

READ AND SAVE THESE INSTRUCTIONS

WATER TREATMENT

400 series
reverse-osmosis systems

Installation, Operation,
and Maintenance Manual



Warnings and cautions

	WARNING
	Attention installer Read this manual before installing, and leave this manual with product owner. This product must be installed by qualified plumbing, HVAC and/or electrical contractors. Installation must be code approved.
	Disconnect electrical power Disconnect electrical power before installing supply wiring or performing service or maintenance procedures on any part of the system. Failure to disconnect electrical power could result in fire, electrical shock, and other hazardous conditions. These hazardous conditions could cause property damage, personal injury, or death.
	Contact with energized circuits can cause property damage, severe personal injury, or death as a result of electrical shock or fire. Do not remove pump cover, or subpanel access panels until electrical power is disconnected. Follow the shutdown procedure in this manual before performing service or maintenance procedures on any part of the system.
	Electric shock hazard If the reverse-osmosis system starts up during maintenance, severe bodily injury or death from electric shock could occur. To prevent such start-up, follow the procedure below before performing service or maintenance procedures on this reverse-osmosis system: <ol style="list-style-type: none"> 1. Use Vapor-logic® keypad/display to change control mode to Standby. 2. Shut off all electrical power to the reverse-osmosis system using field-installed fused disconnect, and lock all power disconnect switches in OFF position. 3. Close field-installed manual water supply shut-off valve.
	Tipping hazard Before installing the 400 series reverse-osmosis system, use supplied leg brackets or lag points to permanently fix the system to the floor and/or adjacent building structure. Failure to install according to instructions can result in serious injury or death. See page 15 for instructions.

Warnings and cautions


CAUTION	
Operate system at above-freezing temperatures. Operating the system at temperatures below freezing can damage the system or cause other property damage.	
Maintain pumping and water treatment equipment. Inadequately maintained pumping and water treatment equipment can cause the system to fail. Refer to the maintenance section of this IOM for recommended maintenance.	
Do not install the system using steel or galvanized-steel piping and joints. Steel and steel-galvanized piping and joints can corrode and cause system damage. Use PVC or stainless steel piping and joints when assembling system.	
Follow all instructions in this manual to maintain product warranty.	
Damage to pump Do not close the valve on the outlet of the pump. Do not operate the pump below minimum combined flow rate (permeate + concentrate + recirculating). Models 401-402: 4 gpm (15.2 L/min) Models 403-412: 6 gpm (22.7 L/min)	
	Team lift required Team lift is required when replacing the membranes. Membrane banks are heavy. Do not try to lift without assistance. Wear steel-toed shoes and have adequate room for maneuvering when servicing. Never lean membrane banks vertically when removed from system. Failure to do so may damage the system or result in injury. See maintenance information on page 40.

Table of contents

OVERVIEW	6
System dimensions	6
System clearances	7
Water quality and component overview	8
Components overview	10
Reverse osmosis station	10
System operation temperature	12
Pressurized RO holding tank	13
Atmospheric RO holding tank	14
Placing components	15
INSTALLATION	16
Piping and instrumentation arrangement	16
Interconnecting tubing requirements	18
Components and tools needed	19
System piping	20
Water pre-treatment	20
Dechlorinator	20
Duplex water softener	20
RO station and pressurized RO holding tank	21
Wiring	23
Electrical installation	23
Service disconnect	23
Preventing electrical noise	23
Grounding requirements	24
OPERATION	25
Start-up checklist	25
Start-up	26
Start-up procedure	26
System operation	28
Vapor-logic keypad/display	29
Status screen	31
Diagnostics and Alarms	32
Modbus, BACnet, LonTalk interoperability	33
MAINTENANCE	35
When to change sediment prefilter cartridge	36
Changing cartridge filters	36
Preserving procedure	39
Flushing out preservative/restart procedure	39
Tools	40
Gauges and valves	41
Dechlorinator	41
Water softener	41
Pressurized RO holding tank	41
Troubleshooting	42
Water quality test strips	45
Water quality test log	46
REPLACEMENT PARTS	47
Subpanel	47
RO system	48
WARRANTY	52

ATTENTION INSTALLER

Read this manual before installing.
Leave manual with product owner.

DriSteem® Technical Support
800-328-4447

WHERE TO FIND MORE INFORMATION

Our website:

The following document is available on our web site: www.dristeem.com

- Water treatment system catalog
- Vapor-logic controller installation and operation manual

DriCalc® sizing and selection software:

DriCalc, our software for system sizing and selection, can be ordered at our web site.

Call us at 800-328-4447

Obtaining documents from our web site or from DriCalc is the quickest way to view our literature, or we will be happy to mail literature to you.

Keypad/display and troubleshooting

The *Vapor-logic Installation and Operation Manual*, which was shipped with the system, is a comprehensive operation manual. Refer to it for information about using the keypad/display and Web interface, and for troubleshooting information.

Download DriSteem literature

Most DriSteem product manuals are available on our website: www.dristeem.com

System dimensions

FIGURE 6-1: DRISTEEM 400 SERIES REVERSE-OSMOSIS SYSTEM OVERVIEW

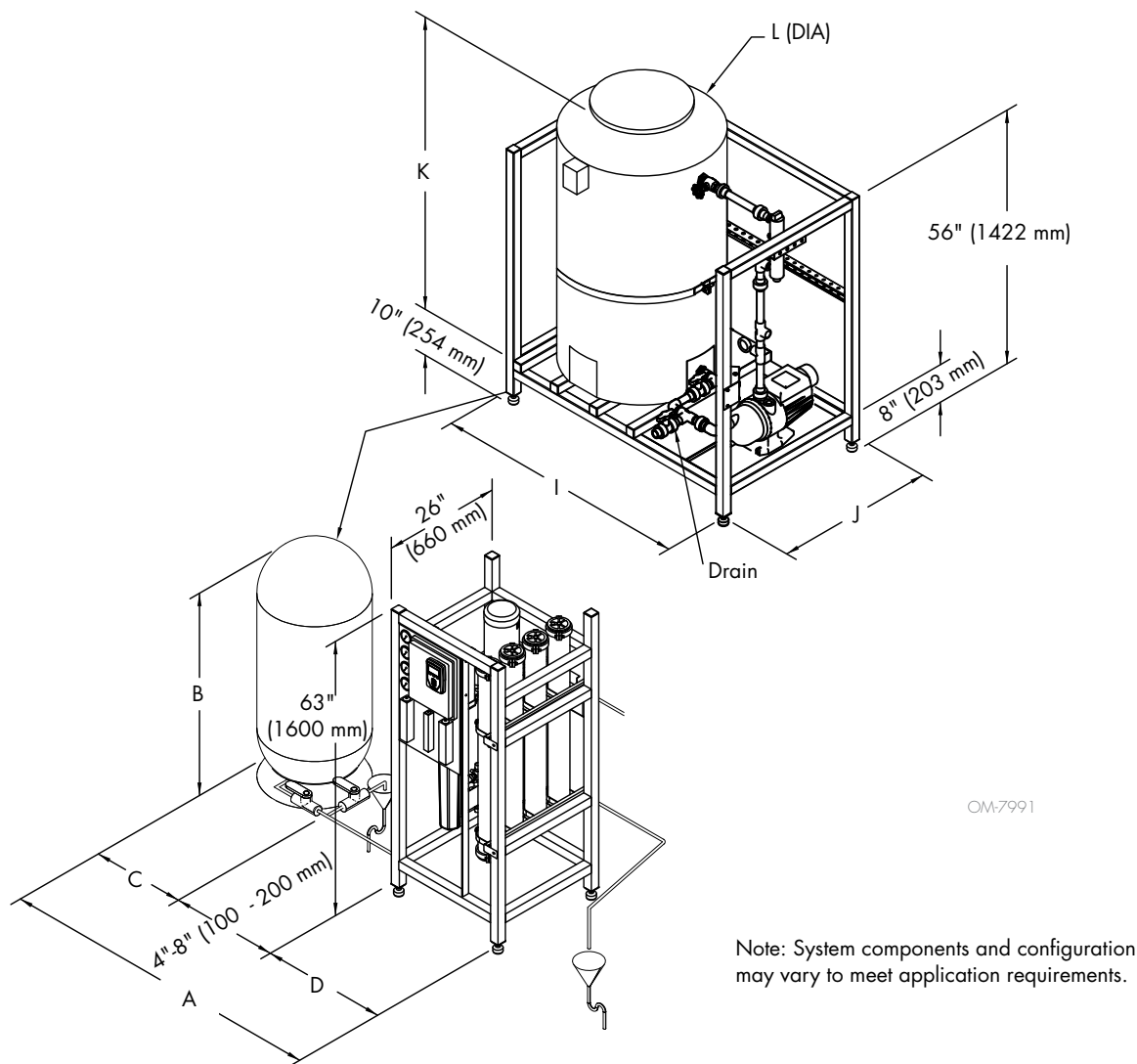


Table 6-1:
DriSteem 400 series RO system dimensions

Model	Dimensions					
	A		B		C	
	inches	mm	inches	mm	inches	mm
401	55	1397	24	610	28	711
402	55	1397	24	610	28	711
403	55	610	24	610	28	711
404	55	610	24	610	28	711
406	80	2032	24	610	37	940
408	72	1829	30	762	37	940
412	90	2286	30	762	46.5	1181

System clearances

FIGURE 7-1: DRISTEEM 400 SERIES REVERSE-OSMOSIS SYSTEM CLEARANCES

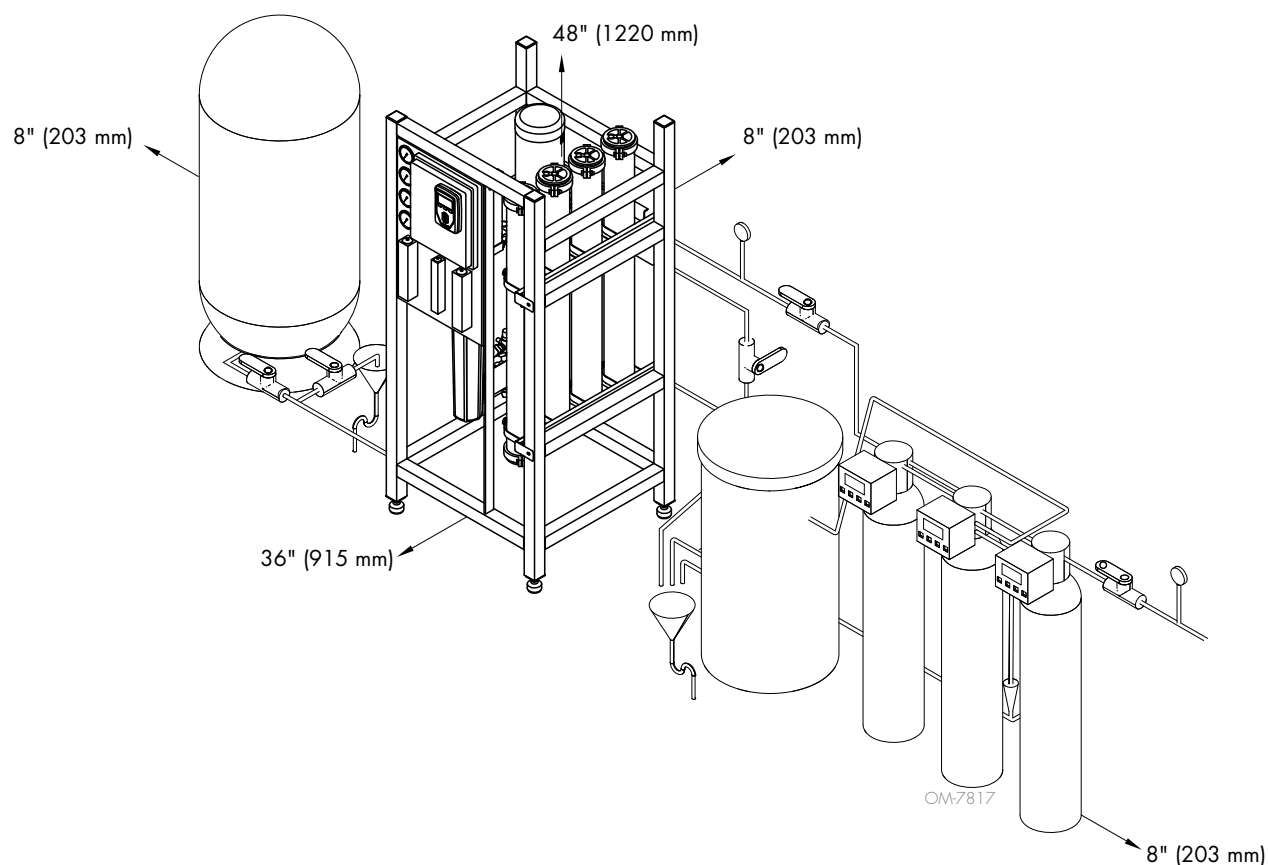


Table 7-2:
Atmospheric RO holding tank specifications

RO station model	Description	I	J	K	L	Weight		Connections
						Shipping	Operating	
AT-165	165 gal (567 L)	56" (1422 mm)	35" (889 mm)	65" (1651 mm)	31" (787 mm)	320 lbs (145.15 kg)	1695 lbs (768.84 kg)	1" (25 mm) PVC, In: Female NPT Out: Socket
AT-300	300 gal (1135 L)	60.5" (1536.7 mm)	39.5" (1003 mm)	88" (2235.2 mm)	35.5" (901.7 mm)	360 lbs (163.3 kg)	2860 lbs (1297.27 kg)	1" (25 mm) PVC In: Female NPT Out: Socket

Water quality and component overview

WATER QUALITY

Supply water must be softened and dechlorinated before being supplied to the reverse-osmosis system. If water is not properly dechlorinated or softened, it can damage reverse osmosis membranes. If you are not installing DriSteem water pretreatment components, verify that your water has had chlorine removed and is softened.

DECHLORINATOR REMOVES CHLORINE

The dechlorinator removes chlorine from supply water before it enters the reverse osmosis membranes.

Supply water enters the dechlorinator and passes through a charcoal sieve, which neutralizes chlorine before entering the water softener. The dechlorinator is automatically backflushed whenever a programmed calendar date or water meter usage is met. During automatic backflushing, clean water flows through the dechlorinator to rinse the charcoal, and then flows to drain (tank dechlorinators only).

WATER SOFTENER REMOVES CALCIUM, MAGNESIUM, AND IRON

The water softener removes dissolved hard water minerals from supply water before it enters the reverse osmosis membranes.

Water passes from the dechlorinator into the softener where dissolved minerals are removed by an ion-exchange process. Softened water exits through a water meter to enter the reverse osmosis membranes. When the water meter flow setpoint is satisfied, the softener will take brine from the brine tank to regenerate the resin. Water will be rejected to drain during this period of rinsing.

REVERSE OSMOSIS MEMBRANES ELIMINATE REMAINING MINERALS AND ORGANICS

Dissolved minerals and organics must be eliminated from the water in order to keep system components operating properly. Potable water passes through a dechlorinator and duplex water softener to take out chlorine and hard water deposits. The softened water enters the RO station, then flows through a 5 micron filter cartridge. Thereafter, a multi-stage pump pressurizes the water to approximately 125 psig (860 kPa), depending on the quality of water and the desired flow. Then, water is forced to cross a reverse-osmosis membrane, which removes most dissolved minerals. The water is now purified and contains very few minerals (typically less than 10 ppm) and is then stored in the pressurized storage tank. A portion of the rejection water may be recirculated; the rest, which is saturated with minerals, is sent to the drain.

CAUTION

Water supplied to the reverse-osmosis system that does not meet the required water quality standards will cause premature component failure and void the DriSteem warranty.

COMPONENT OVERVIEW

Your system may include all or some of the following components.

- Water pretreatment components
 - Dechlorinator (tank style floor mount recommended on all sizes, cartridge style wall mount available for RO models 401 and 402)
 - Single or duplex water softener and brine tank
- RO storage options include:
 - Pressurized RO holding tank
 - Atmospheric RO holding tank with UV sterilization and booster pump

Water quality and component overview

DESIGN BASIS

- Systems rated at: 50°F (10°C) using 1000 PPM sodium chloride solution operating at 200 psi pressure.
- Minimum feed pressure to RO System: 40 PSI. System capacity changes significantly with water temperature. For higher TDS a water analysis must be supplied and could result in modifications to the system.
- Chlorine must be removed if present in feed water prior to RO with a dechlorinator.
- Water must be pretreated with a softener to avoid scaling the membranes.
- Feed water turbidity: Less than 1 NTU; Feed water silt density index (SDI): 3 maximum. If exceeded, pretreatment with media filter recommended. All pretreatment equipment are available from DriSteem.
- Capacity Basis: 24 hrs/day

DESIGN NOTES

1. Pump flow/Feed flow: The pump has been designed to include recycle flow (if any) coming back to the pump inlet from the concentrate stream based on desired recovery. The sum of permeate flow, concentrate flow and recycle flow (if any) will equal the pump design flow.
2. Permeate flow: Indicates design flow rate from RO membranes as product water for use.
3. Concentrate flow: Water flowing to the drain. Concentrate flow is critical for proper system operation.
4. Recycle flow: Flow stream that returns from the concentrate line back to the pump intake, rather than to the drain.

Important:

- System pressure is a variable. It is important to adjust the pressure to get the correct permeate and concentrate flows. The exact value of the pressure is not important.
- Permeate flow will increase at higher temperature.

CAUTION

Damage to pump

Do not close the valve. Do not operate the pump below minimum combined flow rate (permeate + concentrate + recirculating).

Models 401-402: 4 gpm (15.2 L/min)

Models 403-412: 6 gpm (22.7 L/min)

Components overview

REVERSE OSMOSIS STATION

The reverse-osmosis (RO) station is floor-mounted and removes approximately 98% of total dissolved solids.

Table 10-1:
400 series RO station specifications

Model	401*	402*	403**	404**	406**	408**	412**
Permeate flow rate, lbs/hr (kg/hr) or GPD (LPD) 50 °F (10 °C) (see Note 4)	250 (115) 720 (2,760)	500 (230) 1,435 (5,520)	1,000 (455) 2,870 (10,920)	1,750 (795) 5,025 (19,080)	2,500 (1,140) 7,175 (27,360)	3,500 (1,590) 10,045 (38,180)	5,500 (2,500) 15,785 (60,000)
Permeate flow rate, lbs/hr (kg/hr) or GPD (LPD) 77 °F (25 °C) (see Note 4)	620 (280) 1,800 (6,810)	1,040 (470) 3,000 (11,350)	1,800 (821) 5,170 (19,570)	2,250 (1,020) 6,500 (24,600)	3,475 (1,580) 10,000 (37,850)	4,510 (2,050) 13,000 (49,200)	6,600 (3,000) 19,000 (71,910)
System voltage/phase, Amp draw with RO components (see Note 1)	480/3, 2.5 220-240 /1, 10.0 120/1, 19.2	480/3, 2.5 220-240 /1, 10.0 120/1, 19.2	480/3, 6.0 208-240 /1, 15.4	480/3, 6.0 208-240 /1, 15.4	480/3, 6.0 208-240 /1, 15.4	480/3, 6.0 208-240 /1, 15.4	480/3, 6.0 208-240 /1, 15.4
Fuse size with RO components (see Note 2)	480/3, 15 220/1, 15 120/1, 25	480/3, 15 220/1, 15 120/1, 25	480/3, 15 220/1, 20	480/3, 15 220/1, 20	480/3, 15 220/1, 20	480/3, 15 220/1, 20	480/3, 15 220/1, 20
Dimensions (W/D/H), inches (mm)	28/26/63 (711/660/1600)	28/26/63 (711/660/1600)	28/26/63 (711/660/1600)	28/26/63 (711/660/1600)	37/26/63 (940/660/1600)	37/26/63 (940/660/1600)	46½/26/63 (1181/660/1600)
Shipping weight, lbs (kg)	440 (200)	470 (213)	510 (231)	540 (245)	645 (293)	705 (320)	870 (395)
Operating weight, lbs (kg) (see Note 5)	460 (209)	510 (231)	570 (259)	620 (281)	775 (352)	875 (397)	1100 (499)
Supply water connection dia., inches (see Note 3)	¾" hose barb	¾" hose barb	¾" hose barb	¾" hose barb	¾" hose barb	¾" hose barb	¾" hose barb

Components overview

Table 10-1:
400 series RO station specifications (Continued)

Model	401*	402*	403**	404**	406**	408**	412**
RO system permeate water outlet connection dia., inches	¾" female NPT	¾" female NPT	¾" female NPT	¾" female NPT	¾" female NPT	¾" female NPT	¾" female NPT
Connection to pressurized RO storage tank dia., inches	1	1	1	1	1	1	1
Common drain outlet connection dia., inches	1" hose barb	1" hose barb	1" hose barb	1" hose barb	1" hose barb	1" hose barb	1" hose barb
5-micron RO prefilter diameter x height, inches (mm)	2.5 x 20 (64 x 508)	2.5 x 20 (64 x 508)	2.5 x 20 (64 x 508)	2.5 x 20 (64 x 508)	4 x 20 (102 x 508)	4 x 20 (102 x 508)	4 x 20 (102 x 508)
RO pump motor power, hp (kW)	1 (0.75)	1 (0.75)	3 (2.2)	3 (2.2)	3 (2.2)	3 (2.2)	3 (2.2)
Qty. of RO membranes	1	2	3	4	6	8	12
RO membrane diameter x height, inches (mm)	4 x 40 (102 x 1016)	4 x 40 (102 x 1016)	4 x 40 (102 x 1016)	4 x 40 (102 x 1016)	4 x 40 (102 x 1016)	4 x 40 (102 x 1016)	4 x 40 (102 x 1016)
Notes: 1. 220V/1-phase systems can also operate on 208V/1-phase and 240V/1-phase power. 2. Wiring and branch circuit protection (Type RK1, J, or T fusing) to be provided by installer in accordance with NEC requirements. 3. 40 psi (280 kPa) minimum supply water pressure. 4. Extra low energy membranes. 5. Without tank weight * RO-401 and 402 220V/1-phase systems can also operate on 240V/1-phase power. ** RO-403 thru RO-412 220V/1-phase systems can also operate on 208V/1-phase and 240V/1-phase power.							

System operation temperature

DriSteem rates reverse-osmosis systems at 50°F (10°C).
This is lower than the industry standard of 77°F (25°C).

To find the membrane permeate rate at a different temperature, follow these steps:

1. Find the temperature correction factor (TCF) from the below table.
2. Divide the rated permeate flow from Table 10-1 on page 10 by the temperature correction factor.

The result is the permeate flow at the desired temperature.

Table 12-1:
Optional permeate rate

Feed water temperature			Feed water temperature			Feed water temperature		
°C	°F	TCF for thin film	°C	°F	TCF for thin film	°C	°F	TCF for thin film
1	33.8	3.64	18	64.4	1.29	35	95.0	0.73
2	35.6	3.23	19	66.2	1.24	36	96.8	0.71
3	37.4	3.03	20	68.0	1.19	37	98.4	0.69
4	39.2	2.78	21	69.8	1.15	38	100.4	0.67
5	41.0	2.58	22	71.6	1.11	39	102.2	0.65
6	42.8	2.38	23	73.4	1.08	40	104.0	0.63
7	44.6	2.22	24	75.2	1.04	41	105.8	0.61
8	46.4	2.11	25	77.0	1.00	42	107.6	0.60
9	48.2	2.00	26	78.8	0.97	43	109.4	0.58
10	50.0	1.89	27	80.6	0.94	44	111.2	0.56
11	51.8	1.78	28	82.4	0.91	45	113.0	0.54
12	53.6	1.68	29	84.2	0.88	46	114.8	0.53
13	55.4	1.61	30	86.0	0.85	47	116.6	0.51
14	57.2	1.54	31	87.8	0.83	48	118.4	0.49
15	59.0	1.47	32	89.6	0.80	49	120.2	0.47
16	60.8	1.39	33	91.4	0.77	50	122.0	0.46
17	62.6	1.34	34	93.2	0.75			

Components overview

PRESSURIZED RO HOLDING TANK

The pressurized RO holding tank holds RO water in reserve to be available for high-pressure pumping when there is a demand.

FIGURE 13-1: PRESSURIZED RO HOLDING TANK



Table 13-1:
Pressurized RO holding tank specifications

Model	RO station model	Dimensions		Weight		Connections	
		Diameter	Height	Empty	Full		
401 402 403 404	80 gal (303 L)	24" (610 mm)	55.5" (1410 mm)	58 lbs (26 kg)	295 lbs (134 kg)	1 ¼" male NPT	FRP with rubber bladder
401-406	120 gal (454 L)	24" (610 mm)	66 (1676 mm)	335 lbs (152 kg)	1235 lbs (560 kg)	2" female NPT	Painted steel with rubber bladder
401-408	158 gal (598 L)	30" (762 mm)	58 (1473 mm)	435 lbs (197 kg)	1620 lbs (735 kg)	2" female NPT	
401-412	211 gal (799 L)	30" (762 mm)	76 (1930 mm)	515 lbs (234 kg)	2100 lbs (953 kg)	2" female NPT	

Notes:

- There is a possibility that the tank becomes much heavier if the air balloon is emptied or if precharge is different than 28 psi (195 kPa).
- Listed water volumes and weights are at an operating pressure of 30 to 50 psi (210 to 345 kPa) with a precharge of 28 psi (195 kPa).

Components overview

ATMOSPHERIC RO HOLDING TANK

The atmospheric RO hold tank holds a large amount of RO water for large jobs or when additional runtime needs to be guaranteed. System includes a recirculation/booster pump and an UV sterilization system to ensure water purity and supply 30-50 psi (207-345 kPa) water to downstream equipment.

FIGURE 14-1: ATMOSPHERIC RO HOLDING TANK

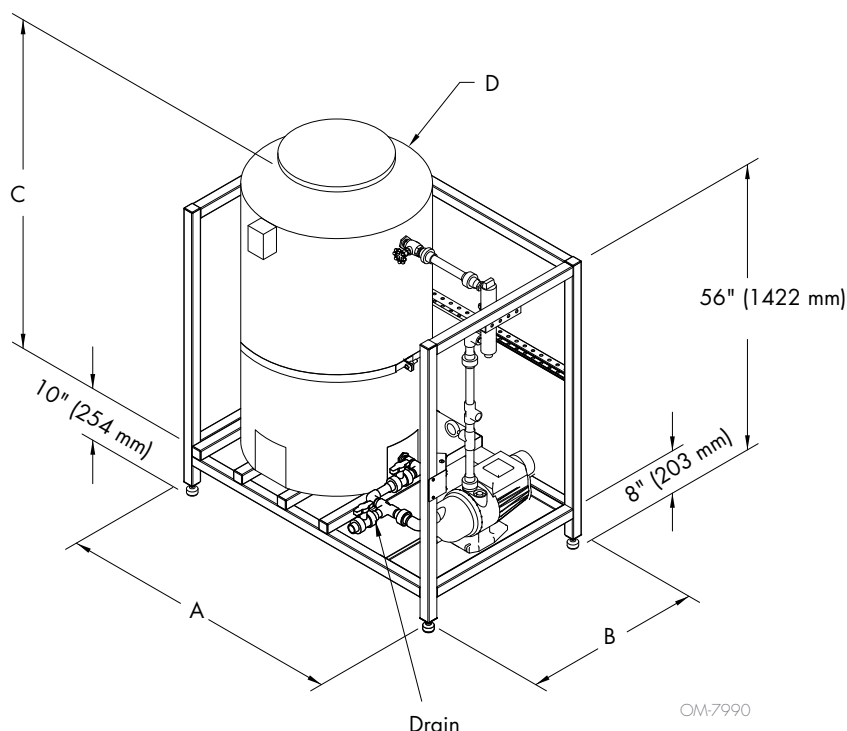


Table 14-1:
Atmospheric RO holding tank specifications

RO station model	Description	A	B	C	D	Weight		Connections
						Shipping	Operating	
AT-165	165 gal (567 L)	56" (1422 mm)	35" (889 mm)	65" (1651 mm)	31" (787 mm)	320 lbs (145.15 kg)	1695 lbs (768.84 kg)	1" (25 mm) PVC, In: Female NPT Out: Socket
AT-300	300 gal (1135 L)	60.5" (1536.7 mm)	39.5" (1003 mm)	88" (2235.2 mm)	35.5" (901.7 mm)	360 lbs (163.3 kg)	2860 lbs (1297.27 kg)	1" (25 mm) PVC In: Female NPT Out: Socket

Table 14-2:
Pumps and disinfection

	Make	Model	Voltage	Phase	Frequency	Running Amps
UV system	Viqua	VT4	120V	single	60 Hz	0.28A
Forwarding pump (165 gallon tank)	Grundfos	MQ 3-35	120V	single	60 Hz	8.0 A
Forwarding pump (300 gallon tank)	Grundfos	MQ3-45	120V	single	60 Hz	10.0 A

Placing components

When placing components, consider the following:

- Easy access for maintenance
- Select a location near a water supply, power supply, and drain.
- Minimize distance between the RO station and the equipment using the RO water.
- Maximum ambient temperature is 104°F (40°C).
Minimum ambient temperature is 40°F (4.4°C)
- Clearance recommendations (see Figure 7-1).
- Electrical connections: Power, control, and safety circuits
- Plumbing connections: Supply water and drain piping (see the "System piping" section of this manual, beginning on Page 20).
- Avoid locations above critical equipment or processes.
- Avoid locations close to sources of electromagnetic emissions, such as power distribution transformers and high horsepower motors controlled by variable frequency drives.

Important:

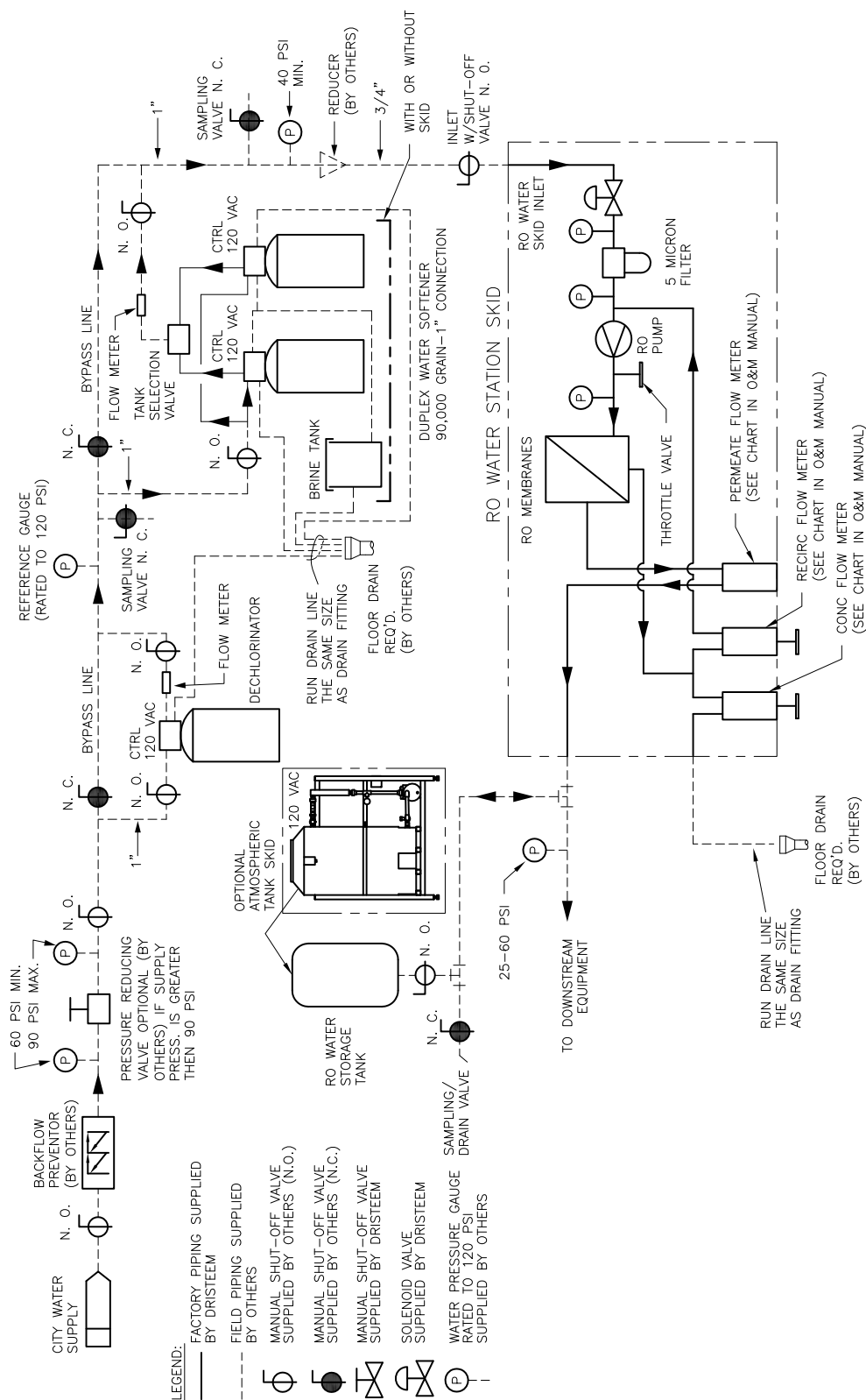
Installation must comply with governing codes.

WARNING

All DriSteem RO-400 series reverse-osmosis systems must be bolted to the floor or permanently attached to the building structure. Use the shipping brackets that come with the system to anchor the system to the floor or use the attachment points on the underside of the top frame rail on the back of the system to secure the system to the building structure. Ensure adequate anchors and/retaining means are used. Failure to install according to instructions can result in serious injury or death.

Piping and instrumentation arrangement

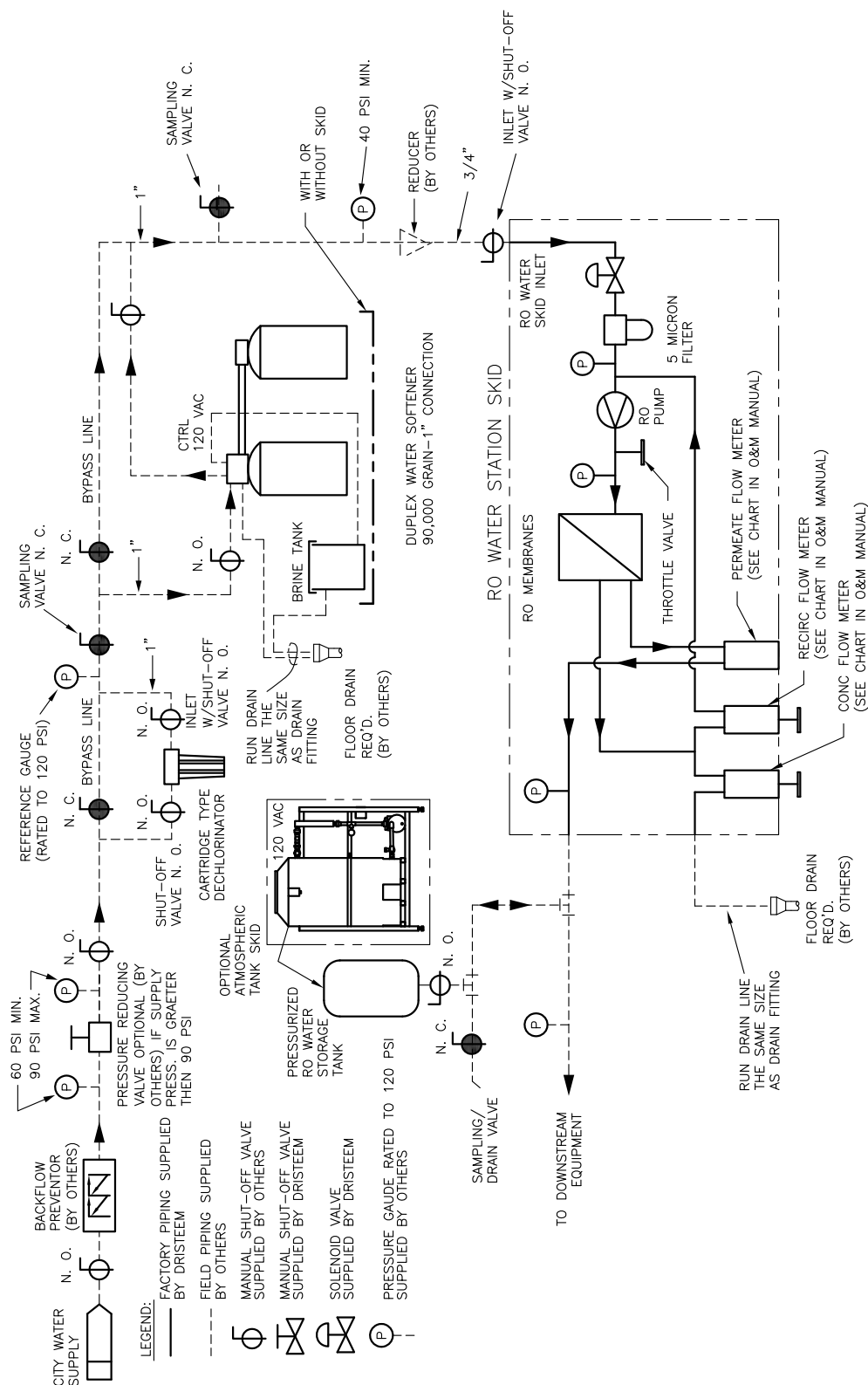
FIGURE 16-1: FLOW SCHEMATIC WITH A TANK DECHLORINATOR



OM-7828c

Piping and instrumentation arrangement

FIGURE 17-1: FLOW SCHEMATIC WITH A CARTRIDGE DECHLORINATOR



OM-7829c

Interconnecting tubing requirements

Table 18-1:
Maximum length of interconnecting tubing between pump station and RO holding tank

RO station model	Volume		Tubing nominal diameter	Minimum tube I.D.		Maximum developed length*	
	gpm	L/m		in.	mm	ft	m
401	0.55	2.1	1/2"	0.375	10	>100	>30
			3/4"	0.625	16	>100	>30
			1"	0.875	23	>100	>30
402	1.10	4.2	1/2"	0.375	10	64	>20
			3/4"	0.625	16	>100	>30
			1"	0.875	23	>100	>30
403	2.20	8.3	1/2"	0.375	10	18	5.5
			3/4"	0.625	16	>100	>30
			1"	0.875	23	>100	>30
404	3.85	14.6	1/2"	0.375	10	—	—
			3/4"	0.625	16	>100	>30
			1"	0.875	23	>100	>30
406	5.50	20.8	1/2"	0.375	10	—	—
			3/4"	0.625	16	95	29
			1"	0.875	23	>100	>30
408	7.70	29.1	1/2"	0.375	10	—	—
			3/4"	0.625	16	51	16
			1"	0.875	23	>100	>30
412	12.1	45.8	1/2"	0.375	10	—	—
			3/4"	0.625	16	22	7
			1"	0.875	23	89	27

* Calculations are based on pipe finish factor of 130 and low-pressure piping length of 1' (0.3 m).

** Installation must meet the minimum and maximum inlet pressures for all components, as stated in the specification tables in the "Installation" section of this manual.

Components and tools needed

System configuration may not include all components.

TYPICAL TOOLS/SUPPLIES NEEDED

- PTFE-tape
- Adjustable wrench for water fittings
- Screwdrivers for power connections and cabinet access
- Precision screwdrivers for signal connections
- Air compressor (for precharging RO tank)

TYPICAL FIELD-SUPPLIED COMPONENTS

- Gauges, fittings, and interconnecting piping as shown in Figure 16-1.
- Pipe supports/hangers (if needed)
- Reducing fittings for water connections (if needed)
- Drain line and clamp for flush valve
- Interconnecting piping and fittings
- Water softener salt (pulverized type recommended)
- Plastic tee for duplex-water-softener-to-brine-tank connection
- Funnel for pouring resin beads into duplex water softener tanks for 21" (533 mm) and larger
- Code approved electrical disconnect.

System piping

FOR SYSTEMS TO BE PIPED IN THE FIELD

WATER PRE-TREATMENT

Typical inlet pressure range to dechlorinator is 60 to 90 psi (415 to 620 kPa). Minimum inlet dynamic (while running) pressure to dechlorinator is 60 psi (415 kPa).

DECHLORINATOR

For detailed instructions see the dechlorinator manual that shipped with your system.

Refer to Figure 16-1 for arrangement of piping and instrumentation.

1. Connect the water supply and bypass piping to the inlet of the dechlorinator.
2. Plumb drain outlet from the dechlorinator to nearby drain.
3. Connect outlet of dechlorinator to water softener inlet.
4. Plug in the power cord to a 120V, single-phase receptacle.

Wall mounted dechlorinator (Models 401 and 402 only):

1. Mount dechlorinator housing assembly near the water softener.
2. Insert carbon block filter and reattach blue housing.
3. Connect the water supply to the inlet of the dechlorinator.
4. Plumb dechlorinator outlet to water softener inlet.
5. **For systems that have a tank style carbon filter with control valve:** Be sure that the elastomeric Drain Line Flow Control restrictor washer is installed correctly in the drain outlet plumbing assembly prior to use. This item is required to prevent overflow and potential carry over of carbon to the drain system.

For wall mounted systems that use extruded carbon black filter: Weekly chlorine level checks are recommended. Once chlorine is determined to be passing through, change the carbon filter. Typical life is 1-3 months depending on usage.

DUPLEX WATER SOFTENER

For detailed instructions see the water softener manual that shipped with your system.

Refer to Figure 16-1 for arrangement of piping and instrumentation.

1. Connect water supply and bypass piping to inlet to duplex water softener.
2. Connect brine tank to water softener control system using plastic hose supplied.
3. Add salt to brine tank. DriSteem recommends using pulverized salt because it dissolves easily.
4. Plumb drain outlet from water softener to nearby drain.
5. Connect water softener outlet to RO station inlet.
6. Plug in power cord to a 120V, single-phase receptacle.

System piping

RO STATION AND PRESSURIZED RO HOLDING TANK

Refer to Figure 16-1 for arrangement of piping and instrumentation. Minimum inlet dynamic (while running) pressure is 40 psi (275 kPa).

1. Connect outlet of water softener to RO station inlet.
2. Plumb RO drain connection to drain.
3. Plumb RO water output to pressurized RO holding tank and downstream equipment.

Be sure to install manual shut-off valve for pressurized RO holding tank as shown in Figure 21-1 to prevent tank contamination while flushing the RO system.

It is recommended to install an additional manual shut off valve with piping for flushing and draining the system (see Figure 16-1 or 17-1.

4. Set recirc flow meter to desired level, but not above the maximum allowed setting corresponding to specific model as shown in Table 28-1.
5. Precharge pressurized RO holding tank to 26 to 28 psi (180 to 195 kPa). See "Pressurized RO Holding tank" on Page 41.

FIGURE 21-1: HOSE FROM RO WATER OUTLET CONNECTED TO PRESSURIZED RO HOLDING TANK



System piping

PLUMBING

Plumbing materials can significantly contribute to the contamination of the water. Care must be exercised over the choice of thread sealants. PTFE tape is suitable for all threaded connections in this system. Pipe dope can leach objectionable impurities into the water and must be avoided.

FEED WATER CONNECTION

Connect the raw water supply to the inlet of the solenoid valve, observing the following:

- The line size shall be ¾ inches (19 mm) or larger to minimize pressure loss.
- A manual valve should be installed on this line to shut off the water supply if it will ever be needed. Be sure that this valve in no way restricts the water flow when it is fully open.
- Water supply min pressure 40 psi (276 kPa). A pressure regulator may be required if pressure is above 70 psi (483 kPa).

CONCENTRATE/REJECT CONNECTION

Connect a line to the single point drain outlet on the skid. The drain must have a minimum capacity which meets or exceeds the combined output of all system drains.

PERMEATE/PRODUCT WATER CONNECTION

Connect the product water line to the product connection point on the system. Run this line to your storage tank or other downstream equipment, observing the following:

- Run this line in such a manner as to minimize static head pressure in the product line.
- The product line should have no restrictions to the product flow.
- Inspect to insure that no flexible pumping lines have been kinked or damaged during installation.

CAUTION

This unit produces high quality water which could cause corrosion or leaching of the plumbing following the system. Use only plumbing components of inert material that are compatible with the application. Copper plumbing cannot be used.

Important:

All plumbing is to be done in accordance with state and local codes.

CAUTION

RO membranes will fail immediately if the product water is allowed to flow backward into the elements.

CAUTION

The highest point of the tubing should not be higher than four feet above the top of the RO modules, or the elements may be damaged.

CAUTION

Do not fully close the manual valve located directly after the RO pump. This could cause cavitation and premature pump failure.

CAUTION

Damage to pump

Do not close the valve. Do not operate the pump below minimum combined flow rate (permeate + concentrate + recirculating).

Models 401-402: 4 gpm (15.2 L/min)

Models 403-412: 6 gpm (22.7 L/min)

Connecting components

WIRING

- Ladder style wiring diagrams (included with unit, separate from this manual) show power, control, and equipment-to-control-cabinet interconnection requirements.

Note: If using a field supplied floor water leak switch (terminals P15-3 and P15-4) remove factory jumper from the control board.

- External connections diagrams (included with unit, separate from this manual) show connection points to the microprocessor-based controller and wire terminals for external safety and control devices.

Note: A motor starter switch is provided to interlock any equipment downstream, if desired. The switch is directly located on the motor starter.

All wiring must be in accordance with all governing codes and with wiring diagrams.

ELECTRICAL INSTALLATION

Wiring and branch circuit protection is provided by the installer per NEC (or IEC 60364 in Europe) requirements.

For power supply and machine ground connections, size the wire using the 75 °C wiring table, per NEC (or IEC 60364 in Europe) requirements. Then use copper conductors rated for a 105 °C environment. The wiring from the control cabinet to the equipment must be rated for 105 °C.

Verify electrical current characteristics (voltage, phase and amp draw) and capacity requirements against those listed on the name plate.

SERVICE DISCONNECT

A service disconnect must be installed per NEC requirements and governing codes.

PREVENTING ELECTRICAL NOISE

Electrical noise can produce undesirable effects on electronic control circuits, thereby affecting controllability. Electrical noise is generated by electrical equipment such as inductive loads, electric motors, solenoid coils, welding machinery, or fluorescent light circuits. The electrical noise or interference generated from these sources (and the effect on controllers) is difficult to define, but the most common symptoms are erratic control or intermittent operational problems.

Most electrical noise problems can be prevented by using proper wiring practices and techniques to prevent coupling or inducing of electrical interference into control circuits. The following wiring practices should minimize interaction of noise and controls:

- Connect unit and control cabinet to a code approved earth ground.
- Separate the line voltage wiring from low voltage control circuit wiring when routing electrical wiring inside the control cabinet.

WARNING

Electric shock hazard

Only qualified electrical personnel should perform field wiring installation procedures. Improper wiring or contact with energized circuits can cause property damage, severe personal injury, or death as a result of electric shock and/or fire.

Do not open control cabinet, pump motor, or subpanel access panels until electrical power is disconnected.

CAUTION

Damage from debris

When drilling penetrations in the control cabinet, protect all internal components from debris, and vacuum out the control cabinet when finished. Failure to comply with this directive can damage sensitive electronic components, cause erratic operation or failure, and void your DriSteem warranty.

Important:

Failure to follow these wiring procedures can result in erratic operation or failure.

This product has been tested at the factory for proper operation. Product failures resulting from faulty handling, incorrect wiring, or shorting of wires together on external components are not covered under your DriSteem warranty. Review information and diagrams before proceeding.

Connecting components

GROUNDING REQUIREMENTS

The approved earth ground must be made with solid metal-to-metal connections and must be a good conductor of radio frequency interference (RFI) to earth (multistranded conductors).

Ground wire should be the same AWG (mm²) size as the power wiring or sized per NEC requirements (in Europe, IEC 60364 requirements).

When the control cabinet is mounted remotely from the unit, a ground wire is necessary from the machine ground lug on the unit to the machine ground lug in the control cabinet. The bonding machine ground wire should be the same AWG (mm²) as the largest heater wire or sized per NEC or IEC 60364 requirements.

CAUTION

On three-phase units ensure proper supply line voltage wiring. Incorrect wiring will cause the RO pump to run backwards and void your DriSteem warranty.

Start-up checklist

If an item in the Start-up checklist below does not apply to your system, skip to the next item and continue the process.

- ☐ Read this manual and all other information that was provided with your system.
- ☐ Verify that all field wiring is done according to the instructions in this manual and in the unit wiring diagram.
- ☐ Confirm that proper grounding and an approved earth ground are provided.
- ☐ Confirm that the keypad/display is mounted with its modular cable routed away from high-voltage circuits and connected to the Display connector on the Vapor-logic board.
- ☐ Install cartridge filter and check for leaks. (See "System Piping" on Page 20.)
- ☐ Precharge pressurized RO storage tank to 28 psi (195 kPa).
 Note: This precharge pressure is for pressurized RO storage tank cut-in and cut-out switch points at 30 and 50 psi (210 and 345 kPa) respectively.
- ☐ Turn on the water supply, and confirm there are no leaks.
- ☐ Turn on power to the unit, and confirm the Main menu is displayed on the keypad/display. The display may take several seconds to appear as the controller powers up.
- ☐ Confirm in the Main Menu that the mode is "Auto".
- ☐ Confirm that the inlet pressure is at least 40 psi (276 kPa) on the display.
- ☐ With sufficient water available, the system in Auto mode, and the storage tank pressure less than 30 psi (210 kPa), verify that the pump is activated.
- ☐ Set permeate and concentrate flow meter to desired setting. See Table 28-1.
- ☐ Systems with tank-style carbon filter with control valve: Ensure that elastomeric Drain Line Flow Control restrictor washer is installed correctly in drain outlet plumbing assembly. This is required to prevent overflow and potential carry-over of carbon to the drain system.
 See "Dechlorinator" on Page 20 of this manual.
- ☐ If you experience difficulties, have the keypad/display information available along with the serial number and unit Model, and call DriSteem Technical Support at 800-328-4447.
 Note: Instructions on how to properly care for the freeze protect chemical that is shipped with the system is available on the MSDS sheet at www.dristeem.com.
- ☐ Inspect to insure that no flexible plumbing lines have been kinked or damaged during installation.

WARNING

Tipping hazard

Before installing the 400 series reverse-osmosis system, use supplied leg brackets or lag points to permanently fix the system to the floor and/or adjacent building structure. Failure to install according to instructions can result in serious injury or death. See page 15 for instructions.

Start-up

START-UP PROCEDURE

Check component installation per the layout shown in Figure 16-1 (depending on your model). After all components are installed and connected properly:

1. Perform all applicable "Start-up checklist" items on Page 25.
2. Read and follow instructions in the "Operation" section of *Vapor-logic Installation and Operation Manual*.
Note: During start-up, do not leave the system unattended.
3. Close the manual valves to both the RO holding tank and all downstream equipment. Open the manual valve leading to the drain.
4. Open the feed water supply valve.
5. Open the system pressure (pump throttle) control valve fully counterclockwise (if applicable). Open the concentrate control valve fully counterclockwise. Close the recycle valve.
6. Put the system into 'Auto' mode. Note inlet water pressure must be at least 40 psi (276 kPa).
7. If incoming pressure is too high, an inlet pressure regulator (not included) may be installed. This should be set at 40 psi (276 kPa).
8. Some fittings may have loosened during shipment. Check for leaks at all tube fittings and threaded joints.
9. Allow the unit to run for at least 30 minutes to flush the preservative solution from the system.
10. Once the preservative solution has been flushed from the system, shut down the system by putting the system into 'Standby' mode on the Vapor-logic keypad and close the manual valve going to the drain. Open the manual valves to both the RO storage tank and downstream equipment.

Important

If the system is not in operation within six months of shipment, it is strongly recommended to use an organic cleaning cartridge prior to performing the start-up checklist to ensure proper operation. See page 38 for information and part number.

Start-up

11. Put the system back into 'Auto' mode.
12. Adjust the throttle valve to get the specified permeate flow within the range listed in their individual flow columns to equal the combined flow listed. See Table 28-1.
13. Adjust the concentrate and recycle valves until the specified concentrate flow and recycle flow are obtained. It may be necessary to make iterative adjustments to all three valves. See Table 28-1.
Note: The permeate flow may exceed the minimum value listed depending on water temperature.
14. Test the operation of the pressure switch by slowly closing the inlet water supply valve. The unit should shut off after a short 5 second time delay.
15. Once all the desired flows are set, allow the system to run for approximately 30 minutes. Then record the performance information using the system operation data log on page 44. The values recorded at startup will be important for determining system performance at a later date.
16. Leave system in Auto mode. It will automatically refill the RO holding tank.

OPERATING DO'S AND DON'T'S

DO

1. Change the cartridge filters regularly
2. Monitor the system and keep a log daily
3. Run the system, as much as possible, on a continuous basis.
4. Adjust the system recovery to the recommended value

DON'T

1. Permit chlorine in the feed water.
2. Shut down the system for extended periods. If system will be down for more than one month, treat the system with a membrane preservative. See page 39 for instructions.
3. Close the throttle valve completely.
4. Operate the system with insufficient feed flow.

CAUTION

Do not operate the system with the throttle valve closed.

Important:

By setting the feed pressure as low as possible to meet the application requirement, the service life of the pump and RO elements will be optimized. The system should be run continuously when possible, rather than go through frequent start/stop cycles.

CAUTION

Damage to pump

Do not close the throttle valve. Do not operate the pump below minimum combined flow rate (permeate + concentrate + recirculating).

Models 401-402: 4 gpm
(15.2 L/min)

Models 403-412: 6 gpm (22.7 L/min)

System operation

SHUTDOWN

1. Put the system in 'Standby' mode or remove power. Close the isolation valve if it is installed on the feed line.
2. If the unit is to be shut down for more than one week, a membrane preservative should be used. To accomplish this, perform 30 second flush using cartridge filter insert (see page 26 and 38 for more information). After 30 seconds, press the power button OFF, and close the concentrate valve. This will hold the preservative in the pressure vessel.
3. When the system is restarted after an extended shutdown, follow initial system start-up procedures.

FIGURE 28-1: CONTROL VALVES



CAUTION

To prevent concentrate from precipitating and causing irreversible fouling of the RO membrane, do not operate the system with the concentrate to drain valve completely closed.

Table 28-1:
Recommended concentrate and permeate flow

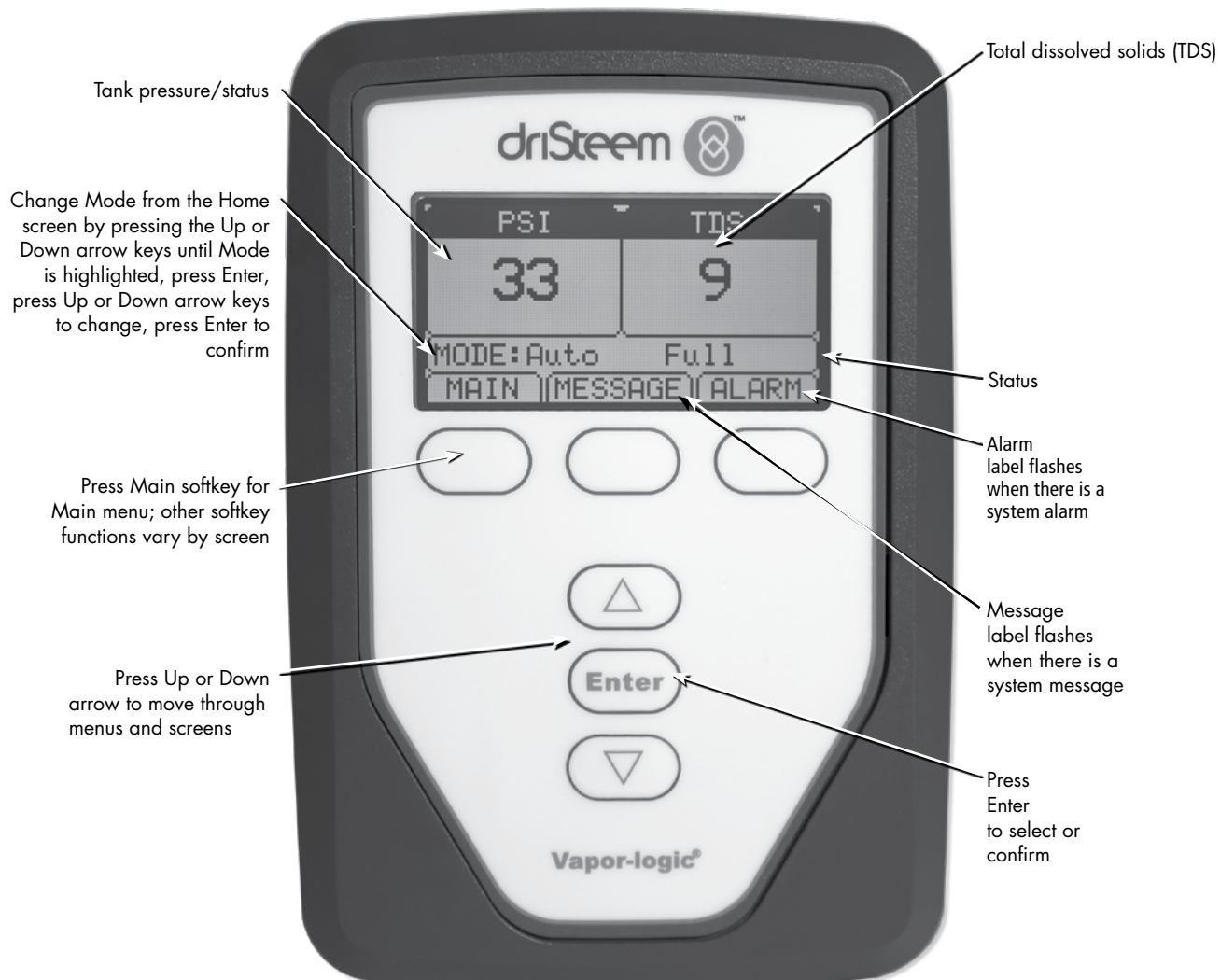
RO station model	Permeate flow (minimum)		Combined concentrate and recirc	Concentrate flow		Recirc (recycle)*	
	gpm	L/m	gal/liter	gpm	L/m	gpm	L/m
401	1.0	3.8	4.3/16.3	0.9 - 4.3	3.4 - 16.3	0 - 3.4	0 - 12.9
402	1.7	6.4	3.4/12.9	1.6 - 2.6	6.1 - 9.8	0.8 - 1.8	3.0 - 6.8
403	2.9	11.0	4.5/17.0	2.3 - 3.5	8.7 - 13.2	1.0 - 2.2	3.8 - 8.3
404	3.6	13.6	4.0/15.1	1.5 - 3.0	5.7 - 11.4	1.0 - 2.5	3.8 - 9.5
406	5.5	20.8	5.5/20.8	2.0 - 4.0	7.6 - 15.1	1.5 - 3.5	5.7 - 13.2
408	7.2	27.3	6.5/24.6	3.5 - 4.5	13.2 - 17.2	2.0 - 3.0	7.6 - 11.4
412	11.0	41.6	6.5/24.6	3.5 - 4.5	13.2 - 17.2	2.0 - 3.0	7.6 - 11.4

*Higher recirculation increases water efficiency.

Vapor-logic keypad/display

FIGURE 29-1: USING THE VAPOR-LOGIC KEYPAD/DISPLAY

Typical Home screen



Keypad/display Home screens, Test outputs, Test run

Vapor-logic returns to the Home screen on the keypad/display after a user-defined period of idleness. The Home screen displays the items most frequently viewed.

CHANGING MODE

Mode can be changed from the Home screen. Press the Up or Down arrow key until the Mode is highlighted, press Enter, press Up or Down arrow key to change value, press Enter to confirm. All other parameters shown on the Home screen are for viewing only and cannot be changed. Go to the Setup menu to change these items.

CONTROLLER DISPLAY ACTIVITY DEFINITIONS (FIGURE 30-1)

RO flush: System is performing an RO flush.

Idle: No demand, or an active alarm is preventing operation.

Filling: System is supplying high-pressure water to meet demand.

Full: Storage tank is full, system not running.

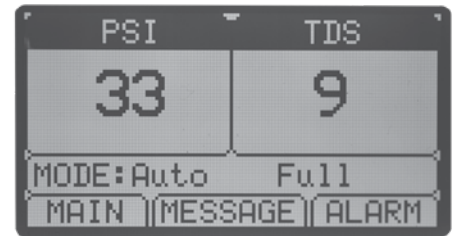
TEST OUTPUTS

When completing an installation or repair, cycle all outputs, to verify operation. Go to the test outputs section of the Diagnostics menu and scroll through each connected output to verify operation. During testing, the unit mode changes to Standby and the tank status changes to Test.

TEST RUN

Vapor-logic has a test run capability to confirm system functionality. This capability allows a technician to simulate a demand when there isn't one (such as when performing routine maintenance). To confirm functionality, go to the test run section of the Diagnostics menu. Set system demand percent and set test run time duration. During testing, the unit mode changes to Standby and the tank status changes to Test.

FIGURE 30-1: RO STATION KEYPAD/ DISPLAY HOME SCREEN



Status screen

Table 31-1:
Status screen

Note: Your system might not have all of the items listed in this table.

Menu item	Default value	Minimum value	Maximum value	Units	Notes
Run mode	Standby	-	-	-	<p>Operating mode of unit. Choose from Auto, Standby, or Drain.</p> <ul style="list-style-type: none"> In Auto mode, the unit operates normally. All unit components are monitored and controlled. If there is a call for cooling/humidification, the system reacts. In Standby mode, the unit is offline. All control inputs appear but are not acted upon; however, if the water temperature falls below the freeze protect set point, the drain valve opens. In Drain mode, the RO Flush valve opens, the RO tank drains, and the RO system begins making RO water. All unit operation is suspended, and the RO Flush valve remains open until the model specific RO flush time is met the unit is taken out of RO flush mode, or the RO tank is drained. See the Diagnostics section for information about Test outputs and Test run modes.
TDS	-	0	9999	ppm	
TDS set point	50	0	100	ppm	
Water temperature	-	-50	250	°F	Sensor range
	-	-46	121	°C	Sensor range
Safety interlock	Closed	Open	Closed	-	
Inlet pressure switch	-	No water	Water	-	
Storage pressure	-	0	100	psi	Storage tank pressure.
Pump hours	-	0	100,000	Hours	

Table 31-2:
Setup screen

Note: Your system might not have all of the items listed in this table.

Menu item	Default value	Minimum value	Maximum value	Units	Notes
Membrane flush	300	0	300	seconds	
System flush	72	1	336	hours	

Table 31-3:
TDS setting

Note: Your system might not have all of the items listed in this table.

Menu item	Default value	Minimum value	Maximum value	Units	Notes
High TDS causes	Alarm	Message	Alarm	-	
TDS setpoint	50	25	100	-	

Diagnostics and Alarms

Table 32-1:
Diagnostics menu

Note: Your system might not have all of the items listed in this table.

Message	Description	Auto-clear?
Pretreat lockout	Softener or other pretreatment is preventing the RO station from operation.	Yes
No master enable	Master enable for the system is open.	Yes
Excessive TDS	TDS measurement during RO production exceeds the TDS set point. The system will continue to operate but the membranes may need to be replaced.	Yes
Service unit	Regularly scheduled unit servicing is due.	No
Lock open	Interlock safety switch is open.	Yes

Notes:

- The Messages Log displays message name, date and time of occurrence, plus "Active," "Cleared" or "Auto-cleared."
- Active messages display first in the Messages Log, followed by cleared messages (auto-cleared and/or manually-cleared) listed in order of occurrence.
- The Messages Log displays a maximum of 10 messages. Cleared messages leave the log first.
- If a message event occurs and is not manually or auto cleared during unit operation, the message will stay there until there is demand and the unit is running.

Table 32-2:
Alarm menu

Alarm level	Description	Auto-clear?
Temp sensor fault	Water temperature/TDS sensor reading is out of range.	Yes
Low inlet pressure*	Water pressure at RO inlet is less than 10 psi.	Yes
High storage pressure	Tank storage pressure has exceeded 60 psi.	Yes
Floor sensor active	Optional flooded floor pan circuit is active.	No
Storage pressure sensor	Pressure sensor reading is out of range.	Yes
Excessive TDS	TDS measurement during RO production exceeds the TDS set point. The system will continue to operate but the membranes may need to be replaced.	No

Notes:

- See the "troubleshooting" section in the Vapor-logic Installation and Operation Manual for alarm possible causes and recommended actions.
- The Alarms Log displays alarm name, date, and time of occurrence, plus "Active," "Cleared," or "Auto-cleared."
- Active alarms display first in the Alarms Log, followed by cleared alarms (auto-cleared and/or manually-cleared) listed in order of occurrence.
- The Alarms Log displays maximum 30 alarms. Cleared alarms leave the log first.
- If an alarm event occurs and is not manually cleared or auto-cleared during unit operation, the alarm will remain until there is demand and the unit is running.

* Pressure alarm will occur if inlet pressure falls below 5 psi. Alarm will self-clear when RO system supply pressure is above 10 psi for at least 10 consecutive seconds. A pressure fault can be manually cleared at any time. System will try to operate every 10 consecutive seconds per hour up to 72 hours while in low pressure alarm condition.

Modbus, BACnet, LonTalk interoperability

Table 33-1:
Interoperability variable and object names

Variable name and BACnet object name	Read Only (RO) or Read Write (RW)	Modbus register number*	BACnet Object Type and Instance	LonTalk variable names**	Description	Units		Range	
						I-P units	SI units	I-P units	SI units
Read-only analog variables									
Storage_pressure	RO	IR-1	AI-1	nvoStoragePress	Storage pressure	psi	bar	0	100
Pump_1_hour	RO	IR-2	AI-2	nvoPumpHours	Hours of operation	hours	hours	0	100000
Water_temp	RO	IR-3	AI-3	nvoWaterTemp	Temperature of RO water	F	C	-50 to 250	-46 to 121
TDS	RO	IR-4	AI-4	nvoTDS	TDS	—	—	0	9999
Set Variables									
Run_mode	Write	HR-1	MSV-01	nviRunMode	Mode of the unit or system. The defined options are: 1=Auto; 2=Local standby; 3=System standby; 4=Manual drain; 5=Test outputs; 6=Test run	—	—	1 to 4	1 to 4
	Read	HR-1	MSV-01	nvoRunMode	Mode of the unit or system. The defined options are: 1=Auto; 2=Local standby; 3=System standby; 4=Manual drain; 5=Test outputs; 6=Test run			1 to 6	1 to 6
TDS_setpoint	RW	HR-2	AV-1	nviTDS_SP	TDS set point	—	—	0	75
Read-only digital I/O									
Safety_interlock	RO	DI-1	BI-01	nvoLockSW	0=Open; 1=Closed	—	—	—	—
Pretreat_lockout_sw	RO	DI-2	BI-02	nvoPreTreatSW	0=Open; 1=Closed	—	—	—	—
Floor_water_sw	RO	DI-3	BI-03	nvoFloorSW	0=Water; 1=No Water	—	—	—	—
Inlet_pressure_sw	RO	DI-4	BI-04	nvoInletPressSW	0=No Water; 1=Water	—	—	—	—
Master_enable_sw	RO	DI-5	BI-05	nvoMasterEnabSW	0=Open; 1=Closed	—	—	—	—
Supply_valve	RO	DI-6	BO-01	nvoSupplyValve	0=Open; 1=Closed	—	—	—	—
Drain_valve	RO	DI-7	BO-02	nvoDrainValve	0=Open; 1=Closed	—	—	—	—
RO_pump	RO	DI-8	BO-03	nvoROpump	0=Off; 1=On	—	—	—	—
Notes: 1. Modbus Input Registers (IR1-IR4) 16 bit read only Modbus Holding Registers (HR1-HR2) 16 bit read/write Modbus Discrete Input Registers (DI1-DI8) single bit read only Modbus Coil Registers (DV1-DV8) single bit read/write 2. nvi LonTalk SNVTs are write-only; nvo are read-only									

Modbus, BACnet, LonTalk interoperability

Table 34-1:
Interoperability variable and object names

Variable name and BACnet object name	Read Only (RO) or Read Write (RW)	Modbus register number*	BACnet Object Type and Instance	LonTalk variable names**	Description	Units		Range	
						I-P units	SI units	I-P units	SI units
Faults and Alarms									
ProgOutput1_status	RW	DV-01	BV-01	nvoDryConStat1	NO or NC output	—	—	—	—
ProgOutput2_status	RW	DV-02	BV-02	nvoDryConStat2	No or NC output	—	—	—	—
Active_manually_cleared_alarm_exists	RW	DV-03	BV-03	nvoAlarmManCl	Flags all manually cleared alarms	—	—	—	—
Clear_all_faults	RW	DV-04	BV-04	nviClrAllFault	When set will clear all active faults	—	—	—	—
Alarm_temp_sensor_failed	RW	DV-05	BV-05	nvoAlmTempSense	See Table 32-1: Alarm menu	—	—	—	—
Alarm_low_inlet_pressure	RW	DV-06	BV-06	nvoAlmInPress	See Table 32-1: Alarm menu	—	—	—	—
Alarm_excessive_storage_pressure	RW	DV-07	BV-07	nvoAlmOutPress	See Table 32-1: Alarm menu	—	—	—	—
Alarm_floor_water_sensor_activated	RW	DV-08	BV-08	nvoAlmFloorWet	See Table 32-1: Alarm menu	—	—	—	—
Alarm_pressure_sensor_out_of_range	RW	DV-09	BV-09	nvoAlmPrSensOOR	See Table 32-1: Alarm menu	—	—	—	—
Alarm_excessive_TDS_during_fill	RW	DV-10	BV-10	nvoAlmExcessTDS	See Table 32-1: Alarm menu	—	—	—	—
Message_pretreat_lockout_active	RW	DV-11	BV-11	nvoMsgPretreatL	See Table 32-2: Diagnostics menu	—	—	—	—
Message_excessive_TDS_during_fill	RW	DV-12	BV-12	nvoMsgExcessTDS	See Table 32-2: Diagnostics menu—	—	—	—	—
Message_service_unit	RW	DV-13	BV-13	nvoMsgSrviceUnt	See Table 32-2: Diagnostics menu—	—	—	—	—
Message_interlock_open	RW	DV-14	BV-14	nvoMsgIlockOpen	See Table 32-2: Diagnostics menu—	—	—	—	—
Message_master_enable_open	RW	DV-15	BV-15	nvoMsgNoMastEnb	— See Table 32-2: Diagnostics menu	—	—	—	—

Notes:

1. Modbus Input Registers (IR1-IR11) 16 bit read only
Modbus Holding Registers (HR1-HR10) 16 bit read/write
Modbus Discrete Input Registers (DI1-DI9) single bit read only
Modbus Coil Registers (DV1-DV15) single bit read/write
2. nvi LonTalk SNVTs are write-only; nvo are read-only

Maintenance information

MAINTENANCE TIPS

Maintain proper operating conditions:

- Do not exceed 60-90 psi (414-620 kPa) on the system inlet pressure gauge.
- Do not over use recycle flow. This can cause premature scaling of the membrane. A proper concentrate flow is required for a long membrane life. See page 10 for maximum recycle flow.
- To ensure no chlorine reaches the RO membranes, test the water from your dechlorinator periodically for chlorine break through.

WHEN TO CHANGE SEDIMENT FILTERS

Sediment filters should be changed regularly to maintain proper pressure and flow.

Change the filters when the difference between filter pressure gauge increases by 10 psi over the initial pressure difference. For example, if initial readings are 60 psi in and 58 psi out, the difference is 2 psi. Therefore, when that difference reaches 12 psi, it is time to replace the sediment and carbon cartridges.

WHEN TO CLEAN MEMBRANES

In normal operation, the membrane in reverse osmosis elements can become fouled by mineral scale, biological matter, and grime. These deposits build up during operation until it causes loss in water output or loss of salt rejection, or both. Elements should be cleaned or replaced whenever the water output rate drops by 10 percent from its initial flow rate (the flow rate established during the first 24 to 48 hours of operation) or when TDS in the product water (permeate) rises above 50. Use the factory mounted TDS sensor located on the right side of the system.

It should be noted that the water output rate will drop if feed water temperature decreases (about 1.5% per °F). This is normal and does not indicate membrane fouling. A malfunction in the pretreatment, pressure control or pump can cause a drop in feed water delivery pressure, feed water flow, product water output, or an increase in salt passage. If such adjustments are needed, the element may not require cleaning.

MEMBRANE CLEANING AND PRESERVATIVE CARTRIDGES

- Clean and preserve membranes without removing them from your system
- Reduce downtime
- Maintain your system performance at a higher level
- Prolong membrane life by regular use of cleaning cartridge

FIGURE 35-1: SEDIMENT FILTER



DriSteem replacement part

- 2½" x 20" - Model 401-404 (part number: 550026-002)
- 4" x 20" - Model 406-412 (part number: 550026-003)

Maintenance continued

SEDIMENT PRE-FILTER CARTRIDGE

WHEN TO CHANGE SEDIMENT PREFILTER CARTRIDGE

Sediment filters should be changed regularly to maintain proper pump pressure and flow. If the pressure drop across the cartridge filter (as indicated by the differential between the filter inlet and filter outlet pressure gauges) increases by 10 psi, the sediment filters should be changed.

CHANGING CARTRIDGE FILTERS

1. Put the system into 'Standby' mode and shut down the RO system.
2. Close inlet supply valve.
3. Un-assemble the filter housing (twist the sump counter-clockwise).
4. Remove and inspect the cartridge. Replace as needed.
5. Before replacing housing, insure that O ring seal is lubed and placed in groove of housing. Inspect seal and replace as needed.
6. Assemble housing (turn the sump clockwise into the cap until tight).

Maintenance continued

MEMBRANE CLEANING IN THE RO SYSTEM

Membrane cleaning cartridges:

- Clean membranes without having to remove them from the RO system
- Reduce downtime
- Maintain the system performance at a higher level
- Prolong membrane life by regular use of cleaning cartridges

HOW DOES IT WORK?

NOTE: Clean monthly to obtain optimum results.

1. Exchange the system's sediment filter with a cleaning cartridge.
2. Follow the instructions.
3. Restart the system.
4. Repeat the process if required.

SCALE CLEANING CARTRIDGE

The scale cleaning cartridge is for removal of mineral scale and build-up.

CLEANING PROCEDURE

1. Put the system into 'Standby' mode and shutdown the RO system.
2. Disconnect permeate line and divert to drain before any cleaning cartridge is installed.
3. Remove the sediment filter from the pre-filter housing.
4. Replace the sediment filter with the cleaning cartridge and assemble into the filter housing.
5. Turn the system ON and put into 'Auto' mode. After 30-40 seconds, shut down the system.
OPTIONAL: Instead of time, use one of the following criteria:
 - a. Run the system until the pH of the concentrate is almost the same as the cleaning solution (pH=3)
 - b. Permeate rate for the system drops to a very low value.
6. Let the membrane(s) soak in the cleaning solution overnight.
7. Remove the empty cleaning cartridge and replace it with the original filter.
8. Restart the system. Direct the permeate to drain for five minutes.
9. Go back to normal operations.

FIGURE 37-1: 20 INCH BIG BLUE SCALE CLEANING CARTRIDGE



DriSteem replacement part

- 2½" x 20" - Model 401-404 (part number: 550045-001)
- 4" x 20" - Model 406-412 (part number: 550045-201)

CAUTION

Handle all chemicals with care. Wear protective clothing and eye protection.

CAUTION

The system must be flushed thoroughly between acid and alkaline cleaning.

Maintenance continued

ORGANIC CLEANING CARTRIDGE

The organic cleaning cartridge is for removal of organics/fouling.

CLEANING PROCEDURE

1. Put the system into 'Standby' mode and shutdown the RO system.
2. Disconnect permeate line and divert permeate to drain during cleaning.
3. Remove the sediment filter from the filter housing.
4. Replace the sediment filter with the cleaning cartridge and assemble into the filter housing.
5. Turn the system ON. After 30-40 seconds, shut down the RO system.
OPTIONAL: Instead of time, use one of the following criteria:
 - a. Run the system until the pH of the concentrate is almost the same as the cleaning solution (pH=10-12)
 - b. Permeate rate for the system drops to a very low value.
6. Let the membrane(s) soak in the cleaning solution overnight.
7. Remove the empty cleaning cartridge and replace it with the original filter.
8. Restart the system. Direct the permeate to drain for five minutes.
9. Go back to normal operations.

FIGURE 38-1: 20 INCH BIG BLUE ORGANIC CLEANING CARTRIDGE



- DriSteem replacement part
- 2½" x 20" - Model 401-404 (part number: 550045-101)
 - 4" x 20" - Model 406-412 (part number: 550045-301)

CAUTION

Handle all chemicals with care. Wear protective clothing and eye protection.

CAUTION

The system must be flushed thoroughly between acid and alkaline cleanings.

Storage

To prevent bacterial growth and help maintain flux, it is recommended that elements be immersed in a preservative solution if the system will be OFF for more than one week.

MEMBRANE PRESERVATIVE CARTRIDGE

PRESERVING PROCEDURE

1. Put the system into 'Standby' mode and shutdown the RO system.
2. Disconnect the permeate line and direct permeate to drain during cleaning/preserving.
3. Remove the sediment filter from the pre-filter housing.
4. Replace the sediment filter with the preservative cartridge and assemble into the filter housing.
5. Turn the system ON. After 30-40 seconds, shut down the system.
6. Drain the system of the permeate solution as much as possible by opening a valve/fitting at a low point in the system.
7. Put the system into 'Standby' mode and shutdown the RO system.
8. Close OFF the inlet and outlet to the system.

FLUSHING OUT PRESERVATIVE/RESTART PROCEDURE

9. Open valves and put the system back in the position it was before preserving.
10. Remove the empty preservative cartridge and replace it with a new sediment filter.
11. Restart the system. Direct permeate to drain for 15-30 minutes.
12. Go back to normal operation.

FIGURE 39-1: 20 INCH BIG BLUE PRESERVATIVE CARTRIDGE



DriSteem replacement part

- 2½" x 20" - Model 401-404 (part number: 550045-801)
- 4" x 20" - Model 406-412 (part number: 550045-901)

CAUTION

Handle all chemicals with care. Wear protective clothing and eye protection.

CAUTION

The system must be flushed thoroughly between acid and alkaline cleanings.

Membrane replacement

TOOLS

- Rubber mallet
- Flat blade screwdriver
- Open end wrench, 7/8 inch
- Food grade RT-111 silicone
- Safety glasses

MEMBRANE REPLACEMENT

1. Remove clamps from vessel using 9/16" socket or wrench. Use two screw drivers on each side to push end caps out of vessel slowly.
2. Push the membrane out through the vessel from the feed end towards the concentrate end.
3. If there is not enough room to remove the membrane from the vessel through the concentrate end it can be removed from the feed end.
4. Install the new membrane from the feed end. Ensure that the brine seal is oriented towards the feed end. Check that the end adapters and all O-rings are in good condition and in position.
5. Replace end plug(s) using glycerin lubricant as required on O-rings.
6. It is highly recommended to have a spare set of O-rings and brine seal while replacing the membranes.
7. As the membranes may have preservative or be contaminated, wash your hands thoroughly after replacing membranes.

Note: Keep all plumbing routed the same as shipped from DriSteem. Any different orientation will destroy the RO membranes.

FIGURE 40-1: DRISTEEM REVERSE OSMOSIS MEMBRANES



DriSteem replacement part number 550035-040.

Clamp

CAUTION

Team lift required

Membrane banks are heavy. Do not try to lift without assistance. Wear steel-toed shoes and have adequate room for maneuvering when servicing. Never lean membrane banks vertically when removed from system. Failure to do so may damage the system or result in injury.

Components

GAUGES AND VALVES

Verify proper operation by visual inspection during operation.

DECHLORINATOR

1. Visually inspect components for leaks or breakage.
2. Monthly, have a water sample taken after dechlorinator to check for chlorine. If 2 ppm or greater, replace carbon media.

WATER SOFTENER

1. Check brine tank salt level at least weekly. Maintain salt level above the half-full mark at all times.
Note: DriSteem recommends using pulverized salt because it dissolves easily.
2. Visually inspect all components for leaks or breakage.
3. Annually, have a water sample taken downstream from water softener to check for hardness. If water hardness is 15 ppm or greater, make sure there is salt in brine tank. If there is salt, and water hardness is 15 ppm or greater, contact DriSteem for water softener resin replacement.
4. See water softener service manual for recommended service.

PRESSURIZED RO HOLDING TANK

1. Precharge pressurized RO holding tank with air to 26 to 28 psi (180 to 195 kPa) using Schrader valve on top of the tank.
2. Set pressurized RO storage tank to cut in at 30 psi (210 kPa) and cut out at 50 psi (345 kPa). See instructions that shipped with Pressurized RO holding tank and RO station interface kit.
3. Check cut-in and cut-out pressures as follows:
Drain pressurized RO holding tank until RO generation cycle begins. Verify that starting and stopping pressures are approximately 30 psi and 50 psi (210 and 345 kPa) respectively.

Troubleshooting

The following troubleshooting instructions are specific to the DriSteem Reverse-Osmosis System. For additional information, including messages and alarms, see the Vapor-logic section of this manual and the main Vapor-logic controller installation, operation, and maintenance manual.

Table 42-1:
Troubleshooting

Issue	Action
The system does not start manually or automatically.	Check supply voltage. Check circuit breakers. Check interlock switch.
	Verify that the field supplied manual inlet valve is open. Verify that the water pressure is at least 40 psi (276 kPa). Verify that the sediment filter is clean.
	Check for alarms.
	Check the control and power fuses located inside the control and power panel. Check the transformer voltage.
	Verify the RO holding tank is empty and is not pressurized with trapped air.
The system is operating but provides only low pressure or no pressure.	The pressure gauge on the pump should match the pressure set point. If needed, adjust the operating pressure with the unloader valve.
	Check if there are any leaks in the water lines. Repair if needed.
	Verify that the field supplied manual inlet valve is open. Verify that the water pressure is at least 40 psi (276 kPa). Verify that the sediment filter is clean.
	Verify the RO flush valve is not open.
	Verify that the field supplied manual permeate supply valve(s) are open.
	Verify that the internal plumbing does not have a kink.
	Check pump rotation for three phase motors.
The system turns on but it turns off after a certain period of time.	Verify that the field supplied manual inlet valve is open. Verify that the water pressure is at least 40 psi (276 kPa). Verify that the sediment filter is clean. Check for alarms.
	Verify that there are no leaks in the water piping. Repair if needed.
	Verify that the RO flush valve is not enabled.
Inlet pressure low*	Correct incoming supply pressure.
	Verify the sediment filter is not plugged. Change filters if needed.
	Verify solenoid valve is working properly. Replace if needed.
* Pressure alarm will occur if inlet pressure falls below 5 psi. Alarm will self-clear when RO system supply pressure is above 10 psi for at least 10 consecutive seconds. A pressure fault can be manually cleared at any time. System will try to operate every 10 consecutive seconds per hour up to 72 hours while in low pressure alarm condition.	

Table 43-1:
Troubleshooting

Issue	Action
Permeate flow low	Adjust water temperature.
	Adjust concentrate control valve to prevent low system pressure.
	Clean membranes.
	Adjust pump throttling valve.
Pump noisy	Correct low inlet pressure.
Permeate quality poor	Adjust concentrate control valve to prevent low inlet flow.
	Correct low inlet pressure.
	Reduce too high of a recovery.
	Clean membranes.
	Replace damaged membranes.
	Ensure adequate concentrate to drain flow.

System operating log

SYSTEM MONITORING AND RECORD KEEPING

The system should be monitored and all pertinent data recorded on a daily basis. This includes cartridge filter pressure in/out, system pressure in/out, flow and water quality (TDS) in/out. Data is needed to determine operating efficiency and for performing system maintenance. The latter includes cleaning of the membranes, adjusting the operating conditions as well as replacement of cartridge filters and RO membranes.

Table 44-1:
System operating log

Date							
Time							
Chlorine							
Filter in psi							
Filter out psi							
Water temperature							
TDS in							
TDS out							
Concentrate in psi							
Concentrate out psi							
Cartridge filter change							
Membrane change							
Recorded by							

Notes

Water quality test strips

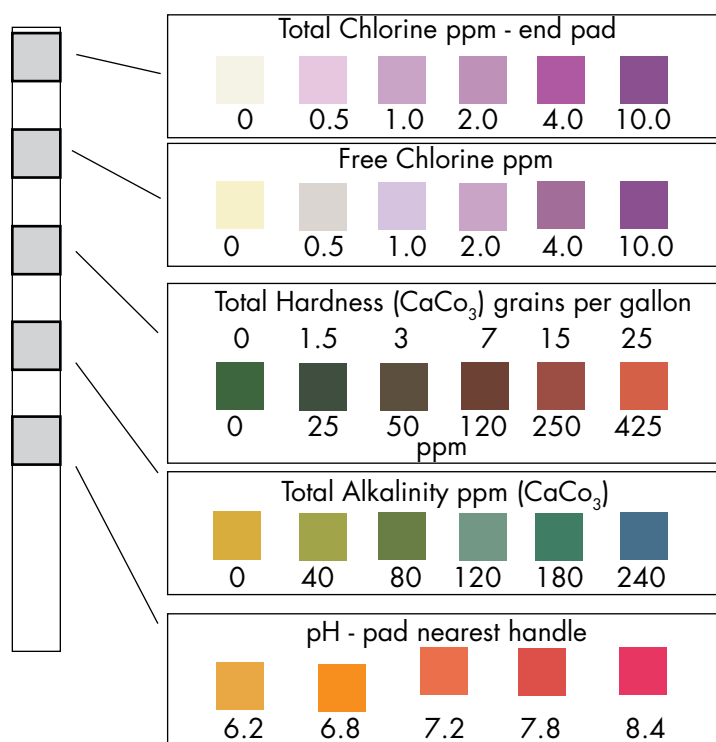
Carbon filters in the low-maintenance humidification system should be changed regularly to maintain proper pressure and flow and water quality.

The carbon filter removes chlorine. Change the carbon filter when chlorine from supply water starts to pass through. Check regularly for chlorine pass through.

To check for chlorine, obtain a water sample from the concentrate drain line and test the water. If chlorine is present, change the carbon filter and record the interval to estimate the next carbon filter change.

For best results, test water chlorine every two weeks.

To order more Water Quality Test Strips, contact your local DriSteem rep, or call 1-800-328-4447.



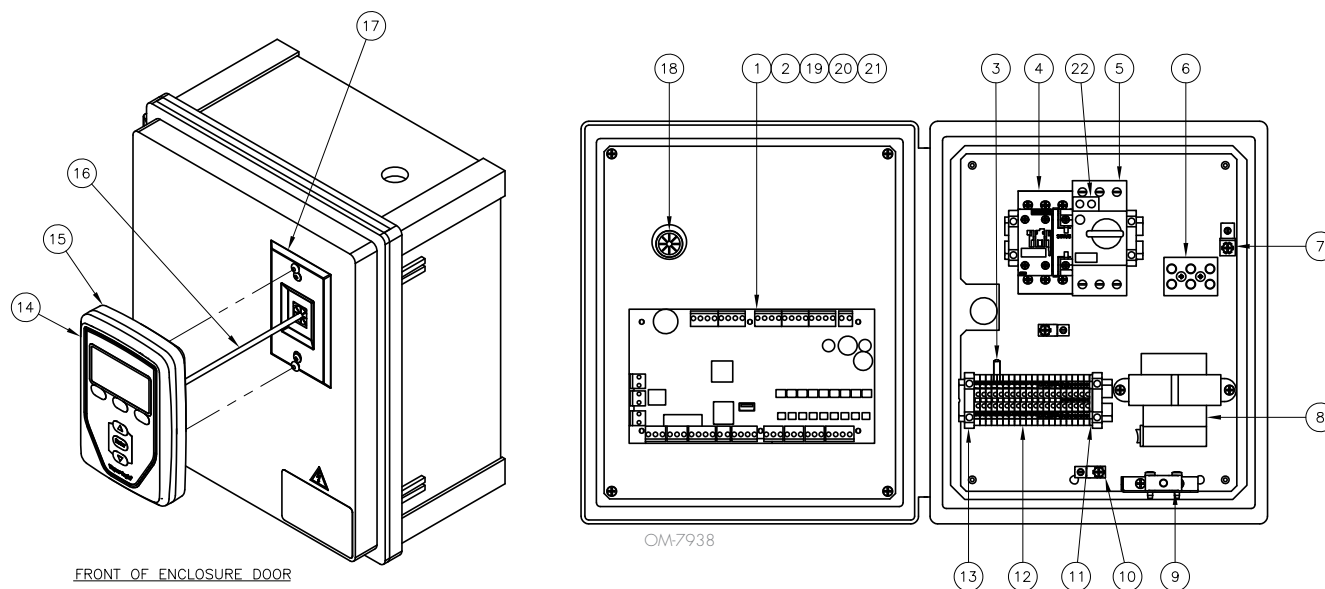
DIRECTIONS:

1. Dip entire strip into water for 1 second (or pass under water stream), remove. Do not shake excess water from the test strip. Hold the strip for 30 seconds.
2. Compare TOTAL HARDNESS, TOTAL ALKALINITY and pH pads to color chart to the left.
3. Dip strip into the water again and move back and forth for 30 seconds (or hold two chlorine pads under water stream for 10 seconds).
4. Compare CHLORINE pads to color chart to the left.
5. Track results in the chart below.
6. Change the carbon cartridge filter once chlorine is detected in the concentrate water of the low-maintenance humidification system (see page 32).

Water quality test log

Date tested	Total Chlorine ppm	Free Chlorine ppm	Total Hardness	Total Alkalinity	pH
Week 1 _____					
Week 3 _____					
Week 5 _____					
Week 7 _____					
Week 9 _____					
Week 11 _____					
Week 13 _____					
Week 15 _____					
Week 17 _____					
Week 19 _____					

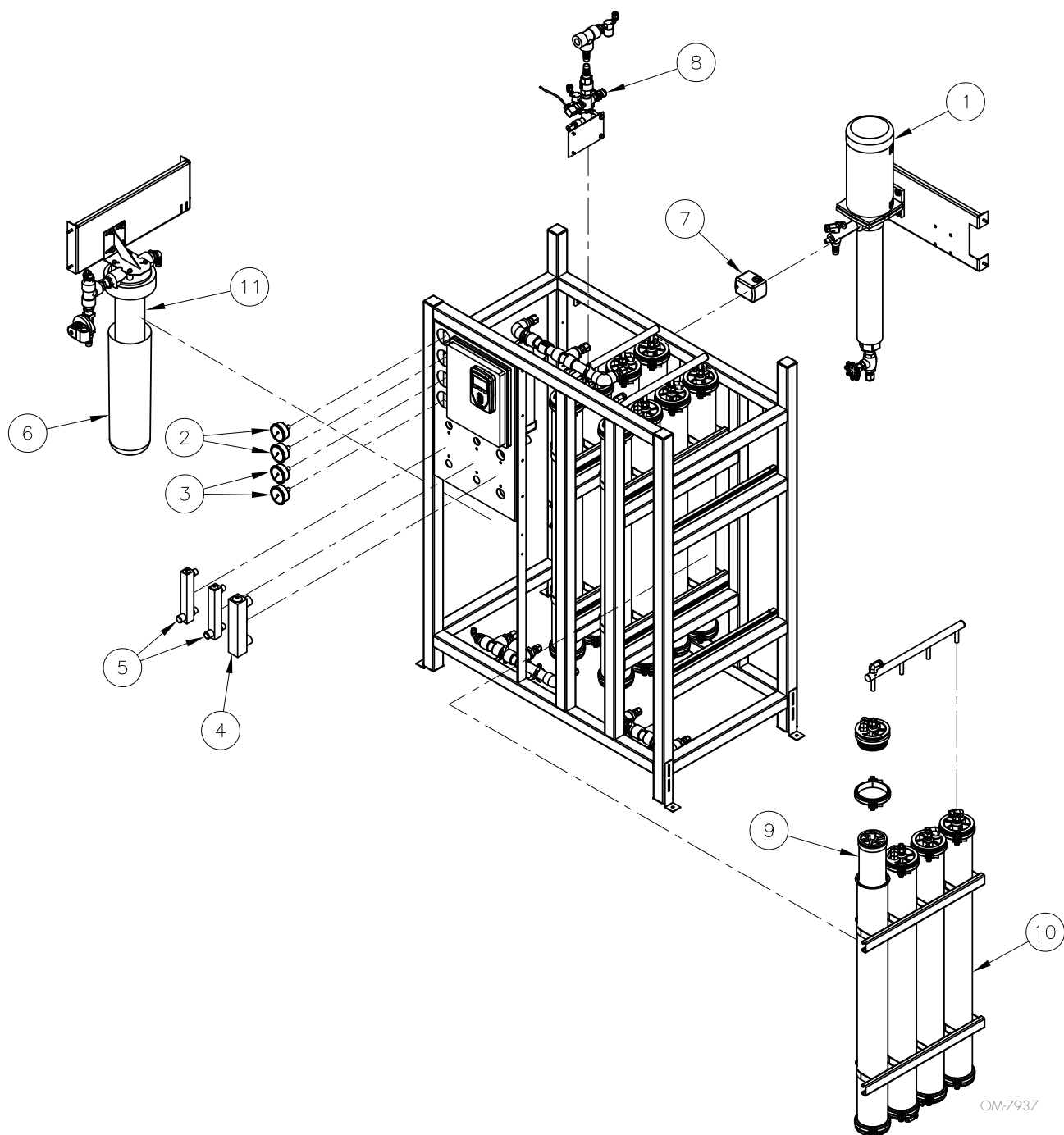
Subpanel

FIGURE 47-1: CONTROL CABINET ASSY RO-400

Table 47-1:
Control cabinet assembly RO-400

No.	Description	Qty.	Part No.	No.	Description	Qty.	Part No.
1	Main controller VL6	1	408496-006	10	Lug wire	1	409250-003
2	Module LON protocol (LON option only)	1	408642	11	Terminal DIN rail end cap	1	408252-005
3	Resistor 1.2K OHM through hole	1	408995-008	12	Terminal DIN rail 20A center	1	408252-001
4	Contactor	1	407010-*	13	Terminal DIN rail end	1	408252-006
5	Starter motor manual 2.5-4 AMP rotary (WT 1HP 480V/3PH)	1	407015-003	14	Display VL w/o back Vapor-logic	1	408495-002
	Starter motor manual 6.3-10 AMP Rotary (WT 1HP 220V/1PH) (WT 3HP 480V/3PH)	1	407015-005	15	Case rear display Vapor-logic	1	408495-003
	Starter motor manual 11-16 AMP rotary (WT 3HP 220V/1PH)	1	407015-006	16	Wire data cable 27" RJ-12	1	408490-014
	Starter motor manual 14-20 AMP rotary (WT 1HP 120V/1PH)	1	407015-007	17	Mount wallplate wallphone SST	1	408490-021
6	Terminal block 3 pole pressure contact	1	408300-002	18	Bushing 7/8" shutter heyco	1	407129
7	Lug medium	1	409250-027	19	Plug 2 circuit vertical euro molex	1	406246-002
8	Transformer 120/208/240/480V TO24VAC 75V	1	408965-001	20	Plug 3 circuit vertical euro molex	1	406246-003
9	Switch door interlock	1	530010-002	21	Plug 4 circuit vertical euro molex	1	406246-004
				22	Motor starter aux switch, no	1	407015-010

RO system

FIGURE 48-1: RO 400 SYSTEM REPLACEMENT PARTS



RO system

Table 49-1:
RO system replacements parts

No.	Description	Qty.	Part No.
1	PUMP RO 10 GPM 1 HP 208-230/460V 3PH	1	400290-010
	PUMP RO 20 GPM 3 HP 208-230/460V 3PH	1	400290-020
	PUMP RO 10 GPM 1 HP 115/230V 1PH	1	400290-110
	PUMP RO 20 GPM 3 HP 208/230V 1PH	1	400290-120
2	GAUGE LIQUID FILLED 100 PSI PNL MNT KIT	1	260004-100
3	GAUGE LIQUID FILLED 400 PSI PNL MNT KIT	1	260004-400
4	METER 5 GPM WATER FLOW	1	501907-105
	METER 10 GPM WATER FLOW	1	501907-110
	METER 20 GPM WATER FLOW	1	501907-120
5	METER 5 GPM WATER FLOW W/ NEEDLE VALVE	1	501907-205
6	PLUMB HOUSING FILTER 2.5" DIA X 20"	1	550028-002
	HOUSING FILTER 4.5" DIA X 20"	1	550028-006
7	PRESSURE SWITCH DPST, 10/5 PSI	1	260172-028
8	MANIFOLD ASSY RO OUTPUT - PRESSURE STORAGE	1	187712-001
	MANIFOLD ASSY RO OUTPUT - ATMOSPHERIC STORAGE	1	187712-002
9	MEMBRANE RO 4.0" X 40" EXTRA LOW ENERGY	1	550035-040
10	HOUSING RO MEMBRANE 4" DIA X 40" 316SST	1	550028-007
11	PLUMB FILTER SEDIMENT 5 MICRON 2.5"X 20"	1	550026-002
	PLUMB FILTER SEDIMENT 5 MICRON 4"X 20"	1	550026-003

* Specify RO system model and serial numbers when ordering.

Notes

Notes

Expect quality from the industry leader

Since 1965, DriSteem has led the industry with innovative methods for humidifying and cooling air with precise control. Our focus on ease of ownership is evident in the design of our Water Treatment Systems, which feature low maintenance and comprehensive control. DriSteem also leads the industry with a Two-year Limited Warranty and optional extended warranty.

For more information

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Continuous product improvement is a policy of DriSteem; therefore, product features and specifications are subject to change without notice.

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Two-year Limited Warranty

DRI-STEEM Corporation ("DriSteem") warrants to the original user that its products will be free from defects in materials and workmanship for a period of two (2) years after installation or twenty-seven (27) months from the date DriSteem ships such product, whichever date is the earlier.

If any DriSteem product is found to be defective in material or workmanship during the applicable warranty period, DriSteem's entire liability, and the purchaser's sole and exclusive remedy, shall be the repair or replacement of the defective product, or the refund of the purchase price, at DriSteem's election. DriSteem shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product. Excluded from the Limited Warranty are all consumable and wear and tear items such as cylinders, membranes, filters, or media replacements. These items are subject to usual wear and tear during usage.

DriSteem's Limited Warranty shall not be effective or actionable unless there is compliance with all installation and operating instructions furnished by DriSteem, or if the products have been modified or altered without the written consent of DriSteem, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Any warranty claim must be submitted to DriSteem in writing within the stated warranty period. Defective parts may be required to be returned to DriSteem.

DriSteem's Limited Warranty is made in lieu of, and DriSteem disclaims all other warranties, whether express or implied, including but not limited to any IMPLIED WARRANTY OF MERCHANTABILITY, ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, any implied warranty arising out of a course of dealing or of performance, custom or usage of trade.

DriSteem SHALL NOT, UNDER ANY CIRCUMSTANCES BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, REVENUE OR BUSINESS) OR DAMAGE OR INJURY TO PERSONS OR PROPERTY IN ANY WAY RELATED TO THE MANUFACTURE OR THE USE OF ITS PRODUCTS. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if DriSteem has notice of the possibility of such damages.

By purchasing DriSteem's products, the purchaser agrees to the terms and conditions of this Limited Warranty.

Extended warranty

The original user may extend the term of the DriSteem Limited Warranty for a limited number of months past the initial applicable warranty period and term provided in the first paragraph of this Limited Warranty. All the terms and conditions of the Limited Warranty during the initial applicable warranty period and term shall apply during any extended term. An extended warranty term of an additional twelve (12) months or twenty four (24) months of coverage may be purchased. The extended warranty term may be purchased until eighteen (18) months after the product is shipped, after which time no extended warranties are available. When a DriSteem humidifier is purchased with a DriSteem RO system, an extended twenty-four (24) month coverage is included.

Any extension of the Limited Warranty under this program must be in writing, signed by DriSteem, and paid for in full by the purchaser.