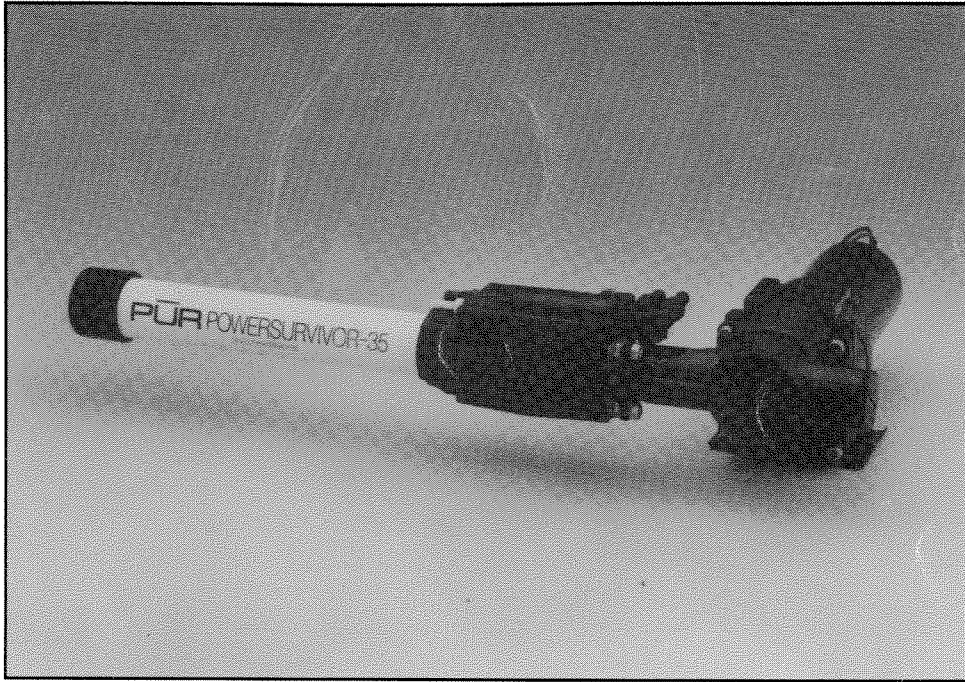


PÜR™

POWERSURVIVOR™ – 35



TECHNICAL MANUAL

■ PÜR, a division of Recovery Engineering, Inc.
2229 Edgewood Avenue South ■ Minneapolis, MN 55426
612-541-1313, 800-845-PURE, FAX 612-541-1230

7873
Form MAN-5 (7-91) Printed in USA

IMPORTANT PRECAUTIONS

- Before starting the system (electrical operation), be sure that the compartment is free of explosive fumes.
- Operate only in clean open-ocean water. Do not operate in dirty harbor water, or when there is oil, diesel fuel, or gasoline in the feedwater. Do not operate in water with high concentrations of chlorine.
- The product water line connection into the fresh water storage tank must be above the highest water level in the tank, to prevent drawing chlorinated water back into the PowerSurvivor-35.
- Inspect the unit often when operating (at least every 4 hours).
- If the unit will be stored for more than 7 days after use in clean seawater, treat the membrane with biocide (see "Storage").

READ ALL INSTRUCTIONS

Because most owners will use the PowerSurvivor-35 to convert seawater to clean drinking water, we have written the following instructions from that perspective. However, we have also included information on special procedures you should follow in other situations (as when using the unit in swamp water).

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Thank You!

Thank you for purchasing this PowerSurvivor™-35 Watermaker. It was designed and built to rigorous specifications by Recovery Engineering, Inc., to provide fresh water while using minimal power.

We urge you to read the entire installation and operation sections of the manual before you begin. By following those instructions, you should enjoy years of trouble-free operation. Although little routine maintenance is required, please pay special attention to the cleaning and storage instructions: for reliable operation, the reverse osmosis membrane must be kept in sound working condition.

For easier future reference, we suggest that you fill in your PowerSurvivor-35 dealer's name, address, and telephone number below. Also, please fill in the enclosed warranty card and return it as soon as possible: it will help expedite a warranty claim if you should have one.

Thanks again for purchasing the PÜR™ PowerSurvivor-35. We value your business, and wish you years of good cruising – knowing that fresh water is always nearby.

DEALER NAME: _____

ADDRESS: _____

TELEPHONE: (_____) _____

If for any reason you cannot get satisfactory information, service, or parts from a local dealer, please contact Recovery Engineering directly at:
TEL: 612-541-1313
1-800-845-PURE
FAX: 612-541-1230

HOW IT WORKS

REVERSE OSMOSIS

Reverse osmosis technology was developed in the 1960's. Scientists observed how liquids pass through a semipermeable membrane in nature, and tried reversing the process. They learned that if seawater is forced against an appropriate membrane at high enough pressure, pure water will pass through – but the membrane will act as a barrier against contaminants such as salts. Moreover, a membrane designed to remove dissolved solids such as salt molecules will easily remove viruses and bacteria, which are much larger.

Only about 10% of the seawater passes through the membrane. The remaining waste brine, which contains the salt, is dumped out. So, for every gallon of pure water desired, up to ten gallons of seawater must be pressurized. Because conventional reverse osmosis processes require up to 1000 psi (7000 kPa) of pressure, this approach is very energy-intensive – yet, in many situations where people need fresh water,

such as emergency life rafts or sailboats, power resources are quite limited.

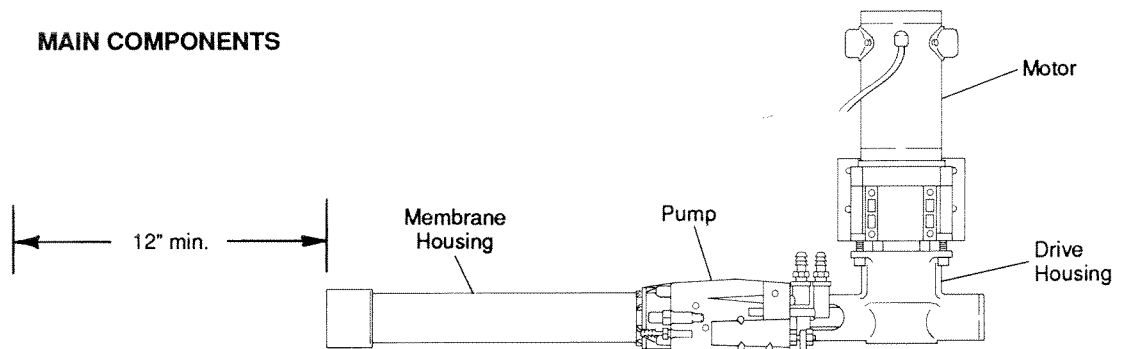
ENERGY RECOVERY

In reverse osmosis, the waste brine stream contains up to 90% of the energy expended. If this energy can be recovered from the waste brine, the power needed to purify seawater is dramatically reduced.

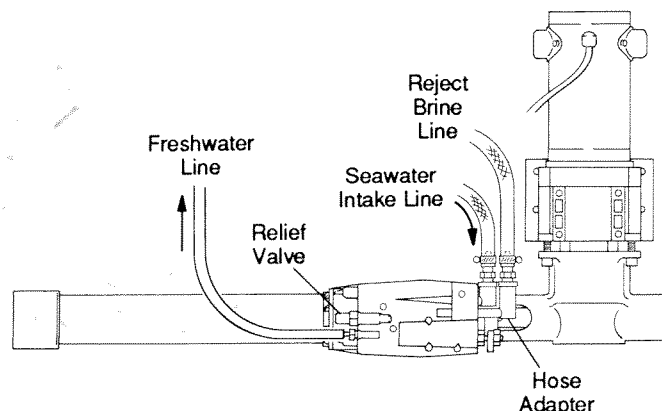
To do so, Recovery Engineering developed and patented a high-pressure energy recovery pump, which recycles the high-pressure brine by redirecting it to the back side of the piston. By balancing the opposing force on the piston's front side, the brine provides a power assist to the limited power supply driving the pump. The result is the PowerSurvivor-35, which desalinates seawater using less than 15% of the energy needed for a conventional reverse osmosis system.

Relying on an imaginative design that uses a minimum number of moving parts, the PowerSurvivor-35 is a simple, reliable watermaker that you can stake your life on.

MAIN COMPONENTS



PLUMBING CONNECTIONS



INSTALLATION

UNPACKING

The PowerSurvivor-35 shipping carton contains the following:

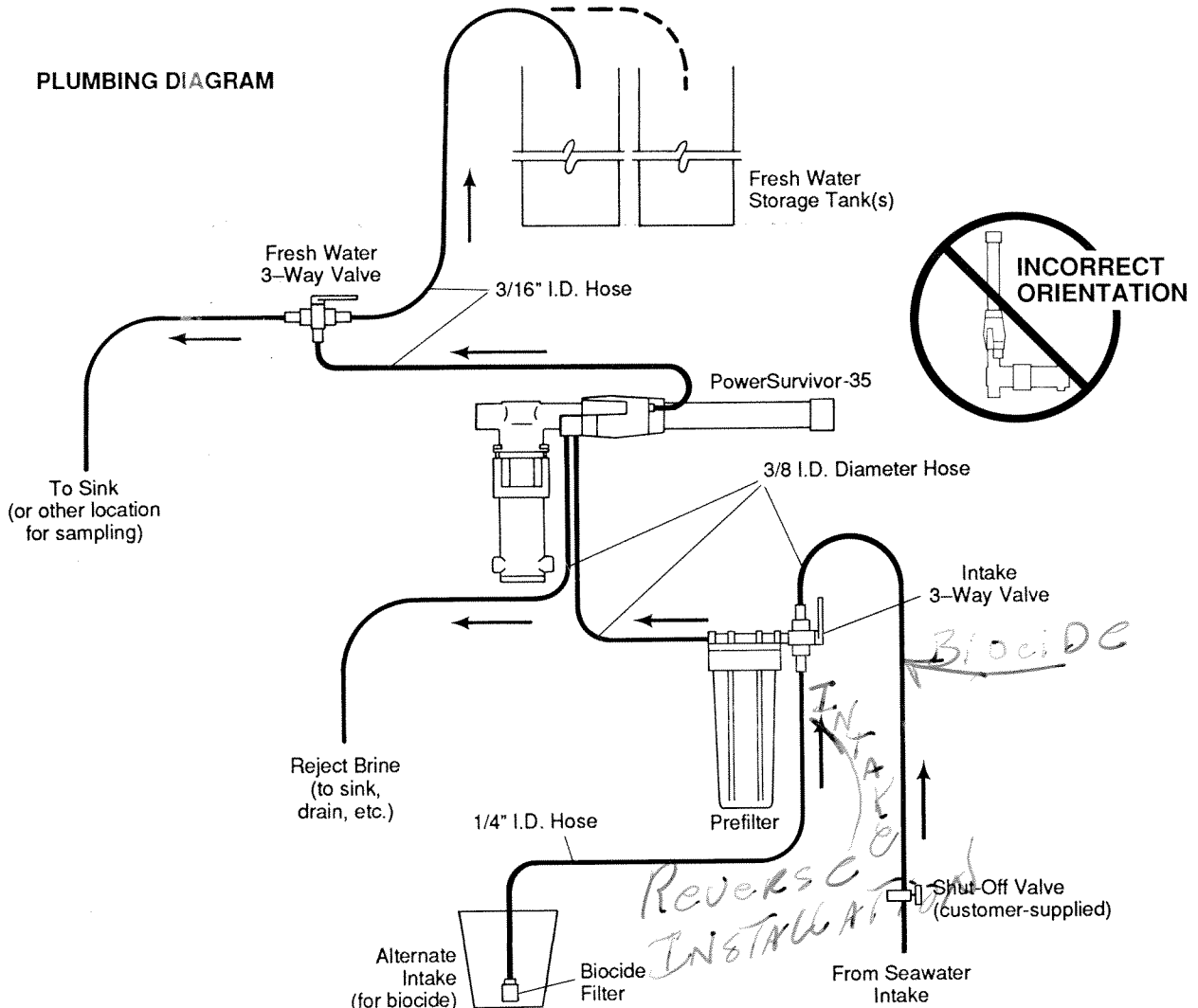
- Motorized pump assembly
- Auxiliary handle assembly
- Prefilter housing, with fittings and filter cartridge
- Prefilter cartridge, spare
- Intake/reject hose, 3/8 in. braided (10 ft)
- Product hose, 3/16 in. I.D. (10 ft)
- Auxiliary intake hose, 1/4 in. I.D. (3 ft)
- Intake valve, with fittings
- Product valve, with fittings
- Auxiliary intake strainer
- Prefilter mounting bracket, with 8 screws
- Membrane preservative (biocide), 100-g. bottle
- Tube inserts for 3/16 in. I.D. hose (qty: 3)
- Tube insert for 1/4 in. I.D. hose
- Stainless steel hose clamps
- Technical manual.

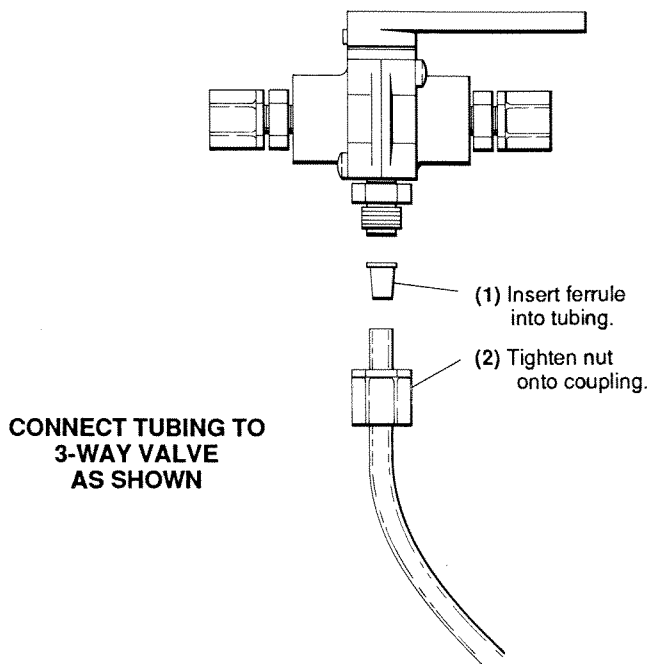
MOUNTING LOCATION

Use the following criteria in determining a mounting location for the PowerSurvivor-35:

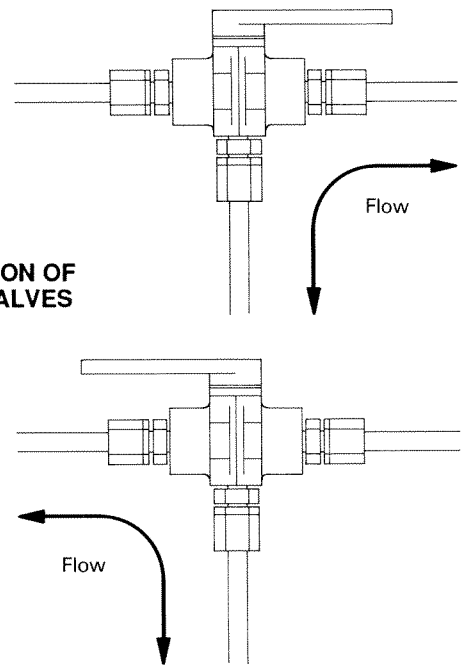
- If possible, install it close to the seawater intake. A feed line longer than 15 ft (4.5 m) may lower the efficiency of the pump.
- Install the PowerSurvivor-35 close to or below the water line, if possible.
- Provide adequate air circulation to cool the electric motor. The area must be free of explosive fumes.
- Mount the unit in an area that will drain to the bilge, as there may be a small amount of leakage from the high-pressure dynamic seals after a period of use.
- While the unit will run properly in any orientation, the drive housing should **not** be directly below the pump (that is, with the membrane housing vertical).

PLUMBING DIAGRAM





OPERATION OF 3-WAY VALVES



PLUMBING

Study this entire section and the plumbing diagram, then plan an appropriate plumbing layout for your specific situation. **Avoid** any shortcuts which violate the guidelines below, and **do not** use inferior tubing or connectors.

NOTE: Remove the red caps from all hose barbs before attaching tubing.

Seawater Intake

For the seawater intake line, select a through-the-hull location that will remain below the water line at all times. Either install a new fitting in the hull, or install a tee in the line from an existing fitting.

An existing through-the-hull fitting can be used **only** if the equipment it is connected to does not cause a negative pressure at the PowerSurvivor-35 when both devices are operating. To minimize this possibility, connect to the existing line **as close to** the hull fitting as possible.

Do not collect feedwater from a sink drain – oil and grease will rapidly foul the membrane!

Do not collect feedwater through rusty lines or fittings – rust also seriously decreases the membrane performance.

Install a shutoff valve and a coarse strainer or hull grill in the seawater intake line.

Prefilter

A prefilter assembly is supplied with the PowerSurvivor-35, to protect the pump and membrane from dirt

in the seawater. Mount it close to or below the water line. The sump should be at the bottom of the filter for easy removal.

Protect the filter from freezing temperatures, or the housing may crack.

The prefilter is shipped with a cartridge installed, and a spare is also supplied. Depending on anticipated usage (and water conditions), you should keep a quantity of additional cartridges on hand: order Part No. IK1-006-0300 for a carton of six.

Plumbing Selection

Use only corrosion-resistant piping: NSF-approved plastic such as PVC, polypropylene, or polyethylene is best. Monel, 90/10 or 70/30 copper nickel, or 316 stainless steel are the most suitable metals (brass and copper will have a shorter life).

The PowerSurvivor-35 is shipped with 10 ft (3 m) of 3/8-in. ID, 5/8-in. OD hose, which should be adequate for the intake and reject lines in most installations. A 3-ft (1-m) auxiliary feed line of 1/4-in. ID hose is also included.

Three-Way Valves

Two three-way valves are supplied with the PowerSurvivor-35.

Connect the inlet three-way valve so that in one position water can be taken in from the seawater intake, and in the other position cleaning or biocide solutions can be drawn in from a bucket.

Connect the fresh water three-way valve so that in one position clean water can be directed to a storage tank,

and in the other position it can be directed to a sink or other location for sampling during pump start-up.

Storage Tank(s)

We recommend that more than one tank be used for storing water. That way, if the PowerSurvivor-35's membrane should fail only one tank of water would be contaminated.

When the PowerSurvivor-35 is shut off, some fresh water from the line to the storage tank will be drawn back into the membrane. Chlorine will damage the membrane: to prevent chlorinated water from the storage tank being drawn back into the membrane, the storage tank inlet should be at the top of the tank above the water line. If that is not possible, the hose to the tank must be at least 5 ft long.

Reject Brine Line

Run the reject brine line to an appropriate drain. Be sure it will **not** be discharged close to the system intake.

Plumbing Connections

The PowerSurvivor-35's pump will not work if any air can get into the intake lines. Use only good-quality tub-

ing connectors similar to those supplied with the unit, and use pipe sealant on the threads at all connections.

ELECTRICAL CONNECTION

Refer to the electrical diagram.

Connect 12V electrical power to the unit, using 14AWG or heavier-gauge wire. The motor runs equally well in either direction, so it doesn't matter which wire is connected to positive or negative.

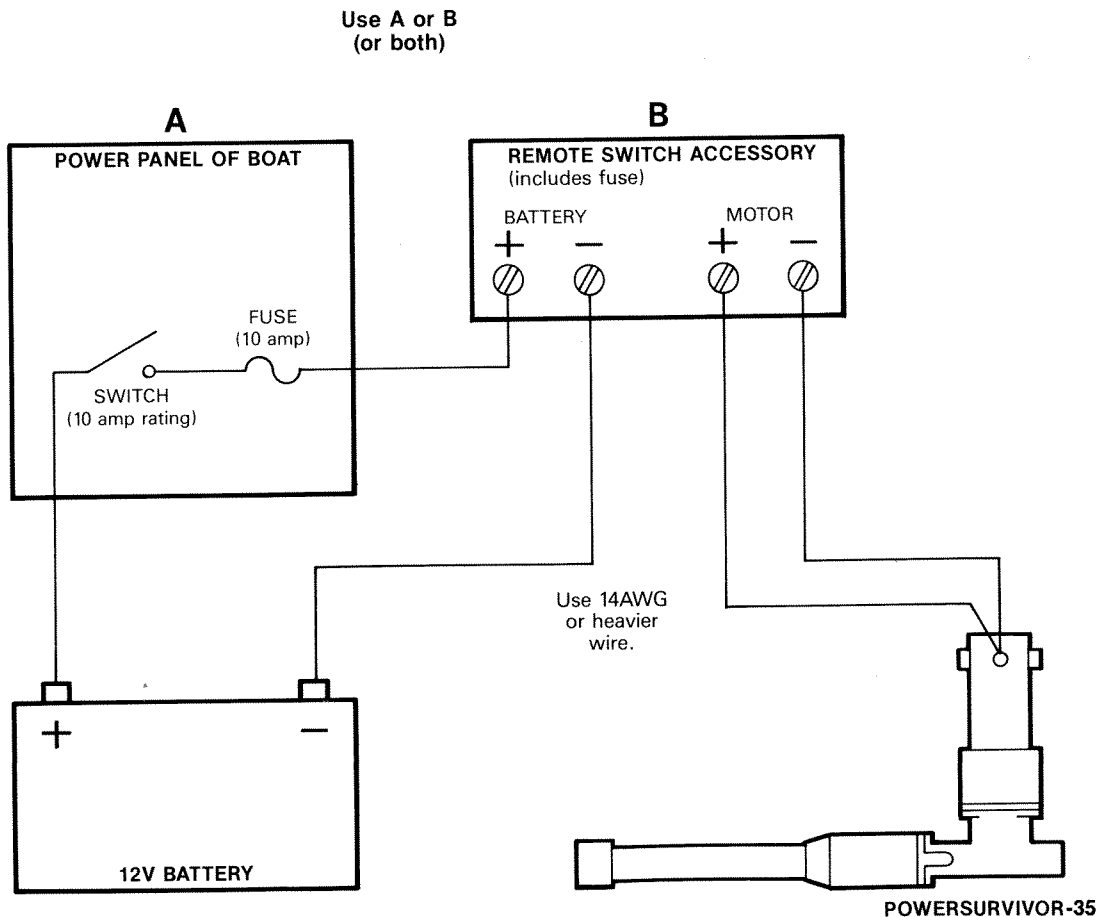
Install a 10-amp switch in the line, in a convenient location for normal operation.

Depending on the location of the PowerSurvivor-35, you may want to install a second switch (near the unit) in series with the first, for convenience when flushing with chemicals or servicing. A Remote Switch Accessory, Part No. IK2-0200, is available from Recovery Engineering and includes instructions for its installation.

Use a 10-amp fuse to protect the line and electrical system.

NOTE: The average current draw is 4 to 5 amps, depending on water temperature and salinity. However, the draw fluctuates during each revolution of the pump, giving a momentary peak current that is higher than the average.

ELECTRICAL DIAGRAM



OPERATING PROCEDURE

START-UP

1. Set the intake 3-way valve at the SEAWATER INTAKE position.

Set the fresh water 3-way valve at the SINK/SAMPLING position.

2. Turn on the power at the electrical panel (also turn on the remote switch, if used).

NOTE: If the prefilter cartridge is new, the unit will not draw in seawater for several minutes. You can speed this start-up time by filling the prefilter housing with clean seawater before you turn on the system.

3. Once seawater has filled the system and the reject brine stream is clear (no air bubbles), pressure will rise in the unit.

Within a few minutes, water will flow from the fresh water line.

4. Continue to divert the water to the sink/sampling line for 3 to 5 minutes, to clear the system of salt that passes through the membrane when not running.

IMPORTANT: At initial start-up of a new unit, or of a unit that has been inhibited (filled with biocide storage solution to inhibit biological growth), divert the product water to the sink/sampling line for **at least 20 minutes** to clear the biocide solution from the system.

5. Once the unit is producing good water (the product water should not taste salty), turn the 3-way fresh water valve to the STORAGE TANK position.

You can then run it for as short or long a time as you wish. However, because of the 3-to 5-minute start-up time, it is usually desirable to collect fresh water for at least a half hour at a time.

TEMPERATURE AND SALINITY

The PowerSurvivor-35 is designed to operate under the following seawater conditions:

Temperature: 2 to 45° C (36 to 113° F)

Salinity: 35,000 ppm TDS (total dissolved solids) average

If the water is colder than 10° C (50° F) or the concentration is above 35,000 ppm, the internal pressure of the pump will be high, and water may squirt from the relief valve. This is normal.

DURING OPERATION

Check the unit and plumbing for water leakage at least every four hours.

Check the prefilter occasionally and change the cartridge when it gets dirty, when the fresh water output decreases noticeably, or when the amperage increases. Keep an adequate supply of new cartridges on hand at all times.

If the unit is used to treat feedwater that has a high bacteria content (for example, swamp water), the membrane should be inhibited **daily** with a biocide (see "Storage Instructions").

For your safety, follow all the warnings under "Important Precautions," page ii.

SHUTDOWN

For normal shutdown, just switch off the power and turn the fresh water valve to the SINK/SAMPLING position.

Any time that the unit will be out of service for 7 days or longer, the membrane should be inhibited with a biocide. See "Storage Instructions."

STORAGE

Biological growth will occur in the membrane if seawater is left in the PowerSurvivor-35 for long periods of time. If the unit is used regularly, the growth will not be significant. However, larger amounts will reduce the membrane's performance.

If the unit won't be operated for 7 days or longer, use the following inhibiting procedure to prevent such growth.

NOTE: If operating in swamp water, or extremely hot humid conditions, follow this procedure **daily**.

BACTERIAL INHIBITING PROCEDURE

Biocide (a chemical to prevent biological growth in the membrane) is provided with the unit.

IMPORTANT: The biocide chemical contains sodium bisulfite, which is not harmful but may cause an allergic reaction. Be sure to follow the described procedures.

1. Turn the intake 3-way valve to the ALTERNATE INTAKE position. Refer to the plumbing diagram, page 3.
2. Fill a plastic container with about a quart of clean water. Fresh water is preferable, but clean seawater can be used if fresh water is not available.
3. Mix one capful of the biocide with the water until dissolved.

4. Place the alternate intake line into the container, and run the system until all the solution has been drawn from the container.

Continue running the system until as much liquid as possible has been flushed out of the reject line (about 30 seconds).

5. If the system will be shut down for several weeks, or if there is a possibility of freezing temperatures, empty the prefilter housing and remove the cartridge.
6. If seawater was used to mix the biocide solution, repeat the above procedure with fresh water as soon as it is available.

IMPORTANT: Repeat the above procedure at least once a year if the system has not been run. The membrane will last for several years in storage if it is inspected yearly and the above inhibiting procedure is repeated.

Under severe fouling conditions, a capful of biocide can also be dissolved into the prefilter housing to prevent fouling of the cartridge.

RETURNING TO OPERATION AFTER STORAGE

When returning the unit to operation after storage, simply follow the normal procedure under "Start-Up" in the Operation section (divert the fresh water to a sink for at least 20 minutes to flush out the biocide chemical).

MANUAL OPERATION

You can operate the PowerSurvivor-35 by hand if there is an electrical power failure. To do so, replace the electric motor with the manual operating handle as outlined below.

ATTACHING THE HANDLE

1. For easy access, pull the tubing off the two hose barbs on the drive end of the pump.
2. Slide back the rubber cap and pull or tap out the pin which connects the pump shaft and motor drive shaft.
3. With a 1/2-in. wrench, remove the four drive housing nuts. Pull the pump from the drive housing. Remove the rubber cap from the piston shaft.
4. Remove the clevis pin from the free end of the linkage on the handle assembly.
5. Align the handle brackets with the two pump bolts that are opposite the cutout in the pump end.
6. Position the brackets over the bolts, and fasten with two of the nuts that held the drive housing in place. Do not overtighten the nuts.
7. Line up the holes on the handle linkages with the hole on the pump shaft. Insert the clevis pin (from step 4) through the two linkage halves and the pump shaft.
8. Push the hair pin through the clevis pin. Rotate the clevis pin so the hair pin is vertical, with the loop at the top.
9. Reattach the intake and reject-brine tubing.
10. You may need to use longer hose(s) so you can operate the unit in a convenient location.

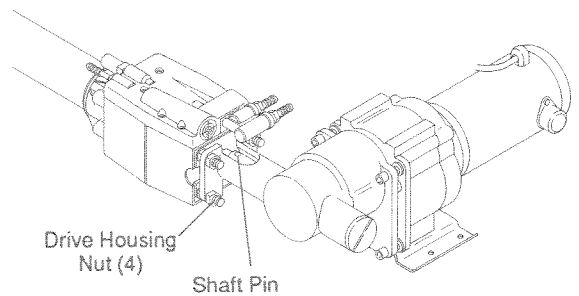
PUMPING WITH THE HANDLE

Move the handle back-and-forth to the full end of its travel in each direction. Pump about one complete back-and-forth stroke every two seconds (one second back, one second forward). If water squirts from the relief valve, you are pumping too fast.

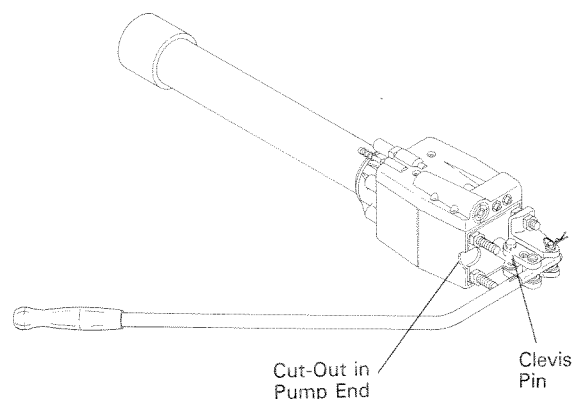
RETURNING TO ELECTRICAL OPERATION

Reverse the above procedure to reconnect the motor drive to the pump. Align the pin holes in the pump shaft and motor drive shaft **before** you slide the pump onto the four bolts. Tighten the four nuts equally.

REMOVING THE DRIVE HOUSING



ATTACHING THE HANDLE



MEMBRANE CLEANING

The membrane does not have to be cleaned regularly. However, even in normal operation it can eventually become dirty or fouled with biological growth and particles which are small enough to pass through the prefilter. Also, under certain conditions mineral scaling can occur on the membrane surface.

This build-up on the surface of the membrane can cause the fresh water flow rate to be low or the operating pressure to be high. The most likely symptom will be discharge of seawater from the relief valve on the pump body, because of higher-than-normal operating pressure.

Under the above circumstances, the membrane should be cleaned as described below. Use Recovery Engineering's IK4-0200 Membrane Cleaning Accessory, which consists of a special membrane-cleaning housing and cleaning agents.

Two types of cleaner are provided with the accessory – alkaline and acid. The alkaline cleaner is used to remove biological fouling, oil, or dirt; the acid cleaner is used to remove mineral scaling.

Cleaning with just the alkaline cleaner will usually restore the membrane's performance. However, if low output or higher-than-normal pressure continues, the acid cleaner should also be used.

The procedure is the same for both cleaners. Use the

alkaline cleaner first, following the procedure below. If the acid cleaner is also required, flush the system and repeat the procedure with it.

CLEANING PROCEDURE

1. Mix three level capfuls of the cleaning agent with one gallon of clean fresh water, in a clean pail. The water should be warm but not hot – maximum of 122° F (50° C). Mix until the cleaner is completely dissolved.

2. Grasp the membrane housing with both hands and turn counterclockwise until it can be removed.

In its place, install the special membrane-cleaning housing provided with the kit. Screw the housing all the way on by hand, but don't overtighten.

3. Place the auxiliary intake tubing (from the intake 3-way valve) into the pail of warm water, and turn the valve to the AUXILIARY INTAKE position.

4. Turn on the PowerSurvivor-35. Discard the water coming from the discharge hose (on the end of the cleaning housing) for about 30 seconds, then place the return hose into the cleaning solution container.

Continue running the unit while recirculating, for about 15 minutes.

5. Turn the pump off and allow the membrane to soak for at least an hour. For severe fouling, an extended soak period of 10 to 15 hours may be desirable.

6. After soaking, restart the pump. Dump the first few pulses of solution that come immediately from the discharge hose.

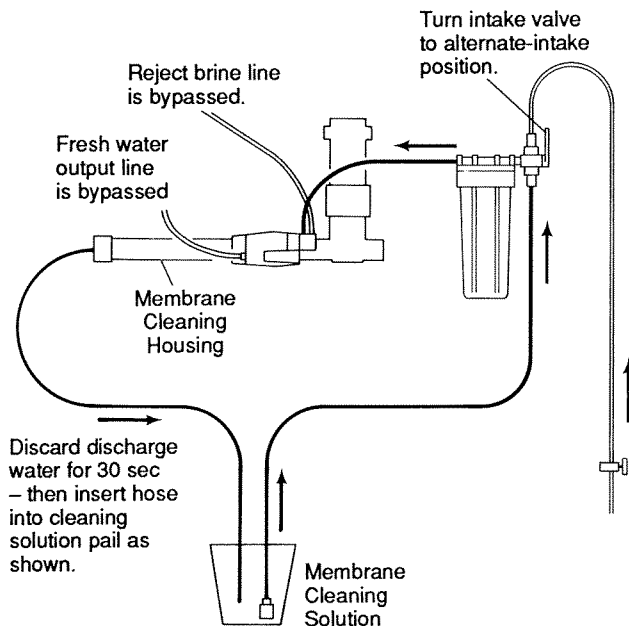
When the stream becomes cleaner, place the hose back into the pail of cleaning solution and recirculate for another 30 to 60 minutes.

7. After cleaning, flush by pumping warm fresh water through the system (insert the alternate intake hose into a pail of fresh water, and run the discharge water from the cleaning housing to a drain). If fresh water is not available, you may use seawater if it is above 68° F (20° C).

8. Remove the cleaning housing and reinstall the normal membrane housing.

9. If the unit won't be used for at least 7 days after cleaning, follow the inhibiting instructions under "Storage."

**PLUMBING DIAGRAM,
MEMBRANE CLEANING**



PREFILTER CARTRIDGE REPLACEMENT

The prefilter protects the pump and membrane from dirt in the incoming seawater. Depending on the amount of use and the condition of the seawater, the prefilter's cartridge may last for months or only days.

If the fresh water flow is reduced to less than 70 cc/min, or if the flow stops because of pump cavitation (pump draws air), the cause is usually a dirty prefilter cartridge. Replace it when the fresh water output decreases.

NOTE: The life of the filter cartridge can be extended by rinsing occasionally with clear seawater. If the symptoms continue, replace the cartridge.

TO REPLACE THE CARTRIDGE

1. **IMPORTANT:** Close the shut-off valve between the through-the-hull fitting and the prefilter intake.
2. Unscrew the bottom of the prefilter housing by turning it counterclockwise. The O-ring seal may come out of its groove or stick to the housing cap.

3. Remove the old filter cartridge and empty the water from the housing.
4. Wipe the housing bowl and gasket clean, and rinse them with clean water.
5. Wipe the O-ring seal clean with a cloth, then lubricate it very lightly with silicone grease. **Do not use** petroleum-based lubricants on the O-ring.

Reinstall the O-ring seal snugly into its groove in the housing bowl. Do not wipe off the lubricant after the O-ring is seated.

6. Install a new cartridge in the housing. To speed the priming of the PowerSurvivor-35, fill the housing with seawater.
7. Reattach the housing by turning clockwise. Hand-tighten only, just enough to avoid leaks – over-tightening will make it hard to remove the next time.

OVERHAUL PROCEDURE

TOOLS AND SUPPLIES REQUIRED (to overhaul the PowerSurvivor-35)

- Needle-nose pliers
- 5/32-in. Allen wrench
- 1/2-in. open-end or socket wrench
- Standard-blade screwdriver
- IK1-015-3900 Silicone Lubricant.

If your PowerSurvivor-35 requires an overhaul – to replace the various O-rings and seals which will gradually deteriorate with use or age, or to replace one or more of the major modules of the unit – we recommend that you return it to Recovery Engineering. However, if this is not possible, the next three pages explain in detail how to overhaul the unit yourself.

This section is arranged in the proper sequence for a **complete** overhaul, first giving complete disassembly and then complete reassembly procedures. If less components are to be replaced, select those steps which are required.

The parts list at the end of this manual shows the replacement parts which are available, and has an exploded-view of all the modules.

DISASSEMBLY

Remove Membrane Assembly from Pump

NOTE: If you are only going to replace the manifold or the drive housing, you don't have to remove the membrane assembly from the pump.

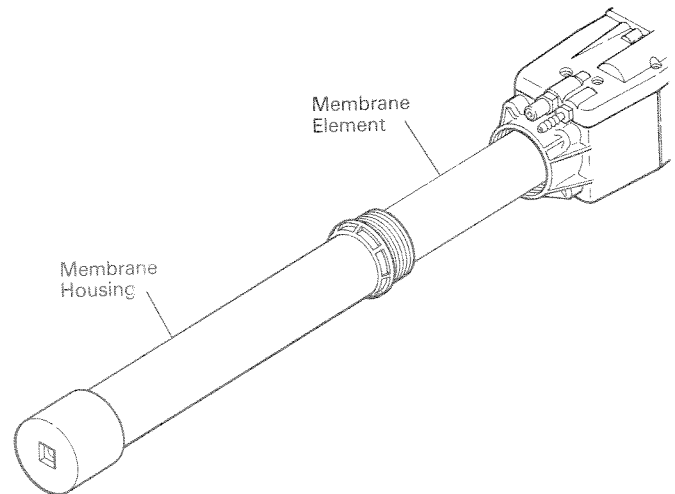
1. Grasp the membrane housing with both hands and turn counterclockwise until it can be removed.
2. Remove the membrane element with a pulling-and-twisting motion.

Remove Pump from Drive Housing

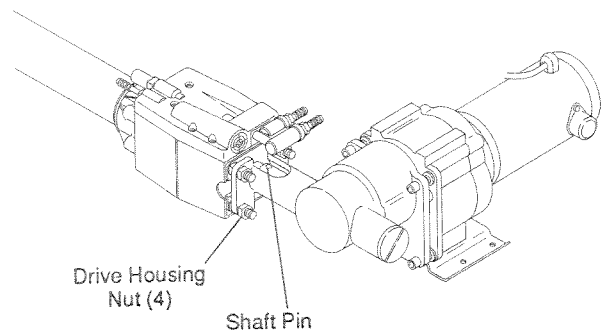
NOTE: If you are only going to replace the manifold, you don't have to remove the pump from the drive housing.

1. Pull the tubing off the two hose barbs on the drive end of the pump.
2. Slide back the rubber cap, and pull or tap out the pin which connects the pump shaft and motor drive shaft.
3. With a 1/2" wrench, remove the four drive housing nuts. Pull the pump from the piston shaft. Remove the rubber cap from the piston shaft.

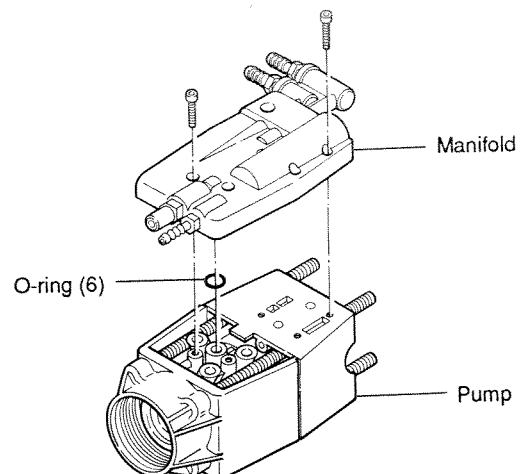
REMOVING MEMBRANE ASSEMBLY FROM PUMP



REMOVING PUMP FROM DRIVE HOUSING



REMOVING MANIFOLD FROM PUMP



Remove Manifold from Pump

1. Pull the hoses off the hose barbs on the manifold.
2. With a 5/32-in. Allen wrench, remove the six machine screws (early-model PowerSurvivor-35's had only five screws) which secure the manifold to the pump. Lift off the manifold (the six O-ring seals between the manifold and pump will normally remain with the manifold).
3. Pull the hose adapter from the manifold. Remove the four old O-rings from the hose adapter.

New O-rings and screws are included in a Manifold Replacement Kit.

Separate Pump Back and Pump Front Assemblies

1. Remove the four nuts and washers from the drive end of the threaded rods which secure the pump halves together.
2. Separate the collar and threaded rods from the rest of the pump (the pump back and pump front will stay together).
3. Pull off the gland plate from the drive end of the pump.
4. With a flat-bladed screwdriver, carefully pry apart the pump back and pump front. The valve retainer plate may fall out of the pump front.

Remove Check Valve from Pump

1. Set the pump front upright. The end which attaches to the membrane assembly should be at the bottom.
2. With a needle-nose pliers, remove the valve retainer plate from the pump front (if it hasn't already fallen out).
3. With the same pliers, pull out the intake and discharge poppet valves.

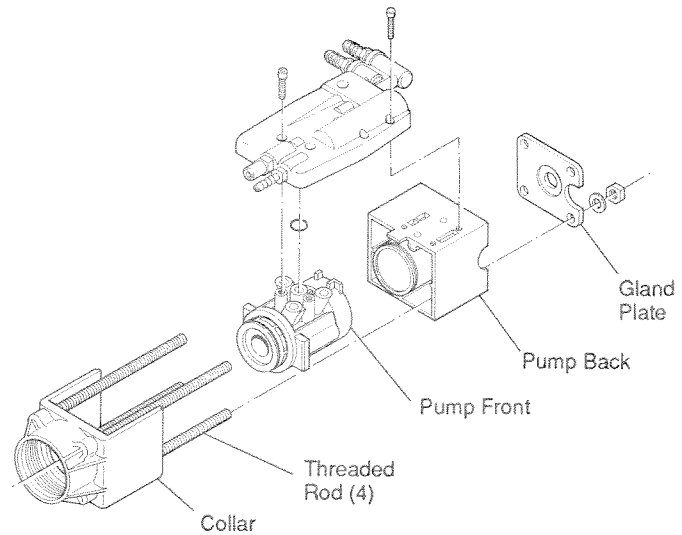
The seat for the discharge poppet valve will come out with the poppet; the seat for the intake poppet valve will remain in the pump front.

4. The intake seat doesn't have to be removed unless it is damaged. To remove, pull it out using a small hook or the head of a nail.

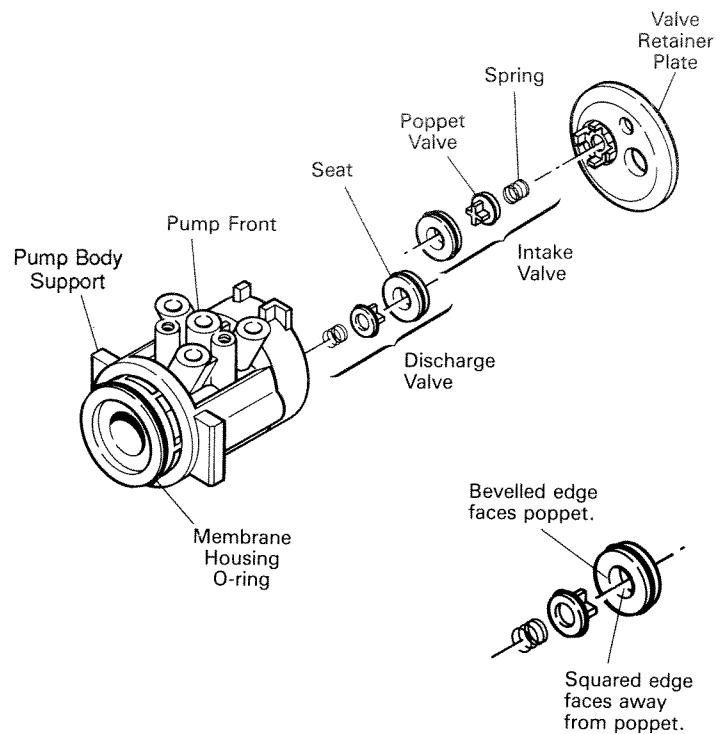
You don't have to remove the O-rings from the valves, as the replacement check valve kit will have new poppets and seats with O-rings already installed.

5. Remove the membrane housing O-ring from the other end of the pump front.

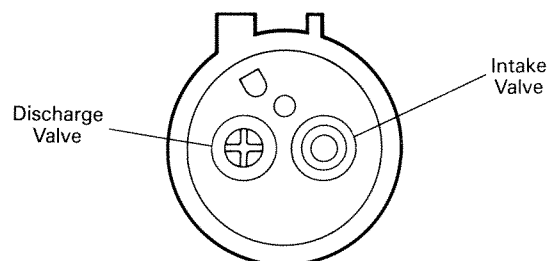
SEPARATING PUMP BACK AND PUMP FRONT



REMOVING CHECK VALVES FROM PUMP



END VIEW OF PUMP FRONT



REASSEMBLY

NOTE: For the following reassembly steps, refer to the appropriate illustration next to the **disassembly** procedure.

NOTE: Lubricate all O-rings and seals with silicone lubricant when the components are reassembled. **Do not use** any petroleum-based grease or oil (including petroleum jelly), as they will degrade the membrane.

IMPORTANT: Clean all components before reassembly.

Reinstall Check Valves

1. Install the membrane housing O-ring on the pump front, and lubricate it with silicone lubricant.
2. Install the new check valve components into the pump front, in the order shown. Lubricate the O-rings with silicone lubricant before assembly.
3. Insert the spring into its recess in the valve retainer plate, then reinstall the plate over the check valves in the pump front. Maneuver the retainer plate until it sits squarely (not tilted).

Reattach Pump Back and Pump Front Assemblies

NOTE: A Pump Back Replacement Kit includes a Pump Seal Kit; a Pump Front Replacement Kit includes both a Pump Seal Kit and a Check Valve Kit. Install the kit(s) whenever you replace either assembly.

1. Set the pump front upright. The end that attaches to the membrane housing should be at the bottom.
2. Hold the pump back over the pump front, align the tabs on the two, and press the piston cylinder into the opening over the valve retainer plate. Push in until the two components fully mesh.
3. If the pump body support has fallen off the pump front, reinstall it.
4. Push the collar and threaded rods onto the pump assembly. The collar and pump don't have to be completely flush when assembled.
5. Reinstall the gland plate on the end of the pump back. The outside of the plate is flat; the inside has a recess which matches the shoulder on the pump back.

Reattach Manifold to Pump

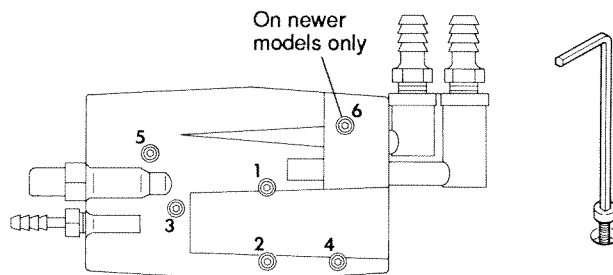
1. Install the new O-rings onto the hose adapter, and push it into the manifold.
2. Position the manifold over the pump assembly, being careful not to disturb the O-rings.

IMPORTANT: For the following step, tighten the screws in the order shown. Overtightening can

easily strip the threads in the plastic manifold: first snug to about 5 in.-lbs (lightly finger-tighten with an Allen wrench inserted as shown); then repeat in the same sequence to about 15 in.-lbs (1/8 to 1/4 turn additional).

3. Secure the manifold screws (new screws are included with a replacement manifold).
4. Reattach the hoses.

REINSTALLING SCREWS (follow the sequence indicated)



Reattach Membrane Assembly to Pump

NOTE: Unless damaged by chlorine or other contaminants (such as petroleum-based substances), the membrane element will seldom have to be replaced.

1. Clean the membrane housing with a warm mild detergent, rinse with clean water, and wipe dry with a lint-free cloth.
2. If the membrane element is also being replaced, lubricate the seals on the new element with a small amount of silicone lubricant.
3. Insert the element into the pump front, then push the reject tube assembly all the way into the element.
4. Slide the housing over the element. Screw it all the way into the pump collar by hand, but don't over-tighten.

Be sure there is not a gap between the pump collar and the thread stop on the membrane housing.

Reattach Pump to Drive Housing

1. Slip the rubber cap onto the pump shaft.
2. Align the pin holes in the pump shaft and motor drive shaft.
3. Insert the pin through the holes in the pump and motor drive shafts. Lift the rubber cap over the pin.
4. Insert the four threaded rods (on the pump) into the matching holes in the drive housing, and secure loosely with four nuts. Be sure the notch on the pump is aligned as shown.
5. Tighten the four nuts securely.
6. Reconnect the tubing to the two hose barbs on the pump.

SERVICE LOG

DATE	USED BIOCIDES	CLEANED MEMBRANE	OTHER SERVICE
12-15-91			
11-15-91	Cleaned		OPERATED FOR 1.5 Hours
12-15-91			STARTED OPERATING MADE 12 GAL.
12-18-91			RAN FOR 30 MIN TEST BAHIA De TORTUGAS

TROUBLESHOOTING

For questions not covered in this section, contact your local distributor or dealer,
or call Recovery Engineering, Inc. at 1-800-845-PURE.

PROBLEM	CAUSE	REMEDY
Poor-quality product water (above 1200 ppm)	At start-up, or after unit has been inhibited, system needs to clear for a few minutes.	Normal: see "Start-Up" in Operation section.
	Membrane damaged because of chlorine or other contaminants.	Replace the membrane. Be sure the storage tank inlet is above the highest water level in the tank. See also "Storage."
	Damaged product tube O-ring.	Replace (install an HP1-058-0300 Seal Kit).
Low flow rate of product water (less than 70cc/min), and:		
A. Water squirts from relief valve.	Cold water or high salinity.	Normal: no correction needed.
	Damaged or dirty relief valve.	Clean the relief valve, or replace the manifold module.
	Restricted fresh water hose.	Check all valves and hoses for restrictions.
	Fouled membrane.	Clean the membrane (see "Membrane Cleaning"), or replace if necessary.
B. Pump leaks. Water doesn't squirt from relief valve.	Rod seal leak, because seal or plunger rod is damaged.	Slight leakage around the rod seal is normal. If excessive, replace the pump back assembly.
C. No leaks.	Pump cavitation, because of kinked or clogged intake line or dirty prefilter cartridge.	Check the intake line. Replace cartridge if dirty (see "Prefilter Cartridge Replacement").
	Intake line is too long.	Move unit closer to seawater intake.
	Air in intake line.	Check all connections for proper seal.
	Spool valve leak (inside of manifold) – reject flow above 850 cc/min.	Replace manifold assembly.
	Check valve leak – reject flow less than 800 cc/min.	Replace check valves.

PROBLEM	CAUSE	REMEDY
No flow of product water.	Damaged piston or check valves.	Check pump back and check valves, and replace if necessary.
	With new prefilter cartridge, unit does not draw in seawater until prefilter housing fills.	Normal: no correction needed.
	Damaged spool valve.	Replace manifold assembly.
Motor current higher than 6 amps (average).	Fouled membrane.	Clean the membrane (see "Membrane Cleaning"), or replace if necessary.
	Blocked internal passages in membrane housing.	Check for debris inside housing.
	Defective motor or drive unit (if higher than 2 amps with no water flow).	If less than 2 amps on motor only, replace drive housing assembly; if higher than 2 amps on motor only, replace motor.

SPECIFICATIONS

PRODUCT SPECIFICATIONS

Size (H - L - W): 5.75 x 26.25 x 13.75 in.
(14.6 x 66.7 x 34.9 cm)

Weight (Dry): 21 lbs (9.5 kg)

Power Requirement: 4 amps @12V DC (50 watts)

Intake (Seawater) Fitting: 3/8 in. I.D. hose

Outlet Fittings: Product Water: 3/16 in. I.D. hose
Brine: 3/8 in. I.D. hose

PERFORMANCE SPECIFICATIONS

Seawater Flow Rate: 15 U.S. gal/hr (57 liters/hr)

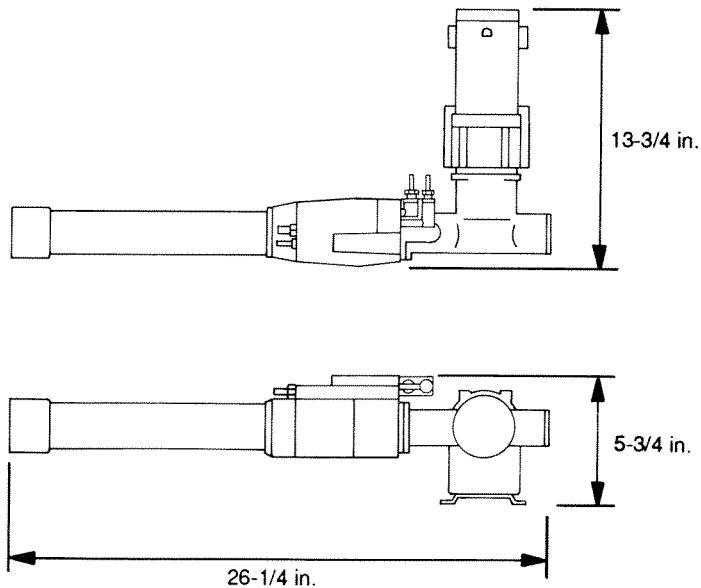
Freshwater Flow Rate: 1.4 U.S. gal/hr (5 liters/hr)

Seawater Temperature Range: 36 - 113° F (2 - 45° C)

Minimum Salt Rejection: 98%

Maximum Suction Lift: 10 ft (3 m)

Above specifications indicate nominal performance at the following standard test conditions: water at 25° C, with 32,000 ppm NaCl and pH of 4 - 10. Actual performance will vary with operating conditions.



WARRANTY

LIMITED WARRANTY FOR PÜR™ POWERSURVIVOR™-35 WATERMAKER

THIS LIMITED WARRANTY AND THE REMEDY PROVIDED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES AND, UNLESS STATED HEREIN, ANY STATEMENTS OR REPRESENTATIONS MADE BY ANY OTHER PERSON OR FIRM ARE VOID. THE DURATION OF ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED TO THE DURATION OF THE EXPRESS LIMITED WARRANTY. NEITHER RECOVERY ENGINEERING, INC. NOR ITS AFFILIATES SHALL BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL LOSSES OR DAMAGES, RESULTING FROM THE USE OR INABILITY TO USE THE POWERSURVIVOR-35 WATERMAKER, WHETHER RESULTING FROM BREACH OF WARRANTY OR ANY OTHER LEGAL THEORY.

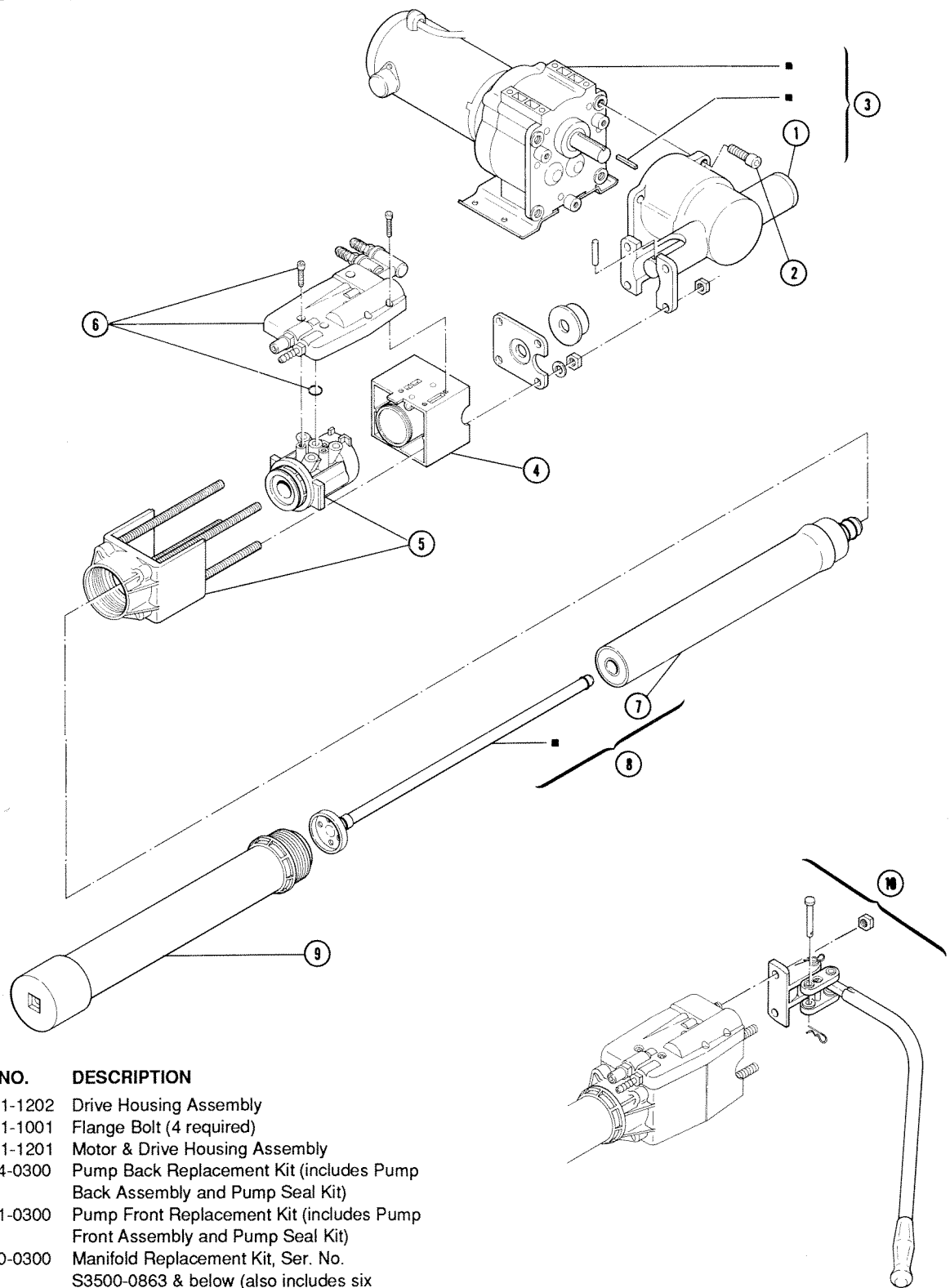
This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from State to State. Some States do not allow limitations on how long an implied warranty lasts, or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

What Is Covered: Recovery Engineering warrants to the original purchaser that the PowerSurvivor-35 Watermaker enclosed with this Limited Warranty conforms to the manufacturer's specifications and is free from defects in workmanship and material for a period of one year from the date of original purchase. If the original purchaser transfers the PowerSurvivor-35 Watermaker to another person, this Limited Warranty will not be enforceable by the person to whom the product is transferred.

What We Will Do To Correct Problems: Should your PowerSurvivor-35 Watermaker prove defective during this period, you must notify Recovery Engineering, Inc. at 2229 Edgewood Avenue South, Minneapolis, MN 55426, or an authorized distributor or dealer of Recovery Engineering, Inc. You must permit Recovery Engineering, Inc. or its representatives to make such investigation, examination and tests as Recovery Engineering, Inc. deems appropriate and, if requested to do so, you will return the product to the factory at the address set forth above. Recovery Engineering, Inc.'s sole obligation under this Limited Warranty is, at its option, to repair or replace the defective unit, without charge for parts or labor. Postage, insurance or shipping costs incurred in presenting your PowerSurvivor-35 Watermaker product for warranty service are your responsibility.

What Is Not Covered: This Limited Warranty is contingent upon proper use and maintenance of the product; it does not cover products that have been improperly shipped or improperly installed, or that have been misused, abused, neglected, or improperly maintained, cleaned or stored, or that have been serviced other than by an authorized Recovery Engineering, Inc. distributor or dealer. The PowerSurvivor-35 Watermaker can be damaged by oil, grease, chlorine and certain other organic or inorganic particulates. It must be cleaned carefully after use, and requires periodic maintenance. Failure to observe the precautions listed in the owners manual may constitute improper use or maintenance of the product and causes this Limited Warranty not to apply. This Limited Warranty does not cover products from which the Recovery Engineering, Inc. label or logo or the rating label or serial number has been removed. This Warranty does not extend to normal wear or to replacement items, including but not limited to filter cartridges, pump seals and O-rings.

PARTS LIST



REF.	PART NO.	DESCRIPTION
1	MD1-001-1202	Drive Housing Assembly
2	MD1-011-1001	Flange Bolt (4 required)
3	MD1-001-1201	Motor & Drive Housing Assembly
4	HP1-014-0300	Pump Back Replacement Kit (includes Pump Back Assembly and Pump Seal Kit)
5	HP1-001-0300	Pump Front Replacement Kit (includes Pump Front Assembly and Pump Seal Kit)
6	HP1-010-0300	Manifold Replacement Kit, Ser. No. S3500-0863 & below (also includes six O-rings and five capscrews)
6	HP1-010-0301	Manifold Replacement Kit, Ser. No. S3500-0864 & above (also includes six O-rings and six capscrews)
7	HP1-030-3900	Membrane
8	HP1-030-0300	Membrane Replacement Kit (also includes Membrane Seal Kit)
9	HP1-003-0301	Membrane Housing
10	HP1-046-0301	Handle Assembly

KITS (NOT ILLUSTRATED)

PART NO.	DESCRIPTION	CONTENTS
1K2-0200	Remote Switch	Electrical box with switch, 10A fuse, and terminal strip
1K3-0200	Prefilter Kit	(6) Prefilter cartridges; Biocide, 100 g.
1K3-0201	Extended Cruising Kit	Biocide, 100 g. Prefilter Kit; Membrane Cleaning Kit; Repair Seal Kit
1K4-0200	Membrane Cleaning Kit	Membrane cleaning agent; Membrane housing
1K1-005-0300	Prefilter Assembly	Filter housing & fittings; (2) Cartridges
1K1-006-0300	Prefilter Cartridges	(6) Prefilter cartridges
HP1-026-0300	Check Valve Repl. Kit	Seat, poppet, spring, & O-rings for both intake & discharge check valves; Pump Seal Replacement Kit
HP1-058-0300	Membrane Seal Kit	Seal & O-rings for membrane & reject tube
HP1-091-0300	Pump seal Kit	Membrane housing O-ring (for end of pump); (5) O-rings between manifold & pump; <i>[Should be replaced whenever pump is taken apart]</i>
HP1-103-0300	Repair Seal Kit	Membrane Seal Kit; Pump Seal Kit; Check Valve Replacement Kit

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