

# REPAIR BULLETIN INDEX

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1/10/05

## CP-1 REVERSING VALVE PROBLEMS

If the Clark pump cycles properly when the pressure release is open ½ turn but is asymmetrical and makes a hissing noise on one stroke when pressurized, and output is very low to none, then one of the annular rings has failed. If it cycles ok depressurized but stalls completely when the pressure release is closed, you may have a broken spool valve. A damaged spool valve sealing ring can cause similar problems.

See the manual or website complete instructions to remove and replace the annular rings and spool. The best way to do it is to remove the complete top section of the pump by disconnecting the top high pressure line and the brine discharge hose. Remove the four allen screws that hold it down. Take care not to damage the bottom sealing surface. Remove both valve end blocks. Push out the black spool valve (P/N KIT-HP-10VSA) in the center valve body. If it is not broken inspect it for any damage on the white seals. If the spool is broken replace it with a new one or it can be temporarily repaired (see bulletin CP-5 SPOOL VALVE REPAIR).

If you suspect a cracked annular ring (P/N HP-TB-AR), mark the out side of the white annular rings that the spool valve rides in with a felt tip pen. Tap the rings out from the opposite side with a wood dowel or plastic end of a screwdriver. There is probably an imperceptible crack running from one of the holes to the edge. You probably can't see the crack unless you pull on the ring to open it. If no replacement is available, the ring can be reused by turning it around and putting the crack to the outside. Reinstall the rings with the marked ends to the inside center of the valve body (Crack to the outside). Reassemble and test. Note that the side blocks are left and right hand. Line up the ports to define proper sides.

NOTE: you must remove the annular rings to see the crack, pull from the inside with your fingers and look for the crack.

6/2/04

## CP-2 CLARK PUMP EXCHANGE / UPGRADE

Spectra Watermakers offers a Clark Pump Upgrade Program. Ship us your Clark pump and we will dismantle and evaluate it. If it has not been damaged or abused we will rebuild it to “like new” current factory specifications and tolerances, bench test it for 24 hours, and return it to you for a charge of \$425 plus freight.

For faster turn around we also offer the Clark Pump Exchange Program: We will ship you a remanufactured Clark Pump built to current factory specifications, and charge your credit card a \$1500.00 deposit plus shipping. You send your Clark pump back to us freight prepaid. We dismantle and evaluate your old pump. If it has not been damaged or abused we will refund your deposit less shipping and the standard \$425.00 upgrade charge.

Parts damaged by misuse or contaminated feed water will be replaced at normal spare parts prices.

Contact the factory for a Return Material Authorization (RMA) form and shipping instructions before shipping your unit, Ask for P/N KIT-HP-10U.

9/23/04

## CP-3 NEW STYLE END CAP REPLACEMENT

Two styles of Clark Pump end caps have been used. The old style cap pushes in from the square end of the cylinder, which is the same diameter from end to end, and the J-tube compression fitting is “down in a hole.” The new style is installed from the round end and kept in place by a black anodized aluminum retaining ring on the end of the cylinder. Determine which style you have before ordering parts.

To change the NEW STYLE Clark pump end caps, p/n HP-CYL-EC, first remove the Stainless Steel J-tubes. No need to remove the cylinders from the center block. Using a fire hose wrench, if available, or a mallet and hardwood stick, unscrew the cylinder end cap retainer (end ring). It will unscrew by hand once loosened. Using the J-tube for a handle, pull the end cap out of the cylinder. Water will spill. Put a new o-ring on the new end cap and lubricate the o-ring with water or silicon watermaker grease. Insert the new cap into the cylinder with the hole at 12:00 o'clock. Screw on and tighten the retaining ring keeping the hole at 12:00. Put a white o-ring on a compression fitting p/n PL-MTS-3/8X1/2S, and screw it into the end cap. Do not over tighten, snug is good enough. See below for J-tube installation.

If no corrosion is noted, the compression fitting on the cylinder base, p/n PL-MTS-3/8X1/2S, can be used over. If it is pitted or corroded, remove it. Put 5 wraps of Teflon tape on the threads of the new fitting and screw it into the cylinder base fairly tight. Install the new J-tubes, p/n HP-CYL-SST, (you can't use the old ones over again). Make sure that the tubes are the correct length; they must reach near the bottom of the socket in both compression fittings. Occasionally you need to trim one end or the other to get it to enter both sockets. Tighten the compression nuts, p/n PL-HWR-1/2HN to compress the ferrule, p/n PL-HWR-1/2FR, using two wrenches.

6/02/04

## CP-4 REMOVING THE CLARK PUMP

To remove the Clark pump from the system. Close the sea suction valve and the brine overboard valves, or set all the service valves to service if your unit is so equipped. Disconnect the feed water hose by loosening the hoseclamp. Disconnect the brine overboard hoses from the Clark pump by loosening the hose clamp or quick disconnect fitting.. Disconnect the black high-pressure hoses by loosening the compression nuts on the stainless steel 90 degree compression fittings. Use two wrenches to avoid stressing the plastic pump and valve bodies. You may have to unbolt the Clark Pump from its mountings to get at the lower high pressure fitting. Once the Clark pump mounts and hoses are disconnected you can lift it out using the Stainless Steel J-tubes for handles.

9/24/04

## CP-6 OLD STYLE END CAP REPLACEMENT

Two styles of Clark Pump end caps have been used. The old style cap pushes in from the square end of the cylinder, which is the same diameter from end to end, and the J-tube compression fitting is “down in a hole.” The new style is installed from the round end and kept in place by a black anodized aluminum retaining ring on the end of the cylinder. Determine which style you have before ordering parts.

The OLD STYLE cylinder the end cap, p/n HP-CYL-ECO, must be removed by following these directions: Remove the stainless steel J-tube. Remove the cylinder from the center block by removing the four large allen head bolts. Hold the corresponding allen head bolt on the opposite cylinder with a second allen wrench while loosening. The cylinders need to be pulled about ½ inch from the block and will then lift right off. Some water will spill out. Take care not to damage the piston rod or the valves and pilot valve pins, which should be left in the center block. The piston will still be in the cylinder. Use a piece of wood to push the end cap into the cylinder and out through the square end. The piston will come out with the end cap. Roll a white o-ring, p/n SO-HPP-CT, over the threads on the new Stainless Compression Fitting, p/n PL-MTS-3/8X1/2S, and screw it into the end cap. The o-rings will seal the pressure easily and the fitting does not have to be tight, just snug. Put new o-rings on the end caps and lubricate them with water or water maker grease. Slide the new end caps in and tap them home with the stick, making sure that the compression fitting is at “12:00 o’clock”. Put the pistons back in the cylinders by hand the same way they came out. Put the cylinders back on. The pistons will locate themselves in the right spot when you do this.

If no corrosion is noted, the compression fitting on the cylinder base can be used over. If it is pitted or corroded, remove it. Put 5 wraps of Teflon tape on the threads of a compression fitting and screw it into the cylinder base fairly tight. Install the new J-tubes, p/n HP-CYL-SST, (you can’t use the old ones over again). Make sure that the tubes are the correct length; they must reach near the bottom of the socket in both compression fittings. Occasionally you need to trim one end or the other to get it to enter both sockets. Tighten the compression nuts, p/n PL-HWR-1/2HN, to compress the ferrules, p/n PL-HWR-1/2FR, using two wrenches. You may have to get creative with the wrenches for the old style cap because the fitting is down in a hole. At the factory we have a crowfoot wrench to do this.

6/02/04

## CP-7 SPOOL VALVE REPAIR

A broken reversing spool, p/n KIT-HP-10VSA, can be temporarily repaired if no spare is available. The spool is pushed back and forth inside the valve block by the white pistons inside the valve block end caps. Because valve timing is very important a repaired valve must be the same length as it was before it broke so that it will move to the right spot when pushed by the piston.

Set aside the white sealing ring and black rubber quad seal ring from the broken end of the spool. Using a ½ inch (13mm) drill, countersink the threaded hole in the end of the broken off end of the spool. Drill in about 3/8 inch (10mm). If the threaded hole does not go all the way through the broken off end piece, drill it out with a ¼ inch (6mm) drill. Find a sheet metal screw or machine screw about 1 1/2 inch (4cm) long which will pass freely through the threaded hole and with a head diameter that will fit inside the countersink but not go all the way through. Center punch as closely as possible the exact center of the broken off end of the larger piece of the spool. Take a tap drill if using a machine screw or a suitable size drill if using a sheet metal screw, and drill as straight as possible down the center line of the spool center section about one inch (2.5cm). Drill far enough in that the screw will not bottom out, but avoid going all the way to the white seal on the unbroken end. If using a machine screw tap the hole. Place the black quad ring and the white seal ring on the larger piece of the spool. Holding the two pieces together in their original positions as closely as possible, insert the screw into the end of the spool and secure them together.

The spool will still work if it is not perfectly straight, and vise or wrench marks on the narrow diameter sections of the spool will not affect performance. Avoid damaging the large diameter sections or the white seals.

6/02/04

## CP-8 WELDING CRACKS

In an emergency cracks at the high pressure ports in the center block, valve block, cylinder end caps, and membrane end caps can sometimes be repaired by welding. You will need a 3/8 inch NPT pipe tap, and a hot blade: (screwdriver, knife, soldering iron.) Clean any thread sealant or foreign materials from previous repair attempts out of the port. Starting at the end of the crack farthest from the threaded hole and working down and toward the threads, melt and rework the plastic around the crack in a “folding” motion until the crack is gone. Chase the threads with the tap and install the fitting using a lot of Teflon tape and not too much torque.

5/11/04

## CP-10 TIGHT PISTONS

Low production and high feed pressure is commonly caused by clogged up membranes. However, some 700 and 1000 model watermakers may exhibit these symptoms due to “tight pistons”. The pistons used in the Clark Pump cylinders on these models may swell after a time, especially in very warm waters. The piston will begin to drag inside the cylinder, slowing the Clark pump and causing the feed pressures to rise and production to fall. In most cases the system will also be erratic, operating for a time and then stalling, or showing varying system pressures.

To diagnose and repair this problem remove the cylinder end caps. Using a wooden stick or a rubber hammer handle try to push one of the pistons farther into the cylinder. If the pistons won't move remove the cylinders from the center block. Using the wooden stick and a mallet drive the pistons out of the cylinders. Push on the end cap side of the piston (the smooth side) to avoid damaging the piston rod socket, which is on the rod side of the piston.

Replacement pistons from Spectra Watermakers have been redesigned to prevent this from recurring. Order 2ea p/n KIT-HP-15PA for a 700 model or 2ea p/n KIT-HP-20PA for a 1000 model.

If you need to get the watermaker working while waiting for replacement parts, remove the white piston rings and the orange o-ring and take the pistons to a machine shop. Have the outside diameter turned down to 2.735 inches (69.50mm). Do not machine inside the piston ring grooves. In a pinch you could carefully sand or file the outside diameter down until the piston slides into the cylinder easily. Be very careful to clean off any abrasive particles from the piston as they will cause rapid cylinder wear.

9/23/04

## HS-3 ADJUST NON-MPC SALINITY CONTROL

If the controls are rejecting product water that you feel should be accepted, or accepting water which should be rejected, they may need to be recalibrated. Before adjusting the system check the product salinity with a calibrated handheld salinity indicator if possible. If not, taste the product water to make sure no salt flavor can be detected.

If the control has the Hanna digital control on the lid of the box, calibrate the probe as follows. With the system operating and the product salinity stable (after at least ten minutes running), test the product with the hand held meter. Make sure the salinity control meter is in the measurement mode (“MEAS” led light on). Using a jeweler’s screwdriver, adjust the “CAL” screw until the display reads the same as the hand held meter. Press the “SET” key. Turn the “SET” screw until the display shows the desired salinity above which the product water will be diverted overboard. If no handheld is available, run the watermaker. When the salinity reading stabilizes, adjust the Setpoint to approx 100 ppm above the salinity reading.

If the control does not have the Hanna Digital readout then the control is mounted to the inside of the lid of the box. Remove the lid and on the control is a ¼” trim pot. If you have no handheld meter, run the watermaker for ten minutes or more. Then turn the pot until the control sends water to the tank and then go a little more. If a handheld is available remove the salinity probe and with the hand held meter make a sample of water using table salt at about 700 ppm. Put the salinity probe into the water sample. Turn the trim pot so that the red “reject” light is on. Then slowly turn the pot until the green “good” light just comes on. This will set the control to divert at that level.

We normally set the controls to divert at 750 ppm.

To improve probe performance and prolong its life, we recommend gently cleaning the probe with a scotch brite pad or stiff brush. The probe may need to be recalibrated after cleaning.

9/24/04

## HS LF-4 ADJUST MPC SALINITY CONTROL

If the unit is not new remove and clean the probe before calibration. Obtain a handheld salinity tester or a calibration solution of known salinity.

If using a handheld tester (the easier method) run the unit making water until the product salinity has stabilized (ten minutes or more), then determine the product salinity. You can get a product water sample for testing by loosening the product water hose fitting at the membrane housing end cap or at the diversion valve. Compare the handheld reading with the reading on the display. If your display shows the salinity as a bar graph, each square equals 100 parts per million. Adjust the MPC-3000 until the display agrees with the handheld as described below.

If using a calibration solution, remove the sensor (part number EC-MPC-SP) from the unit and place it in the solution. The max reading on the MPC 3000 salinity display is 1020 ppm so if you have 1382ppm test solution you will need to cut it 50% with distilled water to produce a 691ppm test solution. Plug the sensor port with a ½”npt pipe plug while the sensor is out. Start the unit by pressing the “stop” or “Auto Run” button. If the salinity display reads incorrectly proceed with adjustments below. The display can read as a bar graph (the default setting) or directly in parts per million. Each square on the bar graph equals 100 ppm. If you prefer to display the salinity as a number, contact your dealer or the factory for instructions on changing the display.

Inside the main white box with all the wires going to it is the main Printed Circuit Board (Part No. EL-MPC-PCB). The salinity adjusting screw is mounted on this board. Remove the lid of the box and inspect the circuit board. Looking at the PCB with the large “Batt+” and “Batt-“ terminals at the right, you will see a single phone jack at the upper left corner. This is the salinity probe cable. About 1 inch (2cm) from the salinity jack is a very small rectangular trim pot with a bronze slotted screw. This is the salinity calibration pot. See the manual for a photo of the calibration pot. You may have to push some of the electrical cables aside to see it. With the probe in the water of known salinity, turn the pot with a jeweler’s screwdriver until the display matches the salinity of the water.

If the unit is rejecting but the product water tastes ok, and no meter or solution is available, the system can be made to accept the water by adjusting the pot until the display reading is below the reject set point. The reject set point was 500 ppm on early units and 750ppm on newer units. There is a short delay between the time the red light goes out and the green light comes on.

12/2/04

## MB-1 ENDCAP WEEP HOLE

Inside the black Spectra membrane end caps there are two o-rings which seal around the product tube on the membrane itself. These O-rings prevent the high pressure salt water in the membrane housing from leaking into the low pressure fresh water inside the product tube. A small weep hole is drilled into the end cap between the two o-rings. If there were only one o-ring seal, salt water could leak into and contaminate the product water. By using two o-rings and a weep hole, any leakage past either o-ring will come out of the weep hole instead. If the water coming out of the hole is fresh, the rear o-ring is leaking, if the water is salty, the front o-ring is leaking.

To repair, remove the end cap from the membrane housing. Check the product tube on the end of the membrane to make sure it is not damaged. If the tube is scratched or grooved, lightly sand it with 600 wet or dry sand paper. If the tube is smooth and round then remove and replace the two o-rings, p/n SO-HPV-BMS, inside the end cap. Lubricate lightly with water maker grease and reinstall the end cap.

Older units with white Codeline brand membrane housings have only one o-ring sealing the product tube and there is no weep hole.

9/27/47

## MB-4 MEMBRANE REPLACEMENT

Before removing a membrane, p/n FT-MB-xx, do a good fresh water flush to purge any sea water in the system. This way you can seal the old membrane in a bag and use as a spare if needed. See the label on the housing for flow direction and brine seal location. The membrane housings have a retaining ring on each end that holds the end cap in place. On the out side of the ring is a machined groove. Use a spanner wrench or a piece of wood or plastic and a mallet on the groove and tap counterclockwise to knock the ring loose and then unthread by hand. The end caps can be backed out as the ring comes off, or the fittings can be removed from the end caps and the end caps removed afterwards.

If you wish to remove only one end cap, remove the endcap at the INLET (BRINE SEAL) end. Use a pair of needle nose pliers cushioned with a rag to pull on the  $\frac{3}{4}$ " product tube to get the old membrane out. The end caps have three o-rings. There is one large o-ring, p/n SO-HPV-BMS, on the outside of the plug and two smaller ones, p/n SO-HPV-SMS, on the inside of the product port. Inspect them and replace if needed. In most cases they can be reused. You must remove the end cap to inspect the o-rings.

If it has been removed, refit the end cap on the outlet end. The membrane has a black brine [lip] seal on one end. Insert the new membrane into the housing so that the brine seal goes in last. Take care not to damage the brine seal, it sometimes wants to catch on the housing and get twisted. Install the second end cap and any fittings that have been removed. Some watermaker grease or water on the o-rings and brine seal will make assembly easier.

Remember to purge the system UNPRESSURIZED for 20 minutes before making water to flush the storage chemical out of the new membranes.

8/05/04

## MB-6 CODELINE MEMBRANE HOUSING

Early Spectra watermakers used a white Code Line brand membrane housing. Current models use a black Spectra brand membrane housing. Code Line no longer manufactures this housing and does not supply spare parts. If the fittings or end plugs on the Codeline housing are leaking, or you wish to remove or replace the membrane, proceed as follows. It is only necessary to remove the end plug on the “HIGH PRESSURE INLET/BRINE SEAL” end of the housing when replacing the membrane.

Loosen the two allen screws that hold the retaining plates in and wiggle the plates to the inside until they come off. Next pull and twist the plug until it comes out. The big o-ring will either come out or be inside. The little o-ring in the center port seals the product water from the brine. It will stay in the plug.

If you wish to remove the membrane carefully grasp the product tube that sticks out of the center of the membrane and pull the membrane out of the housing. If the membrane is to be reused be careful not to mar the o-ring seating surface on the outside of the product tube. Keep the membrane moist, it will be damaged if allowed to dry out.

Once the plug is out you can hold it in a vise to get the fittings out. Do not damage the O-ring seating area. Clean up all the parts the best you can. If there is any corrosion where the o-rings seat, feather it out the best you can with wet sand paper and scotch bright. Replacement stainless steel fittings and O-rings are still available as a special order from Spectra Watermakers. Use a good pipe dope on the pipe threads.

To reassemble, first install a plug in the brine outlet end of the housing with the product o-ring already in place in the plug. A little silicon grease on the o-rings will help assembly. When you put the plugs back in place be very careful to only push them in just enough to get the clips in. If the plug goes too far in and you have to pull it back out the big o-ring can slide off the end and it will leak big time. The membrane will have a black rubber brine seal ring on one end. Insert the end without the brine seal into the housing until the product tube seats in the end plug. Install the other plug.

9/27/04

## MB-7 ENDCAP REPLACEMENT

Membrane end cap replacement is relatively simple if you have the newer black membrane housing. If you have a white housing, ask for bulletin MB-6: Codeline Housing.

You will need An End Cap Kit, p/n KIT-PVECAWOR, if your unit is not equipped with a Z-brane electronic water treatment system, or a KIT-PVECAWORZ if you have the Z-brane. The kit contains two caps and all the o-rings and pipe plugs, for each housing to serviced. If replacing both endcaps do them one at a time. If you have the Z-brane see the additional instructions below.

Remove the fittings from the endcap. Loosen the Black anodized aluminum collar that holds the end cap in place. It is threaded onto the end of the membrane housing. Use a spanner wrench or a mallet and wooden stick in the machined groove to loosen it. Unscrew the collar and pull out the old endcap.

Check to make sure that the two internal o-rings that seal the product water tube, and the large external o-ring are in place in the new endcap, and lightly greased with silicon grease. Push the new endcap into place and snug up the collar. The collar does not need to be very tight because the o-rings do all the sealing. Install the high pressure compression fitting p/n PL-MTS-3/8X1/2S. You can use the old one if it is in good shape, if it needs to be replaced order it separately. Roll a white o-ring over the threads and screw it in. It only needs to be snug because the O-ring does the work. The high pressure fitting should be installed without Teflon tape or pipe dope.

Each end cap has 2 1/8 inch NPT ports for the product water outlet fitting. Use the supplied pipe plugs to plug the unused ports.

Z-Brane Instructions: One endcap has the ground wire attached to a 1/4 inch stud. Remove this wire before removing the cap and attach it to the new cap after installation. The other cap has the zeta rod screwed into it. Remove this cap before removing the zeta rod. Clip the wire ties which hold the zeta rod cable so that you will have at least 12 inches (30cm) slack. Slide the cap and rod out carefully; the zeta rod is about seven inches (16cm) long and fits closely inside the product tube. Install the zeta rod in the new cap, using Teflon tape on the threads, before installing the cap in the housing.

7/20/04

## MISC-1 DWYER FLOW METER SERVICE

The mechanical flow meter, p/n PL-FMT-XX, used on our manual watermakers can be opened for cleaning if it gets hard to read or the little ball in the flow meter is stuck at the bottom. If the ball is stuck first try giving it a tap to break it loose.

The flow meter will come completely apart for cleaning. First remove the meter from the panel. Next remove the four small screws that hold the stainless bracket in place.

Carefully pry off the SS bracket. On the very top of the meter is a clear plastic slide off cover that covers a clear plastic allen screw. Use a flat bladed screwdriver to push the cover off. Holding the meter upright, remove the allen screw with a 1/4" allen wrench. Invert the flow meter and catch the ball as it falls out. Now you can get inside and clean things up. You can use tooth paste or plastic window polish to polish the inside using a small bottle brush. Clean the ball and give it a few coats of wax. If the o-rings are damaged or the unit has been leaking, install new o-rings using a little Vaseline or water maker grease to ease assembly. These are standard o-rings and should be available at most larger auto parts or bearing stores. Reassemble in reverse.

5/06/04

## MISC-2 SERIAL NUMBERS

Spectra watermakers Models 150, 300, 400, 700, and 1000 have a Serial Number Attached to the outside of the Feed Pump Module: (XX/XX000/00/00). This number provides us with the model, size, and date of manufacture of the unit.

Model 380 and 200 watermakers with MPC-3000 have a similar serial number on the MPC-3000 electrical box.

In addition, each Clark Pump is given a separate serial number engraved in the front of the Center Block just above the feed water inlet: (0000- 00).

When contacting the factory for registration, technical support, or parts, please reference the Clark pump serial number followed by the number found on the Pump module or Electrical box.

Note: earlier models had only a ten digit Clark Pump serial number.

6/03/04

## MPC-7 REPLACE EPROM

Turn off the power to the system before changing circuit board components.

On the main feed pump module is a white junction box that most of the wiring goes into. Remove the four screws that hold the lid in place and remove the lid. You will see the main Printed Circuit Board in the box. It has several plug in connectors and two main terminal strips. Right in the middle of the PCB you will see the main eprom chip, p/n EL-MPC-MC. It plugs into a socket. NOTE that it is indexed one direction. One end of the chip has a dimple in it and there is a small white rectangle printed on the board to match it.

Carefully pry the old chip up from its base so as not to damage any other parts on the PCB. Just below the chip are two prongs labeled JP5. If these are shorted together when the unit powers up you will reset the PCB to default settings. Make sure you don't bend these prongs.

Place the new chip in position making sure all the little legs are in their sockets, and the dimple is on the right. Press it into place. When you power up the unit it will think that the unit has been pickled and go into purge mode. If it is not pickled, Press Auto Run and Stop simultaneously to Bypass the Purge Mode.

8/05/04

## MPC-8 CALIBRATE ROTO FLOW METER

Beginning December 1, 2004, All Spectra Watermakers with MPC-3000 Controllers will ship equipped with a "Rotor" flow meter in place of the stroke sensor previously used. The stroke sensor was used to calculate the product flow and for the SYSTEM STALLED alarm. The Rotor flow meter is a flow meter using a magnetic rotor in the product piping. The faster the water flows the faster the rotor spins, much the same as modern knot meters. It is installed in the product line between the membrane outlet and the diversion valve. The MPC-3000 will calculate the Gallons (liters) per minute product flow by counting the magnetic pulses from the rotor and applying a Mathematical Constant. If the flow rate drops below approx. 3 GPH (12LPH) the MPC-3000 will alarm SYSTEM STALLED.

The Rotor flow meter can be retrofitted to older units in place of the Stroke Sensor if desired. The Mpc-3000 printed circuit board will remain the same but the EPROM micro chip must be Updated to the A-28 version. The rotor flow meter connects to the same terminals on the PCB that the stroke sensor used, labeled: STROKE SENSORS, "P" (DC+), "S"(Signal), and "G" (Ground). Red goes to "P" Brown to "S" and Black to "G". The small plastic jumper which is stored on one of the "G/M JP2" prongs must be moved to both of the "Calibrate JP1" prongs so that they are jumped together. Find this jumper by unplugging the ten pin green connector for the pressure switches.

The New Rotor Flow meter can be calibrated as follows: Connect your computer to the PCB using a nine pin connector. Using the Spectra 1.08 Software in your computer, make sure that the "Rotor Flow Meter" box is checked. Click "Write". A number will appear in the "Displacement" Box. This is the Constant used to calculate the flow. The default Constant is 13578. With the watermaker making water, run the product flow into a measured container and using a timer, determine the actual flow rate. If the flow rate shown on the computer does not match the measured flow, change the constant in the "displacement" box. The up/down buttons change the number by 500 each time they are clicked. Increasing the constant increases the display reading. You have to click "write" for the changes to take effect. The display reading is heavily damped so it takes a while for the reading to change.

Always check all the parameters in the programming window before closing it to make sure nothing has been changed unintentionally.

01/10/05

## SF-1 SHURFLO PUMP WON'T RUN

If the pump has power to it (the fan runs), but the pump won't run, the first thing to check is the pressure switch. The pressure switch, p/n EL-FP-PS, is located on the wet end of the pump and has two red wires plugged into it. Jump the two red wires together and see if the pump runs. You can safely run the system with the pressure switch jumped, just keep an eye on the pressure gauge and don't let system pressure exceed 110 psi. Replace the switch when a spare is available.

If the pump will not run with the pressure switch jumped then it is most likely a problem with the brushes or overheat protection switch inside the motor. The motor will come completely apart by removing the two screws on the end of the motor. Remove the rear cover and paper insulator. Pull out the plastic brush holder. The thermal switch is located on one of the brush leads. With an ohmmeter, check for continuity through the switch. If it is open, you can make temporary repairs by wiring around it, being careful that your new wiring doesn't chafe on the moving parts, nor resist the springs that push the brushes on to the commutator.

If any corrosion is apparent the brushes may be sticking. Once apart clean all the carbon dust from all the parts. Clean the commutator with light sand paper. Make sure to clean the small grooves on the commutator with a small sharp tool to remove the carbon in between the segments. Adjust the springs on the brush holders so the brushes slide smoothly in and out. If the bearings are rough and binding, remove the rubber dust cover and clean the best you can, grease them, and work it free by hand. Don't service the bearing unless absolutely necessary. Reassemble in reverse order. You can hold the carbon brushes back with papers clips inserted through the slots in the brush holder so they don't hang up on the bearing during assembly. Make sure the corrugated bearing shim doesn't push out, if it does, push it back into place.

This will at least keep you going until the motor can be replaced if necessary.

6/03/04

## SF-2 ADJUST SHURFLO PRESSURE SWITCH

The Shurflo feed pumps are equipped with a high pressure cut out switch, p/n EL-FP-PS. This is the small black unit on the end of the wetted end of the pump head, p/n PL-PMP-SFPH. where the two red wires connect. If the pressure switch is not properly adjusted the pump may cut out each time the Clark pump cycles and the feed pressure spikes. When this happens the production will drop and an unusual noise will be heard when operating on two pumps but the system will function normally during one pump operation on either pump. The points in the switch will fail fairly fast if set too low because of the constant arcing from cutting out each time the Clark pump shifts.

For all systems except the Gulfstream the feed pump pressure switches should be set to shut off at 125 psi. (8.5 bar) as follows. On the very center of the switch is a small 5/64" allen screw. Run the system on pump one and close the brine discharge valve (1/2 way 90 deg) to block the flow. Watch the pressure gauge and adjust the pressure switch to shut off at 125 psi. Repeat for pump two. Turn the allen screw clockwise to increase the cut off set point.

Gulfstream models could experience seal failures in the manifold if pressurized too high. For this reason the pump should be removed from the system and the switch adjusted using a separate pressure gauge. If replacing a feed pump or pump head for a Gulfstream model arrange to preset the switch before installation.

8/05/04

## SF-4 PUMPHEAD CHANGE OUT SHURFLO

To replace the pump head, p/n PL-PMP-SFPH, on a Shurflo pump proceed as follows. Disconnect the suction and discharge hoses, taking care not to get salt water on the motor, as it is not waterproof. Remove the pump from its mounting. Note which way the arrows on the old pump are pointing. Unplug the two red wires from the pressure switch. On the end of the pump are nine Philips head stainless steel screws. The three smaller screws near the center hold on the pressure switch and need not be disturbed. Three of the larger screws are 1 1/2 inch (2.5cm) machine screws that mount the pump head onto the pump, while the other three are shorter sheet metal screws holding the pump head together. Compare the new pump head to the one on the motor. The new pump head will have empty holes where the mounting screws go, and mounting screws loose in the box. Remove the corresponding mounting screws on the old pump head, and it will come off easily in your hand. If the aluminum drive adapter stays on the motor pull it off as the new pump head comes with one installed.

Line up the flat on the motor shaft with the flat in the new pump head drive adapter and push the pump head onto the shaft. Rotate the pump head until the arrows point the same as they did on the old one and push it onto the three small locating bosses. It will be somewhat crooked, this is normal. Insert the new mounting screws and tighten them in sequence so that the pump head straightens out and pulls down evenly on to the motor. Plug in the wires, install the fittings from the old pump head into the new one, and reinstall. Adjust the pressure switch on the new pump head to cut off at 125 psi. (See Bulletin SF-2 ADJUST SHUFLO PRESSURE SWITCH.)

8/05/04

## VP-1 VANE PUMP DRIVE FAILED

If the feed pump runs but no water flows, and the system is not air bound, the pump drive on your machine may have failed. It could be one of two things. Between the pump head and the motor there is a bronze tang, p/n HF142CPFFS, that fits into a slot in the motor and another slot in the pump head, transmitting the torque. The tang is simple to replace: Remove the pump module front cover and pull it to the side. Remove the stainless clamp p/n PL-PMP-VBC, that holds the pump to the motor and separate the pump from the motor. (leave hoses in place). Inspect the tang. If it is broken call us and we will ship you a new one.

If the tang has not failed then the rotor shaft may have started to slip. The earlier vane pumps have a two piece shaft/rotor. The shaft is pressed in, and the joint can fail and start to slip under load. It may feel ok by hand but under load it starts to slip. Usually the pump makes a squealing noise when this happens. Temporary repairs can be made by taking the pump apart, drilling the joint, and pressing a pin in place to keep it from slipping. We have done it with a vise and hand tools. Disconnect the hoses and take the pump head to a workbench.

The pump comes apart by removing the circlip on the front cover, pop the cover off. Tap the pump on a hard surface to slide the first graphite end plate out. Next by using a screwdriver or other tool, tap on the end of the rotor shaft that connects to the motor. Tap until the shaft/rotor assembly slides all the way out. If possible, leave the carbon cam and the cam locating pin in place. Now you can work on the shaft. Make sure the two pieces are pressed together all the way. Use a center punch to index the hole in the middle of the bearing area down the center of the shaft. Drill as straight as possible. The pin should be 1/8" diameter. A roll pin works best. Tap the pin in place and using a file, clean things up to be smooth and flush. Tap the shaft back into the body. Be careful that the seal behind the bearing is straight when going through it. Reassemble and test. This will at least get you going until you can get a new pump. As of 8-1-03 all the pumps have a single one piece 316 SS shaft. Models 700 and 1000 take pump no. PL-PMP-240250. The model 400 takes pump no. PL-PMP-140175

If you must pickle or store the unit see MB-3 STORING WITHOUT FEED PUMP

9/27/04

## VP-2 ADJUSTING THE AC SPEED CONTROL

**WARNING ELECTRICAL HAZARD: 120v OR 220v AC POWER WILL BE PRESENT ON THE TERMINAL BLOCKS WHILE ADJUSTMENTS ARE BEING MADE!**

The SCM & SCL speed controls are used to set the feed pump motor speed by changing ships AC 50 or 60 HZ power to another desired frequency. This allows the pump to be operated to provide precisely the desired output pressure and flow in the three different modes. The speed control is Spectra factory preset and should only be adjusted after contacting the factory. Do not change any setting except parameter 31: run speed, parameter 32: flush speed, or parameter 33: service speed.

If you have the AC Tech Installation and Operation Manual that ships with replacement speed controllers the parameter menu section will be marked with the Spectra Watermakers factory presets for your unit. The manual is also available on the website at [www.Spectrawatermakers.com](http://www.Spectrawatermakers.com) . Instructions for changing the settings are found in the Programming the SCL/SCM Drive section.

To change a speed setting run the watermaker in the mode in which you want to change the speed. For example: If you want to change the speed the pump runs at while making water, have the unit actually making water.

Enter PROGRAM MODE by pushing the Mode button. This will activate the password prompt. The password is 25. Enter the password with the up and down buttons. When the display reads 25, press Mode. The display will read P01 to indicate that you have entered program mode. Using the up and down buttons select the desired Parameter (e.g. P31 for setting run speed.) Press Mode to display the current setting. The speed settings are displayed in Hertz (cycles per second AC output power frequency.) Use the up and down buttons to change the setting. Do not change the setting more than 3 Hertz at a time. Press Mode to enter the new setting. The pump speed will change, and the controller will enter parameter select mode. To continue changing the same parameter until the desired pressure or flow rate is achieved, Press the Mode button two more times. This will bring you back to Program mode in the same parameter.

If no buttons are pushed for two minutes the controller will require the password to be entered again.

6/03/04

## VP-3 CHECK FEED PUMP BRUSHES CAT 300

If the feed pump runs poorly or won't start, check the brushes on the pump motor. They could be dirty, broken, or worn out. The rear bearing and brush holders are mounted inside the motor rear cover. Remove the two long screws that hold the cover on. The cover will slide off, leaving the bearing on the armature shaft. Check the brushes to see if they spring in and out of their holders freely. If they stick this is probably the problem. Remove the spring clips that hold the brushes in their holders. Inspect the brushes for chips etc. A new brush is about almost 1 inch (2cm) long. If the old brushes are less than 1/2 inch (12mm) long they should be replaced. Clean the end cap, brushes, brush holders, and commutator with compressed air or an electrical cleaner which will evaporate completely. Try not to get the carbon dust down inside the motor as much as possible. Check the commutator for "high mica." There should be a 1/16" (1mm) deep groove between each commutator section. If the copper commutator sections have worn down to the point that the mica insulation is flush with or higher than the copper, the brushes will not be able to touch the copper, and sparking, intermittent operation, and rapid brush wear will occur. In this case the motor should be taken to a repair shop for a rebuild. In an emergency the mica can be cut down with a hook scraper made from an old hacksaw blade or other thin metal.

To reinstall the end cap: Place the brushes into their holders so that they are far enough back to clear the commutator. Slide the end cap on to the armature bearing and secure it with the two long screws. These screws will be difficult to align. Install the brush springs, making sure the little hooks engage at the bottom of the brush holder. Replace the brush access caps.

5/3/04

## VP-4 VANE PUMP PRESSURE RELIEF

The Spectra vane type feed pumps are equipped with an adjustable internal pressure relief valve. When this valve opens water is allowed to flow from the discharge side of the pump to the suction side. The valve will frequently make a “chirping” noise as it opens each time the Clark pump shifts. In cases where the feed pump is not producing its rated flow and pressure, or you here a high pitched chirp at each shift, the internal relief valve setting should be checked

On the side of the pump is an acorn nut. Remove the nut, being careful not lose the o-ring which fits into a groove in the nut. If the unit is running the pump will now suck air and make a lot of noise. Under the acorn nut is a slotted screw. Turn the screw clockwise to increase the pressure setting. Remember how many turns you give it. Replace the acorn nut. If the product flow and feed pressure readings increase then the valve was open. If there is no change the valve was closed. If the valve was closed return the screw to its original position.

If the flow increased set the valve as follows. Install a bronze shut off valve in the brine overboard line. Use an analog gauge if available, or the MPC-3000 pressure display to set the pressure. With the unit operating on manual, start closing the valve in the brine overboard line while watching the pressure. The maximum pressure is the relief valve set point. Stop the feed pump, remove the acorn nut and turn the screw clockwise. Replace the acorn nut. Restart the pump and check the new set point. Repeat until the maximum pressure matches the system design pressure. The correct system pressure is printed or engraved on the pump.

9/27/04