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Culligan®

AQUA-CLEER®
DRINKING WATER SYSTEMS
H-83/H-53 Series Models
Installation, Operating and Service Manual

CULLIGAN INTERNATIONAL COMPANY/NORTHBROOK, ILLINOIS
CULLIGAN USA DIVISION/NORTHBROOK, IL 60062 — SAN BERNARDINO, CA 92402
CULLIGAN FRANCE S.A./YVELINES, FRANCE — CULLIGAN ITALIANA SpA/BOLOGNA, ITALY
CULLIGAN OF CANADA, LTD./MISSISSAUGA, ONTARIO, CANADA L5K 1A5
CULLIGAN ESPANA S.A./08191 RUBI (BARCELONA), SPAIN — JEBEL ALI FREE ZONE/DUBAI, UNITED ARAB EMIRATES

⚠ WARNING: IF INCORRECTLY INSTALLED, OPERATED OR MAINTAINED, THIS PRODUCT CAN CAUSE SEVERE INJURY. THOSE WHO INSTALL, OPERATE, OR MAINTAIN THIS PRODUCT SHOULD BE TRAINED IN ITS PROPER USE, WARNED OF ITS DANGERS, AND SHOULD READ THE ENTIRE MANUAL BEFORE ATTEMPTING TO INSTALL, OPERATE OR MAINTAIN THIS PRODUCT.

Printed in USA

Attention Culligan Customer:

The installation, service and maintenance of this equipment should be rendered by a qualified and trained service technician. Your local independently operated Culligan dealer employs trained service and maintenance personnel who are experienced in the installation, function and repair of Culligan equipment. This publication is written specifically for these individuals and is intended for their use.

We encourage Culligan users to learn about Culligan products, but we believe that product knowledge is best obtained by consulting with your Culligan dealer. Untrained individuals who use this manual assume the risk of any resulting property damage or personal injury.

NOTICE: This system is intended for use on potable water supplies or disinfected water containing cysts. Do not use where water is microbiologically unsafe or with water of unknown quality. If bacterial contamination is present, a recognized method of water disinfection is required.

NOTICE: INSTALLATION OF THIS SYSTEM MUST COMPLY WITH ALL APPLICABLE STATE AND LOCAL LAWS AND REGULATIONS.

SAFE PRACTICES

Throughout this manual there are paragraphs set off by special headings.

NOTICE: Notice is used to emphasize installation, operation or maintenance information which is important, but does not present any hazard.

Example: NOTICE: *The nipple must extend no more than 1 inch above the cover plate.*

⚠ **CAUTION:** Caution is used when failure to follow directions could result in damage to equipment or property.

Example: ⚠ **CAUTION:** ***Disassembly while under water pressure can result in flooding.***

⚠ **WARNING:** Warning is used to indicate a hazard which could cause injury or death if ignored.

Example: **WARNING: ELECTRICAL SHOCK HAZARD! UNPLUG THE UNIT BEFORE REMOVING THE TIMER MECHANISM OR COVER PLATES!**

Serial Numbers

The serial number is located on the rear of the R.O. module.

NOTICE: *Do not remove or destroy the serial number. It must be referenced on requests for warranty repair or replacement.*

This publication is based on information available when approved for printing. Continuing design refinement could cause changes that may not be included in this publication.

CULLIGAN INTERNATIONAL COMPANY
One Culligan Parkway
Northbrook, IL 60062 USA
(708) 205-6000

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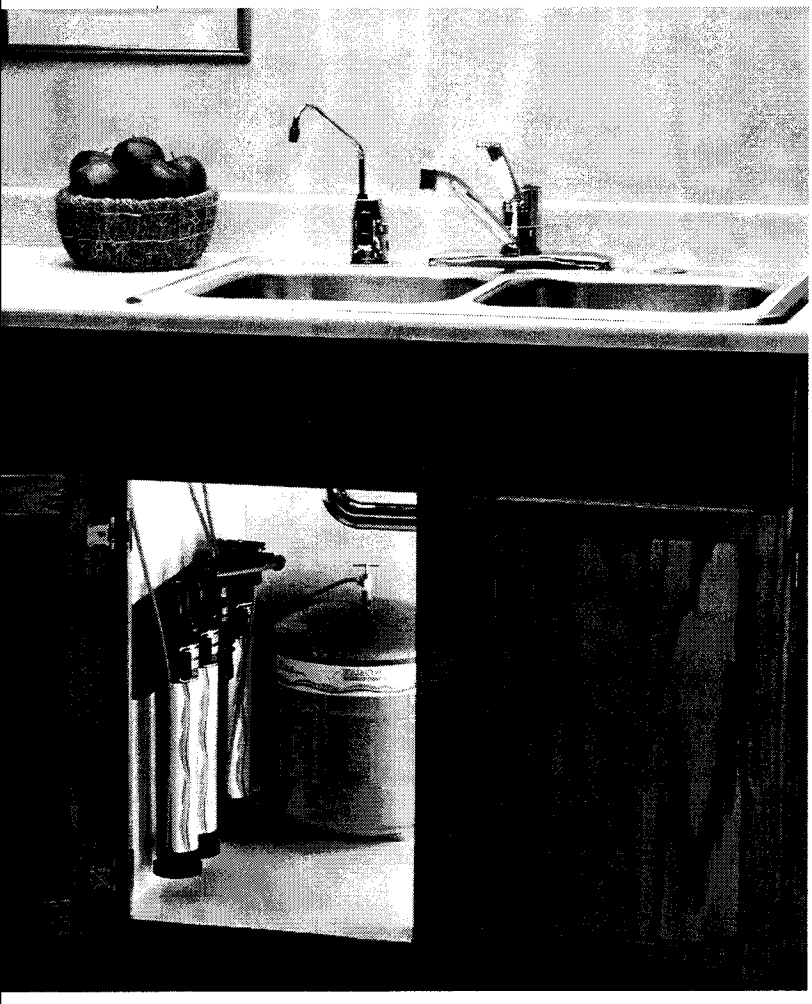

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Specifications

TABLE A - Operating Limits of H-53 and H-83 Series Drinking Water Systems

Property	H-53 Max.	H-53 Min.	H-83 Max.	H-83 Min.
Water Pressure	120 PSIG (827 kPa)	40 PSIG (206 kPa)	120 PSIG (827 kPa)	40 PSIG (206 kPa)
pH	8 (8)	5 (5)	10 (10)	5 (5)
Temperature	80°F (27°C)	35°F (2°C)	100°F (38°C)	35°F (2°C)
Chlorine	1 ppm (1 mg/L)	0 ppm (0 mg/L)	0 ppm (0 mg/L)	0 ppm (0 mg/L)
Iron	1 ppm (1 mg/L)	0 ppm (0 mg/L)	1 ppm (1 mg/L)	0 ppm (0 mg/L)
Total Dissolved Solids (TDS)	2500 ppm (2500 mg/L)	0.0 ppm (0.0 mg/L)	4000 ppm (4000 mg/L)	0.0 ppm (0.0 mg/L)
Turbidity	10 NTU (10 NTU)	0 NTU (0 NTU)	10 NTU (10 NTU)	0 NTU (0 NTU)
Chloramines	3 ppm (3 mg/L)	0 ppm (0 mg/L)	3 ppm (3 mg/L)	0 ppm (0 mg/L)
Bacterial Quality	Potable	Potable	Potable	Potable

(Metric)

TABLE B - Contaminant Rejection

Contaminant	Maximum Contaminant Level (mg/L)*	Average Percent Rejection H-53	Average Percent Rejection H-83	Contaminant	Maximum Contaminant Level(mg/L)*	Average Percent Rejection H-53	Average Percent Rejection H-83
Arsenic(III)	0.05	37	68	Manganese	0.05	43	97
Arsenic(V)	0.05	89	98	Sulfate	250.0	49	99
Barium	2.00	93	99	TDS	500.0	82	97
Cadmium	0.005	93	98	Zinc	5.0	99	99
Chromium(III)	0.05	90	99	Calcium	-	90	98
Lead	0.015	81	97	Magnesium	-	91	98
Mercury	0.002	60	94	Sodium Bicarbonate	-	87	96
Nitrate	10.00	39	91				
Selenium(IV)	0.05	89	98	Sodium Sulfate	-	96	98
Silver	0.10	72	98	Sodium Chloride	-	80	93
Fluoride	2.00	80	86	Sodium	-	80	97
Chloride	250	81	96	Aluminum	0.05-0.2	97	98
Copper(II)	1.3	99	99	Bicarbonate	-	94	97

*Regulated by the Safe Drinking Water Act

Series H-53 is operating at 500/2500 mg/L and the Series H-83 at 500/3000 mg/L TDS water. Both are operating at 40/70 psi pressure across a new module and neutral pH water at 70/74 F.

Consult with Technical Services when TDS exceeds 2000 mg/L or the water temperature needs to be elevated.

Suggested Installation Equipment

Sink Cutting Tools

Porcelain Cutter Kit, 1-1/4 inch diameter, PN 00-5916-25
Greenlee Hole Punch, 1-1/4 inch diameter
Plumbers Putty
Heavy Duty Drill with speed control to 400 rpm

Tools

Crescent Wrench, 10-inch
Screwdriver, blade and Phillips
Pliers
1/8 inch diam. pilot drill for #10 screws
Center Punch
Razor Blade Knife
Faucet Installation Tool, PN 00-4033-75

Accessories/Hardware

Tubing, Plastic, 1/4-inch, PN 00-4021-84 Blue
Tubing, Drain, PN 00-4037-30
Piercing Valve, PN 00-5714-02
Drain Saddle Kit, PN 01-0003-29
TDS Meter, PN D0-4705-04
Graduated Measuring Cylinder, PN 00-4705-03
Thermometer, PN 00-4705-01
9 Volt Alkaline Battery - for Monitor
Silicone Lubricant, PN 00-4715-07
Thread Sealing Tape
Stopwatch, or wristwatch with second hand
Chlorine Bleach (Clorox* regular recommended) (5-¼ % household strength)
Eye dropper (available at drug store)
Pressure Gauge (0-120 psi) with section of 1/4" OD tubing and Parker fitting (for setting optional pressure relief valve)
#10 Screws, type determined by mounting surface and material
Tee, PN 00-4480-16, if system will be connected to icemaker

Miscellaneous

Extension Work Light
Air Pressure Gauge (Automatic type with 1 psi increments, Milton Industries, Chicago, IL, Model S-921 or equivalent.)
Air Pump (bicycle tire pump)
Furniture Pad for Back Protection
Small Portable Blower for Ventilation

*Clorox is a registered trademark of the Clorox Company.

Product Information

This manual covers the installation, operation and servicing of all Culligan® Aqua-Cleer® H-83 and H-53 model drinking water systems. There are differences in the application, operation and servicing of these systems. It is important to read this manual so that you thoroughly understand each system's installation procedure.

A limited warranty is extended to the original end-user by Culligan. This warranty information is available from the Culligan dealer.

NSF LISTING

The Culligan Aqua-Cleer H-83SC, H-83SLC, H-83PRV-C, H-83S-R, H-83SC Premier, and H-83SLC Premier Drinking Water Systems have been tested and certified to ANSI/NSF International Standard 58 for effective reduction of TDS, arsenic, asbestos, barium, cadmium, hexavalent and trivalent chromium, cysts, fluoride, lead, mercury, radium 226/228 and selenium.

EPA Establishment Number 2938-IL-01.

H-83 NITRATE

The Culligan Aqua-Cleer H-83SC Nitrate Drinking Water System has been tested and certified to ANSI/NSF International Standard 58 for effective reduction of TDS, arsenic, asbestos, barium, cadmium, hexavalent and trivalent chromium, cysts, fluoride, lead, mercury, radium 226/228, selenium, and nitrate. It is suitable for influent nitrate concentrations up to 30 mg/L (as N). Additional treatment or individual design shall be required for higher influent levels.

The H-83SC Nitrate is supplied with a nitrate test kit. Product water must be tested frequently according to the instructions provided with the kit.

MODULE DESIGN/CONSTRUCTION

The main component of Culligan Aqua-Cleer H-53 and H-83 series drinking water systems is the reverse osmosis (RO) module. The spiral-wound module design found in these Culligan systems offers several advantages over other products. In addition to high fouling resistance, the spiral design is space efficient and easy to maintain.

The Culligan RO module consists of a membrane envelope wound around a perforated tube. Product water passes through the outer envelope membrane surface and flows through the inside of the envelope where it collects in the tube. A porous backing material provides the flow path through the inner envelope.

The membrane is shipped wet and must not be allowed to dry as it will deteriorate. It cannot be rewetted and rejuvenated.

THE H-53 MODULE

The membrane featured in H-53 series systems is a cellulose diacetate film specially modified to give it all the desired properties of a semi-permeable membrane. It is approximately 100 microns thick (0.004 inches). The rejecting outer surface of the film is extremely thin (about 0.2 microns) and relatively dense. The inner surface of the film is less dense and rather porous. There is no visual separation between the spongy porous part of the membrane and the dense outer surface. The pores become progressively smaller towards the outer surface and appear impermeable at the surface. This membrane contains approximately 67% water by weight and must be maintained in a wet condition at all times.

Effect of pH on Membrane Life

The CDA membrane will hydrolyze to form cellulose and acetic acid. The rate at which hydrolysis occurs is a function of the feed water pH and temperature. This degradation occurs when the acetate groups present in the cellulose diacetate membrane are replaced by hydroxides present in the feed water. At higher pH levels, more hydroxides are present and membrane decomposition is more rapid.

THE H-83 MODULE

The thin film composite (TFC) membrane featured in H-83 series systems is designed for exceptional salt rejection, application versatility and long life.

This membrane material is highly sensitive to attack by chlorine. The activated carbon prefilter must be used on all water supplies that contain or may contain chlorine. Otherwise, rapid disintegration of the membrane will occur.

PROCEDURE FOR STORING MODULE

If you do not intend to install the system immediately, store the module and housing assembly under refrigeration at 35°F/40°F (2/5°C) DO NOT ALLOW TO FREEZE!

Component Description

COMPONENT PARTS

The drinking water system is shipped from the factory in two cartons. One contains the Culligan® dispenser faucet, the complete filter system assembly, including the particulate and carbon prefilter assemblies, the RO module assembly, the carbon postfilter, and the mounting bracket. The other carton contains the reservoir tank and valve (Figures 1, 2, 3, 4, 5).

PARTICULATE PREFILTER ASSEMBLY

The particulate prefilter assembly contains a 5 micron (nominal) filter element. It precedes the activated carbon prefilter assembly and is designed to remove suspended matter that may clog the RO module. The filter element should be replaced at least once a year or whenever it becomes dirty or clogged such that flow rates are reduced and a decrease in water production occurs.

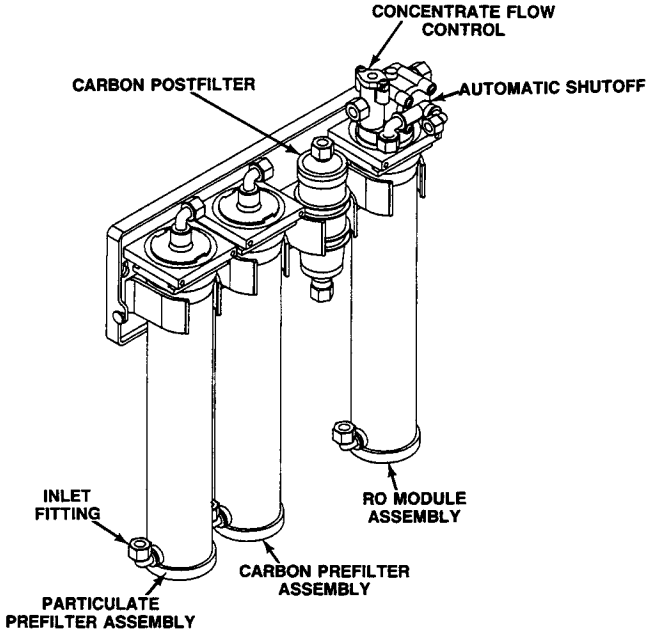

FIG. 1
FILTER SYSTEM ASSEMBLY (H83SC Shown)

CARBON PREFILTER ASSEMBLY (H-83 MODELS ONLY)

The carbon prefilter assembly contains a replaceable filter cartridge which contains Cullar® G activated carbon. It precedes the RO module assembly and is designed to reduce chlorine from the feed water. The carbon filter must be used on all water supplies that contain chlorine. The filter cartridge should be replaced at least annually or whenever it becomes clogged and causes a decrease in flow.

PARTICULATE/CARBON PREFILTER (H-83S-R ONLY)

The Aqua-Cleer® H-83S-R drinking water system features a single particulate/activated carbon prefilter assembly in place of the separate particulate and carbon prefilter assemblies found on other H-83 series systems. This assembly contains a filter-cloth wrapped activated carbon block cartridge for effective sediment and chlorine removal. It should be replaced annually or whenever a decrease in water flow occurs. High sediment levels may significantly decrease the life of this element.

RO MODULE ASSEMBLY

This reverse osmosis system contains a replaceable treatment component critical for the effective reduction of Total Dissolved Solids. The product water shall be tested periodically to verify that the system is performing properly. Check the RO module performance according to the procedure described on page 18.

The RO module assembly contains the reverse osmosis module, the concentrate flow control, the check valve, and the automatic shutoff valve.

CONCENTRATE FLOW CONTROL (Capillary Assembly)

The concentrate flow control is built into the top cap of the reverse osmosis module housing. It serves to restrict the flow of concentrate to drain so that pressure is maintained in the RO vessel. It should be inspected whenever the system is serviced and replaced if it becomes clogged.

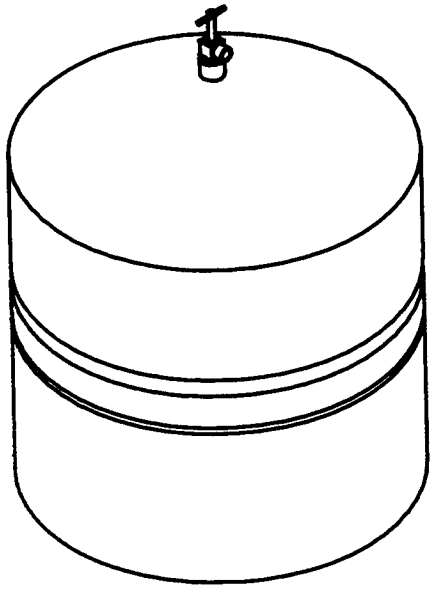

FIG. 2
RESERVOIR TANK

AUTOMATIC SHUTOFF

The automatic shutoff is built into the top cap of the reverse osmosis module housing. It automatically stops the flow of water through the system when the reservoir is full.

CARBON POSTFILTER

The postfilter contains Cullar® G activated carbon. It is positioned after the reservoir to remove any remaining taste or odors. It should be replaced annually or whenever a noticeable change in taste or a decrease in flow occurs.

PRODUCT WATER PRESSURE RELIEF VALVE (Optional)

When a unit is so equipped, the pressure relief valve is built into the top cap of the reverse osmosis module housing. It is used to provide the minimum 20 psi (140 kPa) differential across the RO module. The pressure relief valve is adjustable. See page 10 for adjustment instructions.

RESERVOIR TANK

The reservoir tank (Fig. 2) stores the water that has been produced by the reverse osmosis module. It features a bladder precharged with 5 psi (35 kPa) air pressure to provide the pressure needed to deliver drinking water to the dispenser faucet. The standard reservoir is a plastic-lined steel tank with a maximum capacity of three gallons (11 L). A large capacity version of this tank is available which can store up to 10 gallons (38 L).

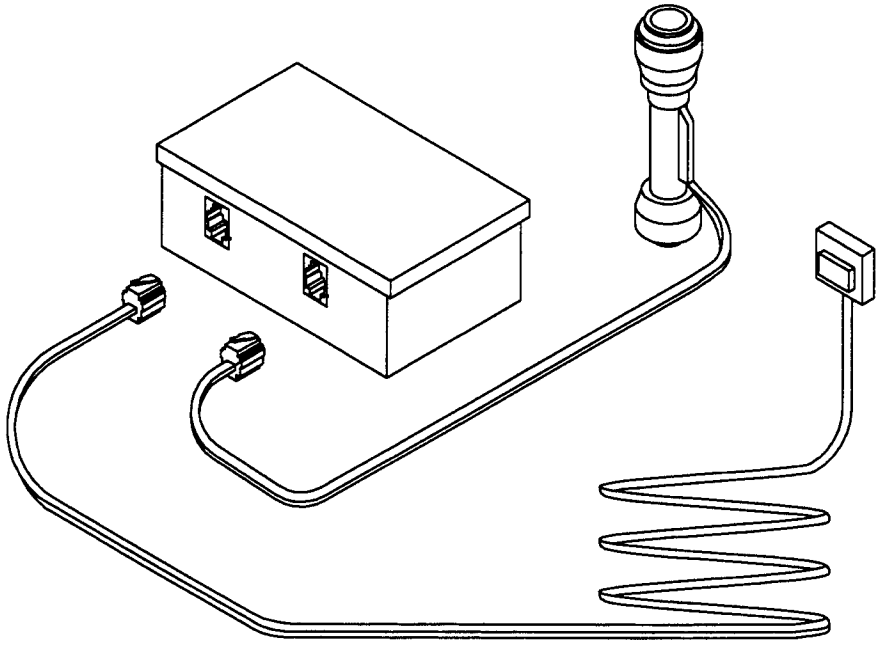

FIG. 3
AQUA-CLEER® SENTRY™ MONITOR

The large tank, PN 00-4026-03, will store about 3 times as much water as the small tank. This added storage will compensate for cold feed water and/or low feed water pressures. The large tank should be installed whenever higher water usage is anticipated.

TANK VALVE

The tank valve assembles to the reservoir. It provides a means of preventing stored product water from flowing out of the reservoir whenever the system is serviced.

AQUA-CLEER SENTRY$_{TM}$ MONITOR

The Aqua-Cleer Sentry (optional) water quality monitor is designed to indicate when the Aqua-Cleer drinking water system (Fig. 3) needs servicing. A faucet-mounted electronic display signals when the product water TDS rises above the pre-set quality level.

The Aqua-Cleer Sentry monitor is standard on the H-83 Premier$_{TM}$ drinking water systems. It may be ordered separately for use on other Aqua-Cleer® drinking water systems.

DISPENSER FAUCET

The Culligan® dispenser faucet (Fig. 4) allows the product water to be drawn from the reservoir tank as needed. The faucet features a built-in air gap siphon break for concentrate discharge as required by most local plumbing codes.

PROTECTIVE COVER

The protective cover (optional) is designed to protect the drinking water system (Fig. 5) tubing and connections from damage.

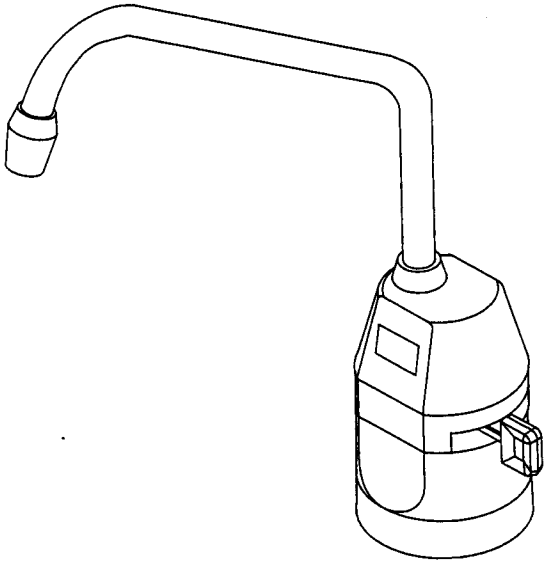

FIG. 4
CULLIGAN® DISPENSER FAUCET

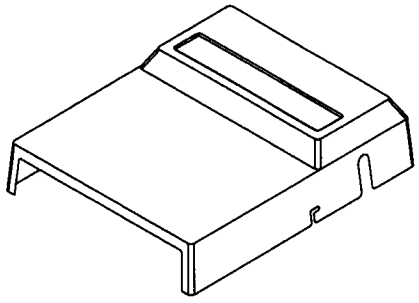

FIG. 5
PROTECTIVE COVER

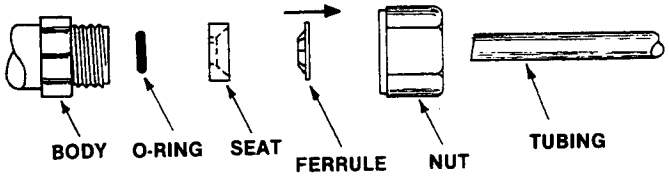

FIG. 6

Installation Instructions

The Culligan® drinking water system is packaged in two cartons. Open both cartons and arrange the components in the assembly area. Identify each component in preparation for the installation.

- Filtration Assembly Carton (Fig. 1)
  1. Prefilter assembly*
  2. Carbon prefilter assembly (H-83 Series only)*
  3. RO module assembly
  4. Carbon postfilter
  5. Mounting bracket (except H-83S-R)
  6. Dispenser faucet with concentrate air gap (Fig. 4)
  7. Tubing Tee (except H83PRV-C)

  *NOTE: H-83S-R features a single particulate/activated carbon prefilter in place of items 1 & 2. See page 5 for description.
- Reservoir Tank Carton (Fig. 2)
  1. Reservoir tank
  2. Tank valve

TUBING CONNECTORS

NOTICE: *Culligan Drinking Water Systems use a standard series of plastic tubing fittings. The 4-piece assembly, consisting of the nut, ferrule, seat and O-ring, may come apart if removed from the body. Parts must be assembled exactly as shown to function properly. Connections are made by assembling the parts onto the body, pushing the tubing into place, and hand-tightening the nut, DO NOT preassemble the parts onto the tubing. Proceed as follows:*

- Place the O-ring into the recess in the face of the BODY.
- Place the FERRULE and the SEAT into the NUT in the proper order and in the proper direction (Fig. 6). The FERRULE has an anti pull-out feature which will permit it to slide over the tubing in the direction of the arrow only. Notice the direction of the bevel on both the FERRULE and the SEAT in the diagram.
- Screw the nut assembly (NUT, FERRULE and SEAT) onto the BODY, leaving three or four threads exposed.
- Cut the tubing at a slight angle (5° to 15°), moisten the tube end with water and push the tube through the nut assembly until it bottoms in the BODY, then hand-tighten the nut firmly.
- To disconnect, simply unscrew the nut assembly and withdraw the tube from the BODY. The O-RING, NUT, SEAT and FERRULE will remain on the tube. To reconnect, simply insert the end of the tube into the BODY and tighten the NUT.

⚠ **CAUTION:** ***Ferrules can be removed from the tubing only by cutting the tube behind the ferrule and sliding the ferrule off in the direction of the arrow (see diagram). Forcing the ferrule off in the opposite direction will damage it and may result in cut fingers.***

Feed Water Connection - The plumbing found in the average home is usually one of two types: copper tubing or galvanized iron pipe. Standard plumbing fittings, found locally, may be used to make the water connection. A top quality piercing valve for copper tubing is also available from Culligan.

Drain Tubing - Culligan flexible drain tubing is required for attachment of the air gap siphon break to the drain connection.

Drain Connection - The concentrate water from the system must go to the drain. The simplest connection is by way of the existing drain tube and P trap in the kitchen sink. Please refer to the section in this manual for installing drain connections on page 15. A drain saddle kit is available PN 01-0003-29.

IN-PLANT PREPARATION

Prior to installation in the customer's home, the unit should be tested and reservoir sanitized and precharged with processed water.

In order for the user to have the greatest satisfaction with the Culligan drinking water system, the following preinstallation steps are necessary:

Carbon Prefilter Preparation (H-83 Models only)

The activated carbon granules in the carbon prefilter (Fig. 7) can rub together during shipment, creating a small amount of carbon dust. The dust MUST be backflushed from the filter prior to final installation.

- Remove the carbon filter from the mounting bracket
- Connect a length of 1/4-inch OD plastic tubing from a source of clean, filtered water to the carbon prefilter outlet fitting.
- Connect a length of 1/4-inch OD plastic tubing to the carbon prefilter inlet fitting. Run this tubing to a suitable drain.
- Slowly turn on the water and flush the filter for 5 minutes at a rate of 1-2 gpm (4-7 L/min). Turning the water off and on several times will help to flush fine carbon particles from the filter.
- Turn off the water supply, disconnect the tubing from the filter and set the filter aside until it is needed for final assembly with the system.

Module Performance Check

The reverse osmosis membrane contains a preservative solution which must be flushed prior to use. To perform this procedure and the important preinstallation performance check, proceed as follows:

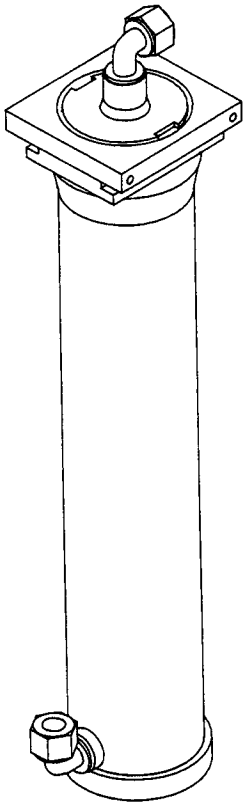

FIG. 7

- Refer to Fig. 8 .
- Connect a length of 1/4-inch OD plastic tubing from a source of clean, unchlorinated or dechlorinated, filtered water (soft water, if available) to the module housing inlet fitting.
- Connect lengths of 1/4-inch OD plastic tubing to the product water outlet fitting and to the waste water fitting. Run these two lengths of tubing to a suitable drain.
- Let the module rinse for 6 hours to flush the preservative solution to drain.
- Follow the procedure on page 18 to check the RO module performance.

NOTICE: *This procedure should be followed whenever replacing a module.*

Carbon Postfilter Preparation

The activated carbon particles in the postfilter can rub together during shipment, creating a small amount of carbon dust. This filter should be **forward flushed** (only) with at least 2 gallons (7 L) of water prior to use.

Check Reservoir Precharge Pressure

The reservoir tank comes from the factory precharged with 5 psi (34 kPa) air pressure.

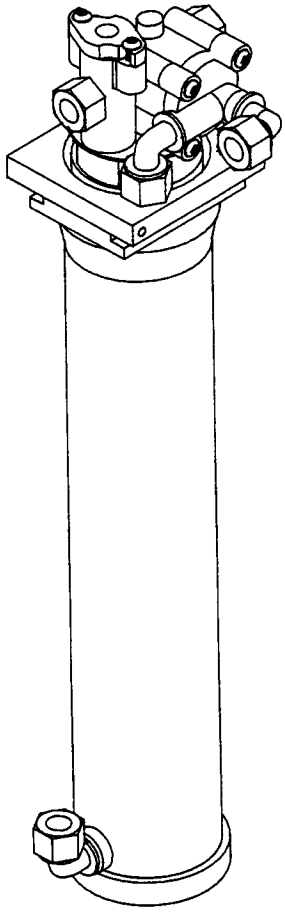

FIG. 8
RO MODULE ASSEMBLY

- Remove the red protective cap from the air valve at the bottom of the reservoir tank.
- Test the air pressure in the reservoir using a passenger car type tire gauge which has one psi (7 kPa) calibrations.
- If the precharge pressure is more than 5 psi (34 kPa), briefly depress the needle of the air valve to reduce the pressure, then recheck the pressure and replace the red protective cap.
- If the precharge pressure is less than 5 psi (34 kPa), attach a bicycle-type hand pump to the air valve and increase the pressure. Recheck the pressure and replace the red protective cap.

Flushing and Sanitizing the Reservoir

To ensure that the product water is stored properly, it is necessary to flush and sanitize the reservoir tank with either chlorine or hydrogen peroxide.

- Assemble the tank valve to the reservoir using thread sealing tape to seal the connection.
- Connect a length of 1/4-inch OD plastic tubing to the tank valve.

Sanitizing with Chlorine

- Put forty (40) drops of standard 5-1/4% liquid chlorine bleach into the plastic tubing and connect the tubing to a supply of clean, filtered water (RO or DI water if available) at no more than 40 psi (276 kPa).
- Turn on the water supply, open the tank valve and allow the tank to fill with water.
- Turn off the water supply, close the tank valve and wait ten minutes.
- Disconnect the plastic tubing from the water supply, open the tank valve and drain the reservoir tank.
- The water coming from the reservoir tank should have a chlorine odor. If it does not, repeat the sanitizing procedure.
- When the water from the reservoir tank has a chlorine odor, flush the tank by repeating the fill/drain procedure until only a faint chlorine odor is present. When the installation is completed, the carbon postfilter will remove residual chlorine taste.

Sanitizing with Hydrogen Peroxide

- Connect the opposite end of the tank valve tubing to the outlet of the particulate prefilter.
- Remove the U-clip and top cap from the prefilter housing.
- Pour 3 ounces (89 ml) of 3-4% hydrogen peroxide into the prefilter housing. Reassemble prefilter.
- Connect the inlet of the prefilter housing to the water supply.
- Turn on the water and fill the reservoir tank.
- When full, shut the tank valve and turn off water. Let sit 30 minutes to one hour.
- Empty reservoir tank and flush.

Reservoir Precharge

It will take eight (8-10) hours or more to fill the reservoir tank after the system is installed. An immediate supply of drinking water can be provided by filling the reservoir tank with RO product water at the plant.

- Connect a length of 1/4-inch OD plastic tubing between the RO product water outlet and the reservoir tank valve.
- Connect another length of plastic tubing between a source of clean, filtered, chlorine-free water (soft water, if available) and the inlet fitting of the RO module housing.
- Open the tank valve and turn on the water supply.
- Fill the reservoir tank to provide a quantity of water that will afford immediate enjoyment when the system is installed.

⚠ **CAUTION:** ***The pressure of the water delivered to the reservoir tank by this method must not exceed 40 psi (275 kPa).***

- When the reservoir tank is full of water, close the tank valve to prevent loss of water from the reservoir during transport to the installation site.

Pressure Relief Valve Adjustment

To help maintain the high quality of drinking water stored in the reservoir, the RO module feed water pressure should be at least 20 psi (140 kPa) higher than the reservoir pressure. The pressure relief valve (PRV) allows manual (Fig. 9) adjustment of the maximum reservoir tank pressure to preserve the proper differential. The pressure relief valve diverts product water to the drain once the tank is full.

Adjust the PRV as follows:

- Plug the faucet fitting of the RO module assembly.
- Connect a short length of 1/4-inch OD plastic tubing to the concentrate water fitting of the RO module housing.
- Connect a length of 1/4-inch OD plastic tubing from a

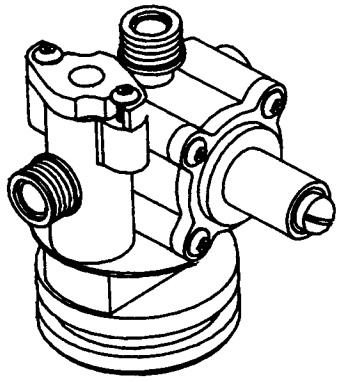

FIG. 9

source of clean, filtered water (soft water, if available) to the inlet fitting of the RO module housing.

- Turn on the feed water supply, wait until product water drips steadily from the product and concentrate fittings.
- Connect a pressure gauge to the product water fitting of the RO module assembly (See Fig. 10).
- Using a blade-type screwdriver, GENTLY turn the PRV adjusting screw counterclockwise to the stop. The PRV is now fully open and the pressure gauge will read zero.
- SLOWLY turn the PRV adjusting screw clockwise until the pressure gauge reads slightly above the desired reservoir tank pressure. This step must be done in fractional turns in order to provide time for the pressure gauge to stabilize after each adjustment.
- SLOWLY turn the PRV adjusting screw counterclockwise until the pressure gauge reads the desired reservoir tank pressure.

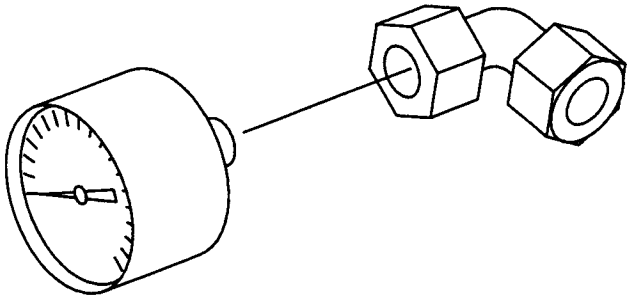

FIG. 10
PRESSURE GAUGE ASSEMBLY

NOTICE: *The maximum relief pressure available is 50 psi (345 kPa).*

The pressure gauge assembly is recommended when performing this adjustment.

NOTICE: *Significant water savings can be realized through the use of the Culligan® automatic shutoff. The automatic shutoff is designed to maintain the proper feed/tank pressure differential and requires no adjustment.*

TYPICAL INSTALLATION

The exact placement of the components will vary by installation. Although shown beneath a sink, it may be installed in a basement, crawl space or in an adjacent cabinet. Regardless of where the system is installed, the flow sequence described by Figure 11 must be observed.

HOUSEHOLD INSTALLATION

The Aqua-Cleer® drinking water system is designed to be

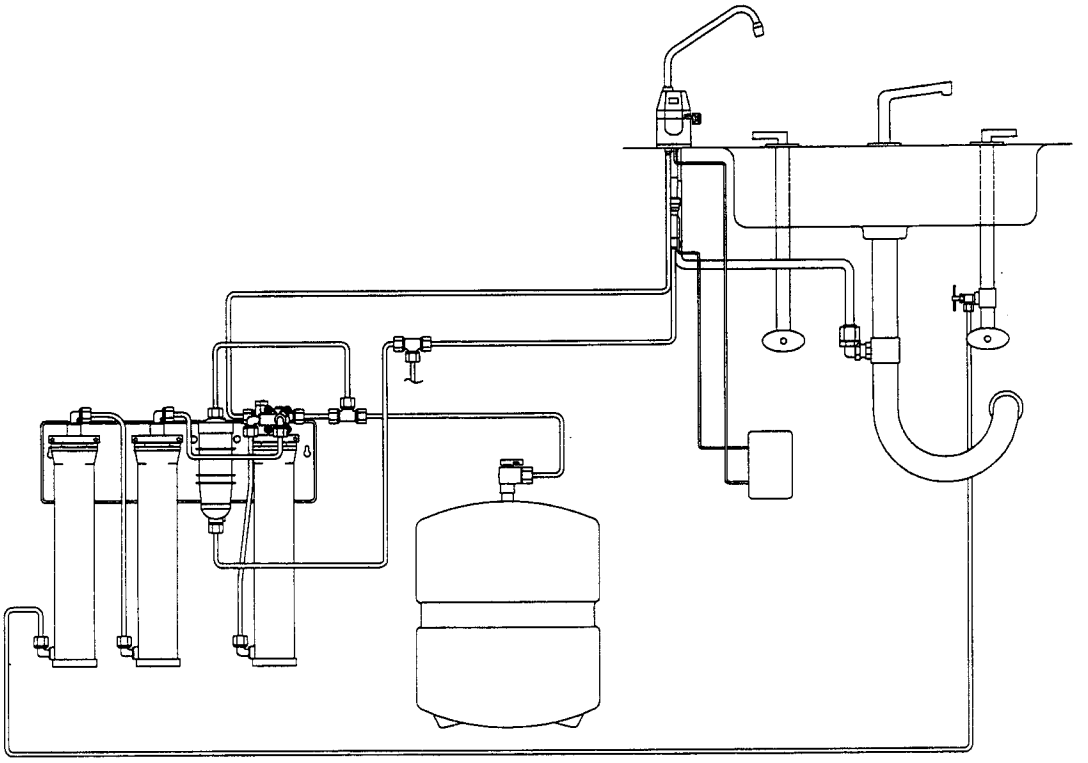

FIG. 11
AQUA-CLEER® SYSTEM FLOW SEQUENCE

mounted near a sink for easy access to cold water and drain lines. Lengths of 1/4-inch OD plastic tubing will be required to make this installation. A length of Culligan® drain tubing is required to install the air gap siphon break.

Evaluate the installation site to determine the easiest path for the plumbing to follow. Take care to make the installation as neat as possible.

NOTICE: *Install the drain line so that it runs downward with no loops or low spots. Otherwise the unit will overflow at the air gap siphon break built into the faucet, or make irritating gurgling sounds. The concentrate line that leads to the faucet should be installed in a straight vertical path to avoid making a gurgling noise.*

The following steps will enable you to install the system quickly and orderly. Some variation may be necessary depending on the installation. See page 3 for a check list of tools and materials.

The flat-bottom design of the filter housings allows the option of standing the filter system assembly on the cabinet floor rather than mounting it to the wall.

Typical installations follow this sequence:

- Select Component Installation Locations.
- Clear and Prepare area.
- Install Faucet.
- Provide Inlet Water Supply.
- Provide Drain Connection.
- Install Reservior Tank.
- Install Filter System Assembly.
- Connect All System Components.
- Start-Up.
- Performance Check
- Clean up Work Area.
- Review Operation With Customer.

SELECT COMPONENT INSTALLATION LOCATIONS

- **Dispenser Faucet** - The Culligan® faucet is designed to be mounted on the rear lip of the sink. It may be installed in an existing sprayer attachment hole or in a hole drilled at the time of installation. It may also be mounted to an adjacent counter top. It should be positioned so that water is dispensed over the sink. A minimum 1-1/4" diameter hole is required.

  When installing the Aqua-Cleer Sentry™ water quality monitor refer to the installation instructions packaged with the monitor. Make certain the TDS level setting corresponds to the customer's water supply.

  Important considerations:
  - Access to the bottom (undersink) of the faucet is required for attachment of product water line.
  - The faucet can be installed for left- or right- handed operation.
  - There should be no undersink obstructions which would prevent smooth tubing runs to the drain connection, carbon postfilter, or RO module assembly.

- **Filter System Assembly** - The filter system assembly is designed to be mounted on any rigid vertical surface such as a cabinet sidewall or basement rafter. It should be positioned such that there is access to an inlet water source and drain. The installation should also allow convenient access to the filter assemblies for servicing.

Inlet Water Supply Connection

Once a location is chosen for installation of the filter system assembly, select a nearby cold water line to provide the water source for the system. For undersink installations, the cold water faucet line can usually be tapped.

The Reservoir Tank

Position the reservoir tank near the faucet for optimum customer convenience. The small reservoir tank will weigh about 28 pounds (13 kg) when full of water, so it must be positioned on its legs or held securely by the optional bracket (Fig. 12).

The reservoir operates best in the vertical position, but it will operate on its side. If the reservoir is positioned on its side, then air will not escape readily, and "foaming" may occur at the faucet nozzle. This should be explained to the customer prior to installation.

Drain Connection

The most convenient entry to the drain is directly above the P-trap of the kitchen sink. However, the concentrate water from the system can be connected to adjacent sinks or a floor drain. Extra care should be taken when entering drains near dishwashers or garbage disposals as back flow may occur through the air gap and cause flooding.

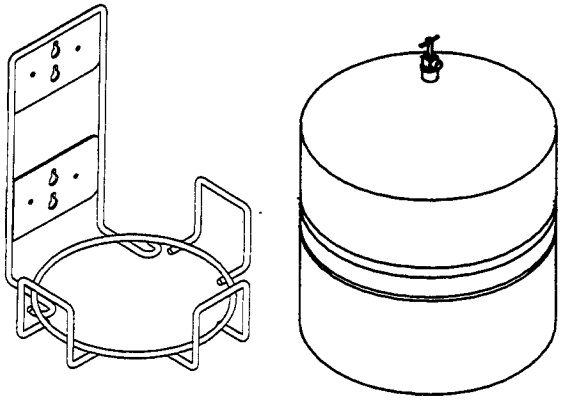

FIG. 12
RESERVOIR TANK WITH BRACKET

CLEAR AND PREPARE AREA

Since this product is more likely to be installed within the customer's daily living space than other water conditioning products, the installation area should be kept neat and clean. If possible, consult with the customer as to how the installation site is used.

FAUCET INSTALLATION

The Aqua-Cleer® drinking water faucet was designed by Culligan to compliment the Aqua-Cleer drinking water system. Properly installed, it will help to maximize your customer's product satisfaction. To simplify its access and installation, we suggest you install the faucet on the rear lip of the sink. It should be evenly positioned with the sink faucet and spray attachment. Should the spray faucet hole not be available for the installation, the sink must be drilled.

Sink Drilling Instructions

Stainless Steel Sink

- Select the proper faucet location.
- Center punch hole to provide a starting point for your drill.
- Drill a 1/2-inch hole to accept the shank of a 1-1/4-inch Greenlee Hole Punch.
- Insert the punch. Cut the hole by tightening the drive screw.
- Remove any roughness with a file and clean up metal chips.

Porcelain Enamel Sink

Follow these basic guidelines when drilling a porcelain sink:

- Penetrate the porcelain to the base material.
- Protect the surrounding porcelain material.
- Use the appropriate tool to drill the base material.

One proven tool is the Relton porcelain cutter kit PN 00-5916-25, when used with a slow speed drill (300-400 rpm).

- Drill a pilot hole through the porcelain and base material with the carbide tip drill.
- Build a putty dam around the drill area. Add enough water to lubricate cutters and reduce cutting noise.
- Insert the porcelain cutter into the drill.
- Place the drill tip in the pilot hole. Check for free movement.
- Apply light pressure to the cutter tool and start the drill motor at low speed (300-400 rpm). When the initial cut has been made in the porcelain, speed may be increased. After a complete ring has been cut through the porcelain, change over to the metal cutter.

⚠ **CAUTION:** ***Avoid high drill speed during penetration of porcelain. A single speed drill can be used at a slow speed by switching it on and off quickly.***

- Avoid contacting the outer rim of cut porcelain when drilling.
- Use a slow speed and light pressure to cut away the porcelain.
- Stop when you reach the metal under the porcelain. Remove the cutter and clean the porcelain chips from the surface. Continue cutting through the metal. NOTICE: *Ceramic tile counters should be treated like porcelain when penetrating the surface, then treated as metal to complete the hole with carbide drills. Formica countertops can be drilled with a high-speed wood drill.*

Faucet Preparation

- Install the two toggle bolts (Fig. 13) loosely onto the faucet base. Adjust to the approximate thickness of the sink.
- Make sure the brass J tube inside the top of the inner body is centered over the drain hole. Push the air gap seal over the air gap port on the inner body.
- Determine whether the installation is right or left handed. Feed the monitor cable, if used, through the top inner body and outer body. Do not position the monitor display at this time.

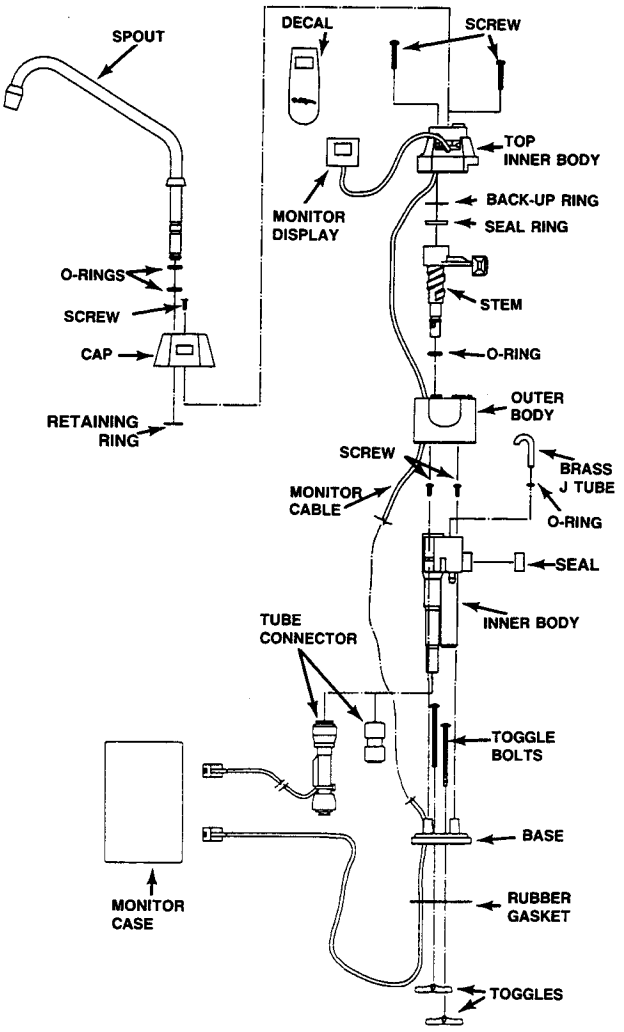

FIG. 13

- Chrome Faucet Only — Based on whether the installation is right or left handed and if a monitor is to be used, insert the spout throught the top cap and install the retaining ring into the top groove of the spout.
- Thoroughly lubricate the stem seal ring and O-ring with Culligan® food grade silicone lubricant. Push the stem seal ring firmly into the top of the stem. Install the stem seal backup ring on top of the seal.

Securing the Faucet

⚠ CAUTION: *Plastic parts will break if screws are overtightened.*

- With the notches in the 3, 6, 9 and 12 o'clock positions, place the gasket, flat side down, over the hole and center.
- Place the faucet base on top of the gasket and push the toggle bolts through the sink hole. The cable notch in the base should be on the opposite side of the desired handle position and should line up with one of the notches in the gasket.
- Slide the installation tool into the base. The "T" on the tool will be on the handle side of the faucet. Align the base by making the stem of the "T" line up with the back of the sink, and the crossbar of the "T" point straight out of the sink. Hold the assembly tool down and tighten the toggle bolts. Remove the installation tool and check that the toggles are firmly seated on the sink.
- Connect drain inlet and drain outlet tubing to the black inner body. Push the 1/4" (blue is recommended) waste inlet tube securely onto the waste inlet barb. Be sure to use enough tubing. Slide the 1/2" black waste tube snugly onto the waste outlet nipple. Feed these tubes down through the faucet base.
- Feed the monitor cable, if used, down through the faucet base. Plug the telephone-type connector into the monitor case and make sure that the display lights. Be sure that all twists are eliminated from the cable.
- Position the monitor cable in the notch of the base; locate the air gap port on the inner body opposite the cable notch, slide the inner body onto the base. Fasten the inner body to the base using two #6-32 x 3/8" Phillips round head screws.
- Align the air gap hole in the outer body with the air gap port and slide the outer body over the inner body until it meets the base. Position the monitor cable in the notch on the outer body closest to the final position of the display.
- Screw the stem into the large hole in the inner body until the handle on the stem is lined up with the air gap port.
- Position the lever clearance slot over the lever and slide the top inner body over the stem until it contacts the outer body. Secure the top inner body using two #6-32 x 7/8" Phillips round head screws. Check to make sure that the handle operates smoothly.
- Push excess monitor cable back through the faucet assembly and position the display on the top inner body so that it is readable. It may be necessary to pull gently on the monitor cable from below the sink.
- Slide the cap/spout onto the faucet assembly until the circular boss on top of the inner body is flush with the top of the cap. If a monitor is installed, be sure that the display is visible through the window in the cap. Fasten the cap to the faucet assembly using the #4-40 x 3/8" Phillips flat head screw. Be careful not to damage the head of this screw as it is always visible.
- Slide the ferrule down the spout so that it rests on top of the faucet cap.
- Push the 1/4" product water tube firmly into the 1/4" x 3/8" union connector or monitor flow switch. From beneath the sink, slide the connector or switch firmly onto the 3/8" product water nipple of the faucet inner body. NOTICE: *To disconnect tubing from the product water fitting, hold the grey collet firmly against fitting body and pull the tube from the fitting. Repeated assembly and disassembly will cause wear to the inner body. Visually inspect for excessive wear and replace the inner body as needed to protect against any leaks.*
- Complete the faucet installation by carefully applying the face decal to the faucet face. Decals are supplied for units with or without the monitor. The decal cannot be reapplied, so ensure position is correct before affixing it to the faucet base.

PROVIDE INLET WATER SUPPLY

A wide variety of plumbing circumstances and choices exist to provide the feed water supply. The first connection in the system is at the prefilter where a 1/4-inch connection is supplied. The supply water plumbing should therefore terminate in a 1/4-inch tube fitting. Copper tubing or galvanized iron pipe is the typical plumbing used in most homes.

Piercing Valve

A special piercing valve, (Fig. 14), is available which makes its own hole as it is tightened down.

CONNECTING AQUA-CLEER® SYSTEM DRAINS

Plumbing codes require that the drain from reverse osmosis drinking water systems be discharged through an air gap siphon break. The Aqua-Cleer faucet incorporates an air gap into its body. The discharge from the air gap must be connected to the plumbing system for proper drainage. This con-

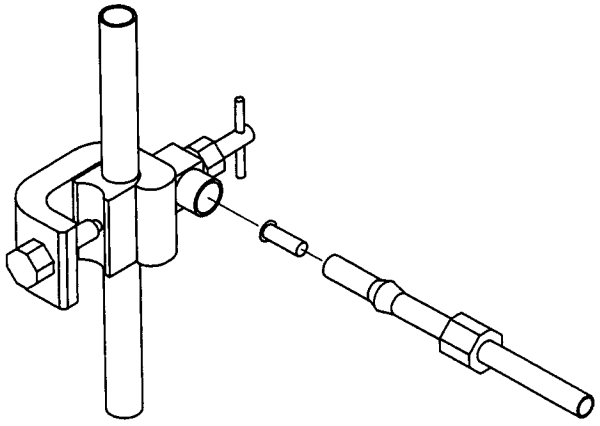

FIG. 14
PIERCING VALVE CONNECTION

nection can usually be made beneath the sink. Incorrect installation may result in overflow of the air gap or excessive noise. If the concentrate water is discharged to an open drain, the air gap may not be necessary.

The air gap feature of the Culligan® faucet requires a special .46-inch ID flexible black poly drain tube. This special size is necessary to meet the space and performance requirements of the faucet design. The exclusive use of Culligan tubing is required to provide a reliable drain connection.

Connections to undersink plumbing can be made with a saddle clamp designed to accept the drain tubing from the faucet. Culligan offers a saddle kit PN 01-0003-29 designed for 1-1/2" undersink drain plumbing (Fig. 15). Be sure to check and follow local plumbing codes prior to installation.

Many homes are equipped with disposals and dishwashers. Special care must be taken when these appliances are present to prevent improper air gap performance. **Home drain plumbing must be free of any blockage since this may cause a backup of dishwasher and disposal waste into the air gap outlet tube and result in improper air gap performance.**

To perform a simple drain check, fill the sink basin with several inches of water, pull the plug, and observe the drainage. If water backs up into the second sink (if present), or if drainage is slow or there is excessive gurgling, drain blockage may be present.

Undersink drain plumbing usually resembles one of the following descriptions. In all cases, the drain tubing from the air gap (RO outlet) should run downward, free of dips and loops. The air gap outlet must not be connected to the effluent side of the trap. This can vent sewer gas, which will produce foul odors.

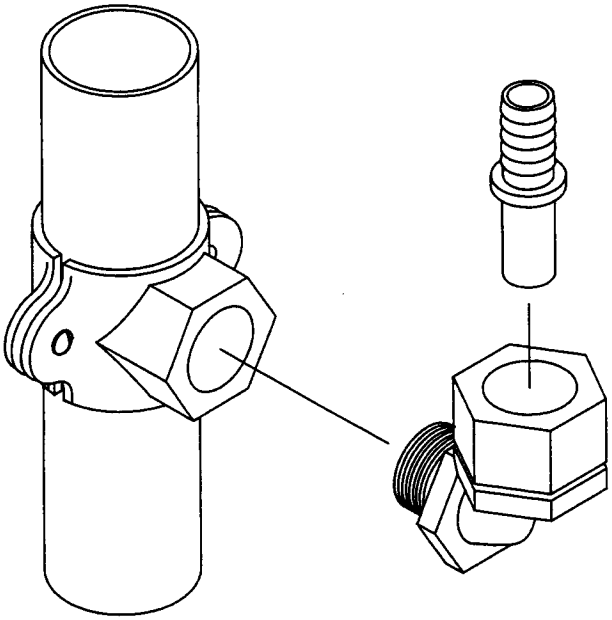

FIG. 15
DRAIN SADDLE KIT

Single basin sink without disposal:

- Connect the RO outlet to the tailpiece directly beneath the sink.
- If a dishwasher drain connection is present, the RO outlet must be connected above it.

Single basin sink with disposal:

- Connect the RO outlet to the dishwasher drain port on the disposal if available.
- If the dishwasher drain port is not available, other arrangements must be made such as running the RO outlet to a basement sump.
- Do not connect the RO outlet to the plumbing below the disposal.

Double basin sink with disposal, single trap

- The fitting which joins the drains from the disposal and second sink should be directional. If not, then Culligan recommends that it be replaced.
- Connect the RO outlet to the tailpiece just below the second sink.
- If a dishwasher drain is present and cannot be relocated, the RO outlet must be connected above it.
- Do not connect the RO outlet to the horizontal plumbing between the two sink drains.

Double basin sink with disposal, double trap

- Connect the RO outlet to the tailpiece just below the second sink.
- If a dishwasher drain is present and cannot be relocated, the RO outlet must be connected above it.

RESERVOIR TANK PLACEMENT

Place the reservoir tank in the location previously selected.

INSTALL FILTER SYSTEM ASSEMBLY

The mounting bracket of the panel assembly contains two mounting slots. The holes are sized to accept #10 round-head wood screws (not supplied). Some types of surfaces such as particle board or drywall, may require the use of plastic screw anchors or toggle bolts to provide adequate support for the unit.

- Using the mounting bracket as a template, mark the two mounting screw locations.
- Drill a 1/8-inch hole at each mounting screw location.
- Thread a wood screw into each of the holes, leave a 1/2-inch space between the screw head and the mounting surface.
- Hang the panel assembly on the mounting screws and tighten.

CONNECT SYSTEM

When cutting plastic tubing use a sharp razor blade. Cut the tube at a slight (5°-15°) angle.

- Connect plastic tubing from the feed water supply source to the inlet of the system (at the prefilter).
- Install plastic tubing from the product water outlet of the RO housing to the reservoir tank angle valve.
- Connect the blue product water tubing from the faucet to the outlet of the carbon postfilter.
- Install a plastic tee in the line between the RO module and the tank.
- Connect the postfilter inlet to the branch of the tee.
- Connect the tubing from the air gap inlet of the faucet to the concentrate water outlet of the module housing.
- If the pressure relief valve was not adjusted at the plant, it must be adjusted now.
- When an icemaker is installed, a tee must be installed between the RO module and the tank.

START-UP

The following procedure should be performed during the plant pre-delivery check out and again after installation:

- Turn on the inlet feed water valve and open the tank valve.
- Check system thoroughly for leaks.
- Run product water from faucet to flush carbon dust out of the carbon postfilter.
- Verify proper module performance.

PERFORMANCE

In order to check the performance of a unit, it is necessary to determine four factors: Product flow rate, product water TDS, feed water TDS, and concentrate flow rate.

When checking the product and concentrate flow rate, the following instruments are needed:

- Graduated Cylinder
- Thermometer
- Stopwatch or wristwatch with a sweep second hand.

Determine the TDS content of the feed and product water by using a hand-held triple range TDS meter.

Checking Product Flow Rate

The nominal production rate of this system is 8 gpd. This will vary depending on influent water conditions. Follow the procedure outlined below to verify the performance of your system.

The temperature of the water will affect the module product water flow rate. To determine what the flow rate would be at the temperature standard of 77°F (25°C), proceed as follows:

- Collect product water directly from the RO module outlet in the graduated cylinder for exactly two (2) minutes.
- Check the water temperature with the thermometer.
- Divide the volume of the water sample in milliliters by 5 to determine the product water flow rate in gallons per day (gpd).
- Correct the product water flow rate for water temperature using the temperature correction factor from Table C. Divide the measured flow rate by the correction factor to determine the product flow rate at the temperature standard of 77°F (25°C).

Example:
Volume collected in 2 minutes is 40 mL.
Water temperature is 78°F (26°C).

40 mL ÷ 5 = 8 gpd.

Temperature correction factor from Table C is 1.03.

8 gpd ÷ 1.03 = 7.76 gpd.

Compare the corrected value to the value in Table D, based on the feed water pressure to the unit.

Checking The Total Dissolved Solids (TDS) Content

Whenever checking module performance always take a sample directly from the module product tube. Avoid sampling product water from the faucet when checking module performance.

This portion of the procedure requires the use of total dissolved solids (TDS) meter; it compares feed water TDS with product water TDS to determine percent rejection.

- Rinse the cell cup twice with water to be tested, then fill to the top (Fig. 16).

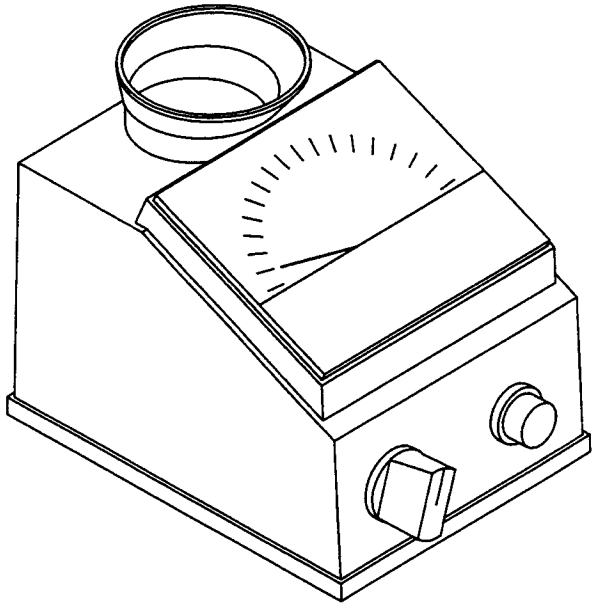

FIG. 16
3 RANGE TDS METER

- Press the button on the front of the meter and read the dial for the dissolved solids content of the product water in parts per million (ppm).

NOTICE: *On a triple range meter, always set the instrument on the highest scale (0-2500) and work down until the proper scale is reached. The meter can be damaged by allowing the needle to run off the scale.*

Next, take a TDS reading on the feed water to the unit. Calculate the percent rejection by the following formula:

$$\frac{\text{Feed water TDS - Product water TDS}}{\text{Feed Water TDS}} \times 100 = \text{percent rejection}$$

For example:

$$\frac{\text{500 ppm(m/L) - 50 ppm (m/L)}}{\text{500 ppm(m/L)}} \times 100 = 90\% \text{ rejection}$$

Checking The Drain Flow Rate

Generally, the concentrate flow rate should be between 3 and 5 times that of the product flow rate, depending on line pressure. At 50 psi (345 kPa) line pressure with a TDS of not more than 1500 ppm (mg/L), recovery should range from 20% to 30% when the water temperature is at 68°F (20°C) to 77°F (25°C).

Test the concentrate flow by removing the drain tube from the module head and collect the water in a graduated cylinder. Divide the volume (in milliliters) of the sample collected in two minutes by five to find the daily concentrate output in gallons per day (gpd). No temperature correction is required for the concentrate water flow rate.

OVERALL SYSTEM CHECK

- Turn on the inlet feed water valve and open the tank valve. A complete systems check can be performed when the reservoir tank has been precharged with water.
- Move the faucet lever to the full open position. A steady stream of product water should be observed if the tank was filled earlier.
- Make a complete systems check and adjust as needed to correct any leaks.
- Run product water through the faucet to flush out any remaining carbon dust from the post filter.
- Perform a final module check to verify proper product performance.
- Thoroughly clean up the equipment and the installation site.

REVIEW OPERATION WITH CUSTOMER

Review the operation of the Culligan® drinking water system with the customer. Explain that the unit will require routine maintenance of the prefilters, reverse osmosis module, and the carbon postfilter. Advise the customer how often these items will need to be serviced based on your past experience. Discuss the product and module warranties.

Technical Data Tables

PERFORMANCE INFORMATION AND DATA TABLES

The following questions will most often be raised in connection with the operation of the Culligan® drinking water system:

- Is the module operating properly?
- How much product water will be produced by the system?
- What water quality (percent rejection) is to be expected from the system?
- How much water can be stored in the reservoir?

See Tables A, B, C, D, E and F for assistance in answering the following:

- **Is the module operating properly?**

  QUANTITY: Close the reservoir angle valve, disconnect the product tube from the valve and measure product flow rate. Correct product flow rate for feed water temperature using Table C. Compare this temperature-corrected product flow rate to the values in Table D for your inlet feed water pressure. These values should agree within ± 10% for a new module.

  QUALITY: Whenever checking product water quality always measure at module product tube. Never test from faucet for module performance.

  Allow product water to run to drain for twenty minutes. Measure product water quality either by using a Total Dissolved Solids Meter or by submitting water samples to Culligan for analysis. Take a TDS reading (or a sample) of the feed water. Calculate percent rejection and compare calculated value to values in Table G for your inlet feed water pressure: agreement should be within ± 10%.

  NOTICE: *If feed water total dissolved solids are significantly higher than 700 ppm (standard) use the correction procedure below.*

- **How much water will be produced by the system and what will the average quality be?**

  Both the quantity and quality of product water produced by the system depends on the average net driving pressure across the module. This pressure is what remains when the reservoir's product back pressure is subtracted from the feed line pressure. The reservoir's back pressure is developed by compressing the precharged air in the reservoir. If the precharged air pressure is compressed to equal line pressure, the net driving pressure becomes zero and product water flow stops. Both the automatic shutoff and the pressure relief valve are designed to maintain the proper feed/tank pressure differential.

EFFECT OF HIGH DISSOLVED MINERALS ON PRODUCTION

The production ratings for the systems as shown in the tables of this section are based on water containing 700 parts per million dissolved minerals. Higher dissolved minerals act as though they were a "back pressure" taking away or reducing the net driving pressure across the module. A practical rule to adjust for this difference is to deduct 500 from the feed TDS. Drop the two right digits of that number and multiply this by 1.4. Deduct this from the net driving force (feed water pressure) and read the gallons per day and percent rejection at that reduced pressure.

Example:

Q. What will be the production and percent rejection at 50 psi (345 kPa) and 1500 TDS?

TABLE C - EFFECT OF FEED WATER TEMPERATURE ON PRODUCT WATER QUANTITY

[77°F (25°C) rating multiplied by correction factor equals capacity]

Feed Water Temperature		Correction Factor	Feed Water Temperature		Correction Factor	Feed Water Temperature		Correction Factor
°F	°C		°F	°C		°F	°C	
36	2	.33	52	11	0.56	68	20	0.83
38	3	0.34	54	12	0.59	70	21	0.87
40	4	0.37	56	13	0.63	72	22	0.90
42	6	0.40	58	14	0.65	74	23	0.94
44	7	0.43	60	16	0.69	76	24	0.96
46	8	0.46	62	17	0.72	77	25	1.00
48	9	0.50	64	18	0.76	78	26	1.03
50	10.0	0.52	66	19	0.79	80	27	1.06

A. 1500 - 500 = 1,000 x 1.4 = 14. Therefore 50 psi (345 kPa) - 14 psi (97 kPa) = 36 psi (248 kPa). See D which shows production of about 6 gpd (21 L/day) compared to 8 gpd (30 L/day) if the water were at the lower mineral content. Similarly percent rejection is reduced to about 92% from 94%.

TABLE D - INITIAL MODULE PERFORMANCE TO OPEN RESERVOIR, H-83 SERIES

FEED WATER PRESSURE		PRODUCT WATER FLOW		PERCENT OF TOTAL DISSOLVED SOLIDS
psi	kPa	gpd(L/pd)	ml/min.	Rejected
10	69	1.6 (6)	4.2	74
15	103	1.6 (6)	4.2	80
20	138	3.2 (12)	8.4	85
25	172	4.0 (15)	10.5	89
30	207	4.6 (18)	12.6	91
40	276	6.4 (24)	16.8	93
50	345	8.0 (30)	21.0	94
60	414	9.6 (36)	25.3	94
70	483	11.2 (42)	29.5	95
80	552	12.6 (48)	33.7	96
90	620	14.4 (54)	37.9	97
100	689	16.0 (60)	42.1	98

Tables C, D and E show typical initial module performance at 77°F (25°C), inlet feed water temperature and 700 ppm (mg/L) total dissolved solids of mixed ions. When there is NO PRODUCT WATER BACK PRESSURE a slight variation from these product water flow values and rejection are normal.

TABLE E - INITIAL MODULE PERFORMANCE TO OPEN RESERVOIR, H-53 SERIES

FEED WATER PRESSURE		PRODUCT WATER FLOW		PERCENT OF TOTAL DISSOLVED SOLIDS
psi	kPa	gpd(L/pd)	ml/min.	Rejected
10	70	.80 (3)	2.1	68
15	103	1.3 (5)	3.3	71
20	138	1.7 (6)	4.4	74
25	172	2.2 (8)	5.8	77
30	207	2.9 (11)	7.6	79
40	276	3.9 (15)	10.3	81
50	345	4.9 (18)	12.8	83
60	414	6.2 (42)	16.1	85
70	483	6.8 (53)	18.0	87
80	551	8.3 (57)	21.9	89
90	620	9.2 (63)	24.1	91
100	68	10.6 (73)	27.8	93

TABLE F - COMPARISON OF WATER STORAGE CAPACITIES OF SMALL TANK AND LARGE TANK, DIFFERENT LINE PRESSURES.

Tank Pressure		Water Stored Gallons (L)	
	kPa	Small Tank	Large Tank
20 psi	138 kPa	1.8 (7)	6.0 (23)
30 psi	207 kPa	2.4 (9)	7.8 (29)
40 psi	276 kPa	2.6 (10)	8.0 (30)
50 psi	345 kPa	2.8 (11)	9.6 (36)
60 psi	414 kPa	3.0 (11)	10.0 (38)
70 psi	482 kPa		10.6 (40)
80 psi	551 kPa		11.0 (42)
90 psi	620 kPa		11.2 (42)

5 psi air charge

Troubleshooting Guide

If a problem cannot be corrected through use of this Troubleshooting Guide and assistance from the factory is required, please have the following information available:

1. Product water flow rate (directly from module).
2. Concentrate flow rate (from concentrate water outlet of module housing). Pressure relief valve must be closed when measuring concentrate flow rate.
3. Feed water line pressure.
*4. Product water quality (directly from module).
*5. Reservoir water quality.
*6. Feed water quality.
7. Feed water temperature.
8. Reservoir precharge pressure.
9. Whether unit is equipped with automatic shutoff or pressure relief valve.

*Check with TDS meter.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Insufficient quantity of product water available to service.	a. Service greater than unit's specified output.	a. Use optional large tank PN 00-4026-03 for more storage capacity.
	b. Insufficient feed water flow.	b. 1. Clogged shut-off valve or feed tubing; clean out or replace 2. Clogged prefilter; replace.
	c. Insufficient feed water pressure	c. 1. Same as (b) above 2. Change in line pressure; install booster pump.
	d. Increase in feed water TDS.	d. 1. Same as (a) above 2. Install booster pump.
	e. Reduced feed water temperature	e. Same
	f. Plugged prefilter.	f. Replace filter element.
	g. Plugged carbon postfilter.	g. Replace carbon postfilter
	h. Module fouled with sediment.	h. Replace module and prefilter element.
	i. Leaking pressure relief valve.	i. Replace rubber diaphragm and/or spring, check adjustment.
	j. Shutoff malfunction.	j. Replace shutoff.

PROBLEM	PROBABLE CAUSE	REMEDY
2. Poor product water quality	a. All of (1) above except (a) and (e)	a. All of (1) above except (a) and (e)
	b. Module fouled.	b. Replace module.
	c. Insufficient pressure relief differential across module.	c. Check for proper pressure valve setting.
	d. Bad O-ring (Module)	d. Replace O-ring
	e. Shutoff malfunction.	e. Replace shutoff.
3. Bad tasting product water	a. Decrease in product quality; see (2) above.	a. Same as (2) above.
	b. Foreign matter in reservoir.	b. Clean; sanitize and flush reservoir.
	c. Carbon postfilter exhausted.	c. Replace carbon postfilter
	d. Leakage around module O-rings.	d. Replace O-rings
	e. Plugged capillary tube.	e. Replace capillary tube; replace prefilter, if necessary.
	f. Product line and concentrate line connections are reversed.	f. Check lines and make correct connections
	g. Reservoir tank bladder is ruptured.	g. Replace accumulator tank and check precharge pressure.
4. External leakage.	a. Loose fittings.	a. Check all fittings for tightness.
5. Overflow at faucet air gap (gurgling sounds).	a. Concentrate tubing plugged	a. Clean concentrate tubing of debris.
	b. Air gap plugged.	b. Clean with vinegar and/or soap.
	c. Concentrate tubing not in continuous downward slope.	c. Eliminate loops or low spots in tubing.
	d. Tubing connections reversed.	d. Change tubing connections.
	e. Obstructed home drain pipe.	c. Free obstruction.

PROBLEM	PROBABLE CAUSE	REMEDY
6. Foaming at faucet tip.	a. Reservoir is positioned on side (Dissolved air cannot escape).	a. Place tank in vertical position.
7. Foaming at air-gap	a. Concentrate tubing connected to same drain line as dishwasher, etc.	a. Find different drain for system.
	b. When sink is full of soapy water and plug is pulled, can back up at air-gap.	
	c. Obstructed home drain	c. Free obstruction
8. Bad smell from product water	a. Carbon postfilter exhausted.	a. Replace carbon postfilter.
	b. Prefilter element	b. Replace filter element.
	c. Unit needs disinfection	c. Sanitize unit.
9. Fast flow to drain.	a. Defective capillary tube	a. Replace capillary tube.
	b. Leaking pressure relief valve.	b. Replace diaphragm and/or spring, check adjustment.
10. Black specks in product water.	a. Carbon fines.	a. Flush carbon postfilter.
11. Low faucet pressure	a. Low precharge in reservoir	a. Increase reservoir precharge.
	b. Carbon postfilter plugged	b. Replace or back-flush carbon postfilter.
	c. Relief valve malfunction	c. Replace rubber diaphragm and/or spring, check adjustment.
12. Capillary tube plugging	a. Excessive turbidity.	a. Install another 5 micron filter in series with existing one.
	b. Iron fouled.	b. Pretreat for iron removal.
	c. Iron-bacteria fouled.	c. Sanitize plumbing.

Filter Replacement

RO MODULE REPLACEMENT

Use the following procedure as a guide when replacing the RO module. **The preservative solution should be flushed from the module prior to installing the system. Refer to page 9.**

- Refer to Fig. 17.
- Turn off the inlet water supply.
- Open the faucet and bleed the pressure.
- Disconnect all tube fittings from the module top cap and the inlet on the module housing (pressure relief valve equipped systems only). You may wish to mark these lines with tape to help assure they are reconnected correctly later. Remove the module housing assembly from the mounting bracket.
- Remove the U-clip from the module housing by prying out with a screwdriver and then pulling the clip free.
- Pull the top cap straight out of the housing with a twisting motion to help free its O-ring seal.
- Remove the module from the housing, being careful to avoid damage which may prevent inspection.
- Clean the inside of the module housing and top cap of dirt and sediment.
- Lubricate the module O-ring with silicone lubricant and carefully insert the replacement module into the housing, module seal end last.
- Lubricate the top cap O-ring with silicone lubricant, reinstall the top cap and insert the U-clip.
- Snap the module housing assembly back into the mounting bracket.

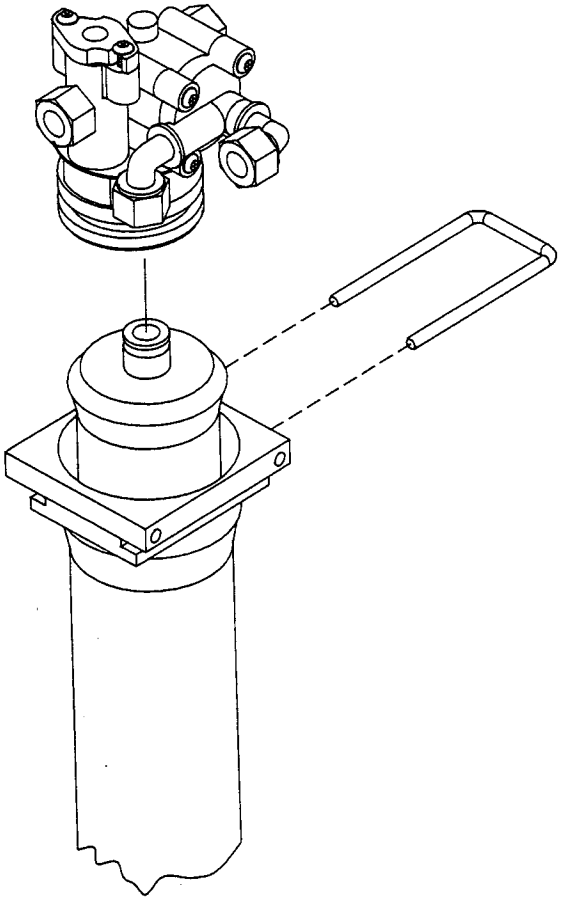

FIG. 17
RO MODULE REPLACEMENT

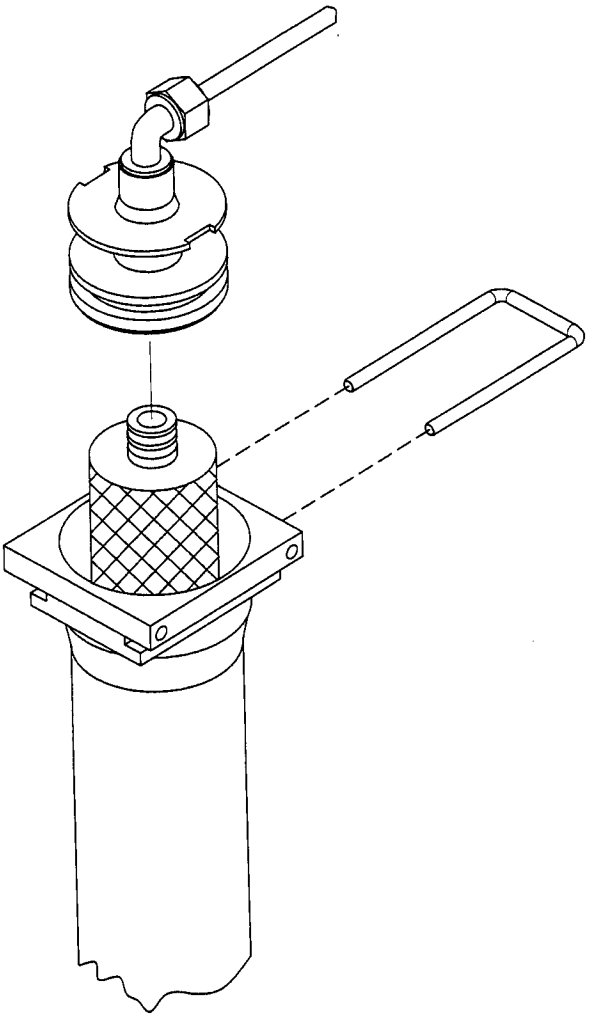

FIG. 18
PREFILTER REPLACEMENT

- Reconnect all tube fittings to the module housing assembly. Make certain that the tubing connections are correct.
- Verify module performance.
- Turn on the inlet water supply.
- Because product water is produced at a slow rate it may be three to four hours before an appreciable amount of water is available from the reservoir tank.

PARTICULATE PREFILTER CARTRIDGE REPLACEMENT SCHEDULE (H-53 & H-83)

The particulate filter precedes the RO module (Fig. 18) to reduce any suspended matter that may clog the module. Prefilters should be replaced when the flow rate is reduced, production is restricted, or low water quality. Use the following procedure as a guide.

ACTIVATED CARBON PREFILTER CARTRIDGE REPLACEMENT SCHEDULE (H-83 only)

The characteristics of the water supply on which the Model H-83 system is installed will affect the life of the carbon prefilter element. This element should be replaced at least once a year OR when the chlorine content of the water from the carbon prefilter exceeds 0.1 ppm.

PREFILTER CARTRIDGE REPLACEMENT PROCEDURE

- Refer to Figure 2.
- Turn off the inlet water supply.
- Relieve the pressure in the filter housing by loosening the tubing nut on the filter outlet. Use a clean rag to catch any dripping water.
- Disconnect the two tubing fittings from the prefilter housing assembly.
- Remove the filter housing assembly from the mounting bracket.
- Pull the top cap straight out of the housing with a twisting motion to help free the O-ring seal.
- Remove the filter element, wrap it in newspaper and discard with trash.
- Clean the filter housing and top cap of dirt and sediment.
- Unwrap the replacement filter element, lubricate the center tube O-ring with silicone lubricant and insert the element into the housing, being certain that the O-ring is at the top of the cartridge.
- Lubricate the O-ring of the top cap with silicone lubricant, reinstall the top cap and insert the U-clip.

NOTICE: *The replacement granular carbon cartridge MUST be properly flushed prior to installation.* Refer to page 9.

- Snap the filter assembly back into mounting bracket.
- Reconnect the inlet and outlet tubing fittings, turn on the inlet water supply and check for leaks.

ACTIVATED CARBON POSTFILTER REPLACEMENT

The carbon postfilter (Fig. 19) should be replaced once a year or whenever a noticeable change in taste or decrease in flow occurs. To replace the carbon postfilter proceed as follows:

- Refer to Figure 4.
- Turn off the inlet water supply, close the needle valve on the reservoir tank, and open the dispensing faucet to relieve pressure.
- Remove the filter from the mounting bracket.
- Disconnect the two tubing fittings at each end of the filter and discard the used element.
- Observe the direction of flow noted on the new filter body. Attach the tube fittings to the inlet and outlet of the new filter.
- Turn on the inlet water supply, open the needle valve on the reservoir tank and check for leaks.
- Open the dispensing faucet and allow about one quart of water to flow to the sink drain to flush carbon dust out of the postfilter.

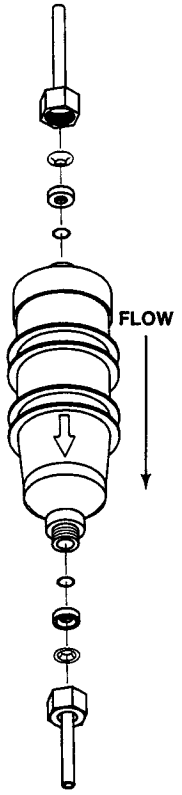

FIG. 19
CARBON POSTFILTER REPLACEMENT

Sanitizing Instructions

Prefilter and Module Housing Sanitization H-52 and H-83

Before a replacement component is installed, the housing and its components must be sanitized.

- Prepare a sanitizing solution. Add one (1) ounce of household bleach to three (3) gallons of water.
- Swab the interior of the module housing with the sanitizing solution. Soak the top cap in the solution for twenty minutes.
- Drain excess solution from the components after the twenty minute period and reassemble. Be careful to avoid contamination of the assembly.
- Allow the module buffering solution, along with any residual chlorine, to thoroughly rinse out as in the plant preparation of the module assembly before connecting module for service.

Reservoir Sanitization H-53 and H-83

If a customer's reservoir tank requires sanitization, bring the tank into your plant and follow the sanitization instructions **Rinsing Out and Sanitizing the Reservoir.**

Sanitizing the H-53 Systems

Periodically, the unit should be sanitized to inhibit bacterial growth.

- Turn off the feed water supply.
- Sanitize the reservoir as instructed in the Reservoir Sanitization section.
- Open the faucet until the product water flow diminishes to a drop. The reservoir should now be drained completely. Leave the faucet open.
- Relieve the pressure in the system by loosening the tubing nut on the prefilter outlet. Use a clean rag to catch any dripping water.
- Disconnect the fitting from the top cap of the prefilter.
- Remove and discard the old filter element. Clean the inside of the filter housing, and insert a new filter element. Fill the filter housing 3/4 full with water and add 40 drops of 5-1/4% household bleach. Attach the prefilter assembly to the system.
- Turn on the feed water supply. Allow the sanitizing solution in the filter housing to flow into the system.
- Let the product water drip slowly from the faucet for one hour. Then, close the faucet and allow the solution to flow into the reservoir tank.
- For the next 18 hour period, the product water may have a disagreeable chlorine taste. This objectionable taste can be flushed out by periodically draining the reservoir. (3 or 4 times during this 18 hour period.)

Sanitizing the H-83 System

Do not attempt to sanitize the H-83 system in the same manner as the H-53 system. The use of bleach (chlorine) will disintegrate the polyamide membrane used in the H-83 systems. Each component of the system should be sanitized separately as previously directed.

SANITIZING INSTRUCTIONS WITH HYDROGEN PEROXIDE

H-53 and H-83 Systems

When using hydrogen peroxide, make sure the solution has not exceeded its expiration date. It has maximum strength when used within 48 hours after opening a new bottle.

DISINFECTION

- Open the faucet, when the product water flow diminishes to a drip, then the reservoir has been drained. Leave the faucet open.
- Turn off feed water supply.
- Relieve the pressure in the system by loosening the tubing nut on the prefilter inlet.
- Remove prefilter from the bracket.
- Disconnect the tube fitting from the top of prefilter.
- Remove U-clip and cap from the prefilter housing.
- Pour 3 ounces of hydrogen peroxide into prefilter with filter in place. Assemble prefilter.
- Place prefilter housing on bracket and connect tubing.
- Pour one tablespoon of hydrogen peroxide into accumulator tank. Assemble system.
- Turn the water on.
- Let unit run. Empty accumulator tank after 6 hours.
- Return the system back to service.

NOTICE: *When unit is biologically fouled, we recommend you replace all filters.*