# Reverse Osmosis (RO) Generator

084309 - Ro Gen,4400Gpd,50@50 208-230/460V

| Specifications | |
|---|---|
| Production | 4,400 gpd |
| Recovery | 50-60% |
| Supply Flow (min. inlet to Carbon Filter) | 50 psi @ 8 gpm |
| Permeate Flow (varies) | 1.8 gpm |
| Concentrate Flow (varies) | 1.2 gpm |
| Max Voltage | 480V 3Phase |
| Total FLA | 6.9 A |
| Frequency | 60 Hz |
| Control Voltage | 120V 5 Amp Single Phase |
| Carbon Filter Electrical Supply | 120V Single Phase |
| Centrifugal Pump | 3/4 HP |
| Repress Pump | 3 HP |
| Membranes | (2) 5 Micron |
| Inlet from Carbon Filter | 1" FNPT |
| Permeate Outlet | 1" FNPT |
| Concentrate Outlet | 1" FNPT |
| Repress Pump Suction | 1-1/2" FNPT |
| Repress Pump Outlet | 1-1/4" FNPT |
| Approx. Dimensions | 25.5”W x 65.5”H x 24”D |

## General Info

The purpose of this manual is to provide the necessary information to install and operate the Hydro-Chem equipment to exceed your defined expectation.

The RO system will include a compact stainless steel constructed skid frame. A frame-mounted instrument panel will include flow meters, pressure gauges, and a water quality indicator light. This unit is based upon 4400 gallons per day and will also include a carbon filter.

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## Contents

## System Overview

Figure 1 outlines the overall flow of the HCS RO System.

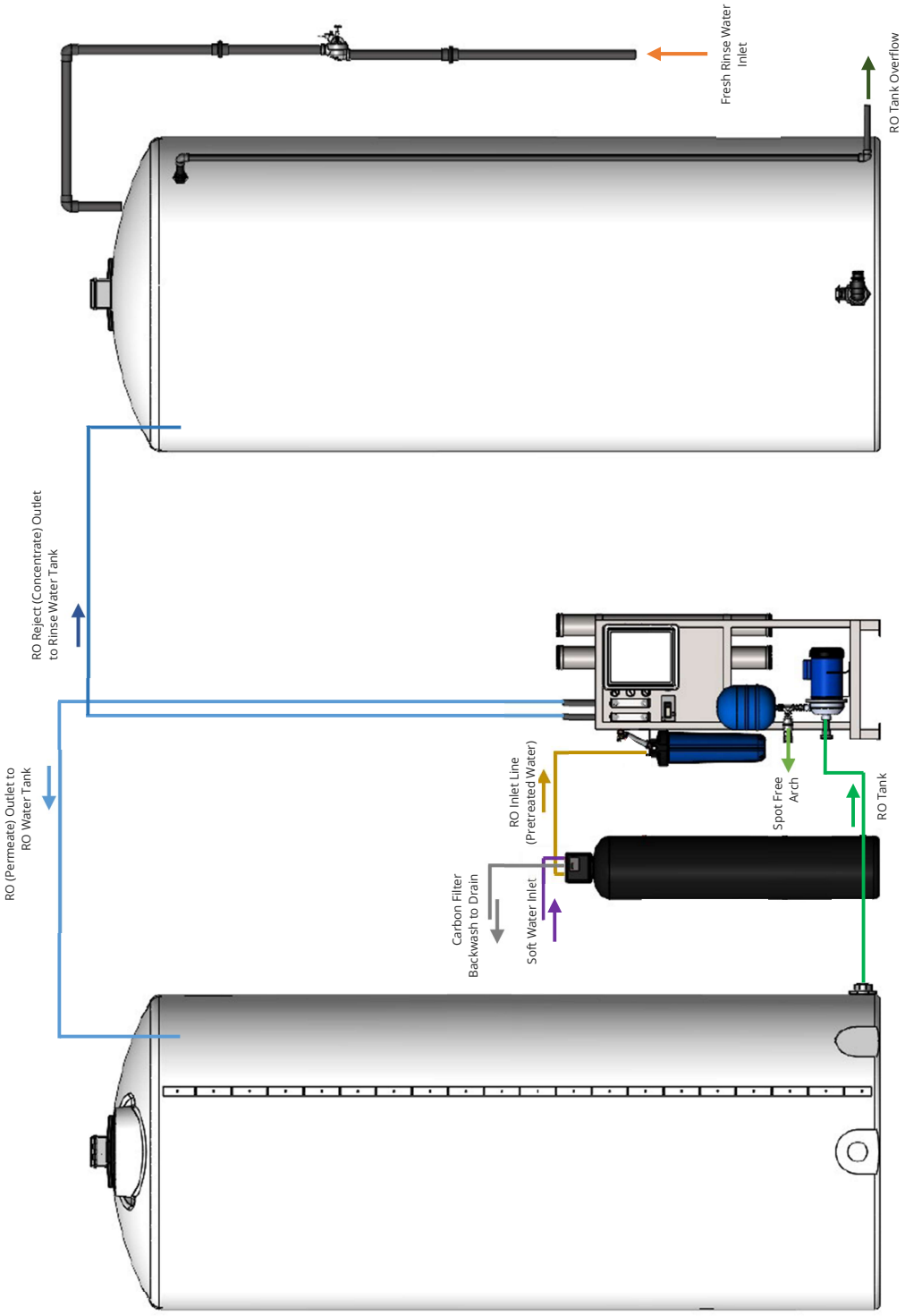



Figure 1. Reverse Osmosis Flow Concept

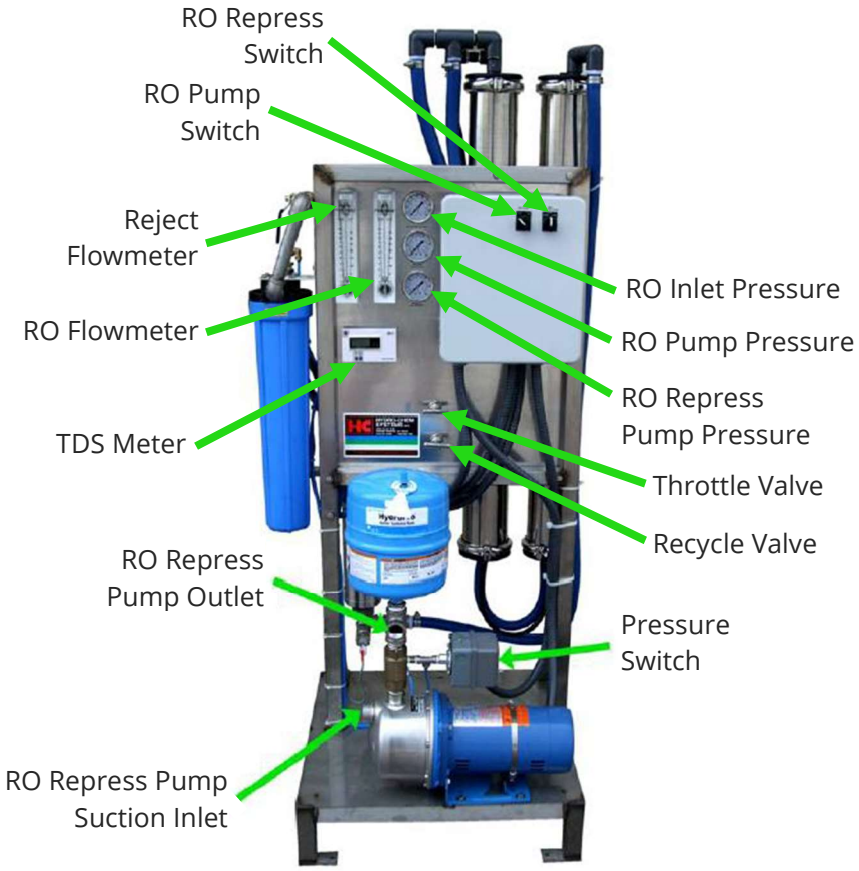



Figure 2. RO System – Front

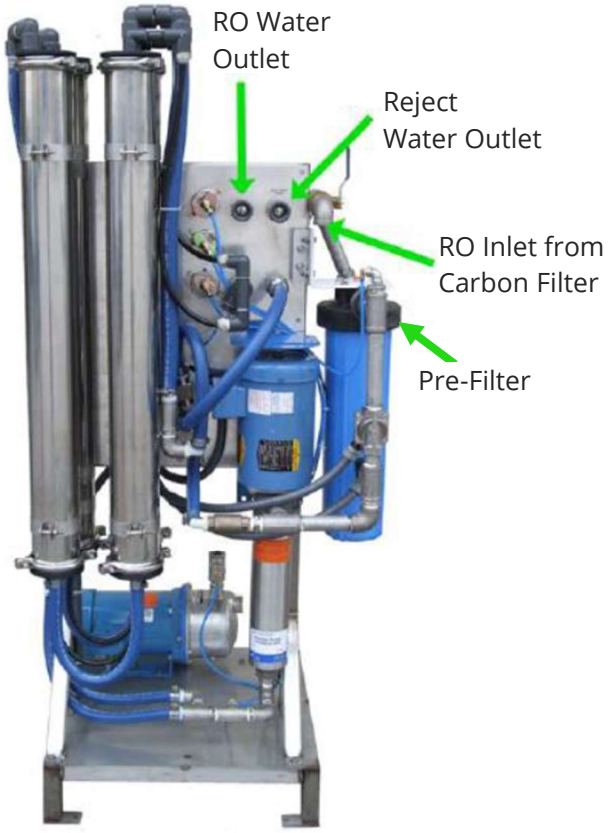



Figure 3. RO System – Rear

The Reverse Osmosis system produces high quality permeate water from municipal and well water. The basic unit is designed to produce fresh water at the capacity of 4,400 gallons per day (GPD). This production rate is accurate +/- 15%.

This RO system is supplied with a sediment pre-filter intended to provide 5-micron pre-filtration prior to the reverse osmosis system membranes. It is recommended that the pre-filter cartridge be checked periodically. Although once a month is a recommended interval between filter cartridge changes, the filter should be checked whenever feed water conditions change, previous experience dictates that more frequent changes are required, or if the pressure drop across the pre-filter exceeds 15 psi. If the per-filter becomes clogged and water flow to the pump is reduced to interrupted, pump hammering will occur. This will damage the pump and/or reduce the performance of the system. A water analysis should be done for every unit. Water conditions vary and some contaminates such as chlorine and Iron will damage membrane and will not be covered under manufactures warranty.

The pumps supplied with the skid are multistage boost type. These must never be run dry, operating without sufficient feed water will cause damage to the pump and void warranty. The pump must also always be fed with filtered water. Debris and sediment in the feed water may result in damage and loss of performance.

## Set-up

### *Carbon Filter Plumbing Connections*

- **Carbon Filter Inlet –** Connect the inlet of the Carbon Filter to a soft fresh water source
    - The membranes and high-pressure pumps used on this HCS skid unit will require continuous and smooth flow of water to the unit. A flooded inlet should be provided at minimum, but a constant, non-turbulent flow of 50 psi and 8 GPM is recommended.
- **Carbon Filter Outlet to RO System –** Connect the outlet of the Carbon Filter to the inlet of the RO System
- **Carbon Filter Backwash –** Connect a drain line to the backwash line of the Carbon Filter

### *RO Process System Plumbing Connections*

- **Inlet from Carbon Filter –** Connect the inlet of the Carbon Filter to a soft fresh water source
- **RO (Permeate) Outlet –** Connect the outlet of the Carbon Filter to the inlet of the RO System
- **RO Reject (Concentrate) Outlet –** Connect a drain line to the backwash line of the Carbon Filter

### *RO Repress System Plumbing Connections*

- **RO Repress Suction Inlet –** Connect the inlet of the Carbon Filter to a soft fresh water source
- **RO Repress Outlet –** Connect the outlet of the Carbon Filter to the inlet of the RO System

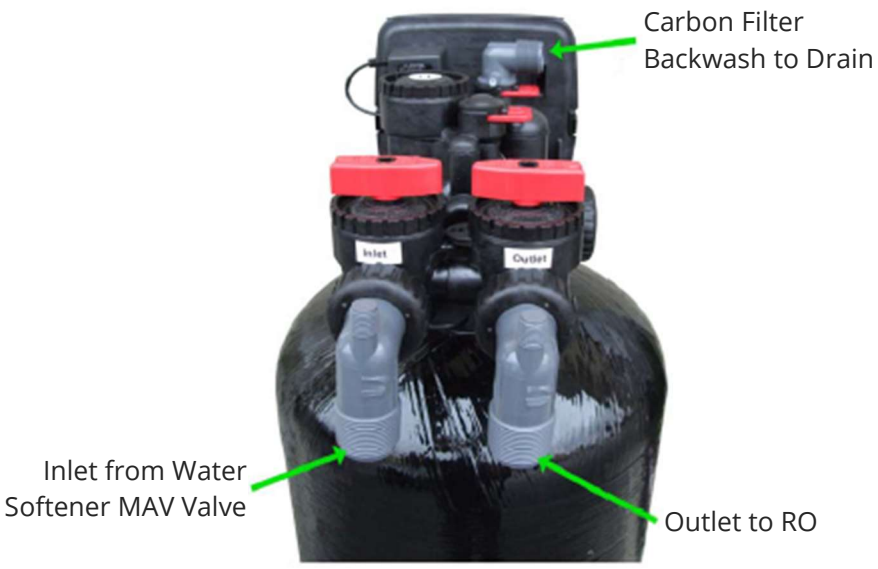



Figure 4. Carbon Filter Connections

### *Control Panel Connections*

The skid unit will come pre-wired and tested. All terminations are shown on Figure 6. The incoming power is listed below.

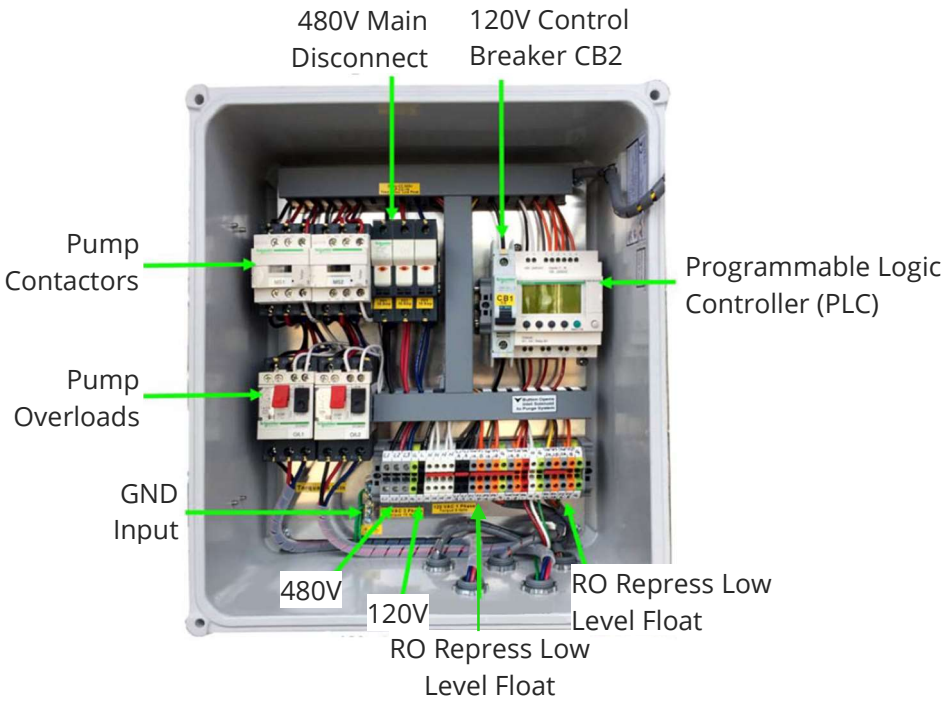



Figure 5. Control Panel Layout

- **Three Phase –** 480V 60 Hz to be terminated on the terminal strip
- **Single Phase –** 120V 60Hz to be terminated on the terminal strip
- **Ground –** Termination of Ground

The Control Panel also includes the following:

- **PLC –** The Programmable Logic Controller retains its own memory and executes all functions of the skid unit. It possesses a display screen that will present a notification of a fault condition. Modifications to the programming can be made through the function keys but will not be warranted by Hydro-Chem Systems.
- **Three Phase Main Disconnect –** Disconnects three phase power and prevents an overload of current
- **Single Phase Control Breaker –** Disconnects single phase power and prevents an overload of current
- **RO Start Float –** Signals the system that the RO Water Tank isn't full after using a set amount of water and to start producing more RO Water
- **RO Repress Pump Low Level Float –** Signals the system that the RO Water Tank is low on water and to not activate the RO Repress Pump

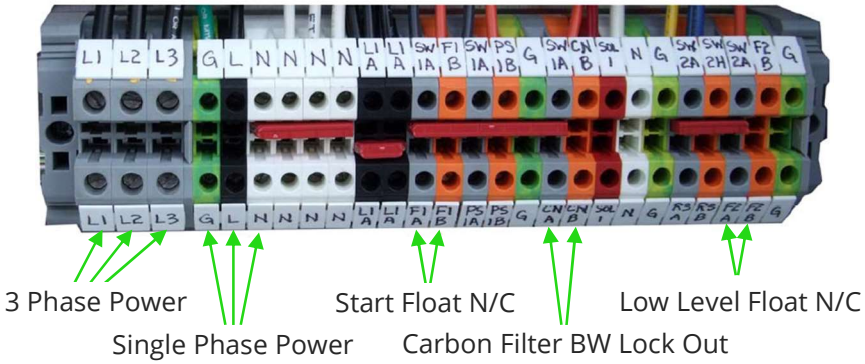



Figure 6. Terminal Strip Connections

- **L1, L2, L3 –** Three Phase Power In
- **G, L, N –** Single Phase Power In
- **F1A, F1B –** RO System Fill Float N/C
- **CNA, CNB –** Carbon Filter Backwash Micro switch lockout
- **F2A, F2B –** RO Water Tank Low Level Float (N/C) shutoff for RO Repress Pump

## *Carbon Filter Connections*

- **Micro Switch Backwash Lockout –** Connect both Micro Switches on the Carbon Filters to CNA and CNB on the terminal strip as shown in Figure 7.
- **Power Source –** Connect the plugs from the carbon filters and any water softeners to 120V Single Phase power

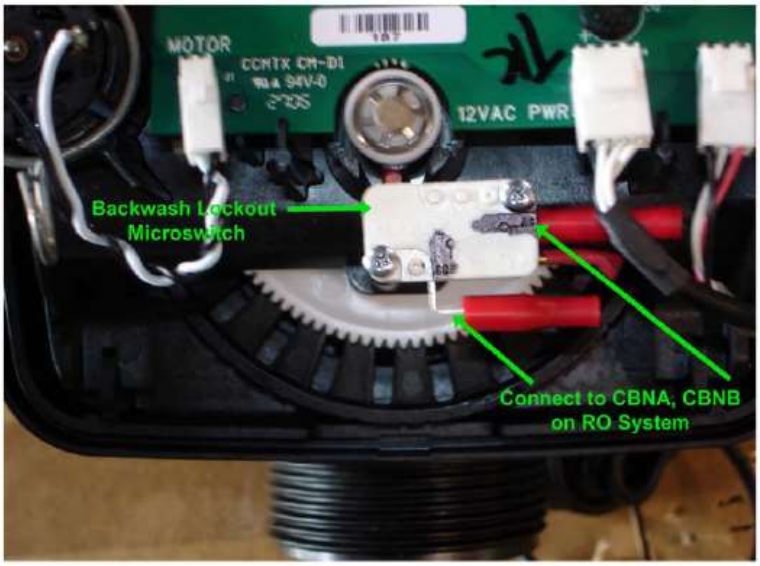


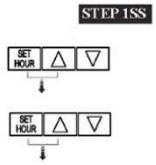

Figure 7. Carbon Filter Control Valve

## *Carbon Filter General Set-up*

The following procedures must be set upon startup of the carbon filter control valve to ensure proper operation:

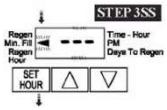
- **OEM System Set-up**
- **Installer Displays & Settings**
- **Time of Day**

### OEM System Set-up

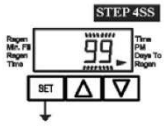



**Step 1 (SS)** – In normal mode, press *SET HOUR* + *UP* buttons simultaneously for 3 seconds and release. Then press *SET HOUR* + *UP* buttons simultaneously for 3 seconds again and release.

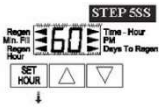

**Step 2 (SS)** – Program P9 (fill time) by pressing the *UP* or *DOWN* buttons until **P9** is displayed. Press *SET HOUR*.



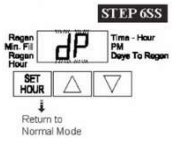

**Step 3 (SS)** – This fill time step may be skipped by setting as dashes appear. Press *SET HOUR*.




**Step 4 (SS)** – Use the *UP* or *DOWN* buttons until **99 Days to Regen** is displayed. Press *SET HOUR*.

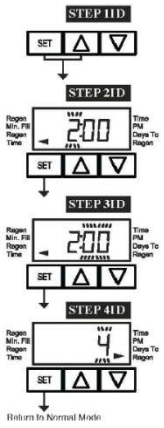



**Step 5 (SS)** – To set the Hz, use the *UP* or *DOWN* buttons until **60** Hz is displayed. Press *SET HOUR*.




**Step 6 (SS)** – This differential pressure switch setting may be skipped. Press *SET HOUR* to exit the OEM system set-up.

### Install Displays & Settings (1-99 Days Between Regeneration Option)




**Step 1 (ID)** – In normal mode, press *SET HOUR* + *UP* buttons simultaneously for 3 seconds and release

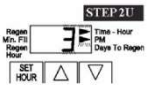
**Step 2 (ID)** – In normal mode, press *SET HOUR* + *UP* buttons simultaneously for 3 seconds and release

**Step 3 (ID)** – In normal mode, press *SET HOUR* + *UP* buttons simultaneously for 3 seconds and release

**Step 4 (ID)** – In normal mode, press *SET HOUR* + *UP* buttons simultaneously for 3 seconds and release

## Set Time of Day


**Step 1 (U)** – Press *SET HOUR*




**Step 2 (U)** – Current time: Set the clock to the closest hour by using the *UP* and *DOWN* buttons. Press *SET HOUR* to exit.
*The time of day will need to be reset after a power outage.

## *RO System Start-Up*

The following start-up procedure should be performed to ensure proper operation of the system:

1. Purge the carbon filters to remove any carbon dust in the carbon tanks before running through the pre-filter.
2. Check the rotation of the RO and RO Repress Pumps by turning the start switch of each pump to *Hand* or *On Momentarily.* The motor shaft is visible between the pump housing and motor. A rotation arrow is engraved in the front portion of the pump.
    - If there is not proper rotation, disconnect the power and swap two legs of the three-phase power to the pump motor.
3. Fill the RO tank completely with water before starting. The freshwater solenoid may be overridden by pressing the ▼ on the PLC. This will allow water to flow through the system without starting the pump. The solenoid will remain open if this button remains pressed.
4. Turn the switch labeled RO Pump on the outside of the control box to the *ON* position. Unit will start if the RO Fill Float is in the down position.
5. Close the Recycle Valve completely. Turn the throttle valve until 115psi is displayed on the RO Pump Pressure gauge.
6. Slowly open the Recycle Valve until a 1:1 ratio is achieved on the RO and Reject Flow meters. If feed water TDS is extremely low or if multiple membranes are included in the system, a higher recovery may be achieved. **Never exceed 75% Recovery.** Premature element fouling will occur at high recovery rates.
    - As the recycle valve is opened, the pressure will drop. This may be compensated for by further adjusting the Throttle Valve.
7. Once the RO Tank is filled above the Low-Level Float, turn the RO Repress Pump Switch to the *Hand* position to verify the pump is primed. Once primed, turn the switch to *Auto*. In the *Auto* position the pressure switch will control the activation of the Repress Pump. Once the pressure in the RO Repress Output Line drops below the set pressure, the pump will run.

## Maintenance

Regular cleaning of the RO system is not required so long as it is operated correctly and the environment it's within is properly designed. The membrane combination of pH stability and temperature resistance may vary the need of regular maintenance and cleaning though.

On a **weekly** basis, the pressures in the membranes should be checked and noted.

On a **monthly** basis, the air filter on the concentrator should be rinsed out.

In normal operation, the membrane may eventually become fouled by mineral scale, biological matter, colloidal particles, and insoluble organic constituents. Deposits building up on the membrane surfaces during operation may cause loss in water output, loss of salt rejection, or both. The membranes then should be cleaned or replaced.

## Troubleshooting

| Issue | Potential Solution |
|---|---|
| Reject Water output is increasing while the RO Water output is decreasing | Check and/or replace the membranes. These could be worn or have excess build-up accumulating. If RO Volume and TDS are both rising, chlorine may be reaching the membranes and deteriorating them. |
| Flowmeter ratio is no longer 1:1<br>TDS increasing | |
| Operating pressure of the membranes is higher than typical pressure of 115-120psi | |
| Rise in RO Volume & rise in TDS | |
| RO Repress Pump is not activating | Check the low-level float in the RO Water Tank. If this is sending a signal to the RO Skid, it is sensing that the tank is empty and will not allow the Repress Pump to operate. These sensors should be N/C when down. |
| RO Water Tank not filling | Check the fill-level float in the RO Water Tank. If this is NOT sending a signal to the RO Skid, it shows that the tank is full and will not tell the skid controls to activate the fill line. These sensors should be N/C when down. |