



Canature™ WaterGroup

Commercial/Industrial Engineering Division



CAN 2540 Series

Installation, Operation & Service Instructions

- ◆ Please read carefully all instructions before proceeding with the installation. Systems must be properly installed, operated and maintained . Failure to do so voids the warranty.
- ◆ Pre-treatment equipment must be properly installed and must always been operating as intended. The pre-treatment equipment must not pass untreated water to the RO when regenerating. A RO lock out switch can be used to shut down the RO during these regeneration periods. Failure to do so will void the warranty.
- ◆ The systems must be protected from freezing temperatures and avoid installing in direct sunlight.
- ◆ Do not use the system with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.
- ◆ Test the water periodically to verify that the system is operating satisfactorily. A regular preventative maintenance inspection by a water professional is recommended.
- ◆ Handle all components with care. Do not drop, drag or turn components upside down.
- ◆ Check all local plumbing and electrical codes. The installation must conform to them.
- ◆ It is recommended to wait until the entire system is fully pressurized , confirmed to be operating properly, and recheck for leaks before leaving the site.

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Table of Contents

Introduction	1.0	Maintenance	5.0
User's Guide	1	Scheduled Maintenance	25
Disclaimer	1	Membrane Cleaning	25
Support	2	Troubleshooting Chart	26
Safety Precautions	2	Membrane Storage	27
Equipment Description	2.0	Operating Data	6.0
Reverse Osmosis Overview	4	RO Data Sheet	28
Components	6	RO Operating Specifications & Guide Lines	28
Installation	3.0	Warranty	7.0
Installation Guidelines	7		
Membrane Loading Instructions	8		
Pre-filter Loading Instructions	9		
System Wiring	9		
Wiring Schematic	10		
Water Hook-ups/Flow Diagram	14		
Operation	4.0		
Pre-Start Up	17		
Start Up	19		
General Operation	19		
Typical Atmospheric RO Layout	22		
Typical Pressurized Water Layout	23		
System Shut Down	24		
Controller Operation	24		

1.0 Introduction

Users Guide

This manual describes the procedures necessary to install, operate, and maintain your Canature Water Treatment System. To avoid warranty nullification, please adhere to the operating instructions as outline in this manual.

The purpose of this manual is to provide the user with the necessary information to operate this equipment. Failure to follow the instructions laid forth in this manual may put the operators at risk of injury and possible fatality. Please read this entire manual before beginning any procedure. This Manual should remain with the equipment at all times.

Icon Key



NOTE



Caution



WARNING

Warnings, Cautions, and Notes are used to attract attention to essential or critical information in a manual. Notes are used to add information, state exceptions, and point out areas that may be of greater interest or importance. Warnings indicate condition, practices, or procedures which must be observed to avoid personal injury or fatalities. Cautions indicate a situation that may cause damage or destruction of equipment or may pose a long term health hazard.

Disclaimer

It is recommended that this manual be read thoroughly before any operation of the unit is performed. The purchaser is urged to keep accurate records of the operation of the unit. This will serve to protect his/her interests and greatly expedite replacement should it be required.

All illustrations, diagrams and photos are used solely to illustrate specific points. Do not refer to any of these as actual representations of your unit unless otherwise stated.

To avoid unnecessary damage to the membrane elements in the RO unit the operator should follow the instructions that they receive from Canature Technicians. Any damage caused by negligence on part of the operator will not be covered under warranty. In all cases, if the operator is unsure of the solution to any RO problems he/she should contact Canature for technical support.

This manual is to provide general assistance for installation, operation, cleaning or troubleshooting. Canature will not be held liable for any damage to the RO unit if the operator causes damage by their misunderstanding of this manual. Though Canature has made every effort to make sure this booklet contains correct information, if it is found that this manual is in error Canature will not be held liable. Operators should contact Canature for any technical assistance, especially if this manual contains conflicting information.

Support

Canature strives to provide safe, efficient & trouble-free equipment. For service, sales, parts, or additional manual copies call your area representative. To avoid damage to the unit please follow the safety precautions outlined below. If there is any uncertainty about any procedures regarding installation and operation of the unit, contact Canature for technical support.

Safety Precautions



This equipment operates at high voltage and high pressure, has moving parts and possibly hazardous chemicals that may cause serious injury or fatality. Exercise caution and common sense when faced with potential hazards.

1. It is the responsibility of the owner to ensure that this equipment is used properly and safely.
2. Do not attempt to operate this equipment if you are drowsy or impaired in any other way.
3. Always wear safety equipment (safety glasses, earplugs, gloves) while working on the equipment.
4. Refer to Material Safety Data Sheets (MSDS) when handling hazardous materials.
5. Always operate the equipment at the parameters specified.
6. Never connect the system to piping that has not been approved by Canature If there are any doubts, please call your Canature dealer.
7. Never remove any components from the unit while under pressure.
8. No one under the age of 18 years of age should operate or be allowed near this equipment.
9. Do not remove any warning labels that may be on the unit.
10. Proper maintenance assures the equipment will run properly and can reduce the risk of injury.
11. Correcting problems as they occur will help prolong the life of the system. Continuously inspect the system for leaks and damage.
12. Use Lock-Out and Tag-Out devices when servicing the unit.
13. Please use common sense when operating or installing this equipment, keep in mind that this manual is to be used as a guidance tool. If you are unsure about a procedure, ask your supervisor. Canature welcomes any questions you may have.

Below is a list of equipment and materials that should be kept nearby the equipment. The equipment is the bare minimum required to maintain a safe working environment.

- Lock-out and Tag-out devices for servicing and shutdowns.
- Eyewash/safety shower for any chemical accidents.
- Safety glasses are to be worn at all times.
- Earplugs should be worn when encountering high levels of noise.
- Gloves that offer protection from the chemicals used herein.
- Steel toe work boots for protection against heavy equipment and components.

2.0 Equipment Description

Reverse Osmosis Overview

Reverse osmosis (RO) is a pressure driven membrane separation process that separates dissolved and suspended substances from water. The membrane acts as a selective barrier, removing unwanted substances such as salt, producing water safe for drinking.

Principles of Osmosis

If you place a semi-permeable membrane between two compartments as in the container shown below, and then place salt water in one half of the container and pure water in the other half, a fundamental scientific principle comes into play. That is, two different concentrations of liquids within the same system will try to reach equilibrium (i.e. the same concentration of contaminants) on both sides of the membrane. Of course the only way for this to happen is for pure water to pass through the membrane to the salt water side in an attempt to dilute the salt solution. This attempt to reach equilibrium is called osmosis.

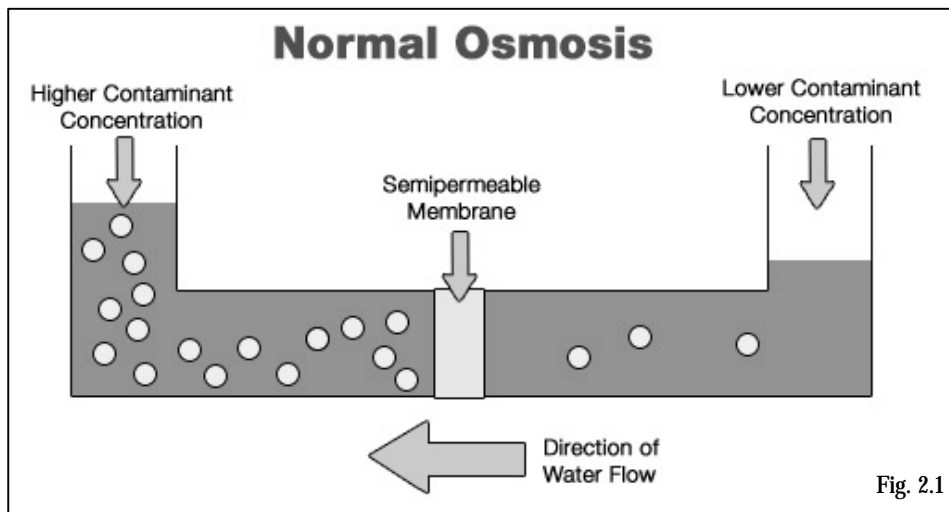


Fig. 2.1

The Pressure Difference

Reverse osmosis is the reversal of the natural flow of osmosis. In a water purification system, the goal is not to dilute the salt solution, but to separate the pure water from the salt and other contaminants. When the natural osmotic flow is reversed, water from the salt solution is forced through the membrane in the opposite direction by application of pressure - thus the term reverse osmosis. Through this process, we are able to produce pure water by screening out the salts and other contaminants.

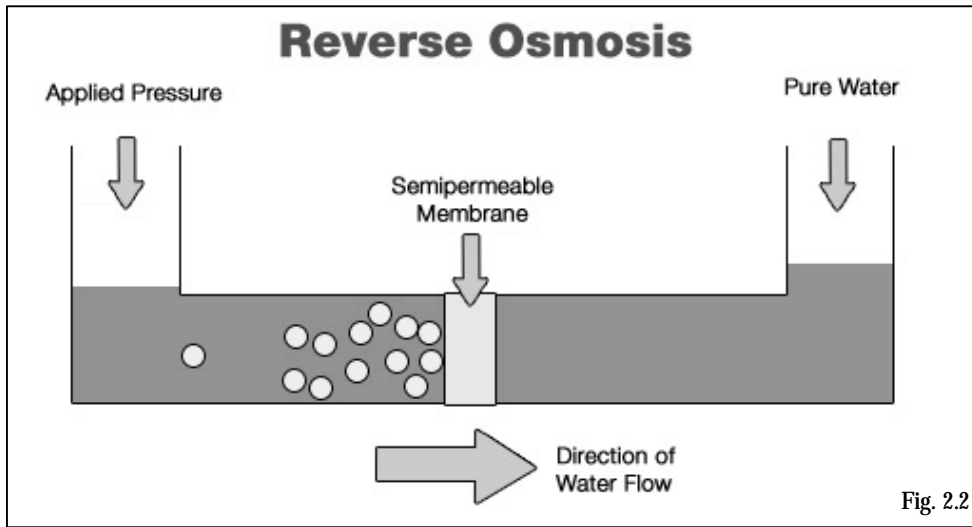


Fig. 2.2

The reverse osmosis process cannot go on indefinitely without removing the contaminants. Ultimately the membrane could become clogged by salt and other impurities, requiring increasingly greater pressure to force water through the membrane. To solve this problem, the membranes are configured to split the feed water into two streams -- one part to be purified and the other part to wash away the particles rejected by the membrane.

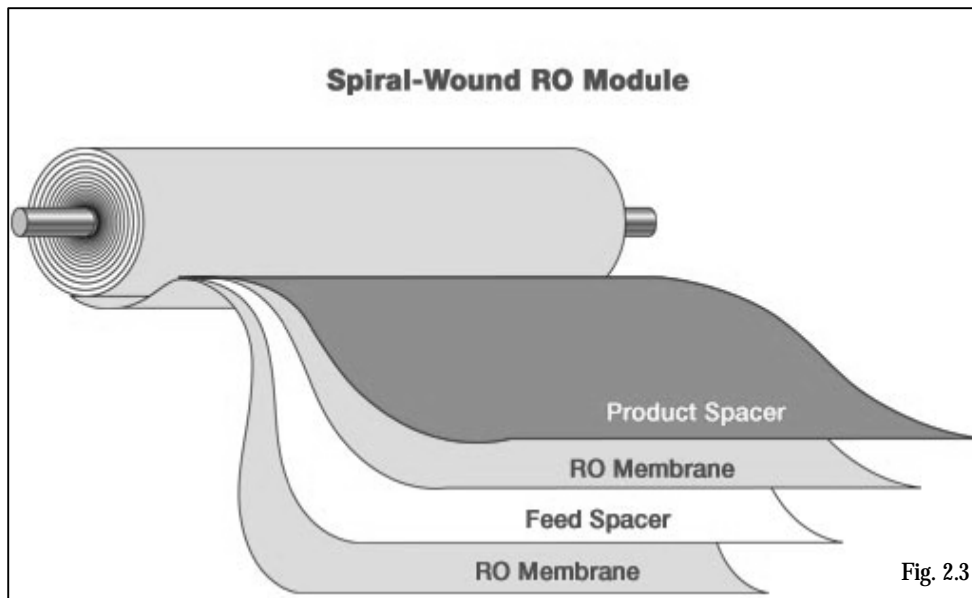


Fig. 2.3

The reverse osmosis membrane consists of several thin layers or sheets of film that are bonded together and rolled in a spiral configuration around a plastic tube. (This is also known as a thin film composite or TFC membrane.)

Components

Frame

Epoxy coated painted steel or powder coated welded frame.

Inlet Solenoid Valve

The inlet valve is a normally closed solenoid valve. A solenoid valve is an assembly used as a switch, consisting of a coil and a metal core free to slide along the coil axis under the influence of the magnetic field. The switch should be in the “on” position so the valve can open and allow water into the system.

Low Pressure Switch

Inadequate feed pressure can seriously damage a booster pump. For this reason the RO unit has been equipped with a low pressure switch. The low pressure switch has an adjustable contact which can only be affected by a pressure from a water supply. A manual override is standard for cleaning purposes.



The low pressure switch is factory adjusted. Readjustments should not be performed without contacting the factory prior.

Booster Pump

Line pressure needs to be boosted by the booster pump after the inlet solenoid valve.

Waste Flow Control

A concentrate valve restricts the rate of water flowing to drain. This maintains a constant operating pressure, as well, allows for constant flushing of the elements. To allow for a range of recoveries the waste flow is adjustable



DO NOT decrease the waste flow below the minimum specified flow; you could permanently damage the membranes.

Controller

Is a state of the art microprocessor that can monitor pressure and level switches.

With optional upgraded controller, it can also monitor and control TDS/Conductivity with an adjustable limit. This would also display the system status and sensor status as well as switch input status. Statuses are shown using a LED display.

3.0 Installation

Follow all applicable codes when installing the unit. Be mindful of the required support and clearance needed for the unit when installing.

Installation of the CAN Series consists of the following steps:

1. Uncrate and move the unit to the installation site.
2. Use leveling feet to adjust and stabilize the unit.
3. Install the feed, product and reject plumbing lines.
4. Connect the electrical high voltage power wiring.
5. Connect control device wiring.
6. Install any pre-treatment equipment and interlock to RO unit.
7. Install any post-treatment equipment and/or storage tank and interlock to RO unit.

Installation Guidelines

1. Before beginning any equipment handling procedures, refer to the appropriate sections in the Occupational Health and Safety Act: "General Industry Standards." Also, refer to any other applicable literature and information for cranes, lift trucks, and other equipment used for lifting and moving.
2. Make sure all equipment used for lifting and moving is properly maintained and is in good repair.
3. Be sure that components being lifted are balanced and will not tip or slip out of the lifting device.
4. All lifting and moving procedures must be performed by experienced construction workers using standard rigging methods.



Never use slings or cables that are cut, frayed or kinked. Compromised lifting equipment can cause serious personal injury or equipment damage.

Membrane Loading Instructions

1. Install the thrust ring in the concentrate discharge end of the vessel.
2. Place the leading end of the first RO or NF element into the feed water end of the first pressure vessel and slide it in approximately one-half of the element length. *Note:* Always load NF or RO elements into the feed water end of the pressure vessel. Verify that the U-cup brine seal is properly seated in the end cap groove of the element such that the brine seal opens in the upstream direction.
3. Install the interconnector into the permeate tube of the element. When installing o-rings, expand them slightly, do not roll them into position. Prior to installation of the interconnector, lubricate the o-ring seals on the interconnector with a very thin layer of silicone o-ring lubricant.



Materials other than glycerin and silicone lubricant must not be used, because they may damage the membrane or components of the element.

4. Apply a thin layer of silicone lubricant to each brine seal.
5. Lift the next element into position and install the trailing end on the interconnector. Be very careful to hold the next element so that the weight is not supported by the interconnector, and push the element into the pressure vessel until about one-half of the element extends outside the vessel.
6. Repeat these steps until all elements are loaded into the pressure vessels. The number of elements loaded into an individual vessel will depend on the length of the elements and the vessel itself.
7. Install the downstream end cap assembly on each end of the pressure vessel:
 - a. Carefully position the downstream end cap assembly in the vessel and push the end cap assembly as a unit squarely into the end of the element. Use care when seating the o-ring seal on the adapter into the element and avoid pinching or rolling o-rings.
 - b. Rotate the end cap assembly to ensure proper alignment with the connecting piping.
 - c. Replace the hardware, sealing the end cap assembly in place. Refer to the pressure vessel manufacturer's drawing.
8. Push the element stack from the feed end (upstream) towards the downstream end.
9. After the elements have been installed, it may be necessary to add shims to reduce the amount of "freeboard" or space between the face of the lead element and the face of the adapter hub, with the vessel adapter being the component which internally connects the element product water tube with the permeate port on the pressure vessel. This procedure helps prevent movement and hammering of elements when the system starts and shuts down. Continue these steps for each pressure vessel in the train or system.

10. Install the feed end cap assembly on each of the pressure vessels like the downstream end cap assembly. Close each pressure vessel with the parts from the same vessel. Re-install any piping that was previously removed for element loading.

Filter Loading Instructions

1. Shut off water to RO unit
2. Relieve pressure on filter housing
3. Use the supplied filter wrench to loosen the filter housing
4. Turn to the left to loosen housing
5. Remove soiled filter and replace with a new one
6. Check the O-ring on the top of the housings for defects, and replace if necessary
7. Apply a silicone lubricant to the o-ring
8. Re-screw the housing back onto the unit



Do not over tighten

System Wiring

Have only a qualified electrician do the wiring of the system. Refer to the following photos and diagrams. If there is any confusion please contact your Canature dealer for technical support.



Fig. 3.1
MiniTrol Front
Controller that is installed on some models (CAN 2521-1 to 2540-3)

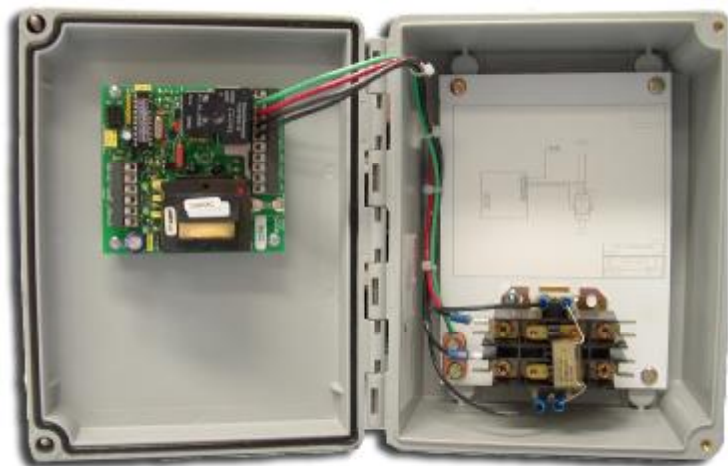


Fig. 3.2
MiniTrol Inside
Controller that is installed on some models (CAN 2521-1 to 2540-3)

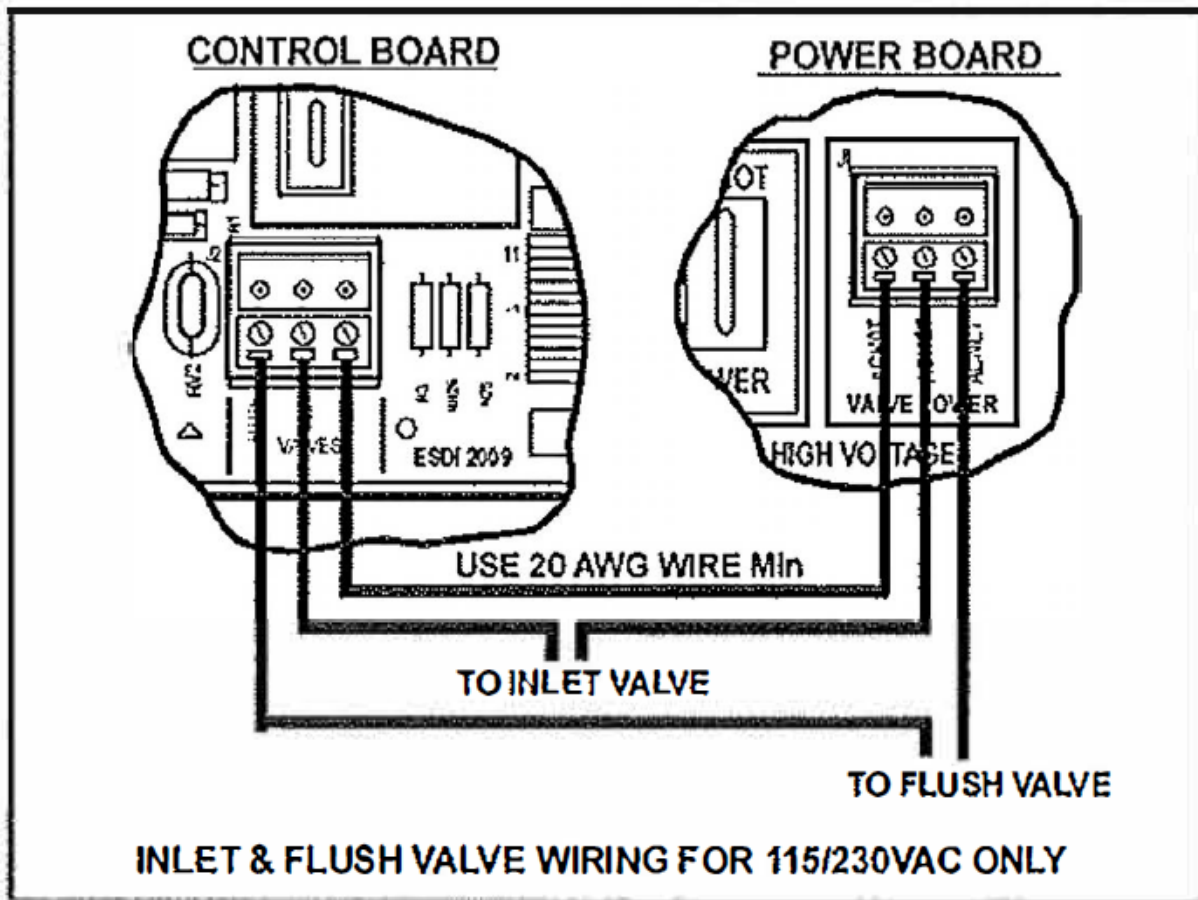
CAN 2521-1 TO CAN 2540-3



Fig. 3.5
Series 100 Front
Controller upgrade (Models CAN 2421-1
to 2540-3)

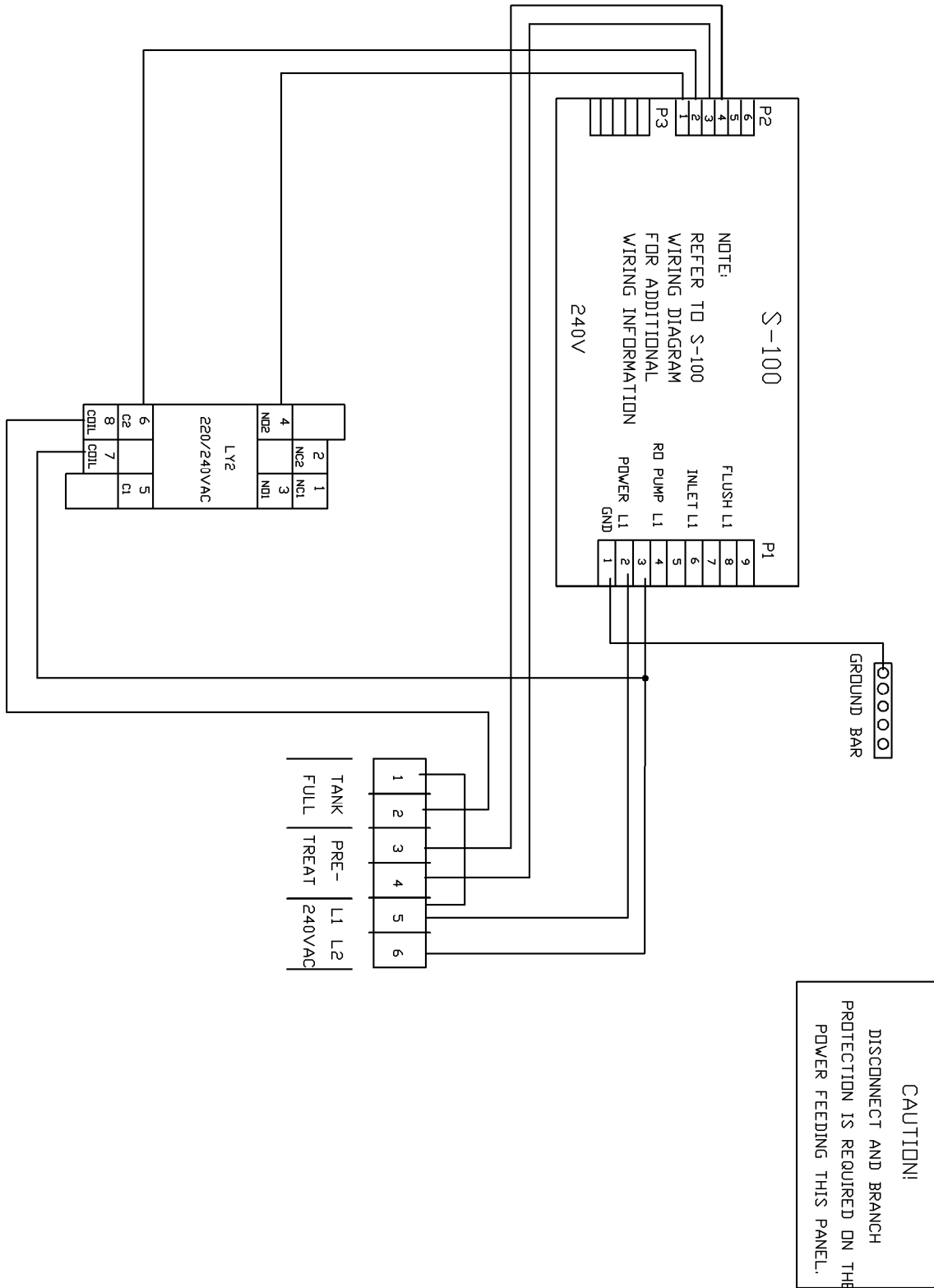


Fig. 3.6
Series 100 Inside
Controller upgrade (Models CAN 2421-1
to 2540-3)



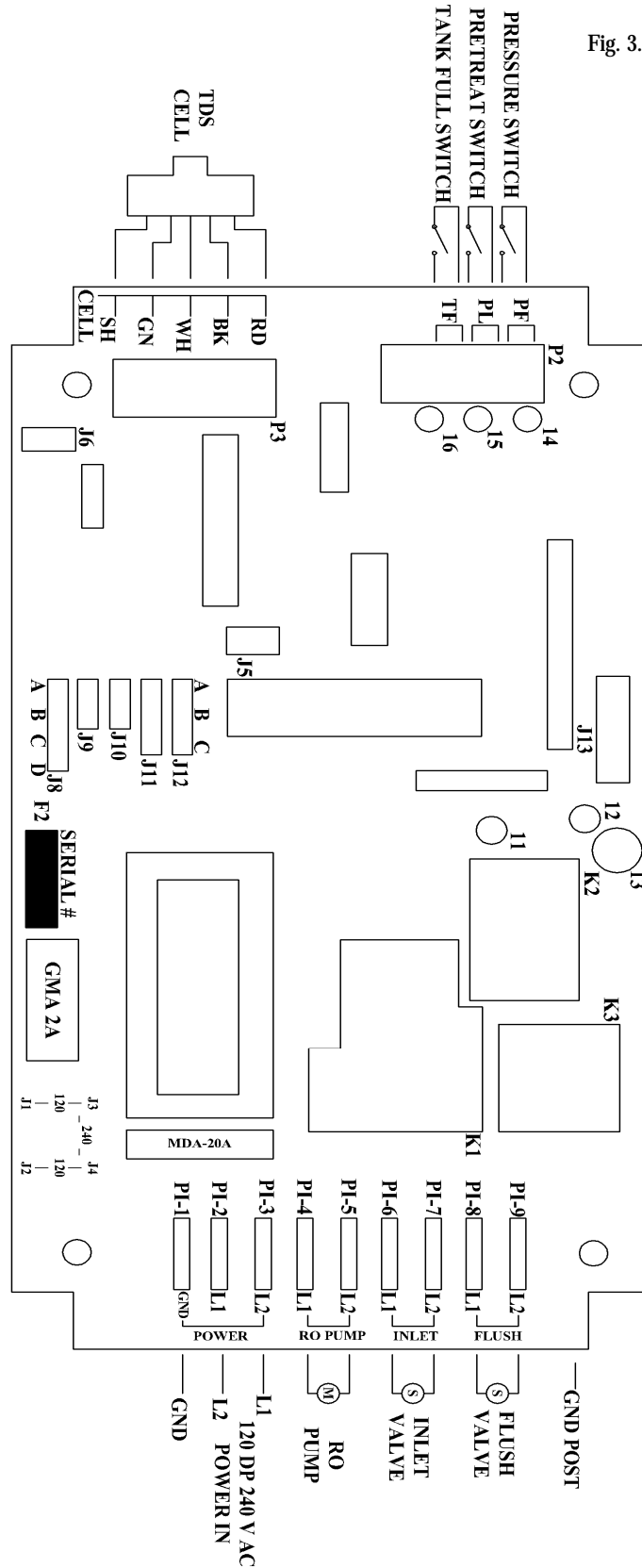
Series 100 Controller Upgrade (Model CAN 2521-1 to CAN 2540-3)

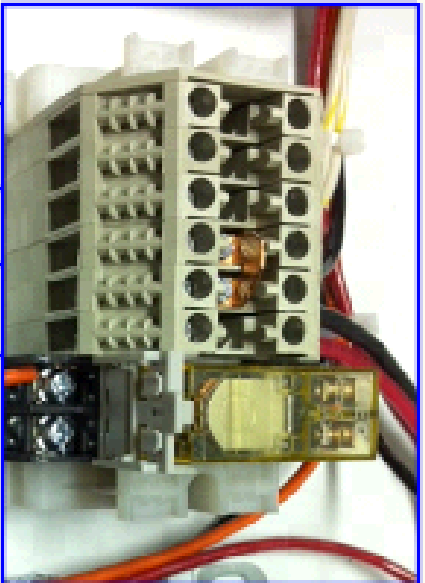
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Pre-Treat Lockout Diagram

Fig. 3.10



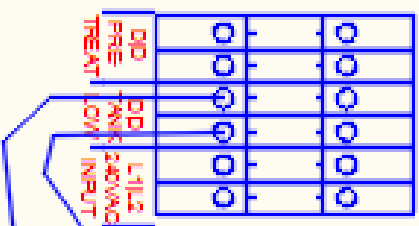


DP PRE-TREAT
 DP TANK
 L1 L2 240VAC
 INPUT

S100 Controller

FLOAT WIRING CONNECTIONS DEPENDS UPON WHICH FLOAT IS USED.

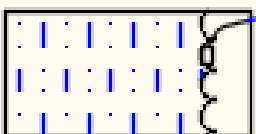
Float Contacts Closed To Enable RO To Run



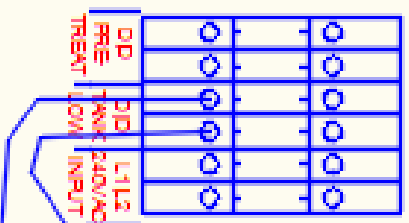
Three Wire Float
 # 70050400
 White - Common

Red-Closed When Float Down
 Black-Closed When Float Up

Red
 White
 Black (capped)



Float Contacts Closed To Enable RO To Run
 # 302535



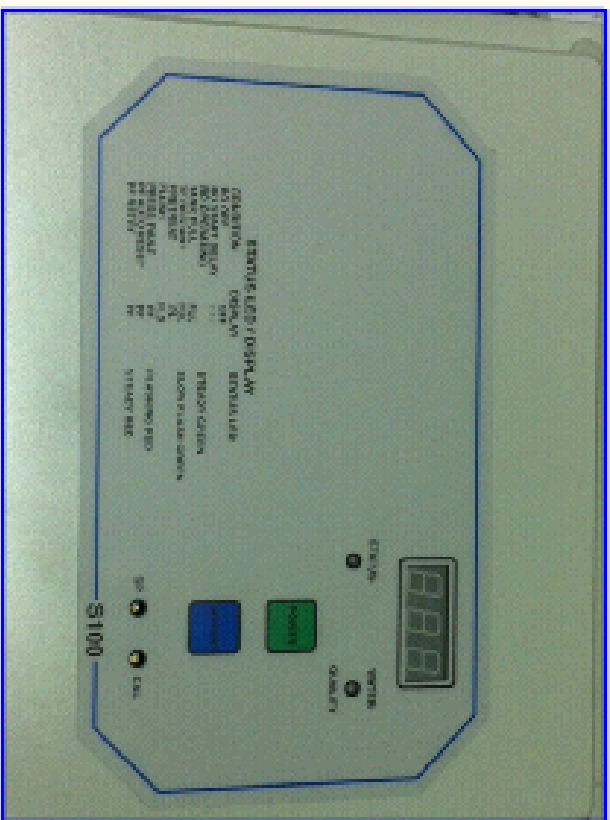
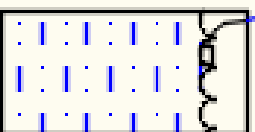
Black - Common

White-Closed When Float Down
 Red-Closed When Float Up

White

Black

Red (capped)



Typical Tank Float Wiring With S100 Controller

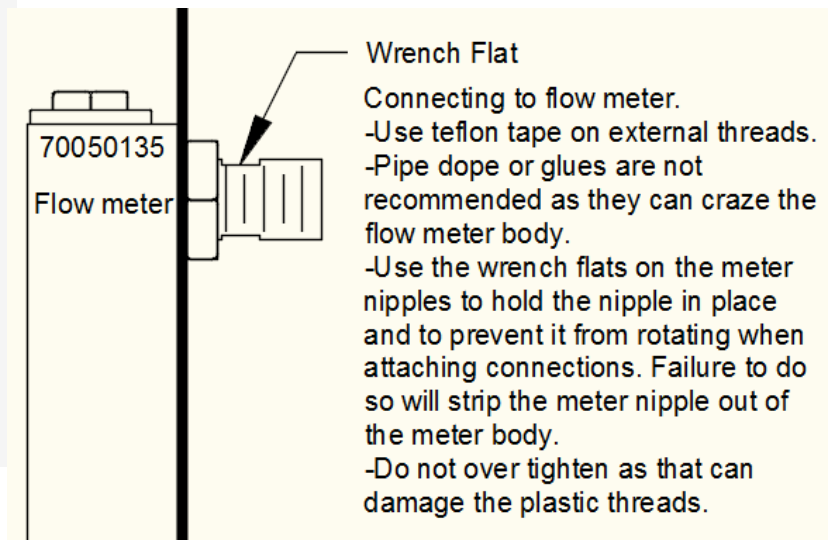
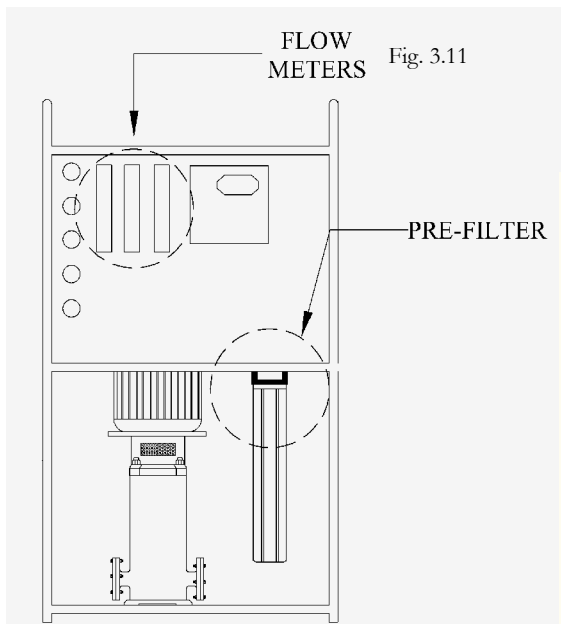
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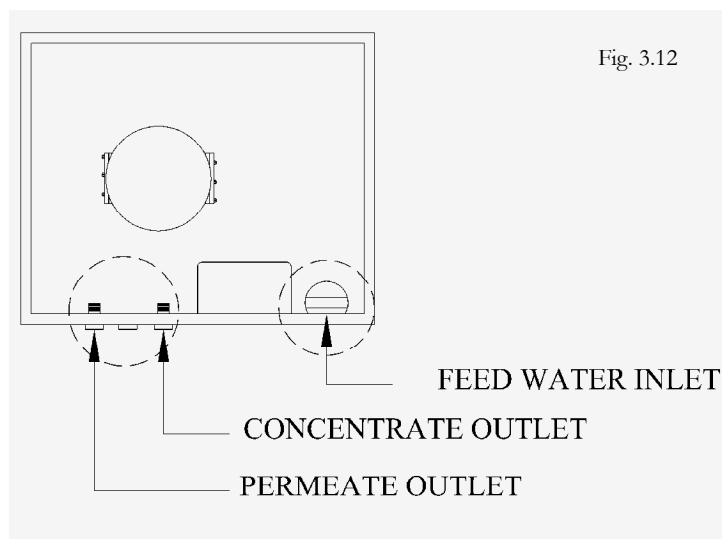
Water Hook-up

1. When the unit is ready for operation connect the piping
2. The permeate outlet is located on one of the flow meters on the front panel of the RO unit (see the Fig. 3.11 & 3.12)
3. The concentrate outlet is also located on one of the flow meters on the front panel of the RO unit (see Fig. 3.11 & 3.12)
4. The Feed water Hook-up is located on the pre-filter (see Fig. 3.11 & 3.12)

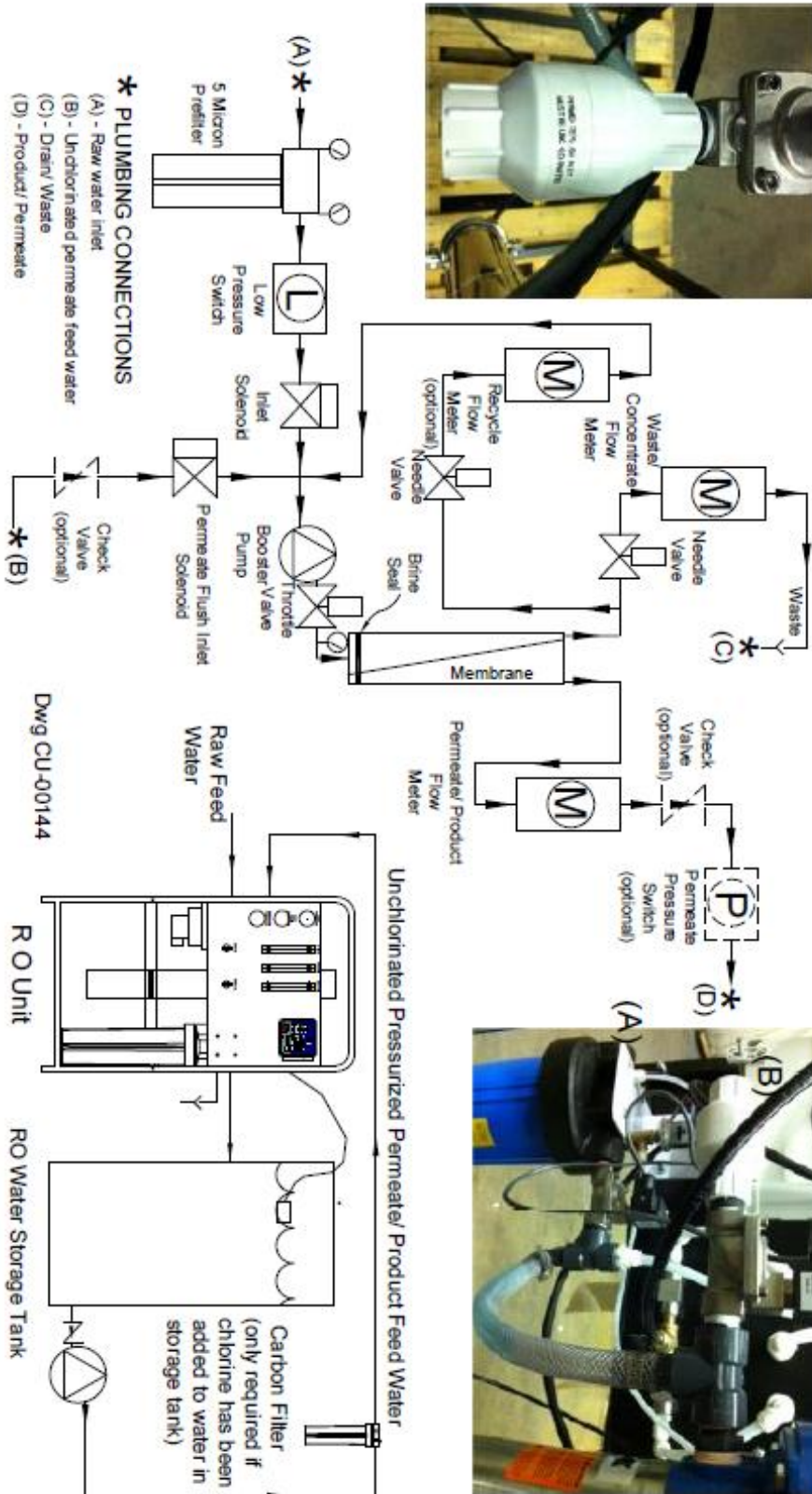
Front View



Top View

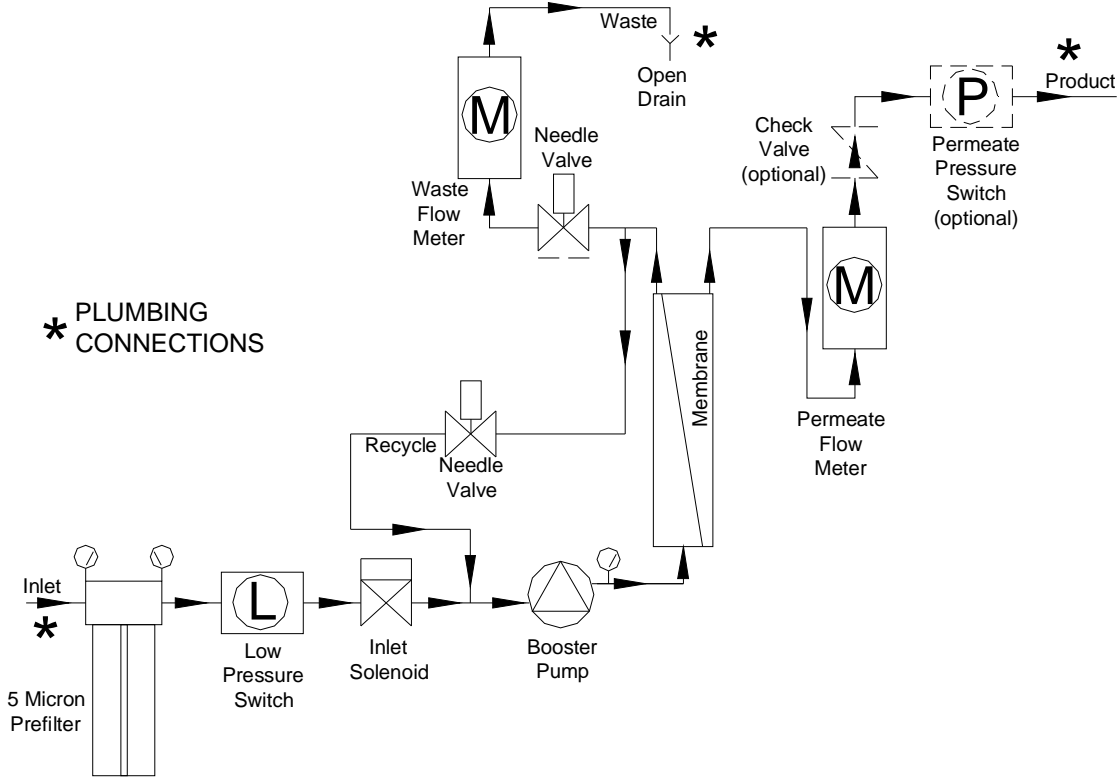


Typical Permeate Flush RO Piping Layout

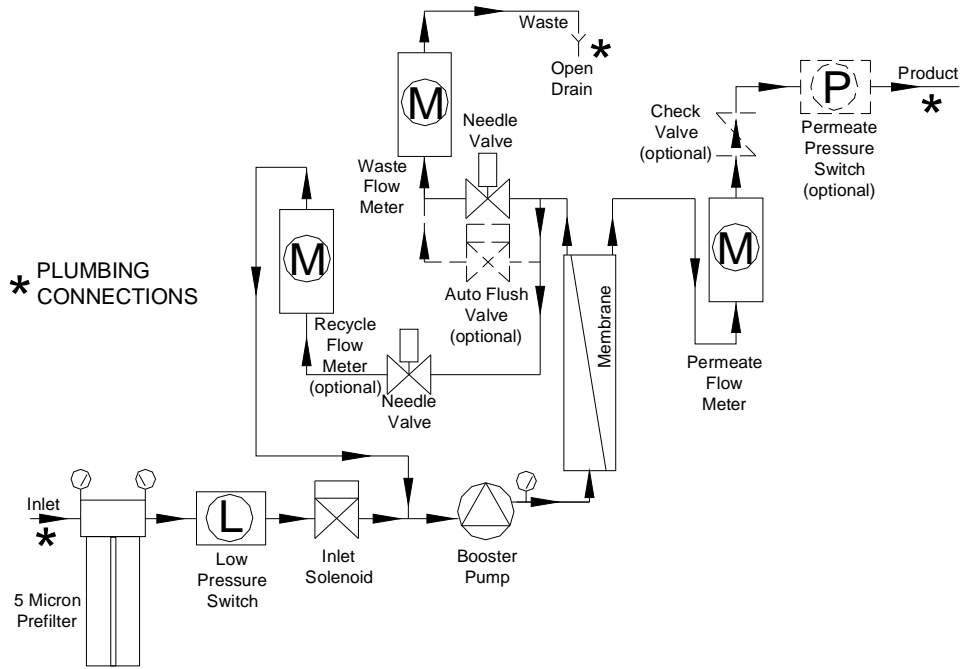


Water Hook-up

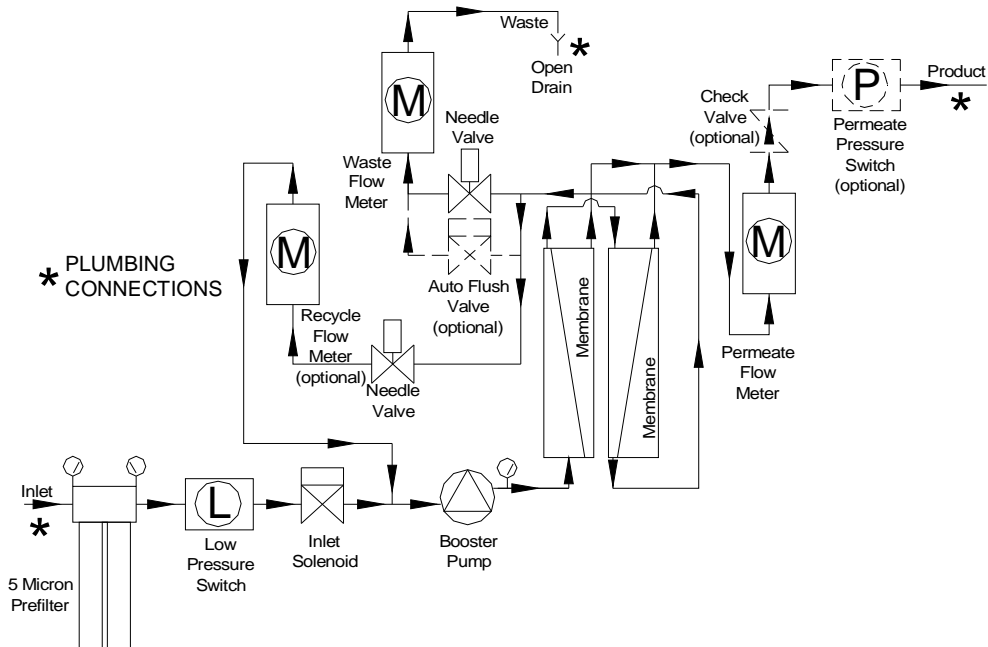
1. When the unit is ready for operation connect the piping
2. The permeate outlet is located on one of the flow meters on the front panel of the RO unit . If permeate is going to a pressure tank (not open storage), then the optional check valve & pressure switch is required.
3. The concentrate outlet is also located on one of the flow meters on the front panel of the RO unit
4. The Feed water Hook-up is located on the pre-filter . (Feed water must be unchlorinated. An additional carbon filter may be required)



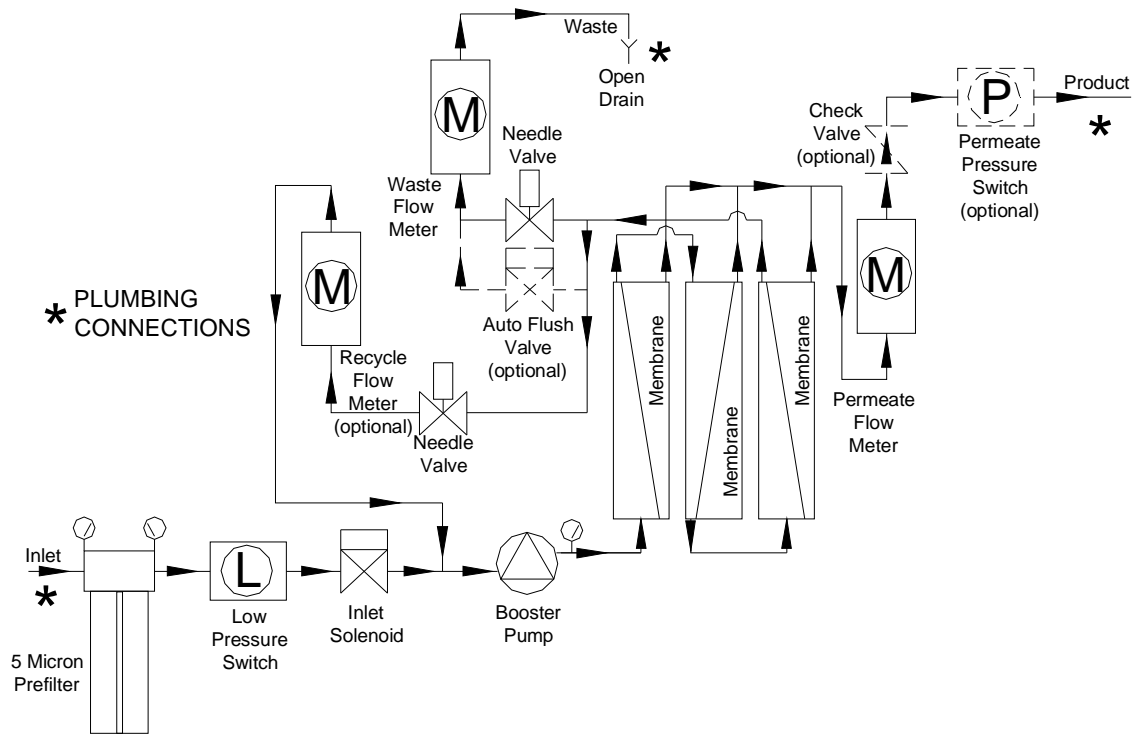
CAN 2521-1 STD – Flow Diagram



CAN 2521-1 & CAN 2540-1 – Flow Diagram



CAN 2540-2 – Flow Diagram



CAN 2540-3 – Flow Diagram

4.0 Operation

Pre-Start up

After having loaded the elements into the pressure vessels and before starting up the membrane unit, make sure that the whole pretreatment section is working in accordance with the specifications. If the pretreatment involved changing of the chemical characteristics of the raw water, then a full analysis of the water entering the membrane unit must be made. Furthermore, absence of chlorine, turbidity and SDI must be determined.

The raw water intake must be stable with respect to:

- Flow
- SDI
- Turbidity
- Temperature
- pH
- Conductivity
- Bacteria (standard plate count)

The following checks of the pretreatment system and the membrane unit are recommended for the initial start-up (results to be included in the start-up report):

Pre-Start-Up Checklist

- ☑ Corrosion resistant materials of construction are used for all equipment from the supply source to the membrane including piping, vessels, instruments and wetted parts of pumps
- ☑ All piping and equipment is compatible with designed pressure
- ☑ All piping and equipment is compatible with designed pH range (cleaning)
- ☑ All piping and equipment is protected against galvanic corrosion
- ☑ Media filters are backwashed and rinsed
- ☑ New/clean cartridge filter is installed directly upstream of the high pressure pump
- ☑ Feed line, including RO feed manifold, is purged and flushed, before pressure vessels are connected
- ☑ Chemical addition points are properly located
- ☑ Check/anti-siphon valves are properly installed in chemical addition lines
- ☑ Provisions exist for proper mixing of chemicals in the feed stream

- ❑ Dosage chemical tanks are filled with the right chemicals
- ❑ Provisions exist for preventing the RO system from operating when the dosage pumps are shut down
- ❑ Provisions exist for preventing the dosage pumps from operating when the RO system is shut down
- ❑ If chlorine is used, provisions exist to ensure complete chlorine removal prior to the membranes
- ❑ Planned instrumentation is installed and operative
- ❑ Instrument calibration is verified
- ❑ Pressure relief protection is installed and correctly set
- ❑ Provisions exist for preventing the permeate pressure from exceeding the feed/concentrate pressure more than 5 psi (0.3 bar) at any time
- ❑ Interlocks, time delay relays and alarms are properly set
- ❑ Provisions exist for sampling permeate from individual modules
- ❑ Provisions exist for sampling raw water, feed, permeate and concentrate streams from each stage and the total plant permeate stream
- ❑ Pressure vessels are properly piped both for operation and cleaning mode
- ❑ Pressure vessels are secured to the rack or frame per manufacturer's instructions
- ❑ Membranes are protected from temperature extremes (freezing, direct sunlight, heater exhaust, etc.)
- ❑ Pumps are ready for operation: aligned, lubricated, proper rotation
- ❑ Fittings are tight
- ❑ Cleaning system is installed and operative
- ❑ Permeate line is open
- ❑ Permeate flow is directed to drain (In double-pass systems, provisions exist to flush first pass without permeate going through the second pass)
- ❑ Reject flow control valve is in open position

- ❑ Feed flow valve is throttled and/or pump bypass valve is partly open to limit feed
- ❑ flow to less than 50% of operating feed flow

Start up

1. Turn the power on switch on the controller to start the unit.
2. Confirm that the flows are correct. If not make necessary adjustments. Follow the adjustment procedures below.
 - 1) Adjusting the pump throttling valve will correct the amount of product water. Opening the valve increases the system operating pressure and water productivity. Closing the valve decreases the system operating pressure and water productivity.
 - 2) Adjust the reject throttling valve to correct the reject to drain flow. Higher flow rate is achieved by opening the valve, as well, reduced flow rate is achieved by closing the valve.
 - 3) Adjust the reject recirculation valve to correct the reject recirculation flow rate. Again open the valve for increased flow rate and close for a reduced flow rate.



As you close the reject valves, the product flow will increase and the reject flow will decrease. As you open the pump discharge throttling valve the product and the reject flow increase. You may have to adjust the pump discharge throttling valve to reestablish the operating pressure to obtain the correct product flow as established in the first step.

3. Once the system is running properly and within the correct parameters, RO data should be recorded. It is very important that RO Data be collected on a daily basis. In the future if a problem arises it will be helpful to have a trended analysis of the RO operating data.

General Operation

Proper start-up of reverse osmosis (RO) water treatment systems is essential to prepare the membranes for operating service and to prevent membrane damage due to excessive pressure/flow or hydraulic shock. Following the proper start-up sequence also helps ensure that system operating parameters conform to design conditions so that water quality and productivity goals can be achieved. Measurement of initial system performance is an important part of the start-up process. Documented results of this evaluation serve as benchmarks against which ongoing system operating performance can be measured.

Following is the recommended RO system start up sequence:

Typical Start-Up Sequence

1. Before initiating the start-up sequence, thoroughly rinse the pretreatment section to flush out debris and other contaminants without letting the feed enter the elements. Follow the Pre-Start-up check described in 4.0 Pre-Startup checklist
2. Check all valves to ensure that settings are correct. The feed pressure control and concentrate control valves should be fully open.
3. Use low pressure water at a low flow rate to flush the air out of the elements and pressure vessels. Flush at a gauge pressure of 30 to 60 psi (0.2 - 0.4 MPa). All permeate and concentrate flows should be directed to an appropriate waste collection drain during flushing.



Air remaining in the elements and/or in the pressure vessels may lead to excessive forces on the element in flow direction or in radial direction and causing fiberglass shell cracking, if the feed pressure is ramped up too quickly.

4. During the flushing operation, check all pipe connections and valves for leaks. Tighten connections where necessary.
5. After the system has been flushed for a minimum of 30 minutes, close the feed pressure control valve.
6. Ensure that the concentrate control valve is open.



Starting against a closed or almost closed concentrate valve could cause the recovery to be exceeded which may lead to scaling.

7. Slowly crack open the feed pressure control valve (feed pressure should be less than 60 psi/0.4 MPa).
8. Start the high pressure pump.
9. Slowly open the feed pressure control valve, increasing the feed pressure and feed flow rate to the membrane elements until the design concentrate flow is reached. The feed pressure increase to the elements should be less than 10 psi (0.07 MPa) per second to achieve a soft start. Continue to send all permeate and concentrate flows to an appropriate waste collection drain.



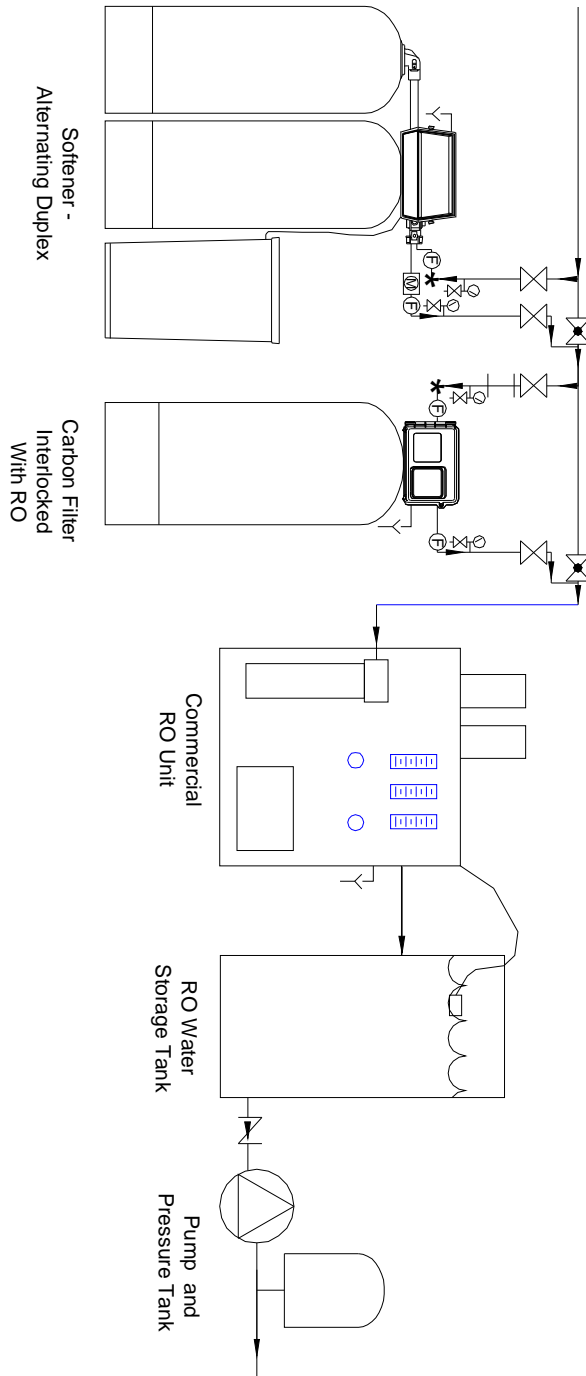
If the feed pressure and/or the feed flow rate are ramped up too quickly, the housing of the elements may be damaged by excessive forces in flow direction and/or in radial direction - especially if air is in the system - leading to telescoping and/or fiberglass shell cracking

10. Slowly close the concentrate control valve until the ratio of permeate flow to concentrate flow approaches, but does not exceed the design ratio (recovery). Continue to check the system pressure to ensure that it does not exceed the upper design limit.

11. Repeat steps "9" and "10" until the design permeate and concentrate flows are obtained.
12. Calculate the system recovery and compare it to the system's design value.
13. Check the addition of pretreatment chemicals (acid, scale inhibitor and sodium metabisulfite if used). Measure feed water pH.
14. Allow the system to run for one hour.
15. Take the first reading of all operating parameters.
16. Check the permeate conductivity from each pressure vessel to verify that all vessels conform to performance expectations (e.g., vessels with leaking o-rings or other evidence of malfunction to be identified for corrective action).
17. After 24 to 48 hours of operation, review all recorded plant operating data such as feed pressure, differential pressure, temperature, flows, and recovery and conductivity readings. At the same time draw samples of feed water, concentrate and permeate for analysis of constituents.
18. Compare system performance to design values.
19. Confirm proper operation of mechanical and instrumental safety devices.
20. Switch the permeate flow from drain to the normal service position.
21. Lock the system into automatic operation.

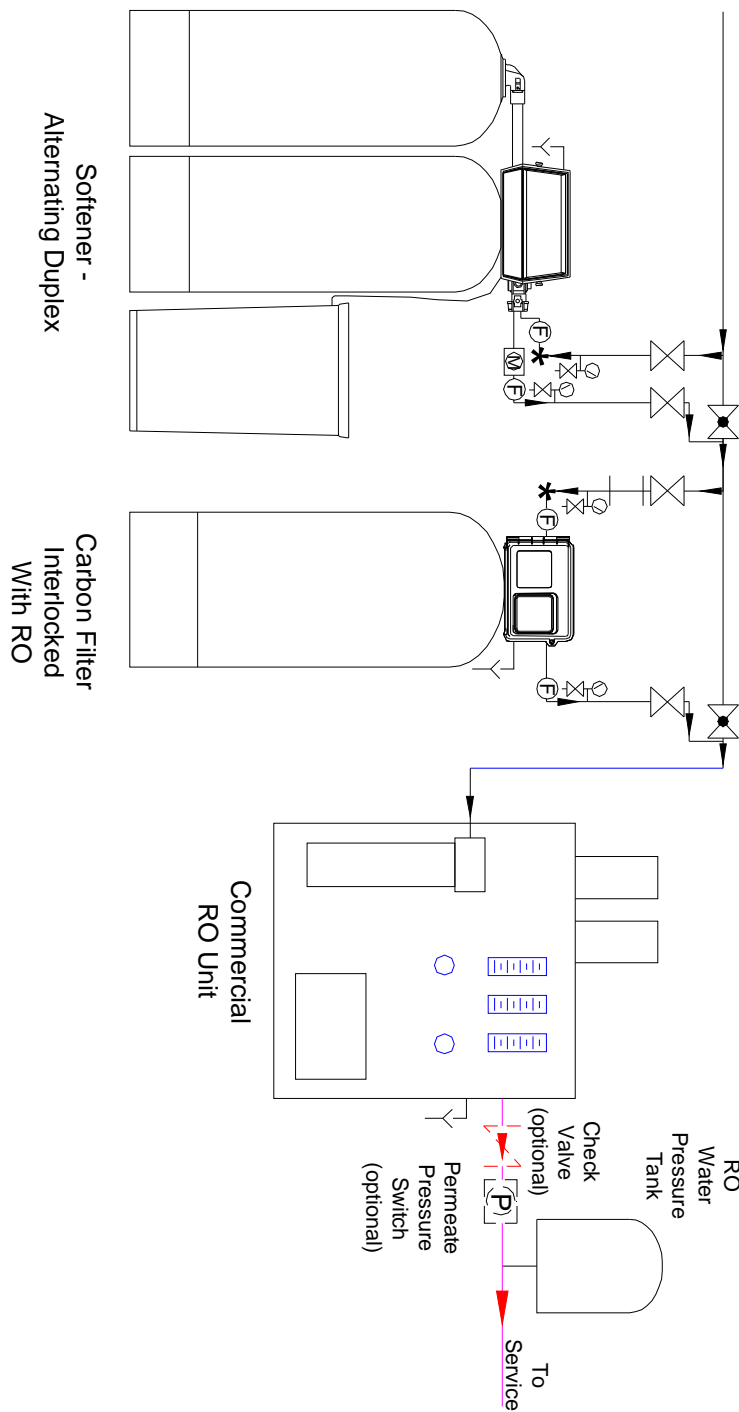
Typical Atmospheric RO Layout

Fig. 4.1



Typical Pressurized Water Layout

Fig. 4.2



System Shutdown

An RO system is designed to be operated continuously. However, in reality membrane systems will start-up and shutdown on some frequency. When the membrane system is shutdown, the system must be flushed preferentially with permeate water or alternatively with high quality feed water, to remove the high salt concentration from the pressure vessels until concentrate conductivity matches feed water conductivity. Flushing is done at low pressure (about 40 psi/3 bar). A high feed flow rate is sometimes beneficial for a cleaning effect; however, the maximum pressure drop per element and per multi-element vessel – as stated on the membranes product information sheet - must not be exceeded. During low pressure flushing, the vessels of the last stage of a concentrate staged system are normally exposed to the highest feed flow rates and therefore they show the highest pressure drop.

The water used for flushing shall contain no chemicals used for the pretreatment, especially no scale inhibitors. Therefore, any chemical injection (if used) is stopped before flushing. After flushing the system, the feed valves are closed completely. If the concentrate line ends into a drain below the level of the pressure vessels, then an air break should be employed in the concentrate line at a position higher than the highest pressure vessel. Otherwise, the vessels might be emptied by a siphoning effect.

When the high pressure pump is switched off, and the feed/concentrate side had not been flushed out with permeate water, a temporary permeate reverse flow will occur by natural osmosis. This reverse flow is sometimes referred to as permeate draw-back or suck-back. Permeate suck-back alone or in combination with a feed-side flush may provide a beneficial cleaning effect. To accommodate permeate suck-back, enough water volume should be available to prevent a vacuum from being drawn or air being sucked back into the membrane element.

If the permeate line is pressurized during operation and the system shuts down, the membrane might become exposed to a static permeate backpressure. To avoid membrane damage from backpressure, the static permeate backpressure must not exceed 5 psi (0.3 bar) at any time. Check valves or atmospheric drain valves in the permeate line can be used to safeguard the membrane. These safeguard valves need to work also and especially in case of non-scheduled shutdowns, e.g. because of a power failure, or emergency shutdowns.

When the system must be shut down for longer than 48 hours, take care that:

- The elements do not dry out. Dry elements will irreversibly lose flux.
- The system is adequately protected against micro-biological growth, or regular flushing is carried out every 24 hours.
- When applicable, the system is protected against temperature extremes.

The membrane plant can be stopped for 24 hours without preservation and precautions for microbiological fouling. If feed water for flushing every 24 hours is not available, preservation with chemicals is necessary for longer stops than 48 hours.

Controller Operation

Please refer to the controller manual that is included with the RO system for operation instructions.

5.0 Maintenance

Scheduled Maintenance

Procedure	Daily	Monthly	Yearly
Check system for leaks & failures	X		
Check feed water chlorine levels	X		
Collect operational data and adjust valves to achieve proper flow rates	X		
Calibrate instrumentation		X (every 6 months)	
Change pre-filter cartridges		3-6 months	
Clean RO membrane elements	When normalized productivity rate drops by more than 15% of the clean membrane normalized productivity rate, when the RO feed pressure increases by 25 PSIG over the clean feed pressure, or when the RO rejection rate drops by more than 3%		
Replace RO membrane elements	When Cleaning fails to restore membranes		

Membrane Cleaning

1. Fill Solution tank with RO Permeate Water.
2. Turn the ball valves to the opposite direction that they are now facing
3. Start cleaning pump and begin to circulate water through the membrane housings.
4. Add acid slowly to the solution until the solution reaches a pH of 4.0.
5. Circulate the low pH solution for at least 30 minutes. You may need to circulate longer if the membrane is heavily scaled. Do periodic pH tests to make sure pH of 4.0 is maintained. If the solution gets quite discolored or dirty, empty solution to drain and repeat steps 1 - 4. Open concentrate valve to pump.
6. When membrane is de scaled, start adding RO permeate water to solution until the pH of the solution reaches at least 6.5.
7. Drain the solution, rinse membrane housing with clean RO permeate until the water coming out of the housing is clean.

8. Refill solution tank with R.O. permeate. Start cleaning pump and circulate the solution through the housings.
9. Add 1 cup of non-phosphate detergent to the solution. Add Sodium Hydroxide until the pH of the solution reaches 10.
10. Circulate the solution for at least 30 minutes. Do periodic pH tests and maintain the pH to 10.
11. When membrane is clean. Start adding RO permeate to the solution and slowly bring the pH down to 7.0
12. Rinse housing with clean water until all the soapsuds are gone and the water coming out of the housing is clean.
13. RO can be put back into service.

Troubleshooting Chart

Problem	Possible Cause	Solution
Pre-Filter High Pressure Drop	Dirt Filter	Replace Filter
Membrane High Pressure Drop	Fouled Membrane	Identify the foulant. Follow appropriate cleaning procedures
Low Product Flow	Fouled Membrane	Identify the foulant. Follow appropriate cleaning procedures
	Feed Temperature Low	Check feed temperature
Poor Quality	Check Recoveries	Re-adjust Flows
	Fouled Membrane	Identify Foulant. Follow appropriate cleaning procedures
	Feed Water Out of Specification	Check Feed water

Low Feed water Pressure	Up stream valve closed	Identify and open
	Build water supply	Verify and install booster pump
Pump Overload	Motor and/or pump damaged	Verify and fix or replace
System will not start	Tank full	Check tank level, drain tank to intermediate level
	Pretreatment in regeneration	Check pretreatment
	System Stopped	Start System

Membrane Storage

The following are guidelines for storage of reverse osmosis membranes.

1. Store cool inside a building or warehouse and not in direct sunlight.
2. Temperature limits: -4°C to +35°C (22°F to 95°F). New, dry elements will not be affected by temperatures below -4°C (22°F).
3. Elements stored in 1% sodium bisulfite will freeze below -4°C (22°F), but the membrane will not be damaged, provided they are thawed before loading and use.
4. Keep new elements in their original packaging.
5. Preserved elements should be visually inspected for biological growth every three months. When the preservation solution is no longer clear, or after six months, the element should be removed from the bag, soaked in a fresh preservation solution and repacked.
6. If equipment for re-preservation (fresh solution, clean environment, bag sealing device) is not available, the elements can be left in their original packaging for up to 12 months. When the elements are loaded into the pressure vessels, they should be cleaned with an alkaline cleaner before the plant is started up.
7. The pH of the preservation solution should be spot-checked every 3 months and must never drop below pH 3. A pH decrease can occur when bisulfite is oxidized to sulfuric acid.

RO Operating Specifications

Operating Parameters (usgpm)

-Note: Raw water feed must be un-chlorinated and have the proper pre-treatment

Permeate (product) Flow – Dependent upon incoming raw water quality (Total TDS), water temperature and pre-treatment.

-Typically on warm water (77 F) and TDS less than 2000 ppm., each 25 x 21 membrane can produce up to a recommended maximum of 300 usgpd (0.2 usgpm) . On cold water, the permeate may be approximately half.

-Typically on warm water (77 F) and TDS less than 2000 ppm., each 25 x 40 membrane can produce up to a recommended maximum of 600 usgpd (0.4 usgpm) . On cold water, the permeate may be approximately half.

Concentrate (reject) Flow- Dependent upon incoming raw water quality (Total TDS), water temperature and pre-treatment.. Typically if the total tds is less than 2000 ppm, the concentrate flow rate is equal to (or slightly higher) than the permeate flow rate. This would give you approximately 50% recovery.

Recycle Flow- Dependent upon unit design If unit is equip with a recycle flow meter., the 2521-1 to 2540-3 units, the recycle flow rate PLUS the concentrate flow rate should be as a minimum (it can be higher) 1 usgpm

Recovery- Dependent upon incoming raw water quality (Total TDS) and pre-treatment. It is adjustable. Typically for units with TDS of 2000 or less with proper pretreatment, the recovery is normally adjusted to 50%

Maximum recommended operating pressure is 190 PSI

Typically if the raw water feed TDS is below 2000 ppm, the waste flow rate is adjusted to be equal to or slightly higher than the product (permeate) flow rate. Also the membrane pressure must be 190 PSI or lower.

This is accomplished by adjusting the recycle and waste needle valves .

Commercial RO Unit Warranty

Subject to the conditions and limitations described below, Commercial RO units manufactured by Canature WaterGroup are warranted to be free from defects in materials and workmanship for a period of 1 year from date of purchase. Any components not manufactured by Canature Watergroup are limited to the warranty given by the manufacturer of the component.

As a manufacturer, we do not know the characteristics of your water supply. The quality of water supplies may vary seasonably or over a period of time. Your water usage may vary as well. Water characteristics can also change if the RO is moved to a new location. For these reasons, we assume no liability for the determination of the proper equipment necessary to meet your requirements, and we do not authorize others to assume such obligation for us. Further, we assume no liability and extend no warranties, express or implied, for the use of this product with a non-potable water source or a water source which does not meet the specified Operating Limits.

The RO must have the correct pretreatment installed. The pretreatment system must ensure the RO feed water always meets the requirements as indicated below. The RO must not be operated contrary to the operating limits listed below.

Operating Limits

Maximum Operating Pressure	150 PSI	10.3 bar
Feed Line Pressure Min/Max	30 to 60 PSI	2 to 4 bar
Feed Water Temperature Maximum	100 F	37 C
Total Dissolved Solids Max	2500 mg/l	2500 mg/l
Turbidity	< 1 NTU	< 1 NTU
pH Range	5 to 10	5 to 10
Silt Density Index - Well Water	<3	<3
Silt Density Index - Surface Water	<5	<5
Chlorine/Chloramines Max	0 mg/l	0 mg/l
Iron Maximum	< 0.1 mg/l	< 0.1 mg/l
Manganese Maximum	<0.05 mg/l	< 0.05 mg/l
Hydrogen Sulfide	0 ppm	0 ppm
Water Hardness	< 1 grain	< 17 mg/l
Oil tolerance	0 ppm	0 ppm
Organic Tolerance	0 ppm	0 ppm

General Provisions:

Other than the membrane and cartridge filters, any part found defective within the terms of this warranty will be repaired or replaced by Canature WaterGroup™. The booster pump warranty is subject to the conditions by the warranty of the pump manufacture.

This warranty shall not apply to any part damaged by accident, fire, flood, freezing, Act of God, bacterial attack, chlorine / chloramines, iron, manganese, sediment and or silt, membrane fouling and/or scaling, sediment, misuse, misapplication, neglect, alteration, installation, or under conditions contrary to the operating limits, or by the use of accessories or components which do not meet Canature WaterGroup™ specifications. If the RO system is altered by anyone other than Canature WaterGroup™ the warranty shall be void.

CANATURE WATERGROUP'S™ OBLIGATIONS UNDER THIS WARRANTY ARE LIMITED TO THE REPAIR OR REPLACEMENT OF THE FAILED PARTS OF THE DRINKING WATER SYSTEM, AND WE ASSUME NO LIABILITY WHATSOEVER FOR DIRECT, INDIRECT, INCIDENTAL, CONSEQUENTIAL, SPECIAL, GENERAL OR OTHER DAMAGES.

Return OF Goods: An authorization number must be obtained before returning any merchandise. NOTE: All material returned to Canature Watergroup must be returned freight prepaid. Upon inspection, if our warranty department determines the goods to be defective under the terms of this warranty, the warranty shall be limited to the defective parts to be repaired, replaced, or credited at Canature Watergroup's discretion. You pay only freight to return defective parts to our factory and local dealer charges, including but not limited to labor charges, travel and transportation expenses, and handling fees.

Some State & Provincial jurisdictions do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Similarly, some State & Provincial jurisdictions do not allow exclusion of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from jurisdiction to jurisdiction. Consult your authorized Dealer for warranty and service information.