



Village Marine LTM-500

Part Number: 95-0023

LTM Series Modular Watermakers

500-1,800 GPD

1900 - 6800 LPD

Installation, Operation & Maintenance

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



ENGINEERING YOUR SUCCESS.

The following are the types of flags used in this technical manual. They designate safety related items and important operational instructions and should be given special attention when they appear in the text:

WARNING

Text formatted in this manner concerns an operating procedure or practice that, if not strictly observed, can result in injury to personnel or loss of life.

CAUTION

Text formatted in this manner concerns an operating procedure or practice that, if not strictly observed, can result in damage to or destruction of equipment.

NOTE

Text formatted in this manner concerns an operating procedure or condition that warrants special attention

MODEL: _____

SERIAL NUMBER: _____

DATE OF PURCHASE: _____

PURCHASED FROM: _____

INVOICE #: _____

VESSEL NAME: _____

INSTALLED BY: _____

DATE OF INITIAL STARTUP: _____

LTM Series Modular Watermakers

500 - 1,800 GPD
1,900 - 6,800 LPD



For Sail Boat and Fishing Vessel Applications

The LTM Series offers high quality Parker Village Marine engineered components with straightforward manual operation. Driven by AC motors (from genset power), the modular configuration comes in ready to mount modules for flexible installation options. Integral to every LTM unit is a control manifold, which includes a regulator and bypass valve.



Village Marine LTM-500

Key Feature:

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Optional salinity monitor and diversion valve system for water quality assurance.

Salinity monitor and diversion valve

P/N 90-0115 110V 500-800 GPD

P/N 90-0116 220V 500-800 GPD

P/N 90-0127 220V 1000-1300 GPD



ENGINEERING YOUR SUCCESS.

LTM Series

500 - 1,800 GPD

1,900 - 6,800 LPD

Standard Features:

- Available for 110/1/60, 220/1/60, 230/1/50, 230/3/50, or 460/3/60 power supplies as shown
- Powder coated mounting brackets included
- 5 micron cleanable prefilter
- Control manifold pressure regulator ensures consistent pressure and prevents over or under pressurization of the unit. Adjustable to allow operation in brackish or fresh water
- High quality spiral wound TFC reverse osmosis membranes
- Magnetic drive boost pump
- Stainless steel glycerin filled pressure gauges
- High pressure plunger pump with stainless steel 316 head
- Acrylic flowmeter to monitor production

Model	Part Number	Electrical Supply Volts/Ph/Hz/Amps	Capacity GPH/LPH	Weight lbs./kg
LTM-500	90-6019 90-6047 90-6048 90-6078	110/1/60/18 220/1/60/8 230/1/50/8 230-460/3/50-60/6-4	21/79	92/42
LTM-800	90-6049 90-6050 90-6051 90-6079	110/1/60/18 220/1/60/9 230/1/50/8 230-460/3/50-60/6-4	33/125	100/45
LTM-1000	90-6052 90-6053 90-6080	220/1/60/12 ** 230/1/50/12.5 230-460/3/50-60/8-6.5	42/158	133/60
LTM-1300	90-6054 90-6055 90-6081	220/1/60/12 ** 230/1/50/12.5 230-460/3/50-60/8-6.5	54/205	153/70
LTM-1800	90-6056 90-6076 90-6077	220/1/60/12 ** 380/3/50/7.5 460/3/60/7	75/284	168/76

*Membrane elements are sold separately.

**For 110/50/60/1 please inquire with factory.

Spare Parts

Part No.	Description	Part No.	Description
85-0050	Pump Oil	33-0271	Filter Housing O-Ring (model 1000 and up)
33-0117	5 Micron Filter (up to model 800)	90-2512	Membrane O-Ring Kit
33-0052	5 Micron Filter (model 1000 and up)	40-0241	Salinity Probe
33-0311	Carbon Flush Filter	85-0102	Cleaning Kit
33-0238	Membrane Element	85-0103	Preservation Kit
90-0005	Filter Housing O-Ring (up to model 800)		

To maintain peak performance always use genuine Parker Village Marine replacement parts.
We reserve the right to change our specifications or standards without notice.

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LTM series Seawater Desalinator is a single-pass purification system that uses reverse osmosis (RO) to produce potable water from seawater. Product water with salt concentrations of < 500 ppm are achieved by removing approximately 99% of the dissolved salt in seawater.

INSTALLATION

The RO unit should be installed in a dry, sheltered location protected from direct weather. Drainage should be provided beneath the RO unit to allow standing water to drain when performing maintenance or repair.

Refer to the Plumbing Diagram for arrangement and connection hose sizes. All connections up to and including the boost pump must be below water line. If necessary, the three way flushing valve may be disconnected from the flushing filter to get the valve below waterline. The prefilter, the HP pump and the membrane rack can all be above waterline as indicated in the diagram below.

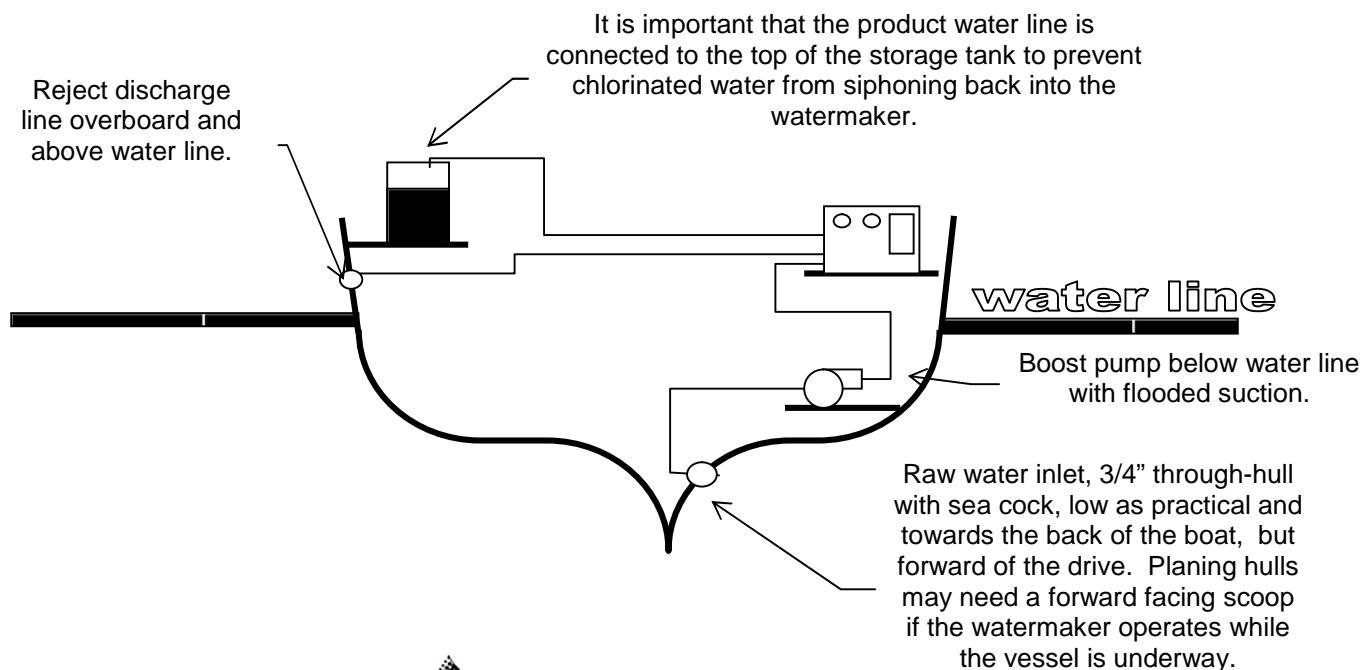


Figure 1.0: LTM - Basic Installation Diagram.

CAUTION

Inlet and discharge interconnecting lines should be constructed of a NON-FERROUS material. Examples of some suitable materials are PVC, copper-nickel, 316 stainless steel pipe or a reinforced non-collapsing hose. Ferrous piping introduces iron that will foul the membranes prematurely.

NOTE

Avoid connecting the seawater source to a water line that services any other piece of equipment. Air could be drawn through the RO unit causing damage to the RO unit's pumps. Cross contamination is also possible. The best practice is a dedicated through hull for the watermaker, with a separate seacock and strainer.

Connect electrical power to the watermaker. Select the circuit breaker size of at least 50% more than the operating amps shown on the serial number tag. 110 VAC 60 hertz units need a three wire supply, black, white and green for hot, common and ground respectively. 220 VAC 60 hertz units need a four wire supply, black, blue, white and green for hot, hot, neutral and ground respectively - bring a separate neutral from the generator if necessary. 230 VAC 50 hertz units need a three wire supply, black, white and green for hot, hot, and earth respectively. Connect power to the main terminal block in the electrical enclosure following the above wire colors.

CAUTION

Strictly observe all applicable electrical codes and regulations governing the installation and wiring of electrical equipment. Typical codes specify the type and size of conduit, wire diameter and class of wire insulation depending upon the amperage and environment. The power supply should always be of a greater service rating than the requirements of the RO unit. Never connect the RO unit to a line that services another electrical device, the RO unit should have its own breaker.

WARNING

Disconnect electrical power to RO unit prior to servicing the watermaker.

START UP AND OPERATING PROCEDURE

- 1) Check the HP pump oil level by observing sight gauge located on the pump. Open the raw saltwater supply to the unit at the through-hull. Also ensure that the flushing valve is in the saltwater position with the valve handle pointing away from the carbon flushing filter. The product sample valve should be in the “sample” position, not directed to tank.
- 2) Verify the bypass valve (black handle) is open, counterclockwise.
- 3) Start the LP pump, verify the filter pressure gauge shows > 5 psi indicating the system is primed with water.
- 4) Start the HP pump. Water should now be flowing through the system and discharging through the overboard reject line. Often installations will connect both pumps to the same circuit breaker. That arrangement is OK, however it is still prudent to confirm the pumps are primed and running correctly. Remember there is no safety switch for low flow, and pump damage will occur if running dry.
- 5) Slowly close the bypass valve, and confirm that the membrane pressure gauge registers 800 psi. The high pressure setting can be adjusted by the regulator set screw on the high pressure manifold on top of the instrument panel.
- 6) After about 2 minutes operation, confirm the salinity by taste test or by hand meter at the sample valve. Once it is ok, turn the sample valve to direct water to your storage tank. A digital salinity monitor and automatic diversion valve is available as an option.
- 7) Now would be a good opportunity to make an operation log of the pressures, flow and salinity.
- 8) For shutdown, reverse the steps. First open the black bypass valve. Then shut down the HP and LP pumps. Turn the product sample valve back to sample position. If you are unsure if the watermaker will be restarted in a day or so, now is time to flush the watermaker to keep the membranes fresh while idle, please see the next section. Bacteria and biologic growth increases the longer stagnant water is in contact with the membranes, so the flushing is advised whenever the unit will be idle. Once flushed, the flush should be repeated once every one or two weeks if the idle period continues. For extended periods, see the section on pickling or preserving the watermaker.

MAINTENANCE

The service life of most system equipment is directly related to the raw water inlet conditions. Improper maintenance will also significantly reduce the life expectancy of the major unit components (such as the membranes, filters and pumps) as well as the reliability of the unit as a whole. Under normal conditions, and with proper maintenance, a reverse osmosis membrane (which is the major consumable item) should have an effective service life.

NOTE

The RO unit must be cleaned when product water production output drops by 20%.

	Daily	Weekly	Monthly	Quarterly	Semi-Annually	Annually	As Required	Labor Hours (approximate)
Clean/inspect micron prefilter			•					0.5
Replace filter(s)*				•				0.5
Clean membranes							•	2.0
Replace Membranes							•	1.0
Check pump oil level			•					0.1
Change pump oil**						•		0.5
Lubricate pump motor						•		0.5



Table 1.0: Maintenance Task Chart.

* VMT prefilter cartridges can be rinsed with freshwater and be reused up to 3 times.

** Change pump oil after first **50** hours of RO use. After the first oil change at 50 hours, change the pump oil every **500** hours thereafter or once annually which ever interval comes first.

FRESHWATER FLUSH / SHORT TERM STORAGE

Ideally, the system performs optimally when the RO unit is used regularly. The likelihood of bacterial and biological growth in the membranes increases, when stagnant seawater (in extended periods) is in contact with the membranes. A freshwater flush procedure is necessary to prevent clogging and growth of organic contaminants in the RO system and its membranes. This method pushes out older stagnant seawater (saltwater) out of the membranes and replacing it with freshwater (non-saltwater), leaving less chance of fouling the membranes. The freshwater flush procedure should be used when the unit will be placed idle or in "stand by" condition for more than several days **OR** idle for three days in hot, tropical climates. Although they do not attack the membranes or other system components directly, high concentrations of biological matter can block enough of the product water channels to cause a reduction of as much as 40% of the total system capacity.



CAUTION

PERFORM A FRESHWATER FLUSH TO THE RO UNIT WITH NON-CHLORINATED FRESH WATER ONLY. EXPOSING THE MEMBRANES TO CHLORINATED WATER WILL CAUSE IRREVERSIBLE DAMAGE AND VOID THE RO UNIT WARRANTY. THE FRESHWATER FLUSH SYSTEM USES A CARBON FILTER INLINE BEFORE SYSTEM TO CONSUME THE CHLORINE THAT MAY BE PRESENT FROM THE DOCK WATER.

TO FLUSH THE LTM UNITS

- Step 1: Verify all power switches and power sources are turned **OFF**.
- Step 2: Verify the High Pressure Bypass Valve is fully open.
- Step 3: Turn the grey Fresh Water Flush Valve to FWF.
- Step 4: Turn on the breaker at the main breaker panel and for two minutes.

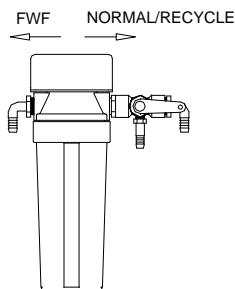


Figure 2.0: LTM - Fresh Water Flush Assembly.

- Step 5: Turn off the breaker at the main braker panel
- Step 6: Turn the grey Freshwater flush valve to NORMAL/RECYCLE position
- Step 7: Leave RO unit in standing condition, for up to three weeks. Then reflush or preserve.
- Step 8: To restart the **LTM**, refer to instructions in start up.

MEMBRANE CLEANING

The membrane elements require occasional service; it is recommended to clean the membranes only when dirty. Basic procedure for all cleaning and preservative treatments are similar- a specific chemical solution is circulated through the system for a pre-determined length of time.

NOTE

All cleaning and preservation procedures should be performed with **NON-CHLORINATED** freshwater to optimize performance of cleaning process.

NOTE

Allow your unit's product water to run with product to **DUMP** for the first 30 minutes after cleaning or upon startup after preservation.

Part #	Description	Cartridge
85-0102	Cleaning Chemical #1	Cartridge (Blue Stripe)
	Cleaning Chemical #2	Cartridge (Red Stripe)
85-0103	Preservative Chemical #3	Cartridge (Green Stripe)

 Table 2.0: Chemical Cartridge Requirements

CLEANING CHEMICALS



CAUTION

CLEANING CHEMICAL #1 IS AN **ALKALINE DETERGENT**, USED TO REMOVE OIL, GREASE, BIOLOGICAL MATTER, AND GRIME FROM THE SURFACE OF THE RO MEMBRANES. SEE WARNING LABEL ON SIDE OF PACKAGE AND OBSERVE ALL SAFETY PRECAUTIONS ON LABEL.



CAUTION

CLEANING CHEMICAL #2 IS AN **ACID**, A MINERAL SCALE REMOVER. SEE WARNING LABEL ON SIDE OF PACKAGE AND OBSERVE ALL SAFETY PRECAUTIONS ON LABEL.



WARNING

THE USE OF CHEMICALS OR CLEANING METHODS OTHER THAN THOSE OUTLINED IN THIS MANUAL WILL **VOID** THE RO UNIT WARRANTY. NON-IONIC SURFACTANTS USED FOR MEMBRANE CLEANING OR ANY OTHER CHEMICALS NOT APPROVED IN WRITING BY PARKER VILLAGE MARINE, WILL VOID THE RO UNIT WARRANTY.

WHEN TO CLEAN

Chemically clean the RO, when product water output drops below 80% of original production. The frequency of this occurring varies greatly upon feed water. Membrane fouling will occur with normal use.

NOTE

Product water output depends on feedwater temperature, pressure and salinity. Product water output reductions from these factors are normal and may not indicate need for membrane cleaning.

STEPS FOR CLEANING CHEMICALS #1, #2, AND #3 (CARTRIDGE FORM)

Single Use Cleaning Cartridges: Chemical #1 and Chemical #2	Single Use Preservative Cartridge: Chemical #3
<p>Step 1. Prior to cleaning the RO, complete a freshwater flush to the system.</p> <p>Step 2. Remove 5 micron prefilter from housing.</p> <p>Step 3. Place cleaning filter Chemical # 1 (Blue Stripe) into prefilter housing and fill with unchlorinated water. Screw housing back into place.</p> <p>Step 4. Fully open the High Pressure Bypass Valve for Cleaning mode.</p> <p>Step 5. Turn cleaning valve to clean/re-circulate position.</p> <p>Step 6. Start RO unit and let unit run for 30 minutes, in the re-circulate mode. Pushing the button on the side of the flushing solenoid valve helps purge air from the cleaning loop.</p> <p>Step 7. Turn Unit OFF after running for 30 minutes; Place cleaning valve to overboard position; Remove the cleaning chemical cartridge from the prefilter housing; Install a 5 micron prefilter cartridge in housing and re-secure housing place.</p> <p>Step 8. Open the inlet seacock and flush with water overboard for 5 minutes at 0 psi.</p> <p>Step 9. If necessary to use Cleaning Chemical #2 (Red Stripe) return to Step 1 to follow steps used for Chemical Cleaning #1.</p> <p>Step 10. Remove the 5 micron prefilter (not necessary to discard, designate that as the cleaning prefilter for next use at Step 7) from the prefilter housing. Then secure the prefilter housing with a NEW 5 micron filter.</p> <p>Step 11. Return RO to Normal Conditions.</p> <p>Step 12. Record production flow rate before and after cleaning to determine effectiveness.</p>	<p>Step 1. Prior to preserving the RO, complete a freshwater flush to the system. (REFER TO PAGE 5)</p> <p>Step 2. Remove 5 micron prefilter from housing.</p> <p>Step 3. Place preservation filter Chemical # 3 (Green Stripe) into prefilter housing and fill with unchlorinated water. Screw housing back into place.</p> <p>Step 4. Fully open High Pressure Bypass Valve for Cleaning mode.</p> <p>Step 5. Turn cleaning valve to clean/re-circulate position.</p> <p>Step 6. Start RO unit and let unit run for 30 minutes, in the re-circulate mode. Pushing the button on the side of the flushing solenoid valve helps purge air from the cleaning loop.</p> <p>Step 7. Turn Unit OFF after running for 30 minutes.</p> <p>Step 8. Leave all valves in position they are now in.</p> <p>Step 9. Remove and discard Chemical Cartridge #3 from prefilter housing. Then secure the prefilter housing empty with no micron filter.</p> <p>Step 10. Unit is now preserved.</p>

NOTE

For resuming normal RO operation (unpreserving or “unpickling”), install a **FIVE MICRON** filter into prefilter housing and fill it with **UNCHLORINATED WATER**. Begin system Start Up Procedures by referring to page 4.

NOTE

IF RO unit storage time is to exceed four months, then it is **NECESSARY** to FLUSH (PUSH OUT) the existing chemical out of the unit and represerve at **EVERY FOUR MONTH INTERVAL**.

OIL CHANGE PROCEDURE

An oil change is recommended after the first 50 hours of RO use. Subsequent oil changes are to be performed every 500-hour intervals OR changed annually. Change oil any time moisture is detected or if oil is cloudy.

NOTE

The first oil change requires a complete oil drain , to ensure your pump is free of any fragments.

CAUTION

DO NOT RUN PUMP WITHOUT OIL IN THE CRANKCASE.

NOTE

Prior to the oil change, it MAY facilitate the oil replacement process by running the RO unit to heat the oil. Heating the oil reduces the viscosity allowing it to drain more easily.

THE LTM UNIT OIL CHANGE PROCEDURE

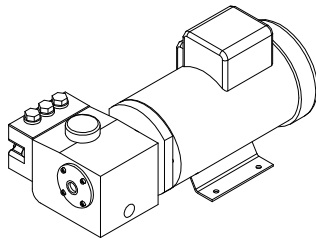
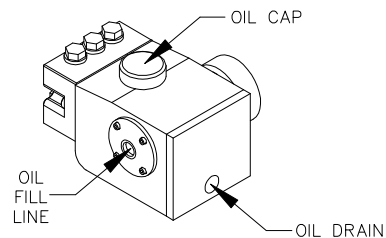



 Figure 3.0: LTM HP Pump and Motor Assembly.



 Figure 4.0: High Pressure Pump – Isometric View.

- Step 1: Turn off all power sources and switches.
- Step 2: Before changing the oil, obtain a container (i.e. a tray or catch basin) to collect the oil drainage.
- Step 3: Place a catch basin/container beneath the high pressure pump and remove the oil drain plug (Refer to Figure 4.0) **(plug may be located on the bottom of the pump of different size systems)** allow the oil to empty from within the pump into the catch basin.
- Step 4: Reinstall the oil plug or oil drain stopper. Then unscrew the oil cap and refill oil to fill line (Refer to Figure 4.0). Check for leaks and re-secure oil cap.

RO MOTOR LUBRICATION

NOTE

Motors should be re-lubricated at least once a year.

Step 1:

Locate the grease fittings on the motor (Refer to Figure 5.0). Use a clean cloth to wipe fittings clean.

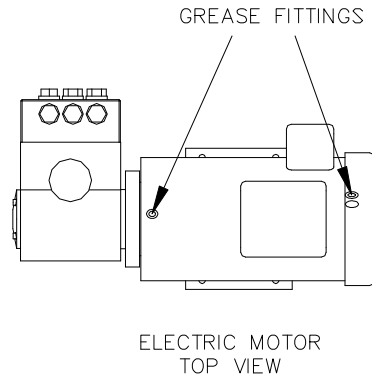


Figure 5.0: Electric Motor - Grease Fitting Locations.

Step 2:

Add 2-3 strokes of grease using a low pressure grease gun (see Table 3.0 for grease type). Filling grease too quickly can cause untimely bearing malfunction. Introduce grease into motor slowly for approximately 1 minute.

Location	Type
High Pressure Pump	Parker Village Marine Pump Oil, P/N #85-0050
High Pressure Pump Motor	Chevron SRI Grease - NGLI 2 ExxonMobil PolyrexEM Grease Shell Oil Dolium R - NGLI 2 Texaco Premium RB
O-Rings and Gaskets	Glycerin or Silicone Lubricant



Table 3.0: Motor and HP Pump Lubrication Requirements.

CAUTION

DO NOT mix grease types. Keep consistent the grade and type of grease used for motor. Also, keep the grease CLEAN.

Step 3:

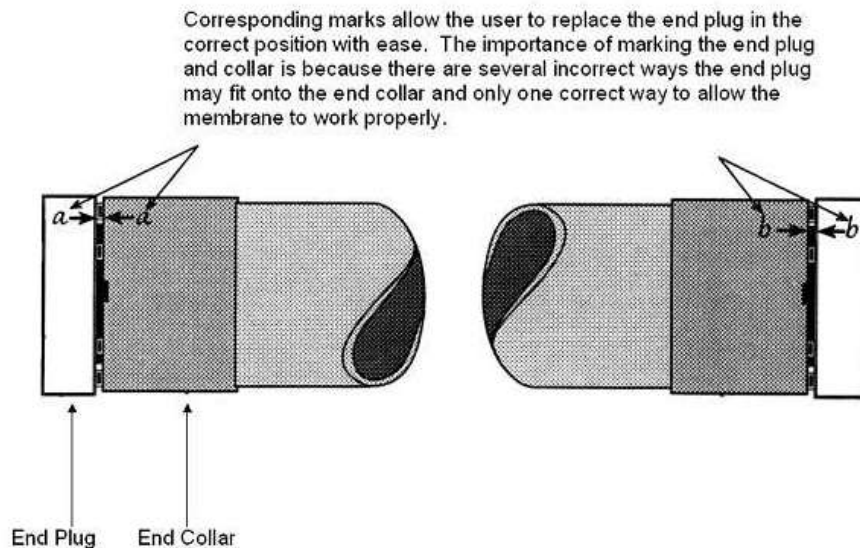
Secure the RO unit, wipe off any of the drained grease and replace the fill and drain plugs, as required. The motor is now ready to resume operation.



PRESSURE VESSEL AND MEMBRANES - DISASSEMBLY

Step 1: Disconnect plumbing from pressure vessel for disassembly. Remove the pressure vessels to a workbench to continue.

Step 2: Remove the six fasteners and cap ring holding each end plug with an Allen wrench. Place a mark on each end plug to be removed, place a corresponding mark on each end collar. This will ensure proper orientation during assembly. See bulletin at the back of the manual for part numbers of the individual components.



Step 3: Locate the screwdriver slots located on opposite sides of the pressure vessel end collar. Place an appropriate sized slot screwdriver in each slot. Twist both screwdrivers until the end plug breaks loose from the pressure vessel. A prying motion on both sides of the end plug with the screwdrivers will quickly remove it. Use this procedure for both end caps. Push or pull the membrane element out of the pressure vessel tube.




CAUTION

NEVER FORCE A MEMBRANE OUT OF A PRESSURE VESSEL BY APPLYING PRESSURE ON THE PRODUCT WATER TUBE (CENTER TUBE), AS THIS WILL DAMAGE THE MEMBRANE. IF MEMBRANE IS DIFFICULT TO REMOVE, USE A 2" DIAMETER PLASTIC PIPE (PVC) TO APPLY PRESSURE ON THE PROTECTED END OF THE MEMBRANE.

Step 4: Note which end of the pressure vessel the brine seal was installed at. The brine seal is a black u-cup seal on the membrane outer diameter near one end. This is the feed end of the pressure vessel. When reinstalling the RO membrane the brine seal must be located at the feed end of the pressure vessel.

PRESSURE VESSEL AND MEMBRANES - REASSEMBLY

- Step 1: Inspect all O-Rings; product O-Rings, end plug O-Rings, and Brine seal. Replace seals if there is visible damage. The product water O-Rings are internal O-Rings, inside the center hole in the end cap.
- Step 2: Lubricate O-Rings and entrances to pressure vessel with glycerin or silicone lubricant. Locate discharge end of pressure vessel. Install discharge end plug by lining up with the holes of the pressure vessel, paying attention to the reference mark. Position end cap ring and insert fasteners by hand.

 **CAUTION** **NEVER USE ANY TYPE OF LUBRICANT CONTAINING PETROLEUM OIL. OIL CAN DAMAGE YOUR UNIT AND REDUCE MEMBRANES PERFORMANCE.**

- Step 3: Align the membrane so the end **without** the brine seal enters the feed end of the pressure vessel first. Slide membrane into pressure vessel until resistance is felt. Continue applying pressure until the product water tube sits into the end plug.
- Step 4: Install the remaining end plug (align end plug holes with mounting holes properly), use the reference mark made in step 2 for correct assembly. Tighten the six fasteners for each end cap. Install the vessels and reconnect plumbing.

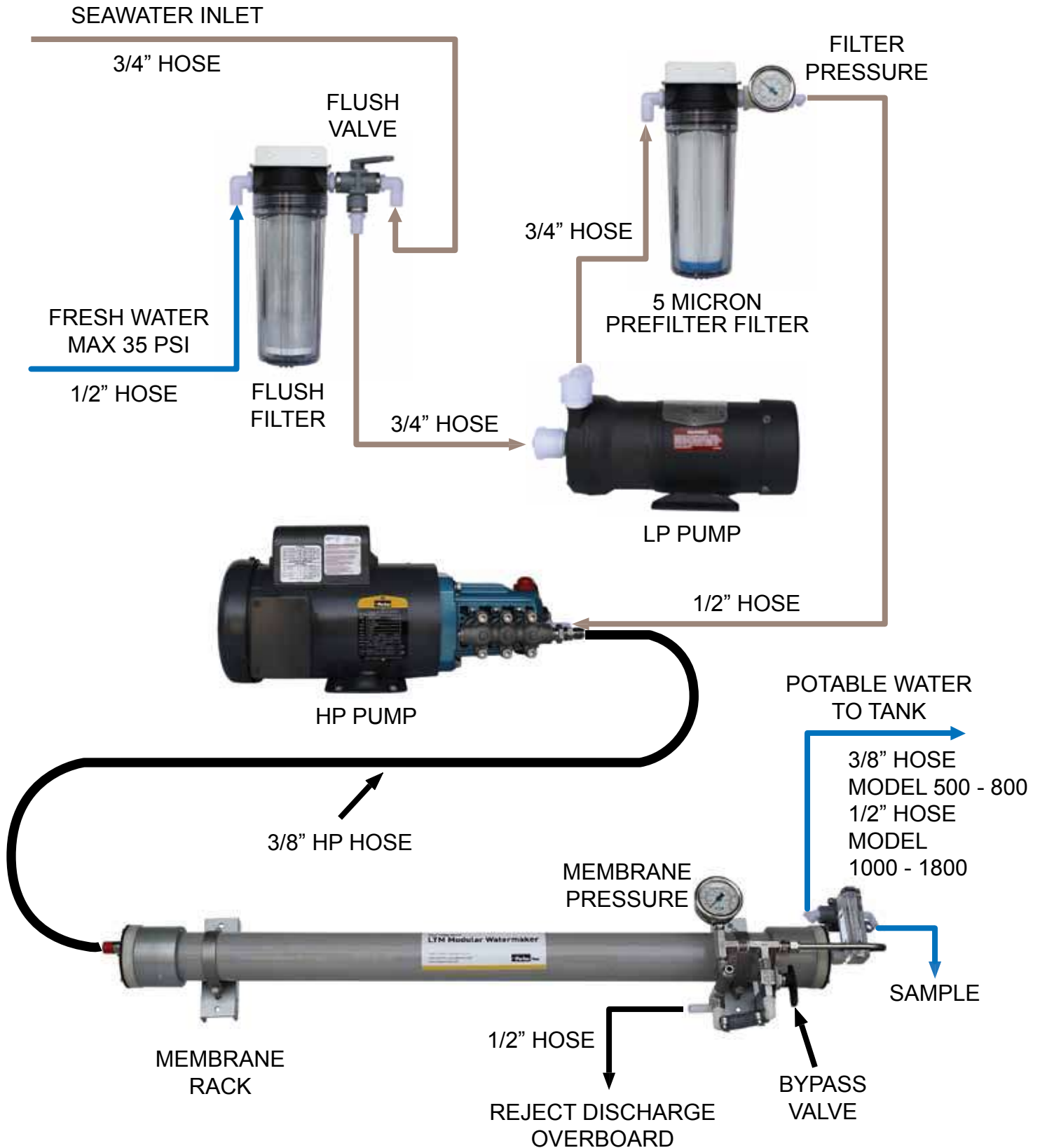
NOTE **Do not apply Teflon tape or sealant to straight thread fittings such as those used on High Pressure Hose ends.**

OPERATION LOG

We encourage operators to keep a simple operation log for the watermaker. Even occasional entries will help in troubleshooting. It is especially important to record performance after the first 3 hours after installation so the baseline is known.

Date	Filter Pressure	Membrane Pressure	Product Flow	Water Quality TDS (ppm)	Water Temp,	Comments

LTM-500 TO LTM-1800 PLUMBING DIAGRAM



**PARTS DIAGRAM - SEE ALSO SPARES
LIST AT FRONT OF MANUAL**

Prefilter Assembly
Replacement Element
Models 500, 800 p/n 33-0117
Models 1000 and up, p/n 33-0052
Filter Pressure Gauge, p/n 40-0300

Flushing Filter Assembly
Replacement Element p/n 33-0311
Flush Valve p/n 60-0014

LP Pump
Models up to 800 at 110 V, p/n 70-7504
Pump repair kit p/n 70-7506
Models up to 800 at 220 V, p/n 70-7505
Pump repair kit p/n 70-7506
Models 1000 and up, p/n 70-1550
Pump repair kit p/n 90-0617

See bulletin for
Pressure Vessel
Parts, back of manual



Pump Oil, p/n 85-0050

Membrane Element
Model 500, one 33-0238
Model 800, two 33-0238
Model 1000, two 33-0238
Model 1300, three 33-0238
Model 1800, four 33-0238

HP Pump
Model 500, p/n 70-1253
Model 800, p/n 70-1255
Models 1000 & 1300 at 50 hz, p/n 70-1254
Models 1000 & 1300 at 60 hz, p/n 70-1256
Model 1800 Pump, p/n 70-1254

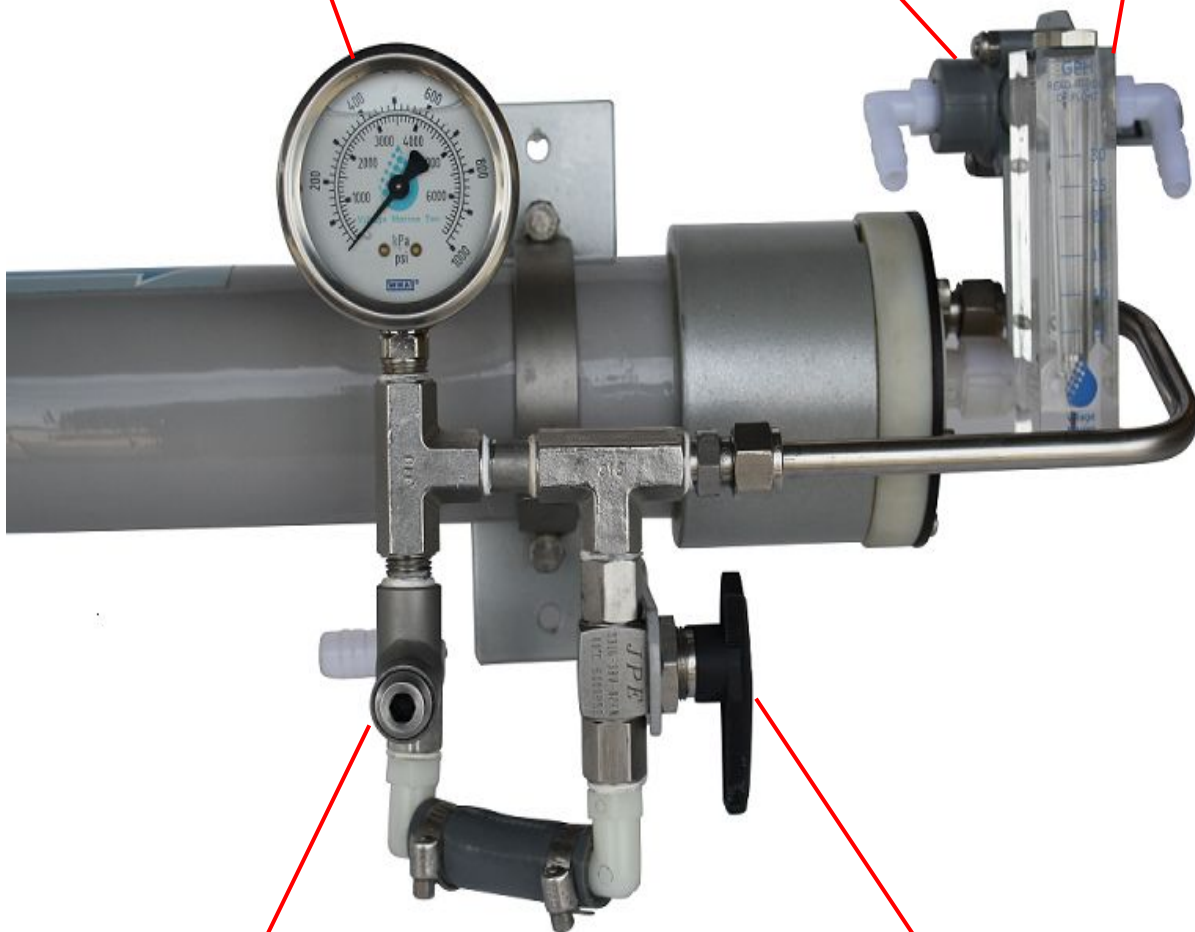
Pumps 70-1253/5/6, HP Pump outlet valve kit, p/n 70-6135
Pumps 70-1253/5/6, HP Pump inlet valve kit, p/n 70-6136
Pumps 70-1253/5/6, HP Pump seal service kit, p/n 70-6134
Pump 70-1254 only, HP Pump outlet valve kit, p/n 70-6138
Pump 70-1254 only, HP Pump inlet valve kit, p/n 70-6139
Pump 70-1254 only, HP Pump seal service kit, p/n 70-6137

PARTS DIAGRAM - INSTRUMENTS

Product Flowmeter
Model 500, p/n 40-1006
Models 800, 1000, 1300, p/n 40-1018
Model 1800, p/n 40-0240

Sample Valve
Models 500, 800, p/n 60-0140
Models 1000 and up, p/n 60-0014

Membrane Pressure Gauge p/n 40-0599

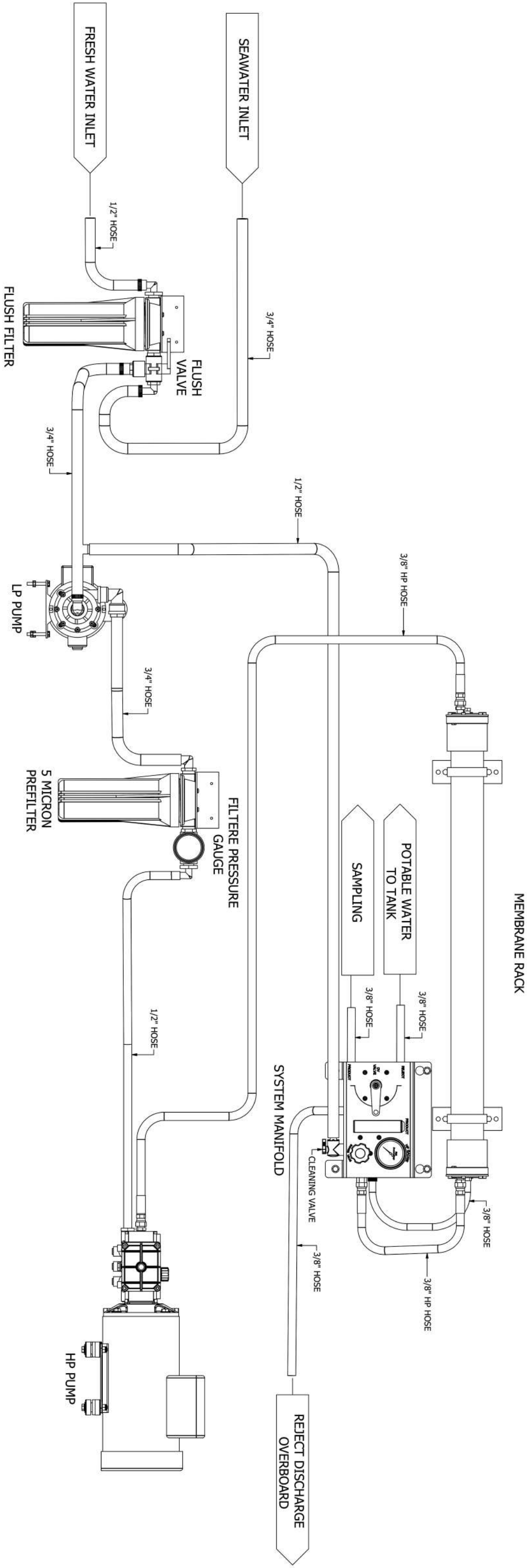


HP Regulating Valve, p/n 60-0088

Bypass Valve, p/n 60-0064
Counter-clockwise for priming,
starting, flushing or cleaning.
Clockwise for making water.

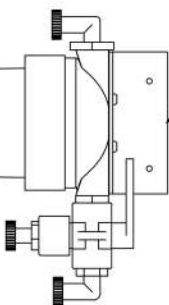
SYSTEM UPGRADE AS OF 3/1/2016

LTM-500 TO LTM-1800 PLUMBING DIAGRAM

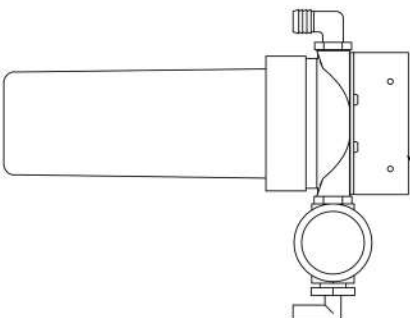


PARTS DIAGRAM
(SEE SPARES LIST AT THE FRONT OF THE MANUAL)

Fresh Water Flush Filter Assembly p/n 90-0215
Replacement Element p/n 33-0311
Flush valve p/n 60-0014



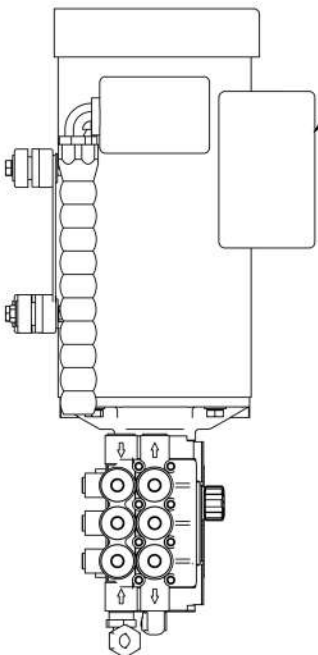
Pre-filter Assembly
Replacement Element
Models 500, 800 p/n 33-0117
Models 100 and up, p/n 33-0052
Filter Pressure Gauge, p/n 40-0300



HP Pump
Model 500, p/n 1218182022
Model 800, p/n 70-1255
Model 1000 & 1300 at 50 hz, p/n 70-1254
Model 1000 & 1300 at 60 hz, p/n 1218182422
Model 1800 Pump, p/n 70-1254

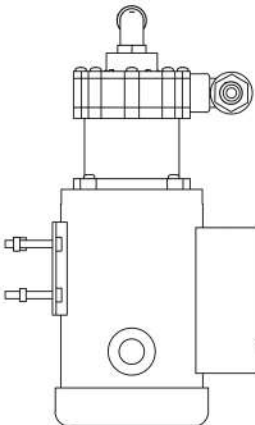


Pumps p/n 1218182022, 70-1255, 1218182422
-HP Pump seal service kit p/n 70-6134
-HP Pump outlet valve kit p/n 70-6135
-HP Pump inlet valve kit p/n 70-6136



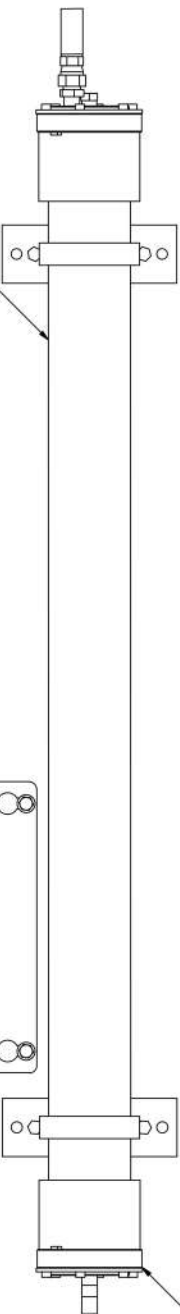
Pump p/n 70-1254 only
-HP Pump seal service kit p/n 70-6137
-HP Pump outlet valve kit p/n 70-6138
-HP Pump inlet valve kit p/n 70-6139

Pump Oil, p/n 85-0050

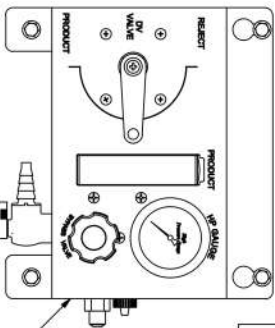


LP Pump
Low Pressure Mag Drive Pump 110/1/60 p/n 70-7504
Low Pressure Mag Drive Pump 230/1/50 p/n 70-7505
Boost Pump Rebuild kit p/n 70-7506

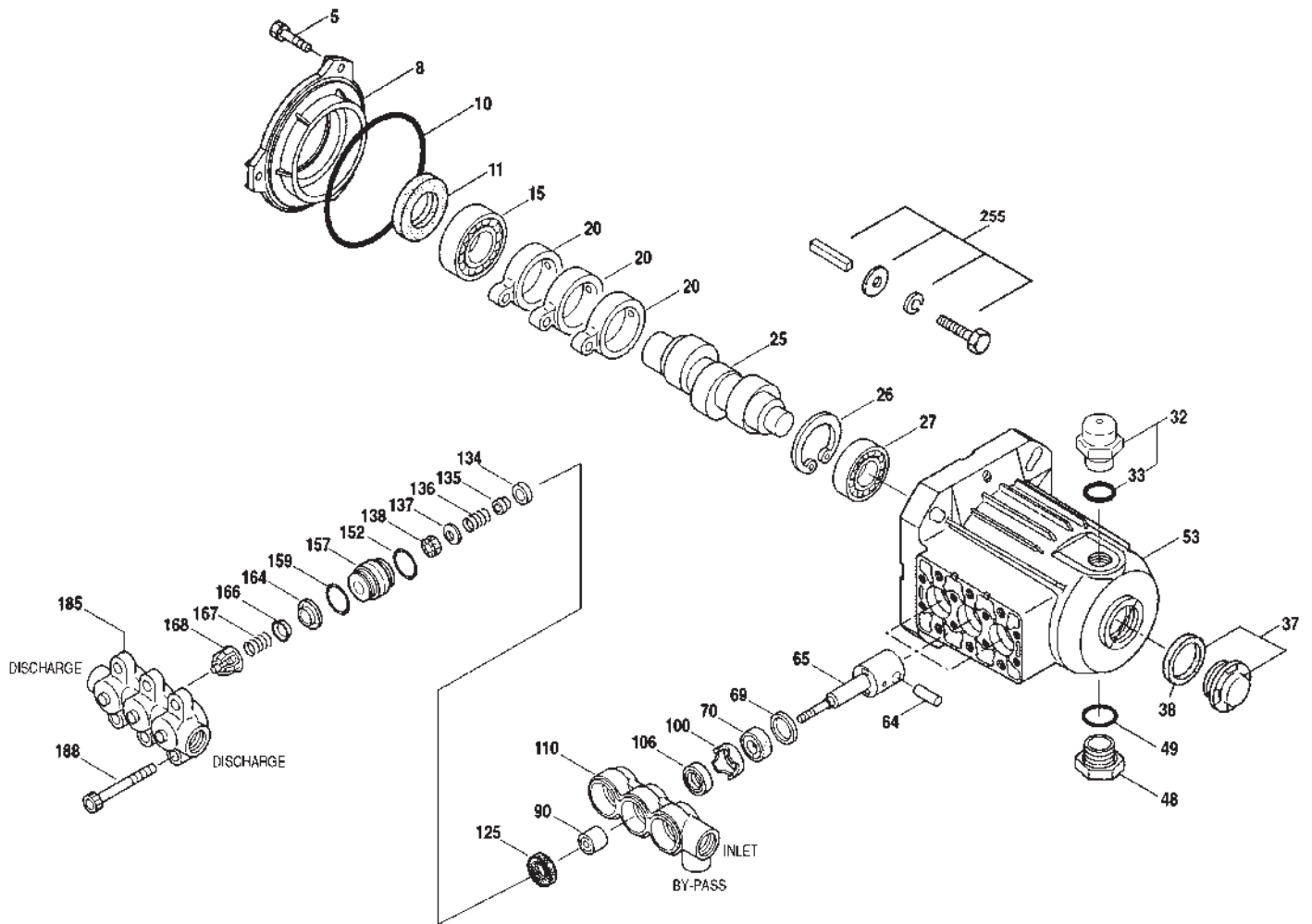
See Bulletin for
Pressure Vessel
Parts, back of manual



Membrane Element
Model 500, one 33-0238
Model 800, two 33-0238
Model 1000, two 33-0238
Model 1300, three 33-0238
Model 1800, four 33-0238



LTM System Manifold Assembly p/n V502060005
HP Gauge Replacement p/n 10181421CC
Flowmeter Replacement p/n 85012009
Manifold rebuild kit p/n V502060006



High Pressure Pump, Parts and Service Guide

HP Pump

Model 500, p/n 70-1253

Model 800, p/n 70-1255

Models 1000 & 1300 at 50 hz, p/n 70-1254

Models 1000 & 1300 at 60 hz, p/n 70-1256

Model 1800 Pump, p/n 70-1254

Pumps 70-1253/5/6, HP Pump outlet valve kit, p/n 70-6135

Pumps 70-1253/5/6, HP Pump inlet valve kit, p/n 70-6136

Pumps 70-1253/5/6, HP Pump seal service kit, p/n 70-6134

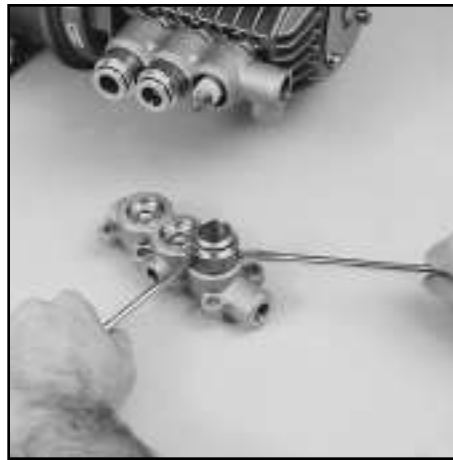
Pump 70-1254 only, HP Pump outlet valve kit, p/n 70-6138

Pump 70-1254 only, HP Pump inlet valve kit, p/n 70-6139

Pump 70-1254 only, HP Pump seal service kit, p/n 70-6137



Removal of Discharge Manifold



Removal of Adapter from Discharge Manifold



Removal of Adapter from Inlet Manifold

SERVICING THE VALVES

Disassembly of the Discharge Valve Assembly

1. Disconnect all plumbing and remove unloader for ease in servicing.

NOTE: CEE and SEEL models do not come with standard unloader.

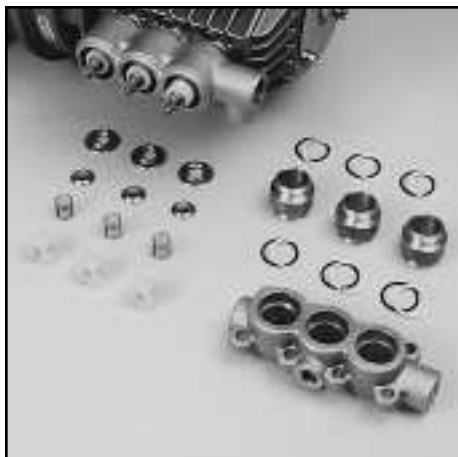
2. Inspect oil for proper level, presence of water or discoloration and replace as needed.
3. Using a standard M6 allen wrench remove the six (6) (2SF) or eight (8) (4SF) Socket Head Screws from the manifold. Remove the outer screws first, then the center screws.
4. Using a soft mallet tap the back side of the Discharge Manifold from alternate sides to maintain alignment and avoid damage to the plungers.
5. Grasp the Discharge Manifold from the underside and gradually lift manifold while you pull away from the Crankcase.
6. The Adapter Spacers may stay with either the Discharge or Inlet Manifold. By inserting two opposing

screwdrivers between Spacer and manifold you can easily pry them out of the Discharge Manifold. If they stay in the Inlet Manifold, gently work them up and down as you pull away from the Inlet Manifold.

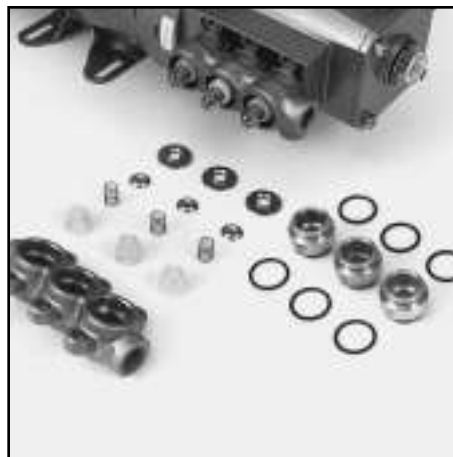
7. The valve assemblies are in the Discharge Manifold ports and will fall out when manifold is turned over. A complete valve assembly includes: Retainer, Spring, Valve and Seat.

NOTE: On "X" models the Adapter and Seat are one-piece.

NOTE: The "GZ" models use the standard "SF" Valve Kit.



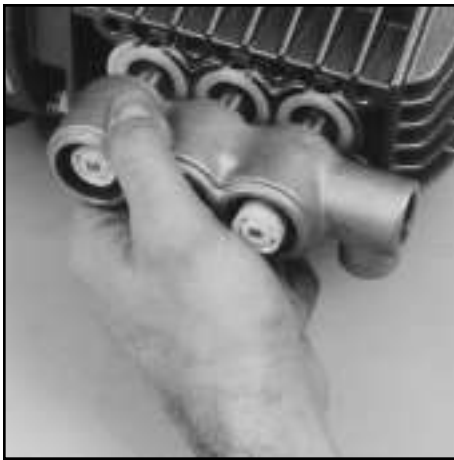
Discharge Valve Assembly (4SF)



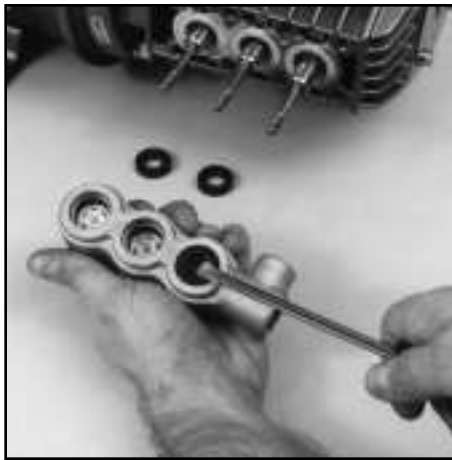
Adapter and Discharge Valve Assembly (2SF)



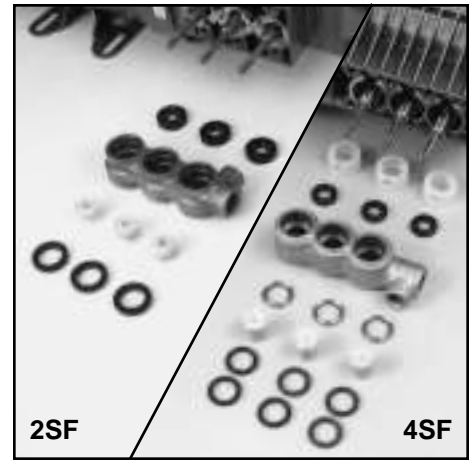
Inlet Valve Assembly



Removal of Inlet Manifold



Removal of Lo-Pressure Seal



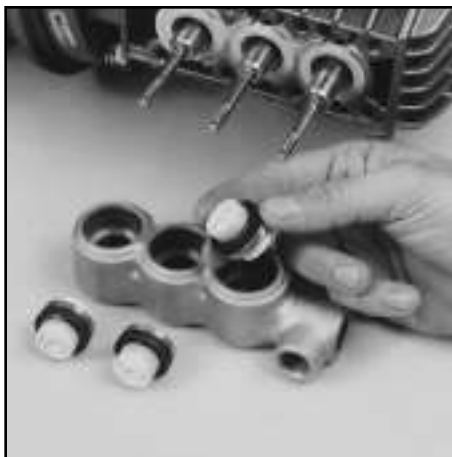
Plunger, Seals and V-Packing Arrangement

Reassembly of the Discharge Valve Assembly

1. Examine Adapter Spacer O-Rings and replace if worn. Lubricate and install O-Rings and Back-up-Rings **on both front and rear of the Adapter Spacer**.
2. Examine the Valve Retainers for scale buildup or wear and install into each Discharge Manifold port with tab down into the manifold chamber.
3. Replace worn or damaged Springs and place into Retainers.
4. Examine Valve and Seats for pitting, grooves or wear and replace as needed.
5. Place Valves over Springs with **concave side down**.
6. Place Valve Seats on Valves with **concave side down**.
- NOTE: On "X" Models, the Adapter and Seat are one-piece.**
7. Lubricate O.D. of Adapter Spacer and insert **smaller I.D. into Discharge Manifold ports**. Snap into position. Exercise caution not to cut or pinch o-rings.
8. Carefully guide Discharge Manifold with Spacers over Plunger Rod ends and press into Inlet Manifold.
9. Replace Socket Head Screws and torque per chart. Use torque sequence chart.
10. If oil was not changed, be certain oil is to mark on Oil Gauge before resuming operation.



Installation of Lo-Pressure Seals



V-Packing Positioning



Installation of V-Packings

SERVICING THE SEALS

Disassembly of the Seal Assembly

1. Remove the Inlet Valve Assembly from the exposed plunger rod ends, including Cotterpin, Nut, Washer, Spring, Spacer and Inlet Valve.
2. Grasp the Inlet Manifold from the front and underside and pull to remove from Plunger Rods.
3. Carefully examine back side of Lo-Pressure Seal before removing from the Inlet Manifold as it will be damaged during removal. If worn, insert screwdriver into I. D. of seal and pry out from the backside of the I.M. Exercise caution to avoid damage to the Inlet Manifold.

4. Press ceramic Plunger with thumb or soft tool from **back side of Inlet Manifold**.

On the Model 2SF the Hi-Pressure Seal may stay with the plungers or remain in the Inlet Manifold. If on the plungers, slide off by hand. If in the manifold, use a reverse pliers to remove.

On the Model 4SF the V-Packing and Female Adapters may stay with the plungers or remain in Inlet Manifold. If on the plungers, slide off by hand. If in the manifold, use a reverse pliers to remove.

5. Remove Seal Retainers from Crankcase by grasping tab with pliers and pulling out.
6. Examine Crankcase Oil Seal to determine if Crankcase servicing is needed.
7. Examine Ceramic Plunger, Lo-Pressure Seals, V-Packings for scoring, cracks and wear and replace.

NOTE: The "S" versions of the 4SF pumps have a replaceable Sleeve.

8. Examine the Sleeve for grooves for scale buildup and replace as needed. Grasp the Sleeve by hand and pull from the Plunger Rod.
9. Examine the O-Ring and Back-up-Ring under the Sleeve for cuts or wear and replace.
10. Examine the Barrier Slinger for wear and replace as needed. Install the Barrier Slinger with the concave side facing away from the Crankcase.

Reassembly of Seal Assembly

1. With Inlet and Discharge Manifold removed, examine Seal Retainers and replace if worn or damaged. Install on Plunger Rod and press into Crankcase **with tab out**.
2. Place Inlet Manifold on work surface with **Crankcase side up**.
3. Lubricate new Lo-Pressure Seals and press into position with **garter spring down**. Be certain the seal is seated squarely on the shoulder in the inlet manifold chamber.
4. Place Inlet Manifold on work surface with **Crankcase side down** (larger I.D. ports up).
5. On the Model 4SF place new Female Adapter into Inlet Manifold chamber with **v-groove facing up**.
6. Carefully examine the Plungers for scoring or cracks and replace if worn.
7. On the Model 2SF lubricate Ceramic Plungers and new Hi-Pressure Seals. Press the plunger into the seal and position seal in middle of plunger.

NOTE: Place the deeper recessed end of the plunger into the seal from the metal back side.

NOTE: The "Hi-Temp" 2SF models use a special Hi-Pressure Seal and Hi-Temp Seal Kit.

On the Model 4SF lubricate Ceramic Plungers and new V-Packings. Press Plunger into the V-Packings and position in the middle of plunger.

NOTE: The deeper recessed end of the plunger should face the same direction as the v-groove on the V-Packing.

8. On the Model 4SF lubricate the Plunger Rod O-Ring to avoid cutting during installation. Install the Back-up-Ring first then the O-Ring into the groove on the Plunger Rod.
9. Install the Sleeve with the tapered end facing out. Gently press towards the Plunger Rod shoulder until flush with the Barrier Slinger.
10. Carefully install Inlet Manifold over Plunger Rod ends and slowly press into Crankcase.
11. Install the Plungers onto the plunger rods. Press into position using the **larger I.D. end of Valve Spacer**.

SERVICING THE CRANKCASE SECTION

12. Examine Inlet Valve and replace if worn. **Inlet valves cannot be reversed if worn.** The S.S. Inlet Valves may be lapped if not badly worn. Install the S.S. Inlet valves with **square edges towards the plungers** (round edges towards the discharge). Install the Nylon Inlet Valve with **ridged side towards the discharge**.

NOTE: The "Hi-Temp" 2SF models use a Nylon Inlet Valve (order individual parts, not standard Inlet Valve Kit).

13. Examine Spacers for wear and replace as needed. Install Spacer on each Plunger Rod with **smaller O.D. towards inlet valve**.
14. Examine Springs for damage or fatigue and replace as needed. Place on Plunger Rods.
15. Install Washers next with **concave side towards Inlet Manifold**.
16. Install Nuts and torque per chart.
17. On 2SF and 4SF models **always install new Cotterpins** and turn ends to secure in position.

NOTE: "X" and S.S. Models do not use Cotterpins.

18. Refer to steps 7-10 under Servicing Valves-Reassembly to replace the Discharge Manifold.

2SF Torque Sequence



4SF Torque Sequence



Torque diagonally in order shown. The outer four (4) screws then center screws all hand tight. Then repeat series to specifications in torque chart.

1. While Inlet Manifold, Plungers and Seal Retainers are removed, examine Crankcase Seals for wear.
2. Check oil level and for evidence of water in oil.
3. Rotate Crankshaft by hand to feel for smooth bearing movement.
4. Examine Crankshaft Oil Seal externally for drying, cracking or leaking.
5. Consult CAT PUMPS or your local distributor if Crankcase service is required.

See section VIII of the Plunger Pump Service Video for additional information.

TORQUE CHART

Pump Item	Thread	Tool Size [Part No.]	Torque in. lbs. ft. lbs. Nm		
Outer Bearing Case Screw	M8	M10 Hex/Phil. [25082]	50	4.0	6
Inner Bearing Case Screw	M6	M10 Hex/Phil. [25082]	50	4.0	6
Manifold Screw	M8	M6 Allen [30941]	115	9.4	13
Plunger Rod Nut	M8	M10 Hex [25082]	55	4.4	6
Bubble Oil Gauge	M26	Oil Gauge Tool [44050]	45	3.6	5
Mounting 2SF					
Adapter Plate to Gas Engine	5/16-24	1/2" Hex	90	7.2	10
Pump to Adapter Plate	3/8-16	9/16" Hex	110	9.0	12
Pump to Electric Motor	3/8-16	9/16" Hex	110	9.0	12
Mounting 4SF					
Adapter Plate to Gas Engine	3/8-16	9/16" Hex	110	9.0	12
Pump to Adapter Plate	1/2-13	3/4" Hex	150	12.5	17
Pump to Electric Motor	1/2-13	3/4" Hex	150	12.5	17

Pressure Vessel Assemblies

For Seawater Elements



Contact Information:

Parker Hannifin Corporation
Filtration Group-Parker Village Marine
2630 E. El Presidio Street
Carson, CA 90810

Toll free: 1800 C-Parker
Phone: 310 608 5600
Fax: 310 608 5692
Email sales:
waterpurification@parker.com
Tech support:
watertech@parker.com
www.villagemarine.com
www.parker.com/watermakers

Key Features:

Parker Village Marine RO membrane pressure vessels feature non-metallic wetted surfaces for excellent corrosion resistance. Simple end plug design allows quick removal for element servicing. If the size you require is not shown please contact us for custom builds.

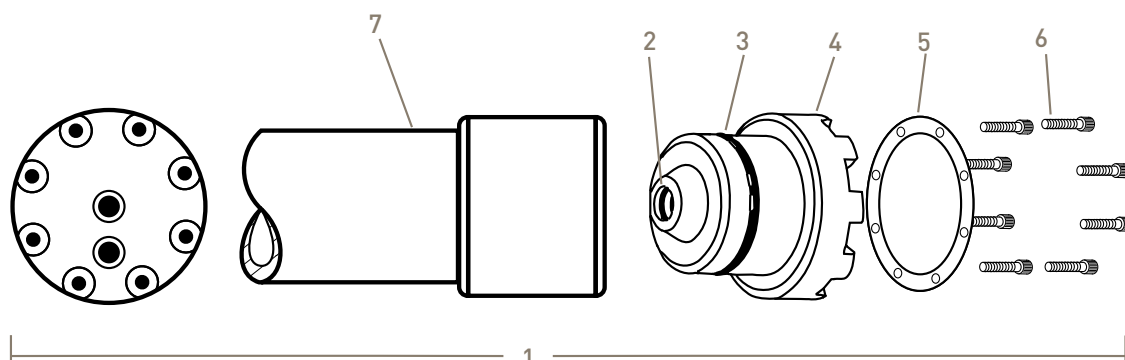
- Operating Pressure: 1000 psi/68 bar
- Shell: Filament Wound fiberglass
- Collars: 6061 T-6 Powdercoated aluminum
- End Plugs: Thermoplastic
- End Ring: 6061 T-6 Anodized aluminum on 2.5" and 4" size SS316 on 6" size
- Fasteners: SS316



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Pressure Vessel Assemblies

For Seawater Elements



Part Numbers:

Item	Description		Quantity per Assembly	2.5" x 19"	2.5" x 38"	4" x 40"	6" x 40"
1	Vessel Assembly**			32-2519	32-2537*	32-0444	32-6040
2	Product O-ring		4	32-2116	32-2116	32-2116	32-2229
3	End Plug O-ring		2	32-2228	32-2228	32-4342	32-0640
4	End Plug		2	32-2513*	32-2513*	32-4012	32-6012
5	End Ring		2	32-4013	32-4013	32-4014	32-0096
6	Capscrews		***	86-0106	86-0106	86-0123	86-0136
7	Shell	White	1	32-0025	32-0026	Please Call	Please Call
		Gray	1	32-0098	32-0099	32-4001	32-0001
	Weight (lbs/kg)			5/2	7/3	22/10	45/20

Notes:

*End Plug 32-2517 is also available for 2.5" vessels, which offers straight, coarse thread feed/reject port used on some VMT PW watermakers. Use of coarse thread end plug changes the vessel assembly p/n to 32-2538

**Membrane not included.
For applicable membrane elements see bulletin No. 7897 (Aqua Pro RO Membranes)

*** Capscrews:
Order 6 per end plug on 2.5" size
Order 8 per end plug on 4" size
Order 10 per end plug on 6" size

To maintain peak performance always use genuine Parker-Racor/Village Marine Tec. replacement parts.
We reserve the right to change our specifications or standards without notice.

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Print Reorder Number 7898 Rev-B 02-17-2016



ENGINEERING YOUR SUCCESS.

AquaPro® Sea Water RO Membranes



Contact Information:

Parker Hannifin Corporation
Filtration Group-Parker Village Marine
2630 E. El Presidio Street
Carson, CA 90810

Toll free: 1800 C-Parker
Phone: 310 608 5600
Fax: 310 608 5692
Email sales:
waterpurification@parker.com
Tech support:
watertech@parker.com
www.villagemarine.com
www.parker.com/watermakers

AquaPro® thin film composite reverse osmosis membranes deliver high salt rejection while maintaining high production rates to obtain the energy efficiency demanded by plant operators.

By selecting the highest grade of materials and thoroughly testing

performance, Racor Village Marine is able to offer the highest quality products.

Aqua Pro® membranes are designed for use in Racor Village Marine pressure vessel housings as well as other brand housings.

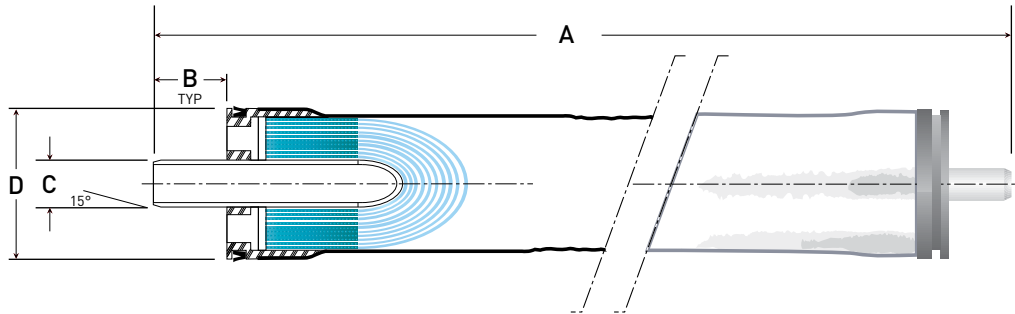


ENGINEERING YOUR SUCCESS.

AquaPro® Sea Water RO Membranes

Recommended Operating Limits:

- Maximum Operating Pressure: 1000 psi
- Maximum Operating Temperature: 113°F (45°C)
- Maximum Feed Turbidity: 1 NTU
- Free Chlorine Tolerance: 0 PPM
- Maximum Feed Silt Density Index: SDI 5
- pH Range:
Continuous Operation: 4-11
Short-term for Cleaning: (30 minute duration) 2.5-11



VMT Part No.	Nominal Size	Product Flow GPD m³/day	Typical Salt Rejection %	Dimensions inches/cm			
				A*	B	C	D
33-2519	2519	220 - 0.83	99.4	19/48	1.1/2.8	0.75/1.9	2.4/6.1
33-3000 **	2519	150 - 0.57	99.0	19/48	1.1/2.8	0.75/1.9	2.4/6.1
33-3001**	2519	105 - 0.40	99.0	19/48	1.1/2.8	0.75/1.9	2.4/6.1
33-0238	2538	550 - 2.08	99.4	38/96.5	1.1/2.8	0.75/1.9	2.4/6.1
33-3002**	2538	210 - 0.80	99.0	38/96.5	1.1/2.8	0.75/1.9	2.4/6.1
33-0440	4040	1200 - 4.54	99.4	40/101.6	1.0/2.5	0.75/1.9	3.96/10.1
33-0036	6040	2500 - 9.47	99.4	40/101.6	1.27/3.2	1.5/3.8	5.98/15.2
33-0840	8040	7250-27.36	99.4	40/101.6	0	1.125/29	7.9/201

* All 19" and 38" elements come with a 2" removable extender so that the stocked size also fits 21" and 40" housings

** Elements are specially designed for low feed flow applications. Use only with certain Sea Quencher and Little Wonder watermakers.

Notes:

- Keep elements moist at all times
- Permeate obtained from first two hours of operation should be discarded
- To prevent biological growth during storage, shipping, or system shutdowns it is recommended that elements be immersed in a protective solution. The standard solution for long or short term storage should contain 1.0 percent (by weight) sodium metabisulfite (available as VMT p/n 85-0103, 85-0038, 85-0044 or 85-0049)
- Standardized test conditions are 32,000 ppm NaCl at 77° F (25° C), with 800 psi feed. Production rates for individual elements may vary +/- 20% and rejection may vary +/- 0.4%

To maintain peak performance always use genuine Parker-Racor/Village Marine Tec. replacement parts.
We reserve the right to change our specifications or standards without notice.

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Print Reorder Number 7897 Rev-C 02-17-2016



ENGINEERING YOUR SUCCESS.

Pleated Filters and Filter Cartridge Kits



Contact Information:

Parker Hannifin Corporation
Filtration Group-Parker Village Marine
2630 E. El Presidio Street
Carson, CA 90810

Toll free: 1800 C-Parker
Phone: 310 608 5600
Fax: 310 608 5692
Email sales:
waterpurification@parker.com
Tech support:
watertech@parker.com
www.villagemarine.com
www.parker.com/watermakers

The Village Marine Tec. line of pleated filters are designed specifically for the RO watermaker industry and are superior to wound or polyspun cartridges to give you a longer filter life as well as increasing flow rates and keeping cartridge size down.

Available in a wide arrange of sizes and micron ranges to ensure that every type of watermaker filter need is taken care of. Stock sizes fit most standard filter housings, if the size you need is not shown please contact us with the dimensions required.

Single use Cleaning and Preservative Cartridge Kits are designed specifically for small RO Systems. The Cartridges allow for easy and effective membrane maintenance.

The Cleaning and Preservative Cartridge Kits eliminate the trouble and mess of measuring powdered chemicals and ensuring correct chemical concentrations. The Chemical cartridges fit directly into 2.5" x 10" or 4.5" x 10" housings and contain the correct amount of chemical for a single use.



ENGINEERING YOUR SUCCESS.

Pleated Filters and Filter Cartridge Kits

Features:

Pleated Filters

- Polypropylene pleated construction
- Longer service life over wound or polyspun cartridges
- Easily cleaned and reused
- Chemically compatible with a wide range of alkalies, most acids and saline solutions
- 0.5, 1, 5, and 20 micron nominal ratings available
- Pliable ends ensures filter seal to eliminate bypass
- High packing density reduces filter size while keeping flow rates up

Pleated Sediment Elements

Part Number	Microns	Filter Area ft ² /m ²	Diameter inch/cm	Length inch/cm
33-0118	20		2.75/7	9.75/25
33-0117	5		2.75/7	9.75/25
33-0053	20		4.5/11.4	9.75/25
33-0052	5		4.5/11.4	9.75/25
33-0020	20	30/2.79	8.63/22	7.75/20
33-0005	5	30/2.79	8.63/22	7.75/20
33-0058	20		4.5/11.4	20/51
33-0057	5		4.5/11.4	20/51
33-0172	100	100/9.29	8.63/22	24.3/62
33-2100	20	100/9.29	8.63/22	24.3/62
33-5100	5	100/9.29	8.63/22	24.3/62
33-1100	1	100/9.29	8.63/22	24.3/62
33-1105	0.5	100/9.29	8.63/22	24.3/62

Filter Cartridge Kits

- Cartridge with Blue stripe contains cleaner #1, a biological cleaner to remove algae, fungi and bacteria
- Cartridge with Red stripe contains cleaner #2, an acidic cleaner to remove scale from the membrane
- Cartridge with Green stripe contains the preservative. This chemical is used for pickling the membranes
- Cartridges are capable of being used in any housing that takes a standard 2.5" (64mm) x 10" (254mm) filter cartridges

Carbon Flushing Filters

Part Number	Diameter inch/cm	Length inch/cm
33-0311	2.75/7	9.75/25
33-0315	4.5/11.4	9.75/25
33-0083	4.5/11.4	20/50.8

Cartridge Filter Kits

Description	Part Number	Contents
Cleaning Kit	85-0102	One Blue stripe cleaner #1 plus One Red stripe cleaner #2
Preservation Kit	85-0103	Two Green stripe preservative

To maintain peak performance always use genuine Parker-Racor/Village Marine Tec. replacement parts. We reserve the right to change our specifications or standards without notice.