



Installation and Operators Manual

Model: Tower System Media Filters STS



FRESNO, CALIFORNIA, USA



STS SERIES MEDIA FILTERS Installation, Operation, & Maintenance Manual

I. INTRODUCTION

The LAKOS STS Series Media Filters are specifically designed for use in full-stream, side-stream, and basin sweeping (SWP) applications. For side-stream, we recommend the industry standard filtration rate range of 10%-20% based on the full-stream flow of the system. The standard STS Series Sand Filters can be filled with media for either 10 micron filtration @ 95% removal efficiency (standard), or 5 micron filtration @ 90% removal efficiency (optional). Please refer to section X for "How it Works" STS system diagram.

The LAKOS STS Series Media Filters can be installed for either full-stream operation or side-stream operation (most common). Side-stream installations should be applied by tapping into a mainstream line after the pump (see drawing STS-0001), or by tapping directly to a basin or remote sump to achieve a given turnover rate. **Please note that all standard STS system pumps require flooded suction for proper operation! Please contact the factory if you have a installation that will require the pump to lift water!**

LAKOS does not recommend using the standard STS Series Media Filters for basin/remote sump sweeping applications. The proper use of this technique requires a specific sweeping design using Hydroboosters and the proper flow/pressure to ensure maximum performance. LAKOS does offer a special system (SWP) for sweeping applications. These systems come with higher head pumps to meet the specific pressure requirements needed for basin sweeping. Please contact the factory to see if the STS/SWP Media Filter can be used for your application.

The maximum operating pressures for the LAKOS STS Series Sand Filters are as follows;

- STS-15-025 thru STS-36-165 models: 100 psi (6.9 bar)
- STS-48-310 models: 80 psi (5.5 bar)

II. WARRANTY

All products manufactured and marketed by this corporation are warranted to be free of defects in material and workmanship for a period of at least one-year from the date of delivery. Extended warranty or no coverage applies as follows:

**All LAKOS separators---five year warranty

**Pump seals are not covered under warranty

All other components and coatings: 12 months from the date of installation; if installed 6 month or more after ship date, warranty shall be a maximum of 18 months from ship date.

If a fault develops, notify us or your local representative, giving a complete description of the alleged malfunction. Include the model numbers(s), date of delivery and operating conditions of subject products(s). We will subsequently review this information and, at our option, supply you with either servicing data or shipping instructions with returned materials authorization number. Upon prepaid receipt of subject product(s) at the instructed destination, we will perform such necessary product repairs or replace such product(s) at our expense.

This limited warranty does not cover any products, damages or injuries resulting from misuse, misapplication, neglect, normal expected wear, chemically-caused corrosion, improper installation or operation contrary to factory recommendation. Nor does it cover equipment that has been modified, tampered with or altered without authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or cost resulting from any such defective products(s).

This warranty supersedes any and all previous warranties provided by LAKOS Filtration Solutions.

III. DELIVERY INSPECTION OF STS SERIES MEDIA FILTERS

1. Immediately inspect the system upon arrival for any damage that may have occurred during shipping. Look for crate damage, pierced or torn boxes or any other signs of handling, which may suggest damage to the system.
2. LAKOS STS Series Media Filters are shipped with all major components assembled onto the skid. Selected small items, such as the pressure gauges, may be removed and inserted into the control box for shipping.

3. LAKOS sand media is shipped separately in 50 lb. bags and gravel shipped in 80 lb. bags. The exact number of bags is determined by the actual system size (see chart below). Do not introduce media sand or gravel into the STS system until the system is placed in its final operating position.

MEDIA SAND CHART

MODEL	MEDIA SAND REQ'D		MEDIA GRAVEL REQ'D	
	(LBS)	(KG)	(LBS)	(KG)
STS-18-045	200	91	80	36
STS-24-075	400	181	120	54
STS-30-110	500	227	160	73
STS-36-165	800	363	240	109
STS-48-310	1300	590	560	254

IV. INSTALLATION OF STS SERIES MEDIA FILTERS

1. A suitable foundation or pad must be provided to support the full operating weight of the STS system, including liquid (see media sand chart above). Use caution when moving the STS system into position. Move the system only by lifting the entire skid (forklift or crane/hoist). Never try and lift the equipment with hooks or straps attached to system piping or manifold, as damage could occur to the system. Anchor the unit to the foundation to prevent vibration and/or movement.
2. All STS systems required flooded pump suction for proper operation. Please make sure that all inlet piping to the system is located to ensure that the pump is flooded with water at all times. If your system is equipped with a self priming pump this will not apply.
3. The control panel must be wired for the proper voltage and rotation of the pump (see wiring diagram in control box door). All wiring should be done by a licensed electrician in accordance with local codes. Motor nameplates should be referenced for voltage, amperage draw, cycles, phase, speed and other motor information.
4. Piping connections to and from the STS system should be of at least the same pipe size as the STS inlet and outlet connections. Do not install smaller diameter pipe anywhere on the inlet, outlet, or backwash lines. Check local codes to determine if appropriate backflow prevention is necessary at the inlet.

5. It is recommended that service valves be installed on the STS system inlet and outlet so that the unit can be isolated for any maintenance or repairs when necessary.
6. All LAKOS STS systems are configured for either Source (S) or City (C) backwash. If your system is designed for City (C) backwash, city (or other external) water supply piping will need to be plumbed to the system backwash inlet connection (see drawing STS-0002). The pressure from this external source must not exceed 30 PSI and may require that a pressure regulator be installed (supplied by others).
7. Backwash connection piping is not supplied by LAKOS and must be provided on-site. Do not reduce the line size any smaller than the backwash outlet pipe size. A backwash throttling valve (by others) should always be installed in the piping to control backwash flow. Check local codes to determine if appropriate backflow prevention is necessary on the backwash line.
8. Determine if the drain for the backwash can handle the necessary backwash flow (see backwash flow chart below). All LAKOS STS Media Filters are factory set to backwash for 3 minutes**. If the drain can not handle the total backwash flow, LAKOS does offer backwash holding tanks that will allow the backwash water to be siphoned off at a slower rate so as not to overwhelm the drain. Please contact you local LAKOS representative for details.

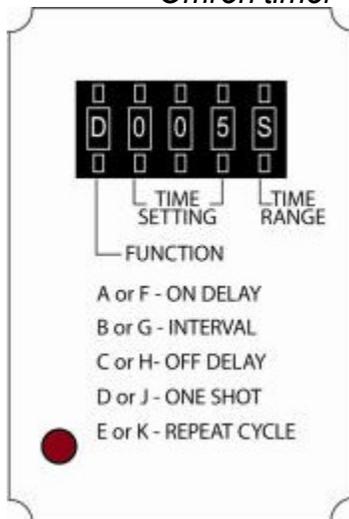
BACKWASH FLOW CHART

MODEL	MINIMUM BACKWASH FLOW	
	(US GPM)	(M3/HR)
STS-15-025	18	4
STS-18-045	27	6
STS-24-075	47	11
STS-30-110	74	17
STS-36-165	106	24
STS-48-310	188	43

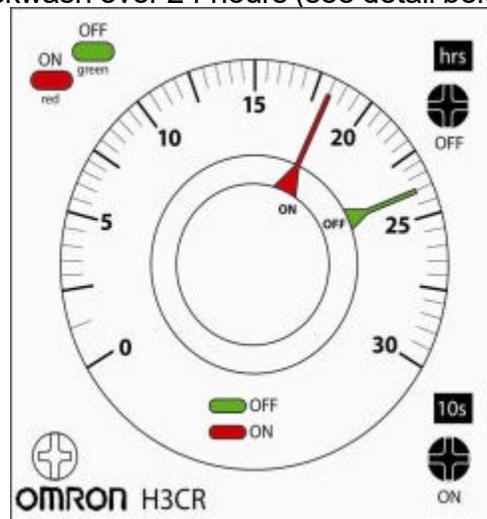
**NOTE: Flow values should be multiplied times "3" minutes to get the total backwash gallons of water that will be purge during a standard factory recommended backwash cycle

9. Check the STS system pump pre-strainer and remove any foreign matter. Close and secure the strainercover.

10. Once all pipe connections are installed and properly secure, open the STS Media filter's top access port. Inspect the PVC underdrain to be sure all parts (laterals) and connections are secure and nothing is broken. Fill the STS about one-third to half full with water. Then, SLOWLY add the appropriate amount of GRAVEL first (refer to media sand chart above). Spread the gravel level within the tank. Then SLOWLY add the appropriate amount of SAND second (refer to the media chart above). Spread the sand level within the tank, then close and secure the access hatch. *It is important that the gravel and sand be added slowly so that no damage occurs to the laterals on the underdrain assembly.*
11. Remove pressure gauges from packaging and install at the street tee connections on the inlet manifold elbow and tank outlet elbow.
12. Double check the controller settings. Factory settings should be as follows:
 - *Pressure differential switch* – 10 psi (0.7 bar)
 - *One Shot Relay* (white timer) – D005S (see detail below)
 - *Omron timer* – 3 minute backwash ever 24 hours (see detail below)

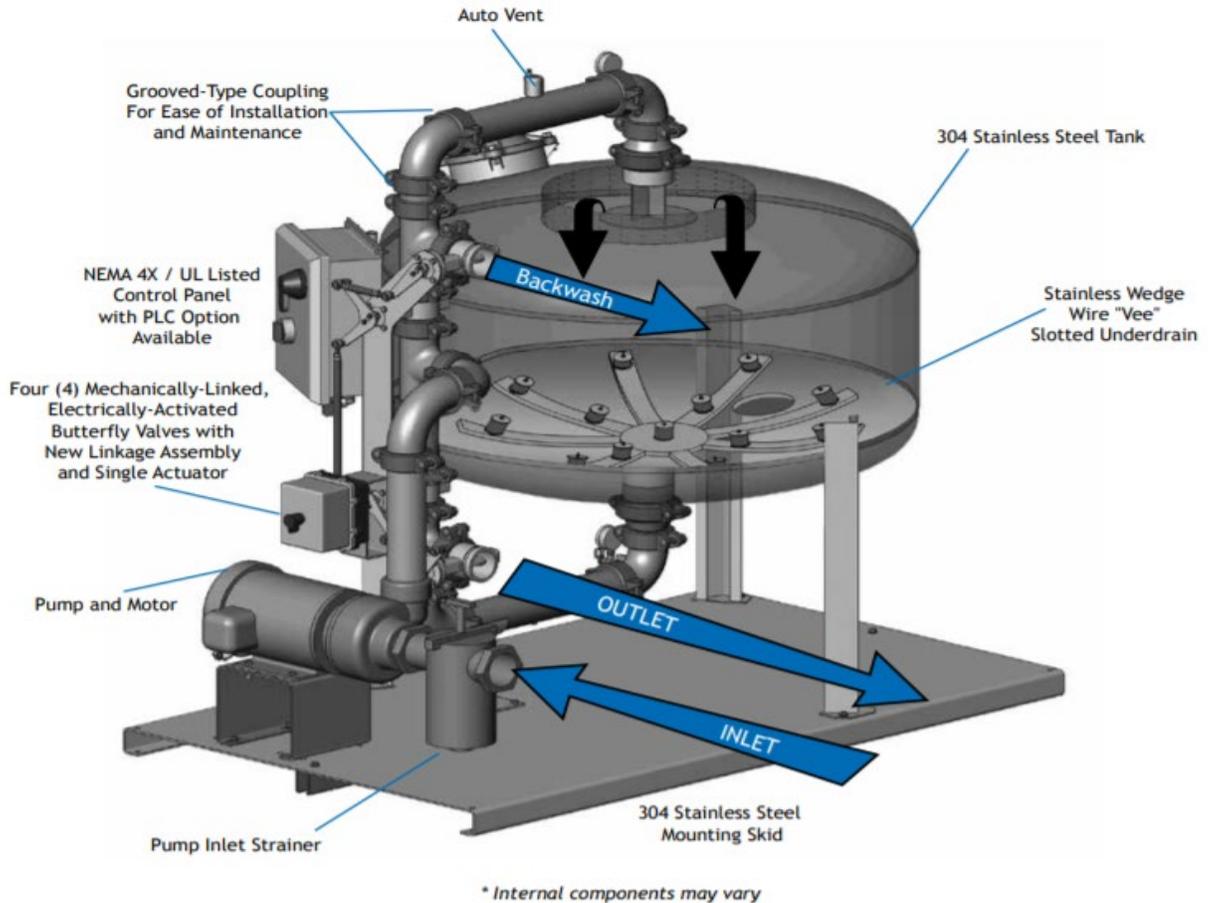


ONE-SHOT RELAY



OMRON BW TIMER

STS - HOW IT WORKS SCHEMATIC



The Basic Steps of Media Filtration

1. Unfiltered system water enters the pump suction INLET.
2. Water is pumped to top and is uniformly dispersed over the media bed.
3. Water passes thru the media bed leaving debris behind.
4. Filtered water exits the OUTLET.
5. The media bed is cleaned through a backwash cycle at specified intervals or differential pressure. The backwash cycle runs for a 3 minute period.
6. System returns to normal operating mode.

V. START-UP AND OPERATION

CAUTION !!!!!!!!!!!!!

Please be aware that when the main power disconnect is turned to the “ON” position the STS system valves and linkage will automatically rotate into a backwash configuration and will stay in the backwash cycle for 3 minutes. The valves and linkage should then rotate back into the filter operation mode.

NOTE:

Make sure that all suction valves (from the source of water to the pump intake) are fully opened when the pump is running. Operating the system with a partially closed suction valve can damage the pump and/or affect the system’s performance. Each model requires a minimum liquid submergence level (above the pump intake) to meet the pump’s Net Positive Suction Head Required (NPSHR) to avoid air intrusion or cavitation (vortexing at point of source). See appropriate pump curve included with this manual. This is also very important when LAKOS Hydroboosters are in use

1. Make sure that there is water in the main inlet line to provide flooded suction to the STS system pump. **DO NOT DRY RUN THE PUMP!** All pumps require a wet/primed suction before starting, using water as a lubricant for their seals. John Crane-type seals (e.g., Silicon Carbide Seals) can wear out in 20 seconds of dry operation. It only takes a small amount of water to lubricate the seal, and it vaporizes during pump operation.
2. Turn the main disconnect switch to the “ON” position. The valves and linkage should move and rotate in the backwash mode. After 3 minutes the valves should rotate back into the filtermode.
3. Turn the HOA switch to “HAND” and “bump” the pump motor to check fan rotation to make sure pump is rotating in the correct direction. Turn the HOA switch back to “HAND” and check the system for any leaks. If leaks start to develop turn the HOA and main disconnect off immediately and fix the problems.
4. Once the STS system is running any air in the system should be vented automatically out of the air relief valve located at the top of the STS system piping.

5. Check STS system inlet and outlet pressure gauges. Proper operating parameters will result in an inlet pressure from approximately 17-20 psi (1.2-1.4 bar) above the system flow pressure to the STS system and an outlet pressure of 16-19 psi (1.1-1.3 bar) above the system pressure flow pressure to the STS system. **If your system is a STS/SWP model that is being used in conjunction with sweeper piping please see addition information below.**

6. STS/SWP systems use a high head pump to provide higher pressure for sweeper piping. These pumps range from 90'-100' TDH. If your system is equipped with one of these pumps, the proper operating parameters will change from listed in Item 5 above. Your inlet pressure should be approximately 35-38 psi (2.4-2.6 bar) and an outlet pressure of 33-36 psi (2.2-2.5 bar) at the discharge connection. Although the hydroboosters do provide backpressure for the system, it is highly recommended that a valve (ball or butterfly type) be installed on the outlet of the system to give additional flow control when using an STS/SWP system.

7. BACKWASHING

Differential pressure across the filter media progressively increases as trapped particulate accumulate in the filter media bed. On filter equipped with automatic backwash, the backwash cycle is initiated upon reaching a 10 psig pressure differential. Since units with automatic controls perform this function as necessary, a detailed backwash procedure is only provided for manual units. However, automatic units can be manually backwashed by pressing the manual push-button switch located on the control panel. The backwash cycle is field adjustable on most units and is factory set at three minutes. To prevent unfiltered water from "short circuiting" through the media and to extend media life, the filter should be backwashed regularly; at least once every 24-48 hours.

8. FOR NEGATIVE SUCTION (LIFT)

If the water level of the sump is lower than the centerline of the pump inlet, the use of a self-priming pump might be necessary. Follow priming procedures every time the pump is started. Consult the factory for systems requiring suction lift.

9. WINTERIZING

In areas subject to freezing winter temperatures, protect the pump when not in use by removing both drain plugs (from the pump volute and from

the suction strainer). Use a compressed air hose to remove any water trapped in the pump casing or flush the system with antifreeze. Do not replace the plugs. Store them in the strainer basket for the winter.

Alternatively, remove the pump and motor from the plumbing entirely. Store them indoors in a warm and dry place.

The STS tank and the purge line should also be drained of liquid to prevent damage from freezing. To remove trapped water from the separator, use a compressed air hose, directed into the acceptance chamber. Alternatively, flush system with antifreeze.

Heat tracing or pipe insulation may be used. Please contact your local supplier of these products to ensure proper usage.

VI. MAINTENANCE

1. A STS System START-UP FORM is included in this manual Record all readings (inlet and outlet pressures, motor amperage draw and liquid flow rate) during start-up as reference point (see note 3). Please complete the required information and return this form to your local representative as soon as possible. You may want to keep a copy for your records.
2. Record and compare these readings whenever periodic check-up and maintenance is required. These records would be helpful in troubleshooting the system when a problem occurs during the operational life of the system.

A. SUCTION STRAINER BASKET:

The suction strainer basket is sized to allow a maximum pressure drop of 2 psi at the specified flow rate. It will protect the pump, separator, flow control valves and other equipment from becoming plugged by dirt and debris 1/4" in size and greater. The strainer basket is easy to clean. Isolate the strainer by closing the isolation valves installed before the pump and after the separator outlet. These are not provided as a standard option by Lakos, but are available if a valve kit is ordered. Loosen the nuts or threaded stud and remove the lid. Remove the basket and clean. Inspect the 'O' ring or gasket and, if damaged, replace. Replace the lid and tighten the nuts.

B. PUMP AND MOTOR

Make sure that there are no leaks in the pump housing. If leaks occur at the back of the volute casing, you may have a damaged the seal (pump seals are not covered under warranty) and/or loose bolts. Replace and/or tighten as necessary.

Whenever maintenance or repair is needed for the pump, SHUT-OFF and LOCK-OUT power into the panel feeding the pump; close the suction and discharge valves, open drain plug/valve, making sure no air or hydraulic pressure is in the system before unhooking the pump. Refer to Pump Manual.

Outside air is very important to cool the motor. The TEFC motor has a fan in the back. Ensure that the fan is rotating when motor is energized. Zerk fittings were installed in the front and back of the pump shaft/bearing housing. A small amount of grease might be needed periodically to replenish the old grease in the housing. Whenever new grease is injected, the old grease will ooze out on the

opposite side. Wipe it clean. Whenever motor is required to be unhooked/ repaired, follow shut-off lock-out procedure and refer to the pump/motor manufacturers I&O manual as required.

C. CONTROL PANEL/PUMP STARTER:

A blown-out fuse and/or consistently kicked-back circuit breaker is indicative of a motor overloading/overheating. The built-in thermostat in the motor is experiencing an excessive rise in temperature, which might be caused by sudden voltage increase/drop, phase imbalance or over-torqued shaft. Verify motor bearings, terminal connections for looseness and correctness. Verify pump is rotating freely. Mechanical interference inside the pump might be causing this problem. Under-rated circuit breakers, contactors, relays and/or heaters will also cause this situation. Use appropriately sized components. Also, undersized wires/cables might cause shorting and overheating. An excessively hot environment might also cause premature failure of motor and electrical components. Avoid installing system in direct sunlight or near heated objects or equipment. Vibrating equipment may cause loosening of terminal bolts and screws; make sure vibration is dissipated whenever the STS System is required to be installed in such a location.

D. PRESSURE GAUGES:

Stuck needles/pegged gauges might indicate false readings. Verify their operation by opening and closing petcock valve installed before the gauges. Replace gauges, if necessary.

STS Operation and Maintenance Schedule

<u>Type of Service</u>	<u>Start Up</u>	<u>Monthly</u>	<u>Semi-annually</u>	<u>Shutdown</u>	<u>Annually</u>
General Condition of Unit	X	X			
Drain Condensate from air line to pneumatic actuator (if applicable)	As Required	As Required	As Required	As Required	As Required
Clean pre-strainer basket	As Required	As Required	As Required	As Required	As Required
Inspect gaskets	X		X	X	
Check pump shaft for free rotation	X		X		
Check operation of valves	X	X		X	
Check, lubricate clamp on filter tank access port				X	X
Inspect over-drain assembly & media pack	X			X	X
Check pump motor for proper rotation	X				
Check motor voltage & current	X	X	X		
Prime Pump	X				
Check pressure gauge reading (top of filter)	X	X			
Check unit for unusual noise or vibration	X	X			
Check unit for leaks	X	X			

VII. TROUBLE SHOOTING PROCEDURES

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Poor Filtration	<ul style="list-style-type: none"> • Excessive flow through filters, causing “coning” of media sand and/or forcing contaminants through filter outlet. • Air in tank(s) may cause disruption of the media sand bed. • Incorrect media sand. • Excessively high pressure differential before backwashing, which forces contaminants through filter bed. • Insufficient volume of media in filter, which allows contaminants to pass through the system. 	<ol style="list-style-type: none"> 1. Install throttling valve to control flow. 2. Bleed off trapped air in system. 3. Replace with proper media sand. Consult your LAKOS representative. 4. Backwash more often at lower differential pressure. 5. Add proper sand media to tank(s) to specified level.
Consistently High Pressure Differential	<ul style="list-style-type: none"> • Excessive contaminant load restricts flow through the filters and prevents sufficient flow for backwashing. • Insufficient backwash flow. • Inadequate media sand volume, which may minimize coverage of backwash flow across filter bed, creating dead spots of accumulated contaminants. 	<ol style="list-style-type: none"> 1. Drain tank and remove manway access ports. Carefully skim away any excess or caked contaminants from the media sand bed’s surface. Return tank to normal service and backwash system. 2. Check backwash valve linkage for proper operation. 3. Add sand media as necessary.

VII. TROUBLE SHOOTING PROCEDURES (con't)

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Automatic Backwash Fails to Cycle	<ul style="list-style-type: none"> • Controller power may be off or circuit fuses tripped. • Improper setting of differential switch. • Actuator malfunctioning. 	<ol style="list-style-type: none"> 1. Be sure wiring is connected correctly. Replace circuit fuses. Turn on power. Controller may be faulty and need replacement. 2. Adjust as necessary. 3. Check connections
Media Sand Appears Downstream	<ul style="list-style-type: none"> • Incorrect media sand (i.e. too fine and too small) • Broken, damaged, or missing lateral. 	<ol style="list-style-type: none"> 1. Replace media with proper sized media. 2. Repair or replace laterals of the underdrain.
Backwash Valve Leaks	<ul style="list-style-type: none"> • Obstruction in the valve seat. • Rubber seating is worn or damaged. • Actuator Diaphragm damaged. • Linkage out of adjustment 	<ol style="list-style-type: none"> 1. Remove the obstruction. 2. Replace Valve. 3. Replace diaphragm. 4. Adjust linkage
Water Hammer	<ul style="list-style-type: none"> • Air in tanks. • Long backwashline causing vacuum. 	<ol style="list-style-type: none"> 1. Bleed off trapped air in system. Air vent on system may be required. 2. Install vacuum breaker on backwash line.

VII. TROUBLE SHOOTING PROCEDURES (con't)

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Pump will not prime (standard, not self-priming)	<ul style="list-style-type: none"> • Suction line is not flooded with water. • Debris in basket strainer. • Air leaks. • Pump rotating wrong direction. 	<ol style="list-style-type: none"> 1. Check and clean out pump suction pre-strainer as required. 2. Check and clean pump pre-strainer as required. 3. Check and tighten all connections as required. 4. Check pump rotation against motor rotation arrow and rewire if necessary for proper rotation.
Pump motor runs hot	<ul style="list-style-type: none"> • Motor located in direct sunlight. • Poor ventilation. • Low voltage 	<ol style="list-style-type: none"> 1. Cover motor with some type of sun shade if possible. 2. All motors require air movement for cooling. Make sure that motor has a fresh source of air for cooling. 3. Check voltage with meter.
System "Trips" out when running and shuts down	<ul style="list-style-type: none"> • Overload setting is too low. • Supply voltage is incorrect. • System flow is too high. • Loose Wire. 	<ol style="list-style-type: none"> 1. Check overload setting in control panel. Overload setting should be just above full load amp value on motor nameplate. 2. Check incoming supply voltage with STS system power requirements located on control panel door (outside and inside). 3. Install valve on system discharge to control flow. 4. Check all wires for loose connections.
Unit stays in backwash or valves do not operate correctly	<ul style="list-style-type: none"> • Incorrect timer settings. • Wire may be loose or wired incorrectly. 	<ol style="list-style-type: none"> 1. Refer to Section IV Paragraph 12 for factory settings. 2. Contact factory while onsite if possible for further troubleshooting review.



**STS MEDIA FILTER SYSTEMS
START-UP FORM**

DATE OF START-UP: _____

COMPANY NAME: _____

ADDRESS: _____

PROJECT NAME/DESCRIPTION: _____

CONTACT PERSON(S): _____

(Please include titles) _____

DESCRIPTION OF LIQUID & SOLIDS (type, size, etc.): _____

COOLING TOWER MODEL: _____

DOES SYSTEM USE HYDROBOOSTERS IN THE TOWER BASIN:.

Yes No **HOW MANY PER CELL:** _____

Upon start-up, please record this data:

MOTOR AMPS: _____ **MOTOR VOLTAGE:** _____

PRESSURE TO INLET OF SAND FILTER: _____

PRESSURE AT OUTLET OF SAND FILTER: _____

BACKWASH DURATION: _____

ADDITIONAL OBSERVATIONS/REMARKS: _____

Please complete this form and send a copy to LAKOS; keep a copy for your records.



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