



Better Water LLC  
1232 R.O. System Operation

1232 R.O. System Operator Manual

# 1232 Reverse Osmosis Unit Used For HEMODIALYSIS



Revised  
June 2011













# 1232 R.O. System Operation

## 1232 R.O. System Operator Manual

### Our Company

Better Water is a leading integrated manufacturer of water treatment machines, components and equipment for the industrial, commercial and institutional markets.



Located in Smyrna, Tennessee, Better Water continues its history of manufacturing and worldwide distribution of equipment specifically designed for the renal dialysis market.

Founded in 1971, Better Water has built a reputation for solving our customers' toughest problems with high-quality products and unmatched service.

### User Assistance Information

Support is available regarding all BW LLC Systems  
24 hours-7 Days.

Normal business hours are Monday through Friday (excluding holidays) 8:00 am to 3:30 pm Central Time call:

**615-355-6063**

Emergency Assistance is available after normal business hours (including holidays)

**BEFORE** calling for emergency assistance:

- Check the Operator's Trouble-shooting guide
- Check the electrical power connections, fuses and/or circuit breakers
- Check all valves to ensure each is in the correct position.

If this fails to correct the problem and an emergency hemodialysis treatment situation exists, call:

**615-355-6063**

Your call will be automatically forwarded to the on-call cell phone directory. Please copy all the numbers and select the most appropriate number for your emergency.

### Contact Us

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## 1232 R.O. System Operation

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#### Warnings and Cautions

## WARNINGS and CAUTIONS

**WARNING:** It is unsafe to operate this device without first reading and understanding the **entire** Operator's Instruction Manual.

**WARNING:** Misuse or improper operation of this device could result in serious injury, death, or other serious reactions to a patient undergoing hemodialysis treatment.

**WARNING:** Misuse, improper use or handling of chemical disinfectants and chemical cleaning solutions could result in serious injury or even death. You must comply with the information contained in the Material Safety Data Sheet (MSDS) for the chemical being used.

**CAUTION:** Improper operation of this device could result in a low or no flow alarm on the hemodialysis machine.

**CAUTION:** Misuse or improper operation of this device will void any warranty.

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# 1232 R.O. System Operation

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### Introduction

## INTRODUCTION

Your Better Water Reverse Osmosis (R.O.) Machine is a computer-aided design of the utmost quality. With proper operation, maintenance and care, this device should give you years of reliable service.

**Before you start using this device**, you must read and understand this manual in its entirety. This manual of Operator's Instructions describes in considerable detail all of the steps and procedures required to **safely** operate this device.

It is **unsafe** to operate this device without a basic understanding of water treatment and a thorough understanding of the contents of this manual.

Your R.O. was designed and built with consideration for the information that has been provided to us on the current tap water conditions at your site of operation.

There is not a Reverse Osmosis Machine on the market that is a panacea for all water treatment requirements. The R.O. cannot do the job alone; therefore, one must understand that changing tap water conditions require monitoring.

Incoming tap water **contaminants, temperature, pH, pressure and flow-rates** have a **direct impact** on the **quality** and **quantity** of the Reverse Osmosis Machine **output**.

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## Introduction

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You must be aware of changing tap water conditions. This can be easily accomplished with good, two-way communications with your municipal drinking water supplier and with routine testing of the tap water provided to you.

To emphasize the importance of water treatment and proper use of water treatment equipment used for hemodialysis, the following is quoted from Health and Human Services Publication FDA 89-4234,

**"Numerous reports have documented that use of inadequately treated water for hemodialysis poses a severe threat to the health and safety of the hemodialysis patient. Despite this, water treatment and water quality are often neglected areas of hemodialysis. A major reason for this neglect is that water treatment is a technically complex subject which is not generally a part of the education and training of clinical staff in hemodialysis facilities."**

We at Better Water LLC, highly recommend the use of this very informative and self-teaching publication in your training programs.

Once the device has been delivered to you, "it is the **responsibility** of the **Medical Director** to ensure that the [device] is operated, monitored, and maintained in such a manner so as to satisfy all applicable standards for which the water may be used". (Quoted from HHS Publication FDA 89-4234).

**Please keep this manual readily available for each of your operators to use.**

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## 1232 R.O. System Operation

### 1232 R.O. System Operator Manual

#### Description

### DESCRIPTION

Your Reverse Osmosis (R.O.) Machine is a computer aided design device that is pressurized by a stainless steel submersible pump and motor that are contained in a stainless steel cylinder. Based upon your specifications and consideration for the tap water data that was provided to us, your R.O. was custom designed and built to exacting standards and Good Manufacturing Practices outlined by the FDA. Your R.O. is a device that uses a membrane separation process for removing solvent (contaminants) from solution (tap water). To best describe the process, the following is a quote from Health and Human Services Publication FDA 89-4234: "In order to use reverse osmosis as a water purification process, the feed [tap] water is pressurized on one side of a semi permeable membrane. The pressure must be high enough to exceed the osmotic pressure to cause reverse osmotic flow of water. If the membrane is highly permeable to water, but essentially impermeable to dissolved solutes [contaminants], pure water crosses the membrane and is known as product water. As product water crosses the membrane, the concentration of dissolved impurities increases in the remaining feed water (a condition known as concentration polarization) and, as a consequence, the osmotic pressure increases. A point is reached at which the applied pressure is no longer able to overcome the osmotic pressure and no further flow of product water occurs. Moreover, if the applied pressure is increased in an attempt to gain more product water, a point is reached at which the membrane becomes fouled by precipitated salts and other undissolved material from the water.

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Therefore, there is a limit to the fraction of feed water which can be recovered as pure water and reverse osmosis units are operated in a configuration where only a portion of the feed water passes through the membrane with the remainder being directed to drain (cross-flow configuration). The water flowing to drain contains concentrated solutes and other insoluble materials, such as bacteria, endotoxins and particles, and is referred to as the **reject stream**. Typically, the product water to feed water ratio is of the order of 25 to 50% for purification of water for hemodialysis by reverse osmosis".

Your R.O. is the most important and costly component in your water treatment system.

With appropriate pretreatment of the tap water, proper cleaning and disinfection, the R.O. life can be prolonged for several years.

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## 1232 R.O. System Operation

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### 1232 RO Start Up Procedure

## REVERSE OSMOSIS MACHINE START-UP PROCEDURES

We have built your Reverse Osmosis Machine (R.O.) to be extremely user friendly. To start the R.O., the operator must change the position of only one switch. However, we have found that some people like to touch an area that is identified "WET PAINT", and we have found that some people like to move switches, because switches are there to be moved. Before you change the position of the one switch required to start the R.O., please perform the following preliminary steps.

### To start the Reverse Osmosis Machine (R.O.):

#### 1. Check the R.O. CONTROL PANEL:

a). All alarm lights should be **OFF** and **NO** audible alarm should be sounding. If any one or more of the alarm lights are **ON** and/or an audible alarm is sounding, **PRESS** the Alarm **RESET** button. All alarm lights should go out and audible alarms should stop sounding.

#### **WARNING**

**Disinfectants can cause serious injury or death to patients undergoing hemodialysis treatment.**

b). The keyed, **OPERATE-DISINFECT** switch should be in the **OPERATE** position. **If this switch is in the DISINFECT position, you MUST verify that the R.O. does NOT contain any disinfecting solution BEFORE proceeding to the next step.**

c). The **OPERATE-DISINFECT-OFF** switch should be in the **OPERATE** position. If the switch is in the **DISINFECT or OFF** position, see step 1b and the warning above.

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d). If you must reset the switches listed above, the alarm lights will illuminate and the audible alarm will sound, **PRESS** the Alarm **RESET** button to return the alarms to normal.

2. Now you are ready to start the R.O.: Simply move the **OPERATE-FLUSH** switch from **FLUSH** to the **OPERATE** position. The rest is automatic.

a). The Purge cycles will commence.

**NOTE:** After approximately 30 seconds the R.O. pump will start, and at the same time, the Water Quality Alarm will begin to sound. This is a normal function to advise you that the first water produced by the R.O. is being routed to drain until the quality equals the set-point on the Water Quality Monitor. This purge cycles may take approximately **two minutes**.

b). After the Purge Cycles have completed, the R.O. should be operating within the parameters as listed below:

- 1). Pump pressure should read: **150-200** psi.
- 2). Membrane pressure should read: **100-150** psi.
- 3). Reject Pressure should read: **50-100** psi.
- 4). Product Pressure should read: **0 (zero)** on tank feed systems, and **20-70** psi on direct feed systems.
- 5). For a 3 membrane array R.O., the Product, reject and recirculate should read 1.5gpm on all 3 flow meters, plus or minus 15%.
- 6). For a 4 membrane array R.O., the Product, reject and recirculate should read 2.0 gpm on all 3 flow meters, plus or minus 15%.

3). If your equipment is not within the design specifications listed above, go to the section titled: Reverse Osmosis Machine- Operator Adjustments.

4). Perform a thorough quality assurance check of your entire water treatment system including pretreatment, primary treatment, post treatment, and distribution.



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#### Shut Down Procedures

## REVERSE OSMOSIS MACHINE SHUT-DOWN PROCEDURES

After the hemodialysis day is over, you will find it very easy to shut-down your R.O. by changing the setting on only **one switch**.

**To shut-down the Reverse Osmosis Machine (R.O.):**  
**NOTE: The R.O. is not completely turned-off. It is placed into an idle or standby mode that is called the FLUSH Mode.**

1. Ensure there are no further requirements for water for hemodialysis or other systems used in your facility.
2. Move the **OPERATE-FLUSH** switch from the **OPERATE** to the **FLUSH** position, and the R.O. will enter into an automatic and scheduled Flush program. The amber Flush light will come on when the R.O. actually starts-up and goes into flush at the pre-determined time, or when manually cycled into the flush mode by the 24 hr. timer.

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## 1232 R.O. System Operation

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#### R.O. Adjusting Procedures

## REVERSE OSMOSIS MACHINE ADJUSTING PROCEDURES

On occasion, your R.O. may require adjustments that can be performed by **qualified operators**. There are many factors that can affect the performance of the R.O. If minor adjustments to the R.O. do not produce the desired results, you must investigate changes in the tap water feeding the RO. Tap water pH, temperature, pressure, TDS, and flow changes can cause a **drastic** reduction in the R.O. performance. **In worst case situations**, changes to the tap water can create conditions the R.O. cannot handle without augmentation.

**CAUTION:** Only **qualified** R.O. operators should make adjustments to the R.O.

**CAUTION:** The inlet water temperature must be **70-85** degrees Fahrenheit with **77°F being optimum**. The temperature must be measured while the R.O. is running. The R.O. inlet water pressure must be 40 psi.

**CAUTION:** While making adjustments, the R.O. must be running with **no** alarm conditions indicated.

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**PREPARATION: Before making any adjustments, read this entire section and pay close attention to cautions, notes, and items marked important.**

**1. Product Flow Adjustment\*:** **NOTE:** This adjustment affects both the Product Flow and the Reject Flow. Peak R.O. efficiency is obtained when the Product Flow and the Reject Flow are the same.

a). On the front panel of the R.O., locate the "T-Handle" on the Reject/Product Regulating Valve.

b). Slowly, turn the "T-Handle" on the Reject/Product Regulating Valve clockwise or counterclockwise, as required, to balance (**as close as possible**) the Reject and the Product Flows.

c). After the Reject and Product Flows have been balanced, perform a Quality Assurance Check on the R.O. to insure all pressures and flows are within design specifications

**2. Reject Flow Adjustment \*:** Same as Product Flow Adjustment. See paragraph 1a, b, & c above.

**3. Recirculation Flow Adjustment\*:**

a). On the front panel of the R.O., locate the "T-Handle" to the Recirculation Regulating Valve.

b). Slowly, turn the "T-Handle" on the Recirculation Regulating Valve clockwise or counterclockwise, as required, to adjust the Recirculation Flow to design specifications.

c). After the Recirculation Flow has been adjusted; perform a Quality Assurance Check on the R.O. to insure all pressures and flows are within design specifications.

4. **Pump Pressure Adjustment\***: There are **no** requirements to adjust the Pump Pressure. The Pump Pressure Gauge is used solely to monitor Pump performance. Please refer to the Membrane Pressure Adjustment below.

5. **Membrane Pressure Adjustment\***: **NOTE**: This adjustment affects both the Pump Pressure and the Membrane Pressure.

a). Read paragraph 4 above.

b). Locate the "**Pump/Membrane Adj.**" valve: On the right-hand side of the R.O. and located at the top of the stainless steel, Pump/ Motor housing, you will find a stainless steel valve with a yellow, lever-type handle used to adjust the Membrane Pressure.

**IMPORTANT NOTE: Only minute adjustments** to the "**Pump/ Membrane Adj.**" valve are required to achieve the desired results. If you make abrupt adjustments, the R.O. may enter into an alarm condition.

c). This is a delicate adjustment. **Very slowly**, move the Yellow handle on the Membrane Adjustment Valve **left to decrease** or **right to increase** the Membrane Pressure to design specifications.

d). After adjusting the Membrane Pressure, perform a Quality Assurance Check on the R.O. to insure all pressures and flows are within design specifications.

6. **Reject Pressure Adjustment\***: There are **no** requirements to adjust the Reject Pressure. The Reject Pressure Gauge is used solely to monitor the pressure drop across the membrane.

**7. Product Pressure Adjustment\*:** There are no requirements to adjust the Product Pressure on a Tank Feed system. If installed, the Product Pressure Gauge is for any possible Feed System changes in the future.

**8. Product Pressure Adjustment for Direct Feed Systems:** Product pressure should be adjusted only when there are no requirements for R.O. water. Locate the pressure by-pass T-handle at the end of the distribution loop. To increase product pressure, turn T-handle clockwise. Maximum product pressure is 70 psi. To decrease product pressure, turn the T-handle counter-clockwise. Minimum 20 psi.

**NOTE:** Product pressure must be 10 psi greater than feed water/5 micron filter out pressure to the R.O. Adjustments on feed water pressure may be required before attempting to adjust product pressure.

**\* If you are unsure of any adjusting procedure, please call our Assistance phone number, we will gladly discuss the situation, and if necessary, talk you through the procedure.**



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#### Disinfection

## REVERSE OSMOSIS MACHINE DISINFECTING PROCEDURE

Your RO comes to you with new, proprietary Thin Film Material membranes that should not be disinfected for a period of six-weeks after initial installation. After the initial break-in period of six-weeks, it is recommended that you routinely disinfect the membranes every 30 days with an approved disinfectant that will not degrade the membranes or the components of the R.O. Based on your specification for Renalin disinfectant, your R.O. was built with components that will tolerate Peracetic acid type disinfectants. The membranes will not tolerate sodium hypochlorite (bleach).

### WARNING

**Disinfectants can cause serious harm or death.  
Wear protective clothing and face protection.**

This procedure covers the mechanical steps required to disinfect the Reverse Osmosis Machine. The preparation of the disinfecting solution must be in accordance with specifications established for the selected disinfectant. The disinfectant must be handled in accordance with its Material Safety Data Sheet(MSDS).

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## CAUTION

**This procedure should be performed by well trained and qualified people.**

1. Preparation: Before performing the disinfection procedure, read the entire procedure.
  - a). Rinse the inside of the Disinfect Tank with R.O. Product water and drain thoroughly.
  - b). Add the predetermined quantity of R.O. Product water (approx. 20 gallons) to the Disinfect Tank. **DO NOT ADD THE DISINFECTANT AT THISTIME.**
2. In accordance with the following procedures, place the R.O. into the **DISINFECT** mode:
  - a). Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.
  - b). Turn the keyed, **OPERATE-DISINFECT** switch to the **DISINFECT** position. **REMOVE AND PROTECT THE KEY.**
  - c). Turn the **OPERATE-FLUSH** switch to the **OPERATE** position.
3. In accordance with the following steps, connect the Disinfect Tank to the R.O.:
  - a). Properly identify and connect the **Disinfectant Feed Line** (bottom line on the Disinfect Tank) to the **R.O. Disinfect/Clean Valve** (Yellow Handle Valve, located at the bottom left side of the R.O. and labeled **DISINFECT / CLEAN** Valve).
  - b). On the Disinfect Tank, properly identify and **OPEN** the **Disinfect Feed Valve** (located on the bottom, front of the Disinfect Tank).
  - c). **OPEN** the **RO Disinfect/Clean Valve** (Yellow Handle Valve located at the bottom left side of the R.O. and labeled **DISINFECT/ CLEAN** Valve).
  - d). Disconnect the **R.O. Drain Line** from the drain, and connect it to either of the Disinfect Tank top ports.
  - e). Disconnect the **R.O. Product (permeate) line** from the Storage Tank, and connect it to the remaining **port located at the top of the Disinfect Tank.**

**NOTE:** On a Direct Feed system, proceed with steps a-d. Before proceeding to step f, ensure that the disinfectant of choice is compatible with water contact materials, as well as the Dialysis Machine. Also ensure that all post R.O. filters are removed, and D.I. tanks are by-passed. The product / permeate line should remain connected to the loop. Disconnect the loop return line from the R.O. and connect it to either of the disinfect tank top ports.

### CAUTION

**If the lines are not connected properly and the valves are not open, the R.O. pump will be damaged.**

f). Double-check your work. **DO NOT ADD THE DISINFECTANT.**

4. Using the following procedure, check the disinfecting system for leaks.

**For safety reasons, this step is performed without the disinfecting chemical.**

### CAUTION

**Upon pump start, there must be an immediate flow into the top of the disinfect tank.**

a). Turn the **OPERATE-DISINFECT-OFF** switch to the **DISINFECT** position.

b). **IMPORTANT:** Check for an **immediate** flow into the top of the Disinfect Tank. If there is no flow, **immediately** turn the **OPERATEDISINFECT-OFF** switch to the **OFF** position and check the **RO DISINFECT/CLEAN VALVE** and the **DISINFECT FEED VALVE** on the Disinfect tank. **BOTH** valves must be **OPEN**.

c). Allow the water to flow for one to two minutes and check for leaks.

d). Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.

1. On the R.O., close the RO **DISINFECT/CLEAN** Valve.
2. On the Disinfect Tank, close the **DISINFECT FEED** Valve.

**WARNING:** All lines from the Disinfect Tank to the R.O. contain disinfecting solution, and when each one is disconnected from the R.O., the solution will drain from the line; therefore, you must use a disposable container to catch the solution or hold the line in a position to cause the solution to flow to the Disinfect Tank.

3. Disconnect the R.O. Drain line and return it to drain.
4. Disconnect the R.O. Product (permeate) line and connect it to **DRAIN**. On Direct Feed systems, the R.O. product line will remain connected to the distribution loop.
5. Disconnect the Disinfect Feed Line from the R.O. **DISINFECT/CLEAN** Valve.
  - 5a. On Direct Feed systems , connect the loop return line to drain.
6. In accordance with approved methods and procedures, dispose of the remaining disinfecting solution.
7. Allow the disinfecting solution to stand or dwell in the R.O. for the specified period of time for the disinfectant used.
8. Alert the nursing supervisor; the R.O. contains a disinfectant.



## 1232 R.O. System Operation

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### Removing Disinfectant from the RO

## REMOVING DISINFECTANT FROM THE REVERSE OSMOSIS MACHINE.

### WARNING

**ALL R.O. lines contain disinfectant.  
Wear protective clothing and face protection.**

1. Ensure the disinfectant has been allowed to stand or dwell for the specified time.
2. Ensure the R.O. Product (permeate) line is connected to **drain**. Secure the line. (On Direct Feed systems, the product line should remain connected to the distribution loop.)
3. Ensure the R.O. Reject (drain) line is connected to **drain**. (On Direct Feed systems, ensure that the loop return line is connected to the drain.)
4. Ensure the RO **DISINFECT/CLEAN** Valve is closed.
5. Ensure the **OPERATE-FLUSH** switch is in the **OPERATE** position.
6. Insert the key into the **OPERATE-DISINFECT** switch and turn it to the **OPERATE** position.

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Removing  
Disinfectant  
from the  
RO  
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7. Turn the **OPERATE-DISINFECT-OFF** switch to the **OPERATE** position and **PRESS** the alarm **RESET** to reset the alarms.

- a). The Purge cycles will begin.
- b). After approximately 30 seconds, the R.O. pump will start.
- c). The product water will be routed to drain.
- d). The Water Quality Alarm will sound.

8. Allow the R.O. to operate in this configuration for a **minimum of two hours**, or until the disinfectant is rinsed clear.

9. After the two-hour time period and by using an approved reagent, check for residual disinfectant. If residual disinfectant is detected, allow the R.O. to run and retest every 30 minutes until no residual disinfectant is detectable.

10. Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.

11. Allow the R.O. to stand idle for **30 minutes**.

12. After the 30 minute, idle period, turn the **OPERATE-DISINFECT-OFF** switch to the **OPERATE** position and **PRESS** the alarm **RESET** to reset the alarms.

13. Allow the R.O. to run for another 10 minutes (**minimum**).

14. Check the R.O. product water for residual disinfectant. This test is for a phenomenon known as "**disinfectant rebound**". If disinfectant is detected, continue the run-test procedure until no residual disinfectant is detectable.

Removing  
Disinfectant  
from the R.O.  
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15. When no residual disinfectant is detectable:

- a). Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.
- b). Reconnect the R.O. Product (permeate) line to its normal operate position. On Direct Feed systems, reconnect the loop return line to the R.O.
- c). Remove the **WARNING** placard from the R.O.
- d). Advise the Nursing Supervisor that the disinfectant has been removed from the R.O. and no residual disinfectant is detectable.

**16. Before the next hemodialysis treatment, have a second, knowledgeable person verify the absence of residual disinfectant.**

17. Perform a Quality Assurance Check on the R.O. Begin normal operation.



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#### R.O. Membrane Cleaning

## REVERSE OSMOSIS MACHINE MEMBRANE CLEANING PROCEDURES

On occasion, your R.O. Membranes will require cleaning with chemical cleaners to regain maximum performance. The membrane cleaning procedure is almost identical to the R.O. disinfecting procedure with the exception: there is no stand or dwell time for the chemical cleaning solution. Membrane fouling is **indicated** when:

- The Product Flow **decreases** and the Reject Flow **increases**, and the two cannot be adjusted to design specifications.
- The Pump Pressure **increases**, the Membrane Pressure **increases**, and the Reject Pressure **decreases** and cannot be adjusted to design specifications.
- The Quality Monitor indicates a continuous **decline** in water quality.

**NOTE:** Other factors, such as changes in the tap water pH, TDS, temperature, and/or pressure can cause **drastic** changes in the overall performance of the R.O.

## WARNING

**Chemical cleaners can cause serious injury or death.**

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This procedure covers the mechanical steps required to clean the Reverse Osmosis Machine Membranes. The preparation of the chemical cleaning solution must be in accordance with the specifications established for the selected cleaning chemical. The cleaning chemical must be handled in accordance with its **Material Safety Data Sheet (MSDS)**.

## CAUTION

**This procedure should be performed by well trained and qualified people.**

**1. Preparation: Before cleaning the membranes, read this entire procedure from beginning to end.**

- a). Rinse the inside of the Disinfect/Cleaning Tank with R.O. Product water and drain thoroughly.
- b). Add the predetermined quantity of R.O. Product water to the Cleaning Tank. **DO NOT ADD THE CLEANING CHEMICAL AT THIS TIME.**

In accordance with the following procedure, place the R.O. into the **DISINFECT (Clean)** mode.

- a). Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.
- b). Turn the keyed, **OPERATE-DISINFECT** switch to the **DISINFECT (Clean)** position. **REMOVE AND PROTECT THE KEY.**

**R.O.  
Membrane  
Cleaning  
Con't**

3. In accordance with the following steps, connect the Disinfect/Cleaning Tank to the R.O.:
  - a). Properly identify and connect the Disinfectant (Cleaner) Line (bottom line on the Disinfect/Cleaning Tank) to the R.O. **DISINFECT/CLEAN** Valve (Yellow Handle Valve, located at the bottom left side of the R.O. and labeled **DISINFECT/CLEAN** Valve).
  - b). On the Disinfect/Cleaning Tank, properly identify and **OPEN** the **DISINFECT/CLEAN FEED** Valve (located on the bottom, front of the Disinfect/ Cleaner Tank).
  - c). **OPEN** the R.O. Disinfect/Clean Valve (Yellow Handle Valve located at the bottom left side of the R.O. and labeled **DISINFECT/CLEAN** Valve).
  - d). Disconnect the R.O. Drain Line from the drain, and connect it to either of the Disinfect/Clean Tank top ports.
  - e). Disconnect the R.O. Product (permeate) line from its normal operate position, and connect it to the remaining port located at the top of the Disinfect/ Clean Tank.

## **CAUTION**

**If the lines are not connected properly and the valves are not open, the R.O. pump will be damaged.**

- f). **Double-check** your work. **DO NOT ADD THE CHEMICAL CLEANER.**

4. Using the following procedure, check the cleaning system for leaks. For **safety** reasons, this step is performed without the cleaning chemical.

## **CAUTION**

**Upon pump start, there must be an immediate flow into the top of the Disinfect/Cleaning Tank**

- a). Turn the **OPERATE-DISINFECT-OFF** switch to the **DISINFECT (Clean)** position and **PRESS** the alarm **RESET** to reset the alarms.
- b). **IMPORTANT:** Check for an **immediate** flow into the top of the Disinfect/Cleaning Tank. If there is no flow, **immediately** turn the **OPERATEDISINFECT-OFF** switch to the **OFF** position and check the R.O.

**DISINFECT/ CLEAN** Valve and the **DISINFECT/CLEANING** Valve on the Disinfect/  
Cleaning Tank. **BOTH** valves must be **OPEN**.

c). Allow the water to flow for one to two minutes and check for leaks.

d). Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.

## WARNING

**Before proceeding, don appropriate protective clothing and face protection.**

**IF NO LEAKS WERE FOUND**, add the predetermined quantity of chemical cleaner to the water in the Disinfect/Cleaning Tank. Do **NOT** close the lid to the Disinfect/Cleaner Tank.

5. In accordance with the following procedures, clean the RO membranes:

a). Turn the **OPERATE-DISINFECT-OFF** switch to the **DISINFECT (Clean)** position and **PRESS** the alarm **RESET** to reset the alarms. The R.O. pump will start, and cleaning solution will circulate throughout the R.O. and immediately return to the Disinfect/Cleaning Tank.

b). **CAUTION:** There must be an **immediate** flow return to the Disinfect/ Cleaner Tank. If **NOT**, **immediately**, turn the **OPERATEDISINFECT-OFF** switch to the **OFF** position **AND RECHECK** the steps in paragraph 4a, b, c, d, and e.

c). Close the lid on the Disinfect/Cleaning Tank.

d). **IMPORTANT:** Allow the R.O. to run in the **DISINFECT (Clean)** mode for 10-15 minutes. A longer period of time can cause the pump to **overheat**.

e). Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position. The R.O. pump will shut-down , and all power will be disconnected from the control panel.

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f). While wearing protective face shields and protective clothing, carefully perform the following steps to remove the Disinfect/Cleaning Tank and lines from the R.O.

1. On the R.O, **close** the R.O. Disinfect/Clean Valve.
2. On the Disinfect/Cleaning Tank, **close** the **DISINFECT/CLEAN FEED** Valve.

**WARNING:** All lines from the Disinfect/Cleaning Tank to the R.O. contain cleaning solution. When each line is disconnected, the solution will drain from the line; therefore, you must use a disposable container to catch the solution, or you must hold the end of the line in an elevated position to cause the solution to flow to the Disinfect/Cleaning Tank.

3. Disconnect the R.O. Drain line from the Disinfect/Cleaning Tank and return it to **DRAIN**.
4. Disconnect the R.O. Product (permeate) line from the Disinfect/ Cleaning Tank and connect it to **DRAIN**.
5. Disconnect the Disinfect/Cleaning Line from the R.O. **DISINFECT/ CLEAN** Valve.
6. In accordance with approved methods and procedures, dispose of the remaining cleaning solution.



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## 1232 R.O. System Operation

### 1232 R.O. System Operator Manual

#### Removing Chemical Solution from The R.O.

## REMOVING CHEMICAL CLEANING SOLUTION FROM THE REVERSE OSMOSIS MACHINE WARNING

**ALL R.O. lines contain cleaning solution.**

**Wear protective clothing and face protection.**

1. Ensure the R.O. Product (permeate) line is connected to **DRAIN**. Secure the line.
2. Ensure the R.O. Reject (drain) line is connected to drain.
3. Ensure the R.O. **DISINFECT/CLEAN** Valve is **closed**.
4. Ensure the **OPERATE-FLUSH** switch is in the **OPERATE** position.
5. Insert the key into the **OPERATE-DISINFECT** switch and turn it to the **OPERATE** position.
6. Turn the **OPERATE-DISINFECT-OFF** switch to the **OPERATE** position.
  - a). The Purge cycles will begin.
  - b). After approximately 30 seconds, the R.O. pump will start.
  - c). The product water will be routed to drain.
  - d). The Water Quality Alarm will sound. You may silence the alarm by pressing the alarm mute switch. The alarm will re-sound in 30 seconds if the R.O. alarm condition still exists.

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Removing  
Chemical  
Solution from  
The R.O.  
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7. Allow the R.O. to operate in this configuration for a **minimum of two hours**.

8. After the two-hour rinse period, check for residual cleaning chemicals by performing a pH test of the tap water feeding the R.O. and the R.O. Product water. The Product pH should be within one point of the tap water pH. If residual cleaning chemicals are detected, continue the rinse program for an additional 30 minutes and retest. Continue the rinse-test procedure until no cleaning chemicals are detected.

9. Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.

10. Allow the R.O. to stand idle for **30 minutes**.

11. After the 30 minute, idle period, turn the **OPERATE-DISINFECT-OFF** switch to the **OPERATE** position and **PRESS** the alarm **RESET** to reset the alarms.

12. Allow the R.O. to run for another **10 minutes (minimum)**.

13. Perform the pH test for residual cleaning chemicals. This test is for a phenomenon known as "rebound". If cleaning chemicals are detected, continue the run-test procedure until no residual cleaning chemicals are detectable.

14. When no residual cleaning chemicals are detectable:

a). Turn the **OPERATE-DISINFECT-OFF** switch to the **OFF** position.

b). Reconnect the R.O. Product (permeate) line to its normal operate position.

c). Advise the Nursing Supervisor that the R.O. Membranes have been cleaned, and the cleaning chemicals have been rinsed from the R.O.

15. **Before the next hemodialysis treatment**, have a second, knowledgeable person verify the absence of residual cleaning chemicals.

16. Perform a Quality Assurance Check on the R.O. and begin normal operations.



## 1232 R.O. System Operation

### 1232 R.O. System Operator Manual

#### Troubleshooting

## TROUBLE-SHOOTING GUIDE

This section of the Operator's Manual is a guide only for operators. It is not all inclusive for R.O. repair technicians. This guide should aid operators with reminders and routine trouble-shooting tasks. For any problem outside the confines of this guide, call for technical assistance. See page ?

**PROBLEM:** The R.O. will not start.

**CORRECTIVE ACTION:**

1. Is the water level in the storage tank above the #2 float switch?
  - If **yes**, this is a normal condition. When the water level drops below the #2 float switch, the R.O. should start.
  - If **no**, proceed.
2. Press the Alarm **RESET** button; all alarm lights should go out and the audible alarm should be silenced and the R.O. should start.
3. Check the position of the R.O. switches:
  - a). **OPERATE-FLUSH** switch should be in the **OPERATE** position.
  - b). **OPERATE-DISINFECT** switch should be in the **OPERATE** position.
  - c). **OPERATE-DISINFECT-OFF** switch should be in the **OPERATE** position.
  - d). **TANK-OFF-DIRECT** switch should be in the **TANK** position.
4. Check the R.O. fuses and/or circuit breakers.

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