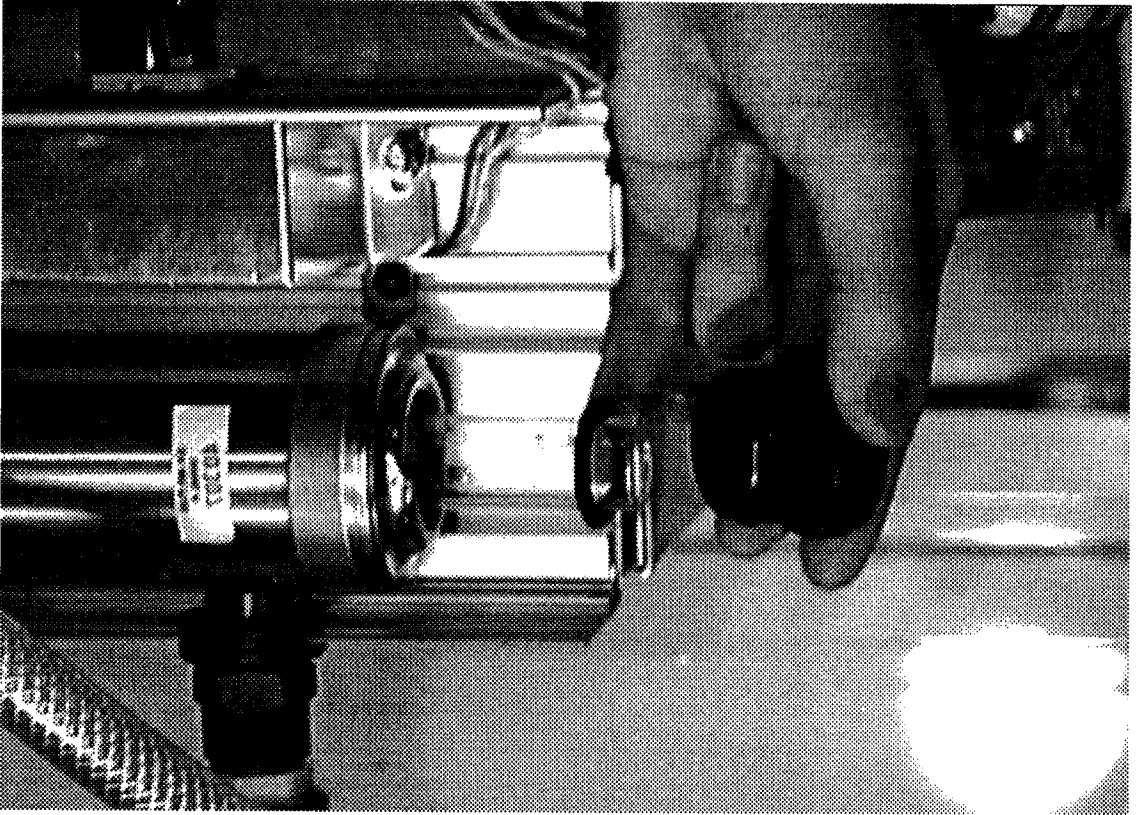


*Dia. 10 Reverse Osmosis Pump and Carbon Filter*

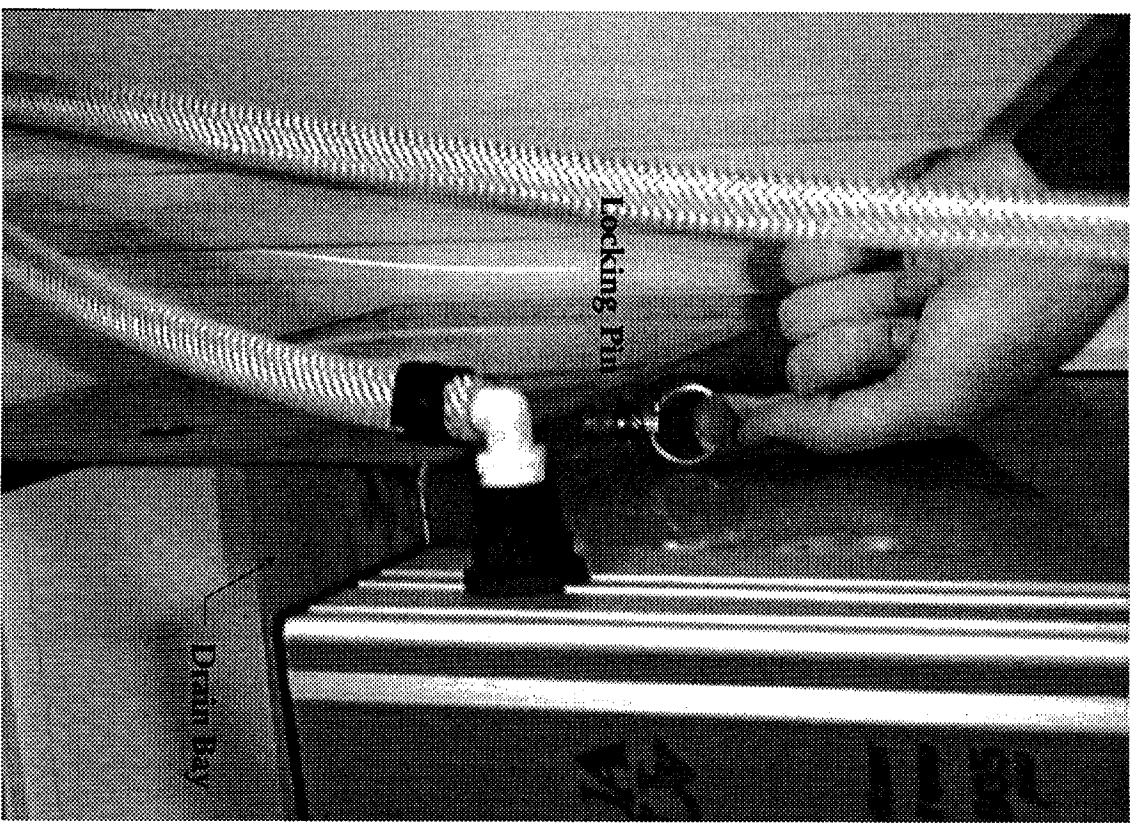


*Dia. 11 Ultraviolet Lamp Snap Lid Removal*

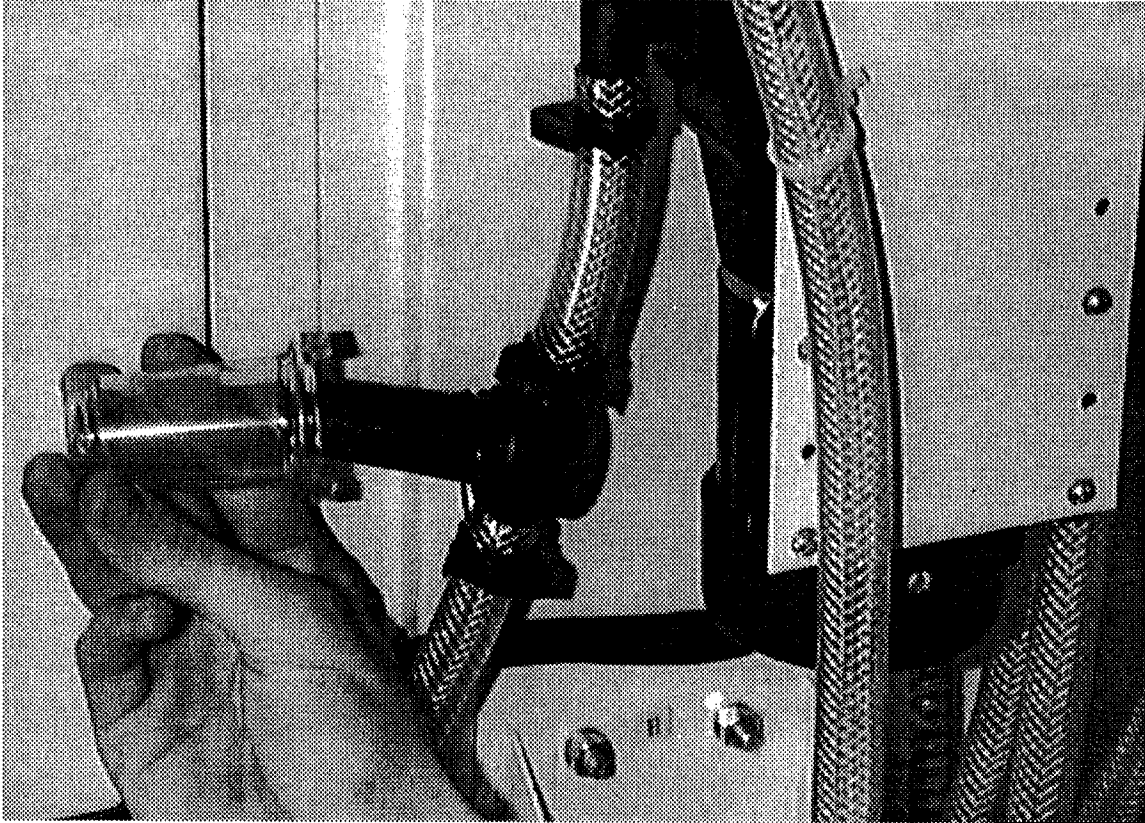




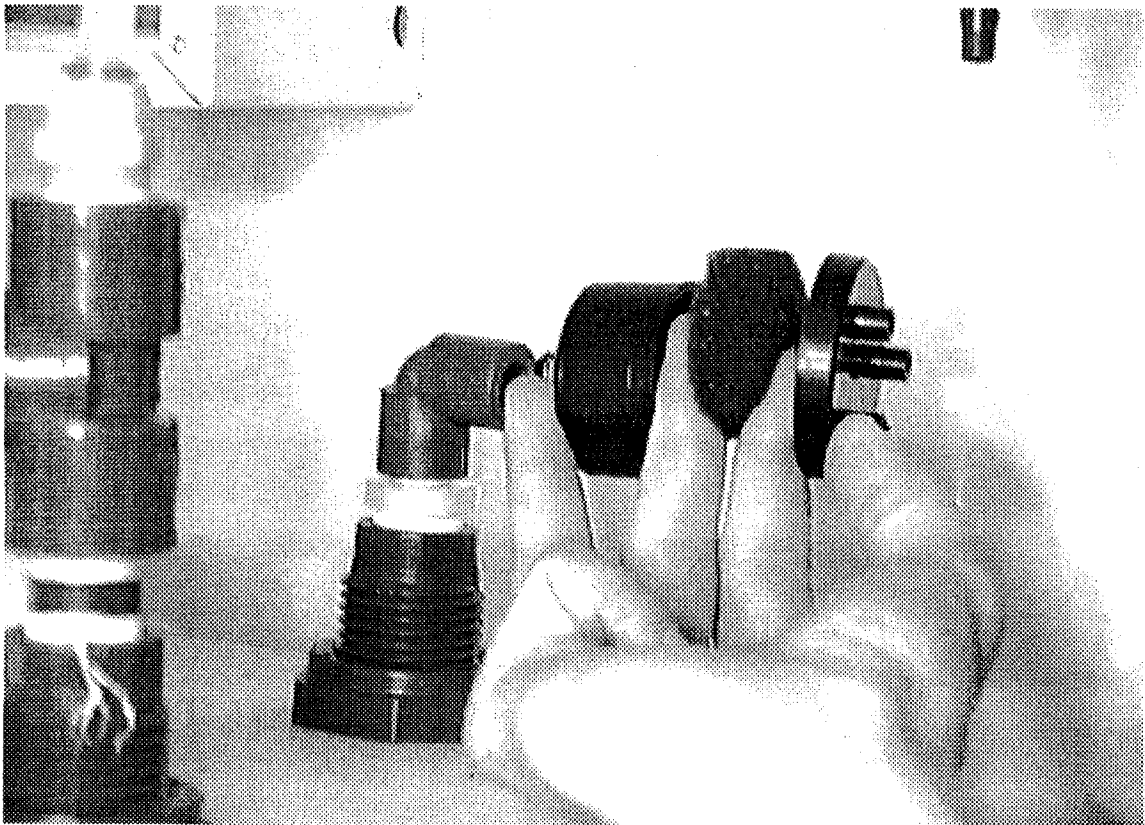
*Dia. 12 Sleeve Bolt,  
Quartz Sleeve and  
O-Ring Detail*



*Dia. 13 Drain Bay  
Locking Pin*



*Dia. 14 Dispensing / Drain Pump Strainer*



*Dia. 15 Air Vent Filter Detail*



*Dia. 16 Teflon Tape Application*

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4--07/25/95-100



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