Reverse Osmosis (RO) Generator

084351 - Ro Gen,4400Gpd,220V,Mid Line

Specifications	
Production (gpd)	4,400
Recovery	50-60%
Supply Flow (min. inlet to Carbon Filter)	20 psi @ 9 gpm
Permeate Flow (varies) (gpm)	1.8 gpm
Concentrate Flow (varies) (gpm)	1.2 gpm
Max Voltage	220V 1PH
Total FLA	20 A
Frequency	60 Hz
Carbon Filter Electrical Supply	120V Single Phase
Centrifugal Pump	3/4 HP
Membranes	20" - 5 Micron
Inlet from Carbon Filter	3/4" FNPT
Permeate Outlet	1/2" Flex to 1" PVC
Concentrate Outlet	1/2" Flex to 1" PVC
Approx. Dimensions	27"W x 52"H x 20"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 painted 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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System Overview

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

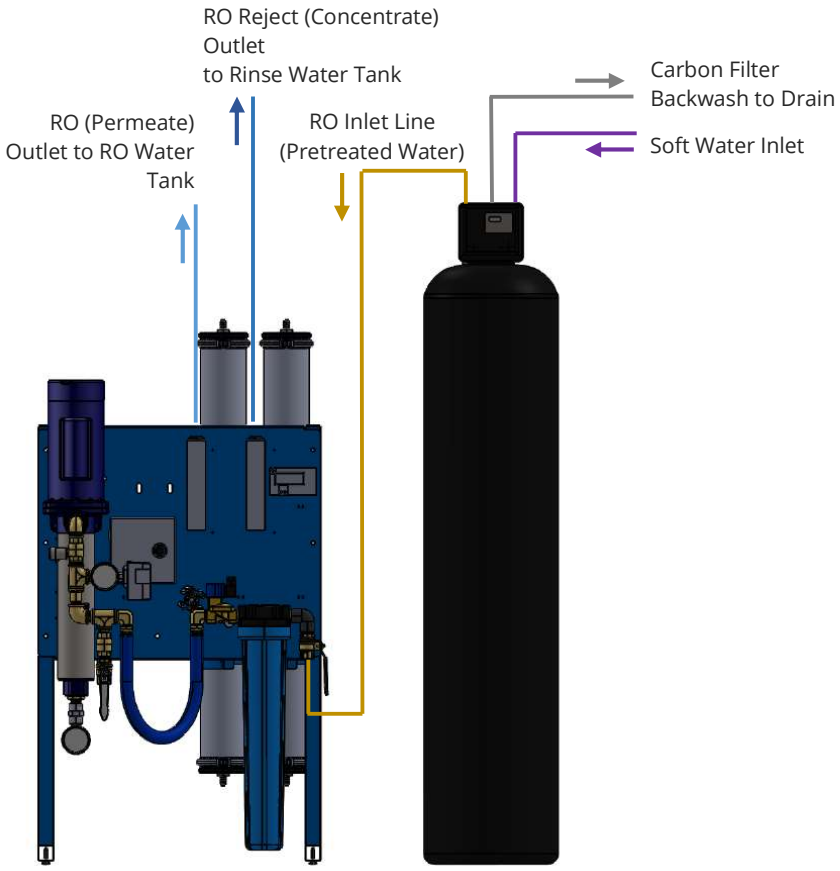


Figure 1. Reverse Osmosis Flow Concept

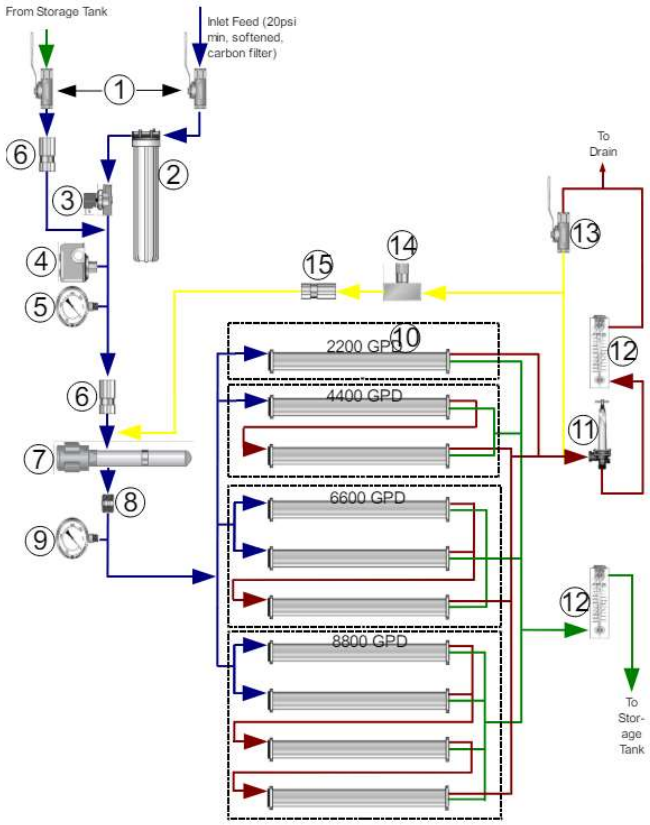


Figure 2: Reverse Osmosis Flow Schematic

Table 1: RO Skid Parts List

Item	Description
1	3/4" Ball Valve
2	5 Micron Sediment Filter
3	3/4" 120VAC N/C Solenoid
4	Pressure Switch
5	Pressure Gauge 0-100 psi
6	3/4" Check Valve
7	Process Pump & Motor
8	Flow Control
9	Pressure Gauge 0-300 psi
10	Membrane Housings
11	Reject Control Valve
12	Flow Meter
13	1/2" Ball Valve
14	Water Saver Valve
15	1/2" Check Valve
16	TDS Monitor

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

Electrical Connections

The skid unit will come pre-wired and tested. 220VAC single phase power shall be provided from a disconnect into the electrical box on the front of the skid unit. The wires in the box are as follows:

Black – 220V Feed
Red – 220V Feed
White – Neutral
Green – Ground

Wiring from the Fill level float switch in the RO Water Tank shall be connected to the wires labelled “upper float switch” within the electrical box.

Figure 3. Carbon Filter Connections

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 4.
- **Power Source –** Connect the plugs from the carbon filters and any water softeners to 120V Single Phase power

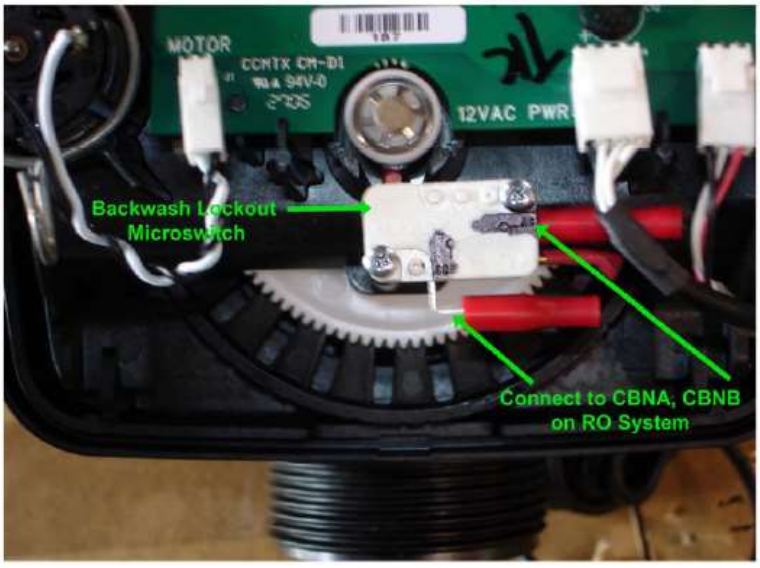


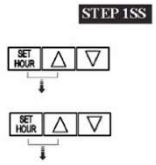
Figure 4. Carbon Filter Control Valve

Carbon Filter General Set-up

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

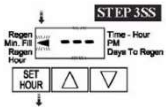
- **OEM System Set-up**
- **Installer Displays & Settings**
- **Time of Day**

OEM System Set-up

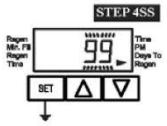


Step 1 (SS) – In normal mode, press *SET HOUR* + *UP* buttons simultaneously for 3 seconds and release. Then press *SET HOUR* + *UP* buttons simultaneously for 3 seconds again and release.

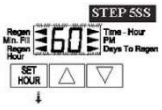
Step 2 (SS) – Program P9 (fill time) by pressing the *UP* or *DOWN* buttons until **P9** is displayed. Press *SET HOUR*.



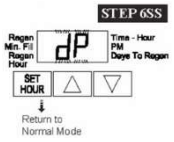
Step 3 (SS) – This fill time step may be skipped by setting as dashes appear. Press *SET HOUR*.



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

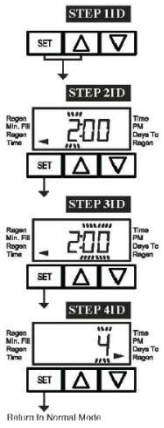


Step 5 (SS) – To set the Hz, use the *UP* or *DOWN* buttons until **60** Hz is displayed. Press *SET HOUR*.



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. Remove the inlet water TDS probe from the adapter at the top of the pre-filter housing to remove any air pockets.
2. Slowly open the water inlet valve from on the RO stand. Once water makes its way out of the TDS probe adapter, insert the probe back in.
3. Open the inlet valve fully.
4. Turn on power to the RO Skid. The skid should now be pressurized.
5. The membrane pressure can be adjusted using the reject control valve or recycle valve. Close the valve completely. Turn the throttle valve until 115psi is displayed on the RO Pump Pressure gauge.
6. Slowly open the water saver valve (needle valve located on the inlet manifold of production pump) 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 reject control valve is opened, the pressure will drop. This may be compensated for by further adjusting the water saver valve.
7. Using the water saver and reject control valves, set the recovery using the recovery setting chart below:

GPM	4400 GALLONS PER DAY			
T.D.S. Level	0-300	500	800	1200
Production Rate*	3.0	3.0	3.0	3.0
Reject Rate*	1.0	1.5	3.0	6.0
Recycle Rate	5.0	4.5	3.0	0
Feed Rate	4.0	4.5	6.0	9.0
Membrane Array	1-1	1-1	1-1	1-1
Approx. Recovery %	75%	66%	50%	33%

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.

> The unit should be flushed weekly as well when possible. Close the inlet ball valve and open the ¾" flush ball valve and the ½" drain ball valve. Press and hold the manual flus toggle switch on the front of the electrical box for 30 seconds for each membrane.

The pre-filter should be replaced every **90 days**.

In normal operation, a 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 TDS increasing	
Operating pressure of the membranes is higher than typical pressure of 115-120psi	
Rise in RO Volume & rise in TDS	
RO Water Tank not filling	Check the fill-level float in the RO Water Tank. If this DOES NOT have continuity, 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.
	Check the pressure to the RO to see if the pre-filter needs to be replaced.
	Check the fuse in the electrical box and check for proper voltage or motor damage.
Production Pump does not stop	Verify that the fill-level float is working and there is no continuity when the float is up. Check the mechanical pressure switch on the inlet side of the pump. Verify that there is no continuity between the line and the motor terminals.
Production Pump does not start	Check the power