

VML3000
Formalin Recycling System
Catalog # VML3000
Operations Manual
Version 1.5, May 2001

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INTRODUCTION

Congratulations on your purchase of a new TBS® VML3000 Formalin Recycler. The objective of this process is for recycling Formalin. The attached glossary defines the various terms used throughout this manual. Formalin is comprised of 37 percent, by weight, aqueous solution of formaldehyde with a small amount of methanol.

Formaldehyde is actually a colorless gaseous compound, the simplest aldehyde, suspended in an aqueous mixture. This gas (HCHO) is used to manufacture melamine and phenolic resins, polyurethane foams, fertilizers, dyes and embalming fluids. The liquid is also used as a preservative and disinfectant.

The primary liquid to be recycled at hospitals uses Formalin further diluted with water to a level from 37% to approximately 3.7% formaldehyde. This solution is used in the pathology departments of hospitals and morgues as a preservative type liquid for tissue and organ samples. These samples can then be dissected and inspected at a later date after removal from the host or saved for future reference.

This system is designed to recover spent and dirty Formalin after use in specimen jars and laboratory equipment. Contaminated Formalin is designated as a hazardous waste in some states and is not allowed to be flushed down the drain into the city sewer system and, thus, requires expensive waste disposal costs.

Contaminated Formalin is considered a biohazard by the Environmental Protection Agency. Formaldehyde is also considered a carcinogen by the Food and Drug Administration. Ingestion, physical skin contact and inhalation can all contribute to the additional risk of cancer.

This Formalin recovery process reduces hazardous waste disposal costs, reduces the expense of purchasing virgin Formalin and helps the environment by reusing existing Formalin while further reducing production requirements by the virgin Formalin manufacturers.

This unique system reduces off-gassing of the Formalin solution by avoiding the use of heat to distill the liquid into a pure state. A series of high technology purification and clarification techniques are used to cleanse the contaminated solution and return the fluid back to its original color. This low energy consumption method utilizes a closed system in order to minimize the operator's exposure to both liquid and vapor during processing.

FORWARD

This manual is designed to exhibit the information needed for installing, operating and troubleshooting the VML3000 Formalin Recycler System, patent #5,685,987. It is specifically designed to recycle Formalin. It is the responsibility of the user to have the permeate analyzed to ensure that it has the appropriate pH and % Formaldehyde concentration. A buffering agent may need to be added to bring the pH to an acceptable level. Concentrated Formalin may also need to be added to raise the Formaldehyde percentage to the target amount.

PRECAUTIONS

1. Always make certain that safety glasses with splash guard, gloves and respirator are worn when handling Formalin and working around the instrument.
2. Always unplug the unit before servicing. Working inside the back cover could result in electrical shock!
3. Install the power supply for the system to a GFI (Ground Fault Interrupt) outlet only.
4. Do not allow the main filter to dry out. (Dry-out is irreversible and is not covered by warranty.) Always make certain the system is filled with solution after drainage from cleaning.
5. Try to minimize the time the system has no flow of dirty fluid.
6. Never expose the main filter to a fluid temperature greater than 130°F. Never start the system cleaning procedure with hot water in the primary carboy.
7. The acceptable pH limits that the system can withstand range from 2 to 11.
8. Do not use any silicone-based materials (waterproofing sprays, lubricating fluids, greases, etc.) or anti-foam agents in or around the Formalin Recycler. The use of any of these compounds can cause permanent damage to the main filter.
9. Check all exterior piping for secure connections before starting the recycler. Make certain that the O-rings are in place on the *Tri-pipe Assembly (5)* and that the top spongeball insertion plug is properly in position.
10. Do not remove wire or polymer mesh or mounting collar from either the *Spongeball Removal Cap (13)* or the *Pre-Filter Cap (9)* for cleaning. Use the round polymer brush supplied with the machine.
11. Do not turn valve handles with the machine running. Make certain that the handles are pointing all-the-way left or all-the-way right, before starting the machine.
12. Never start the system with the *Permeate Return Hose (20)* not plugged in to the machine front *Permeate Quick Disconnect Port (17)*.

GLOSSARY

Concentrate - The exhaust mixture (retentate) returned to the holding tank after processing.

Drip Pan - A pan covering the entire bottom area of the machine used to contain any spillage from batch-to-batch changeover.

Flow Controller - An in-line plumbing device with a fixed orifice used to maintain a consistent flow rate in the system at all times.

Flux - A term expressing gallons per day (GPD) of permeate per square foot of membrane surface, or liters per square meter per hour (LMH). Also called the rate of permeation.

Fouling - The condition when an accumulation of material on the membrane surface restricts the permeate output or flux through the membrane.

Inlet Pressure - The fluid pressure measured at the entrance to the membrane module.

Separation - The molecular separation of fluid elements according to the specific pore size of the primary filter. The smaller molecules of the permeate pass through the membrane while larger molecules/colloids are retained and returned to the holding tank as concentrate.

Outlet Pressure - The fluid pressure measured at the exit to the membrane module.

Permeable - That can allow passage or be penetrated, especially by liquids.

Permeate - The description term used to indicate the passage of fluid through a membrane. The term also refers to the liquid separated from the process fluid in the system.

Preservative Solution - A chemical solution used to pickle and protect the membrane from degradation during idle periods of system use.

Pressure Drop - The difference in pressure (pressure differential) between the inlet and outlet of the membrane filter.

Process Fluid - The contaminated fluid to be cleansed and recovered by the membrane filtration system.

Pump - A motor attached to a pump head used to pull and push the Formalin liquid through the system during the purification phase of the process.

Purge - The procedure used to replace the contaminated process fluid in the system with clean fluid from the permeate tank.

Sludge - A settling of heavier liquids or solids as sediment or dregs on the bottom of the contaminated fluid holding tank which has potential to foul the primary filter membranes.

Solute - A substance dissolved in another substance, usually the component of a solution present in the lesser amount.

Surfactant - Soap-like chemicals and surface active agents used to improve the wet-out and cleansing characteristics of a cleaning solution.

Polishing Filter - An after-filter used to return the contaminated fluid back to its original color, after leaving the primary filter.

Prefilter - A filtration device used to retain large particles of contaminant prior to a second or main filter. This device helps prevent damage or premature loading of the main filter.

Primary Filtration - A permeation process using pressure to force solution through semi-permeable membranes. Membrane pore size, frequency and distribution, along with fluid compatibilities, determine the appropriate flow rates and viscosity thresholds.

Water Flux - The rate of permeate output in GPM when water is processed through the *Primary Filtration Module (24)*. At the standard operating pressure and temperature, this unit of measurement can be converted to gallons-per-day per square foot (GPD) of active membrane surface.

CONDITION OF RETURNED EQUIPMENT

Before returning equipment to TBS, you must contact TBS or the dealer and receive a return goods authorization number. **All returned units must be decontaminated and free of hazardous and infectious materials.** The RGA paperwork includes a Certificate of Decontamination which must be signed indicating that the steps have been performed. TBS will not accept the shipment until the signed certificate is received.

Exact instructions **MUST** be followed for "Preservative Procedure" (detailed in the Operations Manual) for shipping, failure to comply may result in additional repairs and fees.

Transportation to the service depot must be prepaid. In addition, TBS must receive unit packed and shipped in compliance with our shipping/crating instructions. (These can be faxed upon request.) Failure to properly crate and ship the unit could result in additional repairs and fees.

SYSTEM DESCRIPTION

The TRIANGLE BIOMEDICAL SCIENCES, INC. VML3000 FORMALIN RECYCLER consists of *the Primary Filtration Module (24), a Pump (25), Spongeball Insertion Port (12) and Spongeball Removal Housing (14), a Permeate Flowmeter (16), a self-adjusting In-line Flow Controller (26) to maintain proper flowrate, a Tri-pipe ssembly (5) for dirty carboy access and for automatic shutdown, a safety Pressure Switch (39), a High Temperature Thermostat (38) and an Cooling Fan (28) for system cooling.*

INSTALLATION

SETUP INSTRUCTIONS

Before installing and assembling the machine the first time, check the shipped items against the packing list below.

PACKING LIST

Qty	U/M	Description
1	ea	VML3000 Unit
1	ea	Drip Pan
1	pk	screws, washers, and nuts for assembly
1	cs	Liquid Cleanser (12) and Powdered Purifier (12)
1	pk	Sponge balls
1	ea	Tri-Pipe Assembly
2	ea	Collection Carboys
1	ea	Preservative (2.5 gal)
1	ea	Polishing Filter
1	ea	Operations Manual
1	ea	Carboy Cart
1	ea	Funnel for Purging
1	ea	Brush for cleaning Pre-filter cap
2	ea	Syringes for sponge ball removal
1	ea	Rubber Stopper w/ hole for sponge ball removal

PARTS INDEX

<ol style="list-style-type: none">1. Drip Pan2. Carboy Cart3. Machine Base4. Dirty Formalin Carboy5. Tri-pipe Assembly6. Prime Release Rod Knob7. Tri-Pipe Clamping Knobs8. Machine Housing9. Pre-Filter Cap10. Pre-Filter Housing11. Spongeball Insertion Plug12. Spongeball Insertion Port13. Spongeball Removal Cap14. Spongeball Removal Housing15. Polishing Filter16. Permeate Flow Meter17. Permeate Quick Disconnect Port18. Polishing Filter Bypass Valve19. Permeate Recirculation Valve20. Permeate Return Hose21. Clean Formalin Carboy22. Green Start Switch23. Red Stop Switch	<ol style="list-style-type: none">24. Primary Filtration Module25. Pump26. In-line Flow Controller27. Electrical Box Gasket28. Cooling Fan29. Suction Line30. Primary Filter Module End Cap31. Auxiliary Relay32. Permeate End Cap 1.5" Gasket33. Permeate End Cap Band Clamp34. Permeate End Cap35. End Cap Band Clamp36. Saddle Clamp37. Pump Support Bracket38. High Temperature Thermostat39. Pressure Switch40. Timer41. Electrical Box42. Tri-Pipe Assembly Manifold43. Electrical Terminal Strip44. Electrical Fuse45. Primary Module End Cap 3" Gasket46. Thermostat Sensing Probe
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OPERATION

RECOVERY PROCEDURE

1. Place a 5 gallon *Dirty Formalin Carboy (4)* on the *Carboy Cart (2)* with casters. Make certain that the carboy sits directly on the cart with nothing separating the carboy from the cart.
2. Place the *Tri-Pipe Assembly (5)* into the *Dirty Formalin Carboy (4)*.
3. Roll the carboy into place and align the *Tri-pipe Assembly (5)* holes with the two threads rods. Make certain that all three (3) O-rings are in place before tightening.
4. Using the two black *Tri-Pipe Clamping Knobs (7)*, place on the threaded rods and tighten until the gap between the two gray polymer sections is fully closed.
5. Make certain that the *Prime Release Rod Knob (6)* is in the down position before priming.
6. Turn the *Polishing Filter Bypass Valve (18 - top)* to the “run” position (left).
7. Turn the *Permeate Recirculation Valve (19 - bottom)* to the “run” position (right).
8. Remove the *Spongeball Insertion Plug (11)* by lifting the camlocks on each side of the *Spongeball Insertion Port (12)*.
9. Loosen the *Pre-Filter Cap (9)*.
10. Slowly fill the *Spongeball Insertion Port* with clean Formalin. Stop filling when liquid level begins to show through the housing of the *Spongeball Removal Housing (14)*.
11. Tighten *Pre-Filter Cap (9)*.
12. Continue slowly filling the *Spongeball Insertion Port (12)* with clean Formalin until liquid is approximately two (2) inches from the top. Be careful not to overfill.
13. Replace the *Spongeball Insertion Plug (11)* into the *Spongeball Insertion Port (12)*. Make certain that lock-down cam levers are in the down position.
14. Before starting, make certain that the following connections are tight.
 - a. *Spongeball Insertion Plug (11)*
 - b. *Spongeball Removal Cap (13)*
 - c. *Pre-Filter Cap (9)*
 - d. *Tri-Pipe Assembly Knobs (7)*
15. The *Red Start Button (23)* light should be on, if the machine is plugged in.
16. Push *Green Start Button (22)*. Note: If system fails to start or keep running, refer to the TROUBLESHOOTING section.
17. Make certain clean Formalin is exiting the Recycler system via the *Permeate Return Hose (20)*.

PERCENT AND pH ADJUSTMENT

Following recycling of Formalin using the TBS System, both pH and percent Formalin levels must be checked. To perform these tests, the following guidelines to assist your laboratory are recommended for obtaining accurate data. Further, TBS will teach the procedures on how to “reconstitute” your recycled Formalin into working Formalin. With experience, a technologist will be performing these tests and reconstituting recycled Formalin within minutes each day.

pH - The pH after recycling Formalin will vary from run to run. Most laboratory tests demonstrate the recycled Formalin pH to drop to approximately 6.5 to 6.9, depending upon actual laboratory practices. A Formalin pH from 6.9 to 7.2 is usually acceptable. TBS recommends using sodium hydroxide to rebuffer a recovered solution back to the original target; regardless of the previously used buffer. The amount needed generally ranges from 200 to 500 milliliters per five gallons.

CLEANING PROCEDURE

The system will automatically shutdown after running the concentration cycle, and will then be ready for the cleaning procedures.

1. Remove the *Spongeball Insertion Plug* (11) by lifting the camlocks on each side of the *Spongeball Insertion Port* (12).
2. Loosen the *Spongeball Removal Cap* (13).
3. Lift and hold up the *Prime Release Rod knob* (6) on top of the *Tri-Pipe Assembly* (5) to drain the system plumbing, until the gurgling sound stops.
4. Remove the *Tri-Pipe Clamping Knobs* (7) and remove the *Tri-Pipe Assembly* (5) while pulling the *Dirty Formalin Carboy* (4) away from the machine front.
5. Pull the *Tri-Pipe Assembly* (5) half way out of the *Dirty Formalin Carboy* (4) and lift and hold up the *Prime Release Rod Knob* (6) to fully drain. Place the *Tri-Pipe Assembly* (5) in the *Drip Pan* (1).
6. Switch out the *Dirty Formalin Carboy* (4) with a clean carboy, making certain that the clean carboy is fully seated on the *Carboy Cart* (2) with casters. Make sure that the carboy sits directly on the cart with nothing separating the carboy from the cart.
7. Pour in a pre-measured bottle of liquid cleaner and a pre-measured bottle of powdered cleanser in to the clean carboy. Fill the clean carboy with 5 gallons of water.

Note: Use of other cleaners can damage the *Primary Filtration Module* (24) and should be avoided.
8. Place the *Tri-Pipe Assembly* (5) into the clean carboy.
9. Roll the carboy into place and align the *Tri-pipe Assembly* (5) holes with the two threads rods. Make certain that all three (3) O-rings are in place before tightening.
10. Using the two black *Tri-Pipe Clamping Knobs* (7) placed on the threaded rods, tighten till the gap is closed between the *Tri-Pipe Assembly* (5) and the *Tri-Pipe Assembly Manifold* (42).

11. Make certain that the *Prime Release Rod Knob (6)* is in the down position before priming.
12. Turn the *Polishing Filter Bypass Valve (18 - top)* to the “clean” position (left).
13. Turn the *Permeate Recirculation Valve (19 - bottom)* to the “clean” position (left).
14. Tighten the *Spongeball Removal Cap (13)*.
15. Slowly fill the *Spongeball Insertion Port* with water. Stop filling when liquid level begins to show through the housing of the *Spongeball Removal Housing (14)*.
16. Continue slowly filling the *Spongeball Insertion Port (12)* with water until liquid is approximately two (2) inches from the top. Be careful not to overfill.
17. Replace the *Spongeball Insertion Plug (11)* into the *Spongeball Insertion Port (12)*. Make certain that lock-down cam levers are in the down position.
18. Before starting, make certain the following connections are tight.
 - a. *Spongeball Insertion Plug (11)*
 - b. *Spongeball Removal Cap (13)*
 - c. *Pre-Filter Cap (9)*
 - d. *Tri-Pipe Assembly Knobs (7)*
19. The *Red Start Button (23)* light should be on, if the machine is plugged in.
20. Push *Green Start Button (22)*. Note: If system fails to start or keep running, refer to the TROUBLESHOOTING section 6.0.
21. Make certain clean water is not exiting the Recycler system via the *Permeate Return Hose (20)*. The clean water should be recirculating back to the main tank without passing through the *Polishing Filter (15)*.
22. Run the system with cleaning solution for approximately 1-2 hours. After 1 hour, run the *Spongeball Procedure (Section 3.3)* and repeat as necessary in order to achieve a minimum of 2 gallons per hour on the *Permeate Flowmeter (16)*.
23. The red stop button should be used to halt the operation of the machine. Do not disconnect the *Tri-Pipe Assembly (5)*, *Spongeball Insertion Plug (11)*, *Spongeball Removal Cap (13)*, or *Pre-Filter Cap (9)* until ready to process additional dirty Formalin.

Note: If the recycler is to be stopped for longer than two days, refer to the PRESERVATIVE PROCEDURE

SPONGEBALL PROCEDURE

This technique forces spongeballs through the Primary Filter Module using pressure and flow in order to wipe oil and other foulants off the filtration media walls.

1. While on Step 22 of the CLEANING PROCEDURE, push the *Red Stop Switch* to stop the process.
2. Remove the *Spongeball Insertion Plug* (11) by lifting the camlocks on each side of the *Spongeball Insertion Port* (12).
3. Place 3 spongeballs in to the *Spongeball Insertion Port* (12) and replace the *Spongeball Insertion Plug* (11). Make certain that lock-down cam levers are in the down position.
4. Push the *Green Start Button* (22).
5. Allow the system to run until all 3 spongeballs have exited the Primary Filtration Module and returned to the *Spongeball Removal Housing* (14).
6. Shut off the machine by pushing the *Red Stop Switch* (23).
7. Slowly remove the *Spongeball Removal Cap* (13) and allow the system to perk in order to retrieve the 3 spongeballs. This allows better removal of the spongeballs and prevents the spongeballs from going to the *In-line Flow Controller* (26).

Note: All spongeballs must be removed from the system. If all the spongeballs are not accounted for, see the TROUBLESHOOTING section.
8. Replace and tighten the *Spongeball Removal Cap* (13).
9. Repeat steps 1 through 7, as needed, to obtain the 2 gallons per hour target on the *Permeate Flowmeter* (16).
10. Push the *Green Start Switch* (22) to restart the system.

CLEANING SOLUTION

Warning:

When handling cleaning chemicals, use gloves, safety glasses with splash guard, and an apron.

Note:

1. The TBS Cleaning Solution should be used exclusively. Use of other cleaners can result in permanent damage to the *Primary Filtration Module*.
2. Higher temperatures do improve the cleaning efficiency of the *Primary Filtration Module*; however, DO NOT EXCEED 130 DEGREES F.

PRESERVATIVE SOLUTION

If the recycler is not to be used for an extended period of time, then the following procedures should be followed for extending the *Primary Filtration Module* life.

<u>Shutdown Time</u>	<u>Solution</u>
0-2 days	<ol style="list-style-type: none">1. Perform standard cleaning procedure.2. Leave unit on cleaning solution until ready to concentrate again.
2-7 days	<ol style="list-style-type: none">1. Perform standard cleaning.2. Fill a clean carboy with water.3. Recirculate for 1-2 hours per day.4. Clean prior to recycling additional Formalin.
> 7 days	<ol style="list-style-type: none">1. Perform standard cleaning procedure.2. Recirculate the Preservative Solution for 1/2 hour and leave unit on the Preservative Solution until ready to recycle Formalin again.3. Perform standard cleaning procedure, again.

TROUBLESHOOTING

Symptom

1. *Red Stop Switch (23)* light not on.

2. System starts but stops after one (1) minute

3. No permeate after system runs for more than one (1) minute.

4. The Recycler takes too long to process the 5 gallons (> 6 hrs).

5. Formalin from exiting *Permeate Return Hose (20)* is cloudy or retains color.

Solution

- Plug the system power cord into an 110vAC outlet.
- Check or replace light bulb (Bulb is always dim) with power off.
- While unplugged from AC, inspect the power cord for damage.
- Pump not priming. Execute Recovery Cycle step 8 in this manual.
- System pulling in air. Execute Recovery Procedure step 14 of this manual.
- Inspect inlet *Spongeball Removal Housing (14)* or *Pre-Filter Housing (10)* for loading.
- Inspect bottom of *Tri-Pipe Assembly (5)* for loading.
- Check the fluid level in *Dirty Formalin Carboy (4)*.
- Make certain that the *Prime Release Rod Knob (6)* is in the fully seated position.
- *Permeate Recirculation Valve (19)* is pointed to the left. Move valve handle to point right.
- Recycler is maintaining too low of a flow rate. Inspect inlet *Spongeball Removal Housing (14)* or *Pre-Filter Housing (10)* for loading. Check other system components for loading.
- Make certain that the *Permeate Return Hose (20)* is hooked up.
- If the two above solutions do not resolve the problem, then put the machine through the cleaning procedures. If the cleaning does not work, replace *Primary Filtration Module (24)*.
- Put the machine through the cleaning procedures. If the permeate flow rate does not return to at least 2.5 GPH, replace *Primary Filtration Module (24)*.
- Make certain Formalin is exiting the *Permeate Return Hose (20)*.
- Replace *Polishing Filter (15)* cleaning cartridge.
- *Primary Filtration Module (24)* may be damaged allowing dirty Formalin not to be cleaned through the walls of the module.

6. *Permeate Flowmeter (16)* shows zero permeate during cleaning cycle.
 - *Permeate Recirculation Valve (19)* handle is not pointed to the left.
 - *Permeate Return Hose (20)* fitting is not plugged into the self-sealing *Permeate Quick Disconnect Port (17)* mounted on machine front.
 - *Permeate Return Hose (20)* is pinched.

7. *Permeate Flow Meter(16)* will not reach 10 GPH during cleaning.
 - Make-up a new drum of cleaning solution. Repeat cleaning procedure.
 - Call TBS for a more powerful cleaning solution. Repeat cleaning procedure.
 - Replace module (See Module Replacement section of this manual).

8. During Cleaning Cycle, Spongeballs do not return to *Spongeball Removal Housing (14)*.
 - Restart and run machine for 1 minute, then re-inspect *Spongeball Removal Housing (14)*.
 - If spongeballs are not present, with machine shut down, drain the *Tri-Pipe Assembly (5)*.
 - Remove *Ball Insertion Plug (11)*.
 - Remove the *Tri-Pipe Assembly (5)*.
 - Remove the *Spongeball Removal Cap (13)*.
 - Insert the black rubber stopper (with a hole in the center) into the center hole of the *Tri-Pipe Assembly Manifold (42)*.
 - Fill the small tip syringe (slip tip) with water and fill the *Spongeball Removal Housing (14)* till it overflows.
 - Fill the large tip syringe (catheter tip) with water and insert into the black rubber stopper.
 - Push the large tip syringe plunger fast and hard to dislodge and blow out the spongeball.
 - The spongeball should be floating on the surface of the water inside the *Spongeball Removal Housing (14)*.
 - If not, repeat step 8, several times.
 - Go to step 9 if the spongeball has still not appeared.
 - Before reinstalling the *Tri-Pipe Assembly (5)*, make sure that the 3 O-Rings are properly installed on the *Tri-Pipe Assembly Manifold (42)*.

9. After performing Step # 8, spongeballs still have not returned to *Spongeball Removal Housing (14)*.
 - Check the alignment of *Primary Filtration Module (24)* Gaskets. Realign alignment pins on the stainless steel end cap with gaskets and *Primary Filtration Module (24)* face. (See the Module Replacement section of this manual.)

10. Machine Will Not Run when green start switch (22) is pushed & red stop switch light (23) is on
 - High Temperature Thermostat (38) Has Shut Off The Machine Because The Temperature Is Too High. Allow The Machine To Cool Back Down To Ambient Temperature before trying again.

TECHNICAL DATA

REPLACEMENT PARTS

<u>Part #</u>	<u>Description</u>
3000001	Primary Filtration Module
3000002	3" Primary Filtration Module End Cap Gasket
3000003	1-1/2 " Permeate Exit Gasket
3000004	Spongeballs Pkg. (12)
3000005	Spongeball Insertion Plug
3000006	Pre-Filter Cap and Spongeball Removal Cap Screen
3000007	Pre-Filter Cap and Spongeball Removal Cap Collar
3000008	Box Of 12 Liquid Cleanser and 12 Powdered Purifier Bottles
3000009	Carboy (5 Gallon)
3000010	Carboy Cart
3000011	Polishing Filters
3000012	Preservative (2.5 Gallon Container)
3000013	Brush For Cleaning Pre-Filter Cap
3000014	Tri-Pipe Assembly
3000015	Light Bulb For Start & Stop Switches
3000016	Replacement Fuse
3000017	Large Tip Syringe (Catheter Tip - Sponge Ball Removal)
3000018	Small Tip Syringe (Slip Tip - Sponge Ball Removal)
3000019	Black Rubber Stopper With Hole (Sponge Ball Removal)

MODULE REPLACEMENT

At the point when cleaning with spongeballs will not bring the *Primary Filtration Module (24)* back up to the proper flow rate, then the module should be replaced.

1. Unplug the AC power cord.
2. The *Primary Filtration Module (24)*, is located near the bottom of the housing, directly beneath the *Pump Support Bracket (37)*.
3. Remove the two 3" End Cap Band Clamps (35) holding the inlet and outlet *Primary Filter Module End Caps (30)*.
Note: Leave the end cap gaskets on the alignment pins to insure they are not misplaced or misaligned.
4. Loosen and remove the two *Permeate End Cap Band Clamps (33)* and the *Permeate End Cap (34)* from the module.
Note: Be careful not to misplace the permeate gaskets.
5. Remove the *Saddle Clamps (36)* holding the module assembly to the bracket.
6. Remove the module.

7. Remove the plastic covers off all four ports on the new module.
8. Place the new module back onto the Pump Support Bracket (37) inside the system and secure it down with the saddle clamps.
Note: Make certain that the module is turned exactly the same way as before (including the alignment of the end cap pins).
9. Place the gasket and the permeate 1.5" end cap onto both the right and left hand permeate exit port and clamp it in place. Be certain to locate the sealed end cap on the right hand permeate exit port of the module.
10. Reinstall 3" end caps on both ends of the new module and clamp the assembly together.
Note: The faces on the ends of the module have seven channels connecting tubules and one inlet (or outlet) tubule, as well as two 1/16" locating holes. The holes passing through the end caps, gasket, & inlet (or outlet) tubule **MUST** all line up before clamping the assembly together. Location pins, protruding from each endcap, will insure the true alignment of these components. The gaskets should be placed onto the endcap first, followed by the alignment of the end cap locating pins with the locating holes in the module face.
11. Replace the back cover. Be certain to hook up the cooling fan.
12. Plug recycler back into AC outlet with GFI (Ground Fault Interupt).