REVERSE OSMOSIS

OPERATION AND MAINTENANCE MANUAL

MODEL

AVRO3000

AVRO6000

Supplied by -

Thank you for purchasing the AVRO-Reverse Osmosis (RO) System. This machine is a durable piece of equipment which, with proper care, will last for many years. These instructions give operation and maintenance details vital to the sustain performance of the machine. Please read this operating manual prior to use and store in a safe place for referral at a later date.

For service advice or parts please contact your supplier listed below.

Supplied by-

Table of Contents

1. Basic Principles of Reverse Osmosis

Reverse Osmosis (RO) is the separation of one component of a solution from another component by means of pressures exerted on a semipermeable membrane. In other words, reversing the natural passage of a liquid from a concentrated solution to a more dilute solution by using external pressure. Removal of ionic, organic and suspended/dissolved impurities occurs during the RO process. Unlike a filter, which separates by “normal” filtration, the RO membrane element separates using a process called crossflow filtration. Feedwater solution is separated into two streams, permeate and concentrate, and collected from both sides of the membrane. A semipermeable RO membrane, under sufficient pressure, allows passage of purified water while rejecting and concentrating dissolved and suspended solids.

The heart of the system is a semi-permeable membrane that will allow small molecules to pass through, such as water (H20) and reject larger molecules such as sodium chloride (NaCl). At atmospheric pressure, if a membrane separates two of different solution strengths, ions from the stronger solution tend to flow into the weaker solution until equilibrium is attained.

As the name suggests, "Reverse Osmosis," reverses this natural tendency by exerting an "Osmotic pressure," on the membrane.

Now the concentrated side of the membrane forces the smaller water molecules through the membrane to the permeate collection manifold. The concentrated water becomes more concentrated and the diluted water becomes purer.

The most important aspect of reverse osmosis operation is to ensure the raw feed is correctly treated to prevent fouling and possible irreversible damage to the reverse osmosis membrane.

2. Feed water requirement

The following feed water requirement must be met before installing your new RO machine to ensure quality permeate and extended membrane element life.

Rarely, in fact, almost never is water suitable for direct entry to the membrane housing, thus pretreatment is used. This may differ from site to site. (please note this is not a complete list):

Contaminant	Membrane Effect	Treatment Options
Suspended Solids	Colloidal Fouling	Coagulation and or Multi Media Filtration, Cartridge filter
Chlorine (Cl2)	Oxidation Membrane Destruction	Aeration/SMBS dosing/ Activated Carbon Filter
Iron (Fe)	Fouling	Aeration / Chlorination (followed by de-chlorination) Ozone (followed by de-ozonation) Media filtration
Manganese	Fouling	Manganese Greensand Filtration
Calcium Bicarbonate	Scaling	Base Exchange Water Softening, Proprietary Antiscalants
Magnesium Sulphate	Scaling	Base Exchange Water Softening, Proprietary Antiscalant Dosing
Biological Activity	Biological Fouling	Aeration / Chlorination (followed by de-chlorination) Ozone (followed by de-ozonation), carbon

Feedwater Requirements

Item Model	AVRO3000 & AVRO6000
Minimum Feed Pressure	210 kPa
Water Temperature	5 -45℃ (membrane type dependent)
PH	3.0 – 11.0 (membrane type dependent)
Total Hardness	Nominally < 17ppm as CaC03
Turbidity	<1 NTU
Silt Density Index	SDI <5 (membrane type dependent)
Total Dissolved Solids (TDS)	< 2,000 ppm
Iron (Fe)	< O. 1 ppm
Manganese	< 0.05pprn
Dissolved Oxygen	< O. 1 ppm
Organics	< 1 ppm

3. System Features

This RO machine has all the features necessary for safe, continuous production of high-purity water. This assumes properly pre-treated feedwater with a TDS<2,000 ppm, and regular operator maintenance, each shift or daily, to the operation of the system.

1 . AVRO RO Membrane and Membrane Housing (FRP or stainless)

2. Stainless Steel Frame

3. pre-filter housing including 1 or 5-Micron Cartridge Filter

4. High Pressure System Pump (Stainless Vertical Multi-Stage)

5. Low-pressure Protection Switch

6. High Pressure Protection Switch – (option)

7. Automatic inlet shutoff valve (Feed water Solenoid Valve)

8. Autoflush system: automated high-velocity membrane flushing for the membrane life set at the factory (Flush water Solenoid Valve).

9. Permeate, Reject Rotameters (recycle on AVRO6000)

10. Avanale Controller with permeate conductivity monitor

11. Avanale Conductivity monitor

12. Feed water , Pre-membrane ,and Concentrate pressure gauge

13. Stainless Steel Concentrate needle valve.

14. typically 35% to 45% recovery (AVRO 3000) and 45% to 55% (AVRO6000) – may be adjusted outside of this, projection software should be used as a guide.

The machine flow specifications listed below are based 25℃ and 2000 ppm NaCl.

SYSTEM SPECIFICATIONS & OPERATING PARAMETERS

SYSTEM SPECIFICATIONS	
Model No.	AVRO 3000
Design Capacity	3000 GPD (0.5m³/hr)
Pressure Vessel	4040 *2pcs
Vessel Staging	1/1
Element Quantity	4040 *2 pcs
High Pressure Pump	CDLF2-13,220VAC,50Hz,1 Phase,1.5 KW
Pre-filter	20”*1 pcs
System Piping	Inlet Feed 3/4” Permeate 1/2” Reject 1/2”
Feed Flowrate	5.5 gpm (1.2 m³/hr)
Permeate Flowrate	2.2 gpm (0.5 m³/hr) - nominal
Reject Flowrate	3.3 gpm (0.7 m³/hr)

SYSTEM SPECIFICATIONS	
Model No.	AVRO6000
Design Capacity	1.0m³/hr
Pressure Vessel	4040 *4pcs
Vessel Staging	2/1/1
Element Quantity	4040 *4 pcs
High Pressure Pump	CDLF2-15,380VAC,50Hz,3Phase,1.5KW
Pre-filter	20” x 4.5” housing
System Piping	Inlet Feed 1 1/4” Permeate 3/4” Reject 3/4”
Feed Flowrate	2 m³/hr
Permeate Flowrate	1 m³/hr - nominal
Reject Flowrate	1 m³/hr

OPERATING PARAMETERS	
Projected Inlet Feed TDS	2,000 ppm (4,500ppm SS model)
Minimum System Inlet Feed Pressure	30 psig
Maximum Inlet Free Chlorine	＜0.1 ppm
Maximum Inlet Silt Density Index (SDI)	5.0
Standard Electrical Power	220/240VAC,1-phase, 50Hz
Operating Pressure	150-180 psig
Operating Temperature Range	5-45 ℃
Nominal System Recovery – model dependent	35%-45% or 50%-55%
Nominal System TDS Reduction	95%-98%

4. Flow Description

The feed pump transfers the raw water to the pretreatment system, and the raw water pass through media (sand or Zeolite) filter , activated carbon filter , and softener (if fitted)

The feedwater passes through a replaceable 5 or 1-micron cartridge filter which removes suspended solids. Filtered water then flows to the inlet control valve. This solenoid valve opens when the machine is turned on allowing water to flow to the pump inlet. When the machine is turned off, the valve closes, preventing non-turbulent flow through the membrane elements which would lead to shortened membrane life.

The RO HP pump feeds water to the membrane element housings arranged in parallel and series combinations depending on the model. The direction of water flow is indicated by an arrow on each membrane element housing. Water is separated by the membrane within the membrane elements and leaves the membrane element housing in two streams, permeate and concentrate.

Permeate from each membrane element housing is collected in a common manifold. The permeate then flows through a flow meter and conductivity probe and to the outlet point of the machine.

Concentrate leaves the last membrane element housing and flows to the flow control center. The concentrate valve has three functions. It controls the amount of concentrate flowing to drain, the pressure within the machine, and helps control the system recovery. The autoflush solenoid is also included in the flow control center. The concentrate then flows through a flow meter and to the outlet point of the machine.

No backpressure should be applied to concentrate or permeate outlets. The unit is designed for an “atmospheric” open outlet.

5. Main System Components

Option - Media filter The media filter is designed to remove suspended material greater than 10 Micron (dependent on media utilised).

Option - Activated carbon filter The activated carbon filter is designed for the removal of free chlorine and reduction of tastes, odors, and dissolved organic material from municipal and industrial water supplies. Inlet water to activated carbon systems should be relatively free of turbidity and iron for optimal performance.

Option - Softener The softener filter is designed to remove scaling materials such as calcium and magnesium.

Cartridge Filter The cartridge filter is designed to remove suspended material greater than 1 or 5 Micron prior to the pre-treated water flow into the membrane. This protects the membranes from significant colloidal contamination. The cartridge should be renewed if the pressure differential across the filter exceeds 80 kPa

Inlet Solenoid Valve The key function of the inlet solenoid valve is to automatically turn off water supply and to protect membranes from being contaminated when the main unit stops running.

High-Pressure Pump The high pressure pump function is to boost the incoming feed water pressure for correct membrane operating conditions.

RO Membrane Housing The RO membrane housing is designed to house the membrane element and is rated to withstand the normal operating system pressure.

Caution: The operator/installer should apply a small amount of silicon grease to the chevron seal in order to ensure proper sealing of the membrane brine seal.

RO membrane element The RO membrane element is the key component of the RO main unit and has a determinative effect on the quantity and quality of water produced. The RO membrane utilises pressure energy to separate larger contaminant molecules from the body of feed water. For a given temperature, pressure and feed TDS, if the quantity of water produced decreases by 15%, please refer to your supplier of the unit regarding membrane cleaning instructions.

Conductivity Monitor The function of conductivity monitor is to monitor the quality

of the permeate or feed water.

Caution: Please do not clean with strong acid or alkali to prevent the electrodes from being damaged.

Concentrate Control Needle Valve The main function of concentrate control valve is to adjust the concentrate flow from the membrane. Adjust the concentrate control valve to attain the correct recovery rate and system pressure in conjunction with the pump throttle valve.

Caution: Please do not turn off the concentrate valve. The high pressure in the membrane housing may cause irrecoverable damage to membrane and/or housing.

Pump Throttle Valve The main function of pump throttle valve is to adjust the flow from the high pressure pump. Adjust the pump throttle valve to attain the correct recovery rate and systems pressure in conjunction with the concentrate control valve.

Caution: Please do not turn off the pump throttle valve. The high pressure in the pump housing may cause irrecoverable damage to pump and/or impellers.

Flush Solenoid Valve The flush solenoid valve is pre-programmed to flush for 90 sec on start-up and shut-down under the control of the Avanale controller. Periodically the valve opens to flush the membrane at low pressure. This helps to extend the periods between membrane cleans.

Rotameters The rotameters are provided to indicate the permeate, concentrate flow rates

Pressure Gauges The pressure gauges are provided to monitor system operating pressure and feed water supply pressure.

Low Pressure Switch The low-pressure switch is a safety device that in conjunction with the controller, shuts down the unit in the event of low feed pressure.

High Pressure Switch (option) The high pressure switch is a safety device that in conjunction with the controller, shuts down the unit in the event of over system pressure.

Float switch A facility is provided to connect an external float switch in the permeate storage tank. When the circuit is broken between the,"HIGH-LEVEL," contacts the unit automatically stops. The unit will remain on standby until the level in the tank drops and the " LOW-LEVEL" contacts start the system.**) – A float switch may also be**

used on the feed tank to help protect the RO

6. Installation Guide

The **AVRO** RO machine was created to make installation easy for you. The following installation guidelines will help you install your new AVRO RO machine.

Mounting

AVRO RO machines are equipped with a stand-alone frame, which supports the machine. At least 114cm of space should be allowed on each end of the membrane element housings for removal and loading of membrane elements. If 114cm are not available, the entire membrane element housing may need to be removed for membrane element replacement.

The operator should install the unit in a covered dry place, shielded from the elements to protect the electrical and other components generally from damage and premature deterioration.

Sufficient room should be allowed to conveniently operate and service the unit.

The influent water temperature must be between 5 and 40 C.

Plumbing

The **AVRO3000** RO comes with the following connections.

Feedwater Inlet Connection: 3/4-inch upvc

Permeate Outlet Connection: 1/2-inch upvc

Concentrate Outlet Connection: 1/2-inch upvc

The **AVRO6000** comes with the following connections.

Feedwater Inlet Connection: 1.0-inch upvc

Permeate Outlet Connection: 3/4-inch upvc

Concentrate Outlet Connection: 3/4-inch upvc

NOTE -

Permeate and reject lines must be no smaller than the unit outlet size. In the event of long pipe runs, increasing the pipe size diameter may be necessary. Ask for our suppliers engineer to consult on any item above that may be of concern.

AVRO6000 - **Clean-In-Place (CIP) Plumbing**

A clean-in-place inlet/outlet is designed. Run hose or pipe from concentrate and permeate

CIP outlet to CIP tank return fittings.

Power and Electrical Requirements

This machine is equipped with a Avanale controller to provide start/stop , sequential, and alarm control. Three conditions will cause the RO to alarm and subsequently shut down the machine: low inlet pressure (< 12 psi), high RO pressure (> 220 psi if option is fitted), and starter overload. External controls include pre-treatment lockout, feedwater storage tank level control and permeate storage tank level control.

WARNING: Before obtaining access to control cabinet, incoming power must be disconnected. A qualified electrician must be used.

The AVRO machines are supplied with a single-phase, 220 VAC, 50Hz control circuit – version 1.4 onwards utilises 24 volt control and solenoid valves. The main power for this machine is 1-phase, 220/240 VAC, 50 Hz.

Connect the power to the main terminals. Check the tag that indicates the factory wiring.

Caution: Please check that the power supply is the correct voltage and current rating. Refer to the circuit diagram of RO main unit.

The feed pressure must be between 250 to 500 kPa. A pressure reducing valve (PRV) or break tank and pump set may be necessary if the above condition cannot be guaranteed from mains supply.

7. Preparation and Start-up

Pre-treatment for Water Purification

All systems will operate most efficiently on filtered water with a pH of less than 7 and a Silt Density Index (SDI) of 5 or below. If the machine is operated on higher pH water, other forms of pre-treatment may be necessary. A water analysis prior to start-up of the machine is required. Data from the water analysis is processed with a computer program analysis to determine if potential problems may exist.

Before installing the machine, the feedwater must be filtered to at least 5 microns.

The correct operating conditions depend on:

Feed Temperature

Feed water analysis

Calculated recovery

Pre-treatment conditions

Initial Start-up

NOTE: If your machine has the membrane elements installed in the housings, proceed to section below. If your machine is provided with the membrane elements in shipping boxes, you must load the membrane elements in the housings prior to starting the machine. For membrane element loading instructions, skip to section Membrane Element Installation.

1. Recheck the function and integrity of your pre-treatment equipment. Ensure that your multi-media filters, activated carbon filers and water softener (where applicable) have been leak checked, backwashed, and thoroughly rinsed for service before starting up your RO unit.

2. Check for leaks at all connection points. Ensure that you have made provisions for voltage required to operate your machine. The motor electrical service must be field wired directly into the motor starter on the machine. Check the voltage label to ensure that you

have brought the correct voltage to the starter.

3. Open your concentrate flow control valve at least two complete turns. Open your pump throttle valve slightly. Proper adjustment of these valves is critical to the operation of the RO machine. The concentrate valve determines the amount of rejected water leaving the machine and creates the operating pressure shown on the pressure gauge. It is important to balance the operating pressure and the respective flows of these valves to ensure that your machine is operating correctly.

4. If fitted turn the feed pump selector switch to MANUAL position to flush pretreatment and RO. Flush RO to evacuate all air with out running high pressure pump

Then turn the feed pump selector switch to AUTO position.

As your machine is filling check for leaks and repair as needed.

5. Turn all selector switches to Auto

6. Turn on/off switch on front panel to on. As you are operating , be sure to watch the primary and final pressure gauges on the instrument panel. The machine is designed to operate at approximately 150 psi (10 bar) average operating pressure. This will depend on feed water quality and membrane being used.

NOTE: Do not allow the pressure to exceed the maximum pressure (Pmax) specified for your machine model. If the pressure exceeds Pmax, open the concentrate flow control valve until the pressure gauge shows Pmax or less.

10. As the machine purges the air and fills with water, the pressure will gradually increase. You should see water flow through the permeate and concentrate piping. If you do not see flow, turn the machine off and recheck.

11. Gradually adjust the concentrate flow control valve. As you adjust the valve, watch the average pressure (Pavg) and your concentrate flow meter. Adjust the valve until your concentrate flow meter displays your design flow and you do not exceed Pmax.

12. With the concentrate flow control valve set to obtain the design concentrate flow and the pressure below Pmax, gradually adjust the pump outlet valve until Pavg reaches 150 psi (10 bar). Readjust the concentrate and then pump outlet valves, if necessary.

13. Your machine is now operating. Your specific needs or conditions may dictate the

need to operate the machine at a lower recovery.

14. Once the desired flow rate and pressures are achieved, no further valve adjustment is needed. If fitted, adjust concentrate recycle as per projections.

NOTE: Permeate flow rates are dependent upon temperature and conditions at your site.

The system is now operational.

15. Before putting the machine into final operation, continue to run the permeate and concentrate streams to drain for at least 30 minutes. This is done to ensure that all of the preservative has been removed from the membrane elements.

Connect the permeate line to the point-of use of the permeate. Check for leaks and ensure that you have no links in hoses or blockage of any plumbing on the permeate and concentrate outlet lines.

16. Create copies of the start-up log sheet, and fill one out. A daily log sheet including general operating conditions (pressures, flows, concentrations, pH, and pre-treatment conditions), and routine or special maintenance (flushing or cleaning as needed) must be kept.

Flow check procedure.

Turn on the power supply

Unlock emergency Stop/Start button by turning the button clockwise and releasing.

Turn on/off selector switch to on

The inlet valve will open and allow water to enter the system. This first stage will expel air to prevent damage to the membrane(s) [telescoping]. The flush valve will be open (the high concentrate flow rate will not be visible in the concentrate rotameter. After a few minutes the flush valve will close. The concentrate flow rate should be at the maximum rate in the rotameter. Slowly close the concentrate valve to attain the correct operating pressures and the pump throttle valve to attain the correct concentrate flow rates*.

Daily Start-up

Check the machine to insure isolation valves are in the proper positions for operation.

To turn the RO on, switch the On/Off switch to on. If the alarm light stays lit, check the RO for an alarm condition. Otherwise, the main inlet valve will open, and the high-pressure pump will turn on. The high-pressure pump will not start if there is insufficient inlet

pressure. Daily performance data must be recorded on the daily log form as explained in Operation and Maintenance section of this manual.

Shut down

Normally the unit will stop when the permeate/product tank is full. However, should the unit be required to be stopped manually simply turn the on/off switch to off.

If the unit is not to be used for a period longer than 48 hours please consult your supplier for advice regarding preservation of the membrane (membrane fouling will occur if the unit is idle for long periods).

Your supplier should be able to provide a computer projection with optimum operating conditions for your feed water.

Caution: Do not start or operate the unit with the concentrate or pump throttle valves closed Severe damage to the membranes and other components may result.

Do not operate the system at excessive pressures.

Do not increase the membrane pressure beyond 115% of recommended operating pressure or permanent damage to the membranes and /or pump may result.

8. Machine Operation and Maintenance

The operation and maintenance of your RO Machine is relatively simple but requires regular data recording and routine preventive maintenance.

The three preventive maintenance procedures which must be done on a regular basis are as follows:

- Change the pre-filter cartridge.
- Flush the machine daily.
- Clean the machine with approved cleaners.

See the following sections for specific maintenance procedures.

Daily Log Sheets

Create copies of the daily log sheet, and fill one out. A daily log sheet including general operating conditions (pressures, flows, concentrations, pH, and pre-treatment conditions), and routine or special maintenance (flushing or cleaning as needed) must be kept.

Pre-Filter

A 1 or 5-micron pre-filter is factory installed to protect the membrane elements and valves from particles which may be in the feedwater.

The filter cartridges must be replaced, monthly or when a pressure drop across the filter of 80 kpa or more during operation. Use only approved filters rated for 5 microns or less. Do not attempt to clean used filters. Install new replacements.

IMPORTANT NOTE: Failure to change the filter according to these requirements will void machine warranty.

Flushing

The Autoflush system, provide on all models automatically flushes the machine and eliminates the need for frequent manual flushing. However, if the Autoflush system becomes inoperable, the machine should be flushed manually at least daily to remove sediment from membrane surfaces. To flush the unit:

(1) Open the concentrate valve until the pressure gauge indicates the minimum pressure designed on the nameplate.

NOTE: If pressure will not decrease to designated pressure, or if the concentrate rate

does not increase when the valve is open, the valve may be plugged. If the valve is plugged, remove plug or replace valve.

(2) Operate the machine at the designated minimum pressure for 10 to 20 minutes.

(3) Close the concentrate valve to reestablish original operating conditions and ensure that the proper concentrate flow rate is going to the drain.

Seek technical assistance if:

The permeate conductivity increases by 15% or

The permeate production decrease by 15% or

The HP pump discharge pressure increases by 15%

The influent water quality has changed

Membrane Element Installation

Installing membranes in pressure vessels is an easy process if you have the proper information and tools at hand. Please refer to the following instructions when removing and replacing membrane elements:

1. Remove the end caps from the top of the membrane housings.
2. Remove the membrane bag containing the membrane element from the shipping box.
3. Cut the bag open as close as possible to the seal at the end of the bag, so the bag may be re-used if necessary.
4. Remove the membrane element from the bag and remove the black core tube protectors from each end of the membrane.
5. Remove parts from the parts container (if included) and inspect. Make sure that all parts are clean and free from dirt. Examine the brine seal, and permeate tube for nicks or cuts. Replace the O-rings or brine seal if damaged.
6. Flow directions should be observed for installation of each element in each housing.

As time progresses, the efficiency of the membrane will be reduced. The permeate flow rate will begin to decline slightly after a period of time, but can be extended with diligent flushing and cleaning of the system. A high pH and/or precipitation of hardness can cause premature loss in

rejection of membrane elements in the system.

To replace the membrane elements:

1. Remove all of the membrane element(s) from the membrane element housings from the top of the housing. Heavy-duty pliers and channel lock pliers may be necessary to pull the old membrane element out of the membrane element housing.
2. Install the brine seal side of the membrane elements first. When the housings have a direction of flow from bottom to top, the brine seal should be located on the end of the membrane element at the bottom of the housing.
3. Lubricate the brine seal with a food grade lubricant.
4. At a slight angle insert membrane while slightly rotating element being careful not to tear or flip the brine seal. Re-lube the brine seal if necessary.
5. With a smooth and constant motion, push the membrane element into the housing so that the brine seal enters the housing without coming out of the brine seal groove. A slow twisting motion should be used to insert the membrane element, to ensure that the brine seal stays in place.
6. Re-install the end caps by gently twisting the end cap while pushing it onto the housing. Ensure that you do not pinch or fatigue any O-rings while pushing the end plug on. O-rings should be lightly lubricated. Push the end plug on until the outer diameter of the plug is flush with the outer diameter of the membrane housing or until it is seated (depending on housing type).
7. Insert nylon snap ring until fully seated (if applicable). Snap ring must be able to be spun in place if fully seated. If you are using a stainless steel housing, Install the clamps halves, and tighten bolts until the clamp halves meet.
8. Reconnect any fittings that may have been disconnected when the membrane element housings were disassembled.
9. To Start-Up the system, refer to Start-Up

CAUTION: New or factory cleaned membranes may be shipped in a preservative solution. New or cleaned membranes must be flushed for at least 1

hour to remove the preservative from the membrane or to “wet out” the membrane. Discard all of the permeate and concentrate, which is produced during the flush.

9. RO Controller

This machine is equipped with an Avanale controller to provide start/stop , sequential, and alarm control. Three conditions will cause the RO to alarm and subsequently shut down the machine: low inlet pressure, high RO pressure (if fitted), and starter overload. External controls include pre-treatment lockout, feedwater storage tank level control and permeate storage tank level control.

For full details please refer to controller manual.

WARNING: Before obtaining access to terminals, disconnect unit from power.

10. Trouble Shooting

Symptom	Cause	Remedy
Unit will not start	No power Insufficient water pressure Permeate Tank Full Feed tank low Controller damaged	Check power supply Check signals on controller output and/or input Check inlet valve is open/and check that solenoid is operational/ check Cartridge Filter Reset float switch Service/Replace
HP Pump will not start	Circuit breaker Off Overload Tripped Pump Motor High Temp	Switch on Reset, check current setting Allow to cool
HP Pump starts but system Pressure is low	Flush Valve Open Concentrate Valve fully open Pump throttle valve excessively closed Pump fault Pump cavitation	Wait until flush cycle completes Close valve in Open valve out Inspect pump Bleed air from pump
H P Pump starts but Trips	Motor Overload	Check motor and pump/Check overload setting/Check controller
Excessive Membrane Pressure	Concentrate Valve closed Pump Throttle Valve fully open Membrane(s) fouled Excessive feed Pressure	Open valve out Close valve in Replace / Clean membranes Check feed PRV setting
Permeate water quality poor	Membrane perforated by chlorine attack, membrane compromised	Replace carbon cartridge and membrane

PROCESS DIAGRAM

Attached separately

Electrical Circuit Diagram
Attached separately

START-UP DATA

Customer _____ Date _____
Model No. _____ Tested by _____
Serial No. _____

Generic install sheet

RO model and serial number -

	Units (Circle One)	Data	Data	Remarks
Permeate Rate	°F °C			
Concentrate Rate	gpm gph Lpm Lph	/	/	
Total Flow Rate	gpm gph Lpm Lph	/	/	
Recovery	gpm gph Lpm Lph	/	/	
Pre-Filter Pressure	psi bar			
Post-Filter Pressure	psi bar			
Primary Pressure	psi bar			
Final Pressure	psi bar			
Feed TDS	µS			
Concentrate TDS	µS			
Avg TDS	µS			
Permeate TDS (manual)	µS			
Permeate TDS (meter µS)	µS			
% Passage (Perm TDS/Avg TDS)				
Chlorine in Concentrate	ppm			
Pump Model No.				
Pump Serial No.				
Low Pressure Switch Setting	psi bar			