

# ELIX35 DI WATER SYSTEM



## STANDARD OPERATING PROCEDURES (SOPs) 2021 (v.1)

### NCPRE FABRICATION LAB

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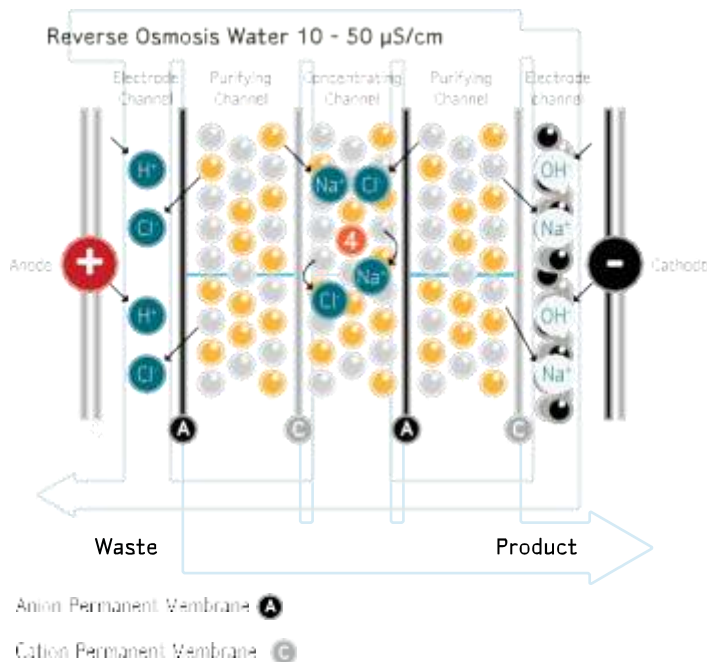
# INTRODUCTION

## Millipore Elix 35

Millipore Elix 35 water purification system gives your lab the ability to produce thousands of liters a day of Type II water from a tap feed. With a flow rate of 35 liters per hour this water purification system uses a four step process to provide total control over pure water production, quality assurance, storage, and distribution to ensure constant flow and quality. Specified Parameters are checked at each step and accuracy is assured with a low 0.15cm-1 cell constant

Water first enters the Millipore Elix 35 water purification system at the Progard pretreatment cartridge to remove particles and colloids, free chlorine and hardness before beginning the reverse osmosis purification. Users can also purchase pretreatment packs that are available separately, these packs compensate for specific feed water characteristics. After RO, the purified water then enters a Elix module equipped with state of the art Elix electro-deionization to further remove ions. The Elix module of this water purification system also contains special carbon beads that eliminate the need to “soften” the water before beginning. The pure water is then passed through a bactericidal 254nm UV lamp before it flows into a storage tank specially designed to maintain water purity.

### Principle:



1. Feed water enters the Elix<sup>®</sup> module and splits into three types of flow channels: the electrode channels, the purifying channels and through the concentrating channels of resin beds sandwiched between anion- and cation-permeable membranes.
2. Electronic-grade, mixed-bed ion-exchange resin captures dissolved ions.
3. Electrical current across the module pulls captured cations through the cation-permeable membranes (C) towards the cathode, and anions through the anion-permeable membranes (A) towards the anode. Ion-exchange resins on both sides of the membrane enhance the transfer of ions through the cation and anion-permeable membranes.
4. Cation-permeable membranes prevent anions from proceeding towards the anode, and anion-permeable membranes prevent cations from proceeding towards the cathode. This results in a reduction in the ion concentration in the purifying channels.

5. Activated carbon beads next to the cathode avoid scaling issues by lowering the local pH at the electrode surface.
6. Ions in the concentrating channels are flushed from the system into the waste stream.
7. Purified water leaves the module.

## **SUPER-Q PLUS WATER PURIFICATION SYSTEM**

The Super-Q Plus System is a high-flow water system designed to provide the "final polish" to water which has been pretreated by reverse osmosis, distillation or deionization. Super-Q Plus systems consistently produce ultrapure (Type 1) water quality. The Super-Q Plus water system features a modular design for the production of ultrapure water. The system also features automatic recirculation of water on an hourly basis to maintain water quality between uses. Because Super-Q product water is produced "on demand", there is no need to store water and risk degrading water quality over time.

NOTE: Effluent quality will rapidly degrade if stored outside of the Super-Q System. Such high quality water will be contaminated by the atmosphere and by contact with a storage vessel.

## **SYSTEM SPECIFICATIONS**

### **ELIX 35 System Performance:**

Product flow rate: 35 l/h 9.2 gal/h (nominal flow rates, 7 to 30 °C)

Water recovery: up to 40 %

Product water resistivity: > 5 MΩ·cm (typically 10-15 MΩ·cm) (compensated to 25 °C)

Product water conductivity: < 0.2 μS/cm (typically 0.067-0.10 μS/cm) (compensated to 25 °C)

Product water TOC: < 30 ppb

Bacteria: < 10 cfu/ml

Silica rejection: > 99.9 %

Available Storage capacity: 350 L

### **ELIX 35 Feed Water Requirements:**

Quality: Potable Mains (Tap) Water

Conductivity: < 2000 μS/cm (@ 25 °C)

pH: 4-10

Feed water temperature required: Between 5 °C and 35 °C.

Feed water pressure: 2 bar minimum, 6 bar maximum (29 psi min, 86 psi max)

Flow rate: > 5 l/min at 2 bar (1.3 gal/min at 29 psi)

## SUPER-Q PLUS system:

### Feed Water Requirements

Operating Temperature: 5°C - 40°C (41°F - 104°F)

Feed Water Pressure: Minimum 0.5 psi (0.03 bar) to Maximum 15 psi (1 bar) depends upon pump specifications.

### Typical System Performance

Resistivity: 18.2 Megohms-cm at 25°C.

Organic: < 20 ppb (When an Organex-Q™ cartridge is used and the system is fed with Reverse Osmosis water)

Microorganisms: < 10 cfu/ml (With 0.22 µm final filtration immediately prior to the point-of-use).

Flow rate: Maximum 10-12 liters/min.

## System Provider

### Regional Support

**1. Merck Life Science Private Limited, an affiliate of Merck KGaA, Darmstadt, Germany**

8th Floor, Godrej One, Pirojshanagar, Eastern Express Highway,

Vikhroli (E), Mumbai- 400079. India

Tel: +91 22 6210 9800

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**2. Merck Life Science Private Limited, an affiliate of Merck KGaA, Darmstadt, Germany**

50A, 2nd Phase, Ring Road

Bangalore, Peenya 560 058. India

Tel: +91-80-39224000, 39224001

## SAFETY PRECAUTIONS

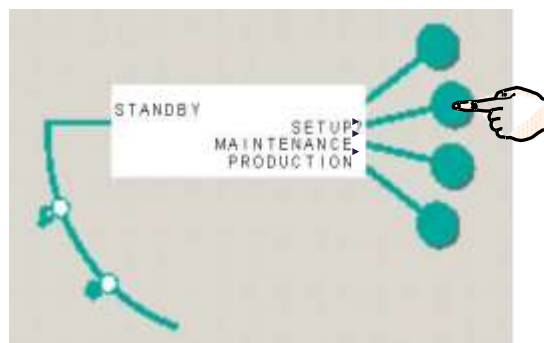
			
Electric shock hazard	Electrical Ground	UV Radiation	Pinch points

# STANDARD OPERATING PROCEDURE

## INSTALLED SYSTEM: ELIX 35



### LCD DISPLAY AND DIFFERENT OPERATING MODES:



#### STANDBY MODE:

The Elix System is not producing water. STANDBY Mode is used to enter other software modes such as MAINTENANCE, SETUP and PRODUCTION Mode.

## PRODUCTION MODE:

The Elix System is producing water. A storage reservoir is getting filled with water from the Elix System. Pressing DATA in PRODUCTION Mode allows various operating parameters to be seen.

## RINSING MODE:

```
R I N S I N G           ■ 40% P R O D U C T >
      15.0MΩ           T C
      T O C :      21 p p b DATA ▶
                          S T A N D B Y ▶
```

The Elix System is diverting the RO Permeate to drain instead of sending it to a Storage Reservoir. RINSING Mode is used to insure that only high quality RO Permeate is sent to the Storage Reservoir. RINSING Mode occurs for a few different reasons.

1. One reason is that the Elix System is going into PRODUCTION Mode. RINSING Mode will occur automatically for one minute or more whenever entering PRODUCTION Mode.
2. The 2nd reason for RINSING Mode is that the RO % Rejection is 1% lower than the Memorised RO % Rejection Value. When 4 continuous minutes of PRODUCTION Mode have occurred, the RO % Rejection is “memorised”.

RINSING Mode will continue until the RO % Rejection is within 0.5% of the Memorised Value.

## FLUSH MODE:

FLUSH Mode occurs when the Inlet Solenoid Valve and the RO Reject Solenoid Valve both are open. This allows Tap Water to enter and to sweep away any accumulated impurities on the Feedwater surface of the RO Cartridge. FLUSH Mode occurs automatically every 6 hours for 5 minutes in either STANDBY Mode or in TANK FULL Mode.

```
R O F L U S H
                          S E T U P ▶
                          M A I N T E N A N C E ▶
                          C A N C E L ▶
```

```
R O F L U S H           ■ 99% P R O D U C T
>      15.0MΩ           T C
      T O C :      21 p p b DATA ▶
                          C A N C E L ▶
```

## TANK FULL MODE:

```
T A N K F U L L           ■ 99% P R O D U C T >
      15.0MΩ           T C
      T O C :      21 p p b DATA ▶
                          S T A N D B Y ▶
```

TANK FULL Mode occurs when a Storage Reservoir is full. A Level Sensor in the reservoir sends a signal to the Elix System indicating that it is full. The Elix System will stay in TANK FULL Mode until water is withdrawn from the reservoir (i.e. emptied about 20%). The Resistivity and TOC values measured upon entering TANK FULL Mode are displayed during TANK FULL Mode.

## DESCRIPTION OF INPUT & OUTPUT CONNECTIONS:

This section describes the use of the various ports and other connection places on the front left side of the Elix System Cabinet.



**PORT DRAIN 1:** This port allows RO Reject Water to exit the Elix System.

**PORT FEED 2:** This port allows Feed water to enter the Elix System.

**PORT CONC. 3:** This port allows Elix Module Waste Water to exit the Elix System.

**PORT PRODUCT 4:** This port allows Product Water to exit the Elix System.

**TANK LEVEL:** A Male Stereo Jack from an Analogue Level Sensor can be plugged into the Elix System here. The Supply Voltage coming from this connection to the Level Sensor is normally 5 VDC but can be set to 24 VDC.

**SOLENOID VALVE:** The Inlet Solenoid Valve is used to control the flow of tap water/ feed water into the Elix System.

**Tank level sensor**



**Solenoid valve**





## PRE-FILTRATION HOUSING ASSEMBLY:

Most municipal tap water supplies contain a very high concentration of suspended particulate, colloids, dissolved organic and inorganic materials. These should be removed by the appropriate pre-treatment methods to prolong the useful life of cartridges, and enhance the product water purity.



### 5 MICRON FILTER (20") and 1 MICRON FILTER (20"):

These inline cartridges are used for removal of sand, dirt particles and other contaminants of size more than 5 micron and 1 micron respectively to achieve good quality feed water to the system.

**Note:** Recommended to change the pre filter cartridge for every 2-3 months to increase the life of Progard and RO Cartridge.

### Exchange of 5 micron and 1 micron Pre filter cartridges:

1. Close inlet tap water
2. Go to standby mode of the system
3. Use pre filter opener spanner / hands to open the filter housing assembly.
4. Loose the housing by moving it anti clock wise direction.
5. Remove the old cartridge, and empty the housing
6. Clean the housing before installing new filter
7. Insert the new cartridge.
8. Re fix the housing by moving it clock wise direction.
9. Open inlet tap water
10. Go to the Production mode.
11. Wait for some time to circulate the water through both the housing.
12. Check for the leakage if any.
13. If there is a leak follow the steps 2- 9 again till the leakage stops.

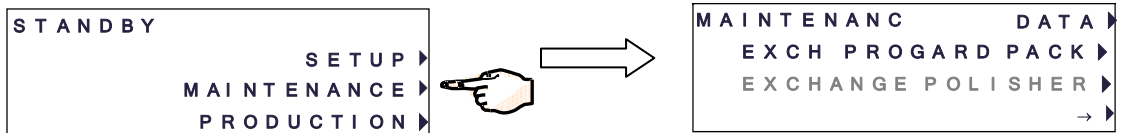
# PROGARD® TL SYSTEM PRETREATMENT PACK:



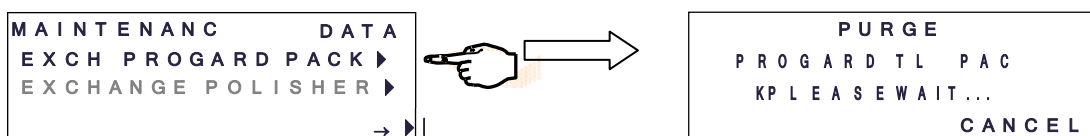
The Progard TL System Pretreatment Pack is used to prevent mineral scaling, organic fouling and chlorine oxidation with the Reverse Osmosis (RO) Membranes. The Progard TL is a consumable device that needs to be periodically replaced during the maintenance of an Elix System. It is located on the left side of the front of the Elix System cabinet.

## Removing of Expired Progard-TL pack:

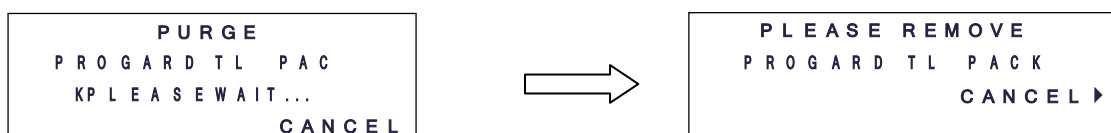
1. Place the Elix System into STANDBY Mode.
2. Press the MAINTENANCE Keypad Button.



3. Press the EXCH PROGARD PACK Keypad Button for a few seconds. The Progard TL (on the Elix System) will automatically be purged of water. This helps to prevent water coming out of the ports of the Progard TL when it is removed from the Elix System. It will purge for 12 seconds during which time the Pump will operate.



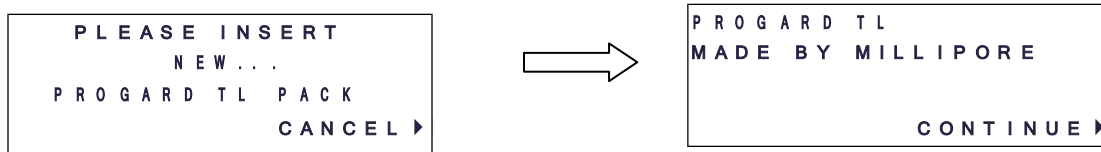
4. When the Progard TL is purged of water, the LCD will tell you to replace it.



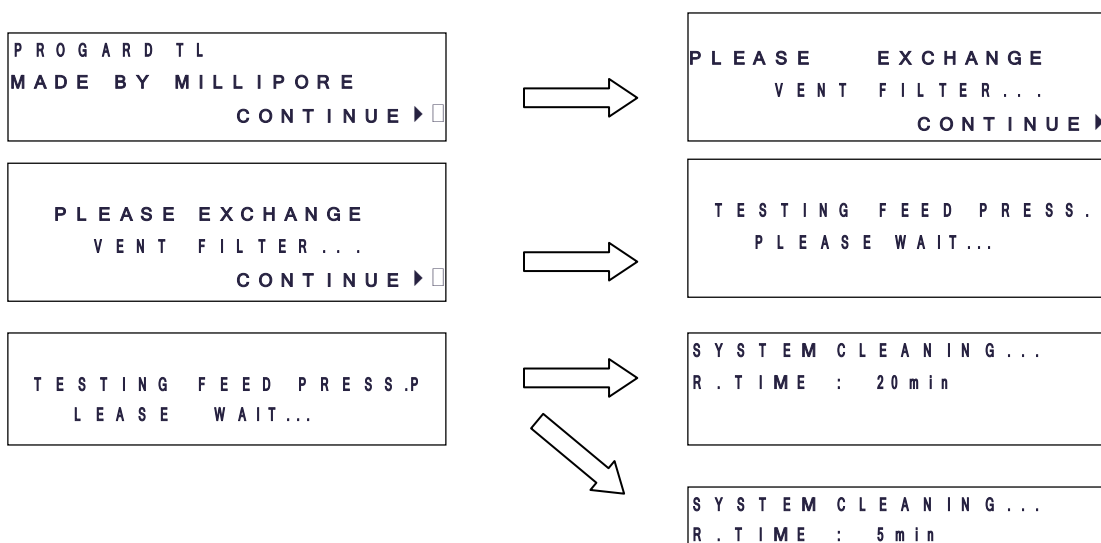
5. Unlock the Pack by lifting up the clip that holds the Progard TL in place.
6. Gently remove the Progard TL from the Elix System.

## Installation of new Progard TL pack:

1. Remove the new Progard TL from its shipping box. Verify the Millipore SAS Catalogue Number by looking at the sticker on the side of the Progard TL. Remove the plastic covers on the 4 ports of the Progard TL Pack. Look inside the ports to locate the black rubber O-rings. Make sure these are pushed in so they are firmly in-place. Wet the Progard TL Pack O-rings with water.
2. Look below the ports on the bottom of the Progard TL. Locate the TAG Sensor.
3. After the used Progard TL is removed, install the new Progard TL with the TAG Sensor at the bottom. The Elix System will automatically identify the type of Progard TL by accessing data contained on the Pack TAG. Normally the Elix System will recognize and accept the information from the Progard TL.
4. Make sure the top and bottom ports of the new Progard TL are pushed in. After this, secure it in place by pushing down on the Pack Locking Handle.



5. The Elix System will now rinse the new Progard TL. This is done to empty it of air and to hydrate the material inside.
6. If you have a Storage Reservoir with a Vent Filter, then the LCD will remind you to change the Vent Filter at this time.
7. **Note:**
  - If the Progard TL does not have a chlorine tablet inside of it, then the Elix System will go into SYSTEM CLEANING Mode for 5 minutes.
  - If the Progard TL does have a chlorine tablet inside of it, then the Elix System will go into SYSTEM CLEANING Mode for 20 minutes.
8. A DEPRESSURISATION Mode and a PRESSURE TEST Mode will occur for a few seconds prior to the 5 minute or 20 minute SYSTEM CLEANING Mode.



9. The CANCEL Keypad Button is not shown if the Progard TL is brand new and never used.

## Reverse Osmosis cartridge:

The Reverse Osmosis membrane removes 95%-99% of contaminants including ions, particulates, bacteria, and organic molecules. (maintenance is done by Millipore Enggineer only)



## INSTALLED SYSTEM: SUPER-Q PLUS

The Super-Q System consist of a series of four housings, each of which holds a disposable cartridge. Each cartridge provides a particular function such as pre filtration, organic adsorption, deionization and final Millipore membrane filtration to particle retention levels ranging to 0.22  $\mu\text{m}$ . The full flow of feed water passes from the various cartridges through a temperature-compensated (25°C) resistivity sensor that monitors ionic purity over an effective range from 1.5 to 18.2 mega ohm-cm.



The feed water source (Reverse Osmosis, deionized or distilled water supply) from the storage of Elix 35 is connected to the inlet of the Super-Q Plus.

### Pump (Super-Q Plus Systems):



The Super-Q Plus Systems include a positive pressure gear-pump that directs the feed water, under pressure, through the system. This selected magnetic drive gear pump is used to eliminate problems of seal replacement, priming, and leakage. It produces a maximum flow of 12 L/min (3 gpm), at a maximum pressure of 55 psi (3.8 bar).

### Meg-O-Meter Assembly & sensor:

This water quality meter provides an accurate, in-line measurement of the Super-Q product water resistivity. The meter scale is graduated from 2 to 18 mega ohm-cm. The unit is internally temperature-compensated to normalize readings at 25°C (77°F) for water temperature between 5°C and 40°C (40°F to 104°F). On Super-Q Plus Systems the assembly is equipped with an auto recirculation feature that allows water to recirculate when the Main Power Switch is in the ON-1 position, and the Pump Control Switch is in the “Standby” mode. This recirculation, caused by periodic operation

(in the “Standby” mode) permits the user to draw water at a high purity level at all times.



The sensor, located just after the last housing, is electrically connected to the Meg-O-Meter Assembly. In operation, the sensor continually measures the product water resistivity as it exits the last housing.

### **Operation Control Switch (Super-Q Plus Systems):**

This switch, located on the face of the Meg-O-Meter Assembly, controls the operation of the pump. To function, the Main Power Switch must be in the ON1 position. Operate position:

In this position, the pump operates continually. Depending upon the position of the production valve, product water is sent either to the point-of-use, or is continually recirculated.

Standby position:

In the standby position, the pump operates only during automatically timed flush cycles, once every one and a half hour for 41/2 minutes.

### **Production Valve (Super-Q Plus Systems):**

This manually operated valve, located to the right of the sensor, directs the product water flow in either of two directions: to the point-of-use, or to the system's recirculation loop. Standard Systems that require a recirculation loop must include a similar valve. The valve is open when the knob is turned anticlockwise to Product position, allowing water to flow to the final filter or point-of-use. The valve is closed when the knob is pointed up, to Recirculation position allowing water to recirculate through the system so that water quality is maintained at a high level.

## **Cartridge Replacement Procedure:**

The cartridges should be changed when the Meg-O-Meter scale indicator falls below 10 MΩ-cm or the desired resistivity level to a point unsatisfactory for your particular use.

1. Before proceeding, make sure the system is in “Standby” mode
2. Turn off electrical power to the system.
3. To reduce the internal pressure, turn off the feed water flow and open the outlet valve that has been diverted to drain.

4. Open the purge valve at the bottom of each housing to purge the system.
5. Remove the housing bowls by releasing the clamp, and twisting or rocking the bowl. Carefully lower the bowls from the cartridges.
6. Pull the cartridges straight down and discard them.
7. When the cartridges are being changed, examine the inside of the housing bowls for residues deposited on the walls. Clean the insides of the bowls with a nonabrasive detergent and a sponge or cloth. Thoroughly wash the inner surfaces of the bowls and the support structures.  
**Note:** Rinse with clean water several times to completely remove all detergent residues before reassembling the system.
8. Replace the elements in the proper sequence, flush the system, and resume operation.
9. Flush the water at least 15 minutes prior to use, after the installation of new cartridges.

## TROUBLESHOOTING

The Alarm messages that can be displayed whenever there is a need to prompt the user about a problem or when the maintenance is needed.

**Maintenance Message:** The Yellow LED is blinking while the message is displayed. The Elix System continues to operate.

**Alarm Message:** The Red LED is blinking while the message is displayed. The Elix System continues to operate.

**Alarm Stop Message:** The Red LED is blinking while the message is displayed. The Elix System is stopped and will not go into PRODUCTION or RINSING Mode.

**SOME COMMON MESSAGES AND ALARM ARE LISTED BELOW:**

LCD message	Message type	Meaning & Action to be taken
Tank empty	Alarm (Red LED).	A SDS (a specific type of reservoir) is empty of water. Verify that the reservoir is empty and is now filling up. Verify that the Level Sensor from the SDS is connected to the Elix System. This message will disappear when the water level is 10% full in the SDS.
REJ. FLOW < SET POINT	Alarm (Red LED).	The RO Reject Flow to the drain is less than a predetermined value. Tested in PRODUCTION Mode and RINSING Mode. Increase the RO Reject Water flow to the drain. Contact Millipore SAS for assistance.
LOW FEED PRESSURE	Alarm Stop (Red LED and System Stopped).	The water pressure after the Progard TL Pack is < 0.3 bar. Verify that the Feedwater supply is turned on. Verify that the Progard TL Pack is not clogged (view the RO Reject Water in FLUSH Mode). This Alarm is automatically reset during FLUSH Mode if the water pressure problem is resolved
EXCH. PROGARD TL IN XX DAYS	Maintenance (Yellow LED).	The Progard TL Pack should be replaced in XX Days. The message will go away when a new Progard TL Pack is installed
EXCH. POLISHER: PRODUCT < SETPOINT	Programmable: Maintenance by Factory Default	The measured Resistivity of the Polisher Product Water is below the Resistivity Setpoint. Exchange the Polisher and Product Water Resistivity is > Resistivity Setpoint
EXCH. UV LAMP IN XX DAYS	Maintenance (Yellow LED).	The UV Lamp in the Elix System should be replaced in XX Days. The message will go away when a new UV Lamp is installed and the software timer is reset.
% REJECTION < SETPOINT	Programmable: Maintenance by Factory Default.	The RO % Rejection is below the RO % Rejection Setpoint. Verify that the RO % Rejection Setpoint is 92%. Allow the Elix System to operate for several minutes. This may raise the measured RO % Rejection.



