PENTAIR

AQUATIC ECO-SYSTEMS®

SWEETWATER®
LOW SPACE BIOREACTOR (LSB)

INSTALLATION AND USER'S GUIDE

IMPORTANT SAFETY INSTRUCTIONS
READ AND FOLLOW ALL INSTRUCTIONS
SAVE THESE INSTRUCTIONS

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TABLE OF CONTENTS

1.0 Important Warning and Saftey Instructions 3
2.0 Installation Recommendations 4
3.0 Maintenance 6
3.1 Biofilter Maintenance Basics 6
3.2 LSB General Maintenance 6
4.0 Diagram 7

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1.0 IMPORTANT WARNING AND SAFTEY INSTRUCTIONS

PLEASE READ THIS CAREFULLY BEFORE UNPACKING OR OPENING YOUR LSB

Your Sweetwater® Low Space Bioreactor is designed for energy efficiency. This is a robust biofilter that is much less sensitive to flow rate variations than other biofilter types. It is compatible with low head recirculating systems and can be installed in many different configurations, including gravity flow in and out of the bioreactor. When operated in low head recirculating systems, it can be sunk into the floor to reduce pump pressure requirements. When installed this way, only a few inches of head loss will occur across the LSB. Because air is used to circulate the media, the LSB adds oxygen and strips carbon dioxide. A gas stripping port is provided to vent the CO_2 outdoors. These units are aquamarine in color—this prevents algae growth on inner surfaces while providing the dark environment preferred by the nitrite-consuming bacteria.

The LSB is fully automatic and self-adjusting, with continuously self-cleaning media. Set it up and forget it! Air diffuser depth can be adjusted for compatibility with your blower/compressor (not included unless requested). The LSB's are complete with recommended amount of media based on inputs provided by the system operator. All you need is appropriately sized male threaded pipe connections for inlet and outlets.

⚠ CAUTION

- WHEN OPENING THE TOP, UNSCREW THE AIR INLET BULKHEAD FIRST, especially when there is no water in the unit.
- THESE UNITS MUST NOT BE PRESSURIZED. Since these LSB's require compressed air to move the media, the gas discharge port must never be blocked!
- VERTICAL LSBs: Pump in and gravity flow out, or gravity flow in and out.

Note: The BF150A plastic media in your LSB will not fluidize (will remain floating) for a few days to a few weeks, depending on the ammonia and nitrifying bacterial content of the water in the filter. This fluidization period will roughly coincide with your bacteria development. For best results, put in half the media, then the rest after the first batch fluidizes. (The smaller LSB's will come with the media already inside).

2.0 INSTALLATION RECOMMENDATIONS

1. Allow for at least a six-inch water level drop (head loss) across the LSB when operating at maximum rated flows. To reduce this head loss or achieve higher flow rates, install a downward vertical pipe on the LSB discharge. This will increase the Elevation Head and enhance gravity flow (siphon effect) from the LSB, provided that the water level in the tank receiving the discharge is significantly lower than the water level in the LSB. For installations demanding precise water levels, you may wish to initially operate your LSB without gluing the inlet and discharge fittings. This will allow you to adjust the elevation of your LSB prior to permanent installation. *NOTE: ON THE VERTICAL SERIES LSBs, AVOID "SUCKING" WATER THROUGH THESE UNITS BY PUMP. AIR FROM THE DIFFUSER SYSTEM CAN BE DRAWN INTO THE PUMPS CAUSING PUMP CAVITATION.

2. Install bypass plumbing to protect your biofilter when making chemical additions to your system. Many chemicals can impair biofilter function or even destroy the nitrifying bacteria in your filter. Use a gate or a ball valve on the inlet and outlet of the LSB. Use TEE fittings and pipe to allow water to bypass the LSB when needed. Install a gate or a ball valve in the bypass line to close the bypass for normal operation. See accompanying diagram, page 7.

3. Install air purge valves (AES part number ST4) at the high point of any pressurized pipe section where air might accumulate. Such "air locks" can reduce flow rates through pipes by reducing the cross-sectional area available for water flow. Never install common air purge valves on suction lines as they will act as vacuum breaks, causing air to be drawn into your pumps.

4. If LSB discharge piping is longer than 10 feet, use larger discharge pipe or increase the discharge drop (increase the Elevation Head) to overcome friction losses.

5. Plumb your air source to the air inlet port located in the center of the screw lid man way (see diagram, page 7). If the diffuser manifold is too deep for your blower, unscrew the air delivery bulkhead {always do this first), then the tank lid. Raise the diffuser manifold until the media roils thoroughly. Cut out a section of the ½" pipe and reconnect using the union fitting (provided) so that your diffuser manifold will operate al the proper water depth. If you require assistance please call PAES and a technician can help determine if equipment on site can aerate the LSB at recommended depth. If needed a small air pump can be sized and designated specifically for the LSB unit. Avoid excessive turbulence from using too much air. Such turbulence can damage your nitrite-converting bacteria.

6. Once you are satisfied with your system hydraulics, glue the external fittings (no gluing is required in the inside of the unit) and begin procedures for establishing the nitrifying bacteria.

7. For indoor installations, install duct work from your off-gas vent to the outdoors. Avoid long runs of small diameter tubing as this will add internal pressure to your LSB. Offgas restriction will also increase back pressure on your blower resulting in reduced LSB gas transfer efficiency. We recommend using light-gage material such as drier duct (available in most hardware stores).

⚠ WARNING Restriction or closure of the off-gas vent can result in tank rupture due to excessive internal pressure.

2.0 INSTALLATION RECOMMENDATIONS

Biofilter Start-up—LSB Start-up—Fluidization and Nitrifying Bacteria Colonization: As with all other biofilters, your LSB will take time to establish a population of bacteria. Initially, the BF150A plastic media will float. Fluidization should occur in roughly the same time period as bacterial colonization. You can use a commercial inoculant (such as ProLine Bacteria Concentrate, PAES part number 239310 for freshwater or 239300 for saltwater) or media from an acclimated biofilter to introduce the nitrifying bacteria. In the absence of fish ammonia excretion, a commercial product such as ProLine Ammonium Chloride (PAES part number 239100) or even non-sudsing household ammonia can be used. "Aqua-Coat" (PAES part number 239600) has been shown to accelerate media fluidization significantly.

Complete nitrification is a two-step process. One group of bacteria (*Nitrosomonas* spp. and others) convert ammonia to nitrite while another group (*Nitrobacter* spp. or *Nitrospira* spp., etc.) convert nitrite to nitrate. You will first see an increase in nitrite concentration. The time period for this event will depend on your water temperature and ammonia concentration. The nitrite "spike" indicates that the Nitrosomonas bacteria is establishing itself and converting the ammonia to nitrite. A subsequent drop in nitrite concentration and creation of nitrate indicates that the second group of bacteria is developing and that the biofilter can support fish in your recirculating system.

NOTE: Monitor nitrite levels closely. Nitrite concentrations exceeding 5 mg/L can inhibit bacteria growth and are lethal to most fish species.

3.0 MAINTENANCE

3.1 Biofilter Maintenance Basics

1. Always filter solids out of the water prior to any biofilter. This will prevent particle and heterotrophic bacterial fouling and improve biofilter performance.

2. Rapid changes in pH or salinity can inhibit nitrifying bacteria colonies.

3. Operate the bioreactor within hydraulic and nutrient loading ranges specified by the manufacturer. Please call PAES for recommendations based on your system feed input and flow rates.

3.2 LSB General Maintenance

1. Media fluidization for maximum nitrification will vary with water quality. For water high in oxygen and low in suspended solids, very low turbulence will maximize nitrification. It has been observed that periodic fluidization (air system operated by a timer for a few minutes several times a day) increases nitrification in high oxygen, low solids water.

2. Media clumping on the out-flow strainer (see diagram, page 7) is normal and provides an excellent environment for the nitrite-converting bacteria. Periodically inspect and break up any media clumps exhibiting sludge build-up. Bypassing the biofilter or turning pumps off will ease this process by stopping suction at the out-flow strainer.

3. If the water treated by the LSB is high in suspended solids, heterotrophic bacteria will out-compete the nitrifying bacteria population to some extent. This will reduce biofilter performance and may result in media clogging. In such systems, inspect the media periodically. If clumped media is observed to be harboring heavy sludge, the clumps should be broken up so the sludge can pass out of the LSB. Bypassing the biofilter or turning pumps off will ease this process by stopping suction at the out-flow strainer.

4. Over time, the heavier sludge will accumulate in the bottom of the LSB. This effect will be more marked if the customer shortens the diffuser feed pipe so that the diffusers are elevated in the tank. Use the bottom drain valve (see diagram, page 7) to drain accumulated sludge. Gently stirring the bottom sludge with a piece of PVC pipe will improve removal.

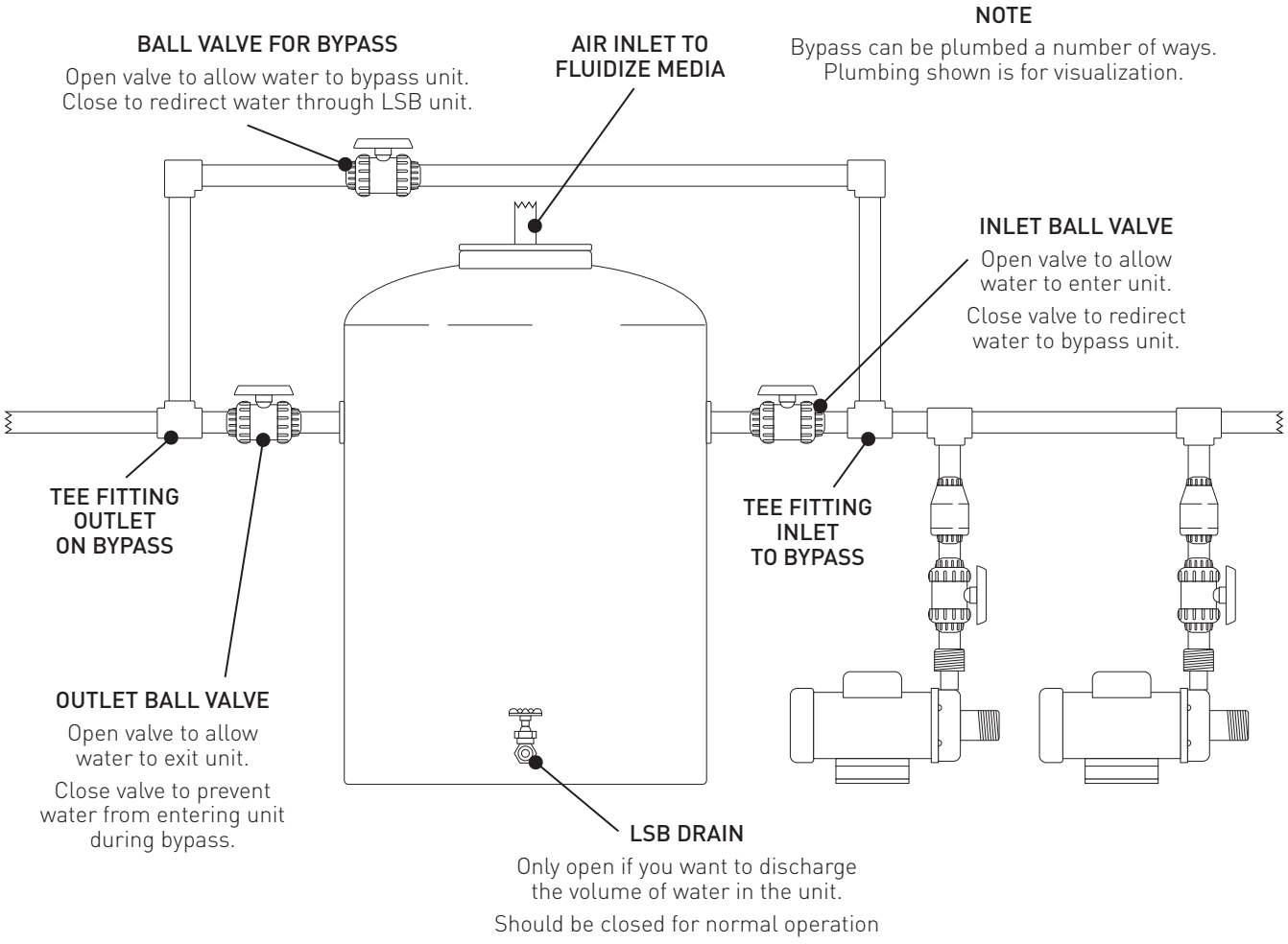
For colonizing/fluidizing new biofilter media, best results can be achieved using the following steps:

1. Isolate your biofilter from ultraviolet sterilization, ozone, foam fractionation, and chemical exposure. Make sure that the entire surface area of your biofilter has enough oxygen (best if above 60% of saturation) but that turbulence is minimal. No water flow other than that achieved by the air distribution manifold is required for the start-up procedure.

2. Make sure the biofilter has a source of ammonia. In the eventthat you are establishing your biofilter off-line (isolated from the rest of your system), you may need to buffer your pH and add micro-nutrients.

3. Add your bacteria (Proline, part number 239310 or 239300, or other). In the absence of fish (off-line start-up), maintaining your total ammonia concentration between 4 and 10 mg/L during bacteria establishment will shorten the biofilter start-up period. NOTE: Monitor nitrite levels closely. Nitrite concentrations exceeding 5 mg/L can inhibit bacteria growth. **We do not recommend adding fish to the system until your biofilter can consistently maintain ammonia and nitrite concentrations below 1 mg/L.**

4.0 DIAGRAM


BALL VALVE FOR BYPASS
Open valve to allow water to bypass unit.
Close to redirect water through LSB unit.
AIR INLET TO FLUIDIZE MEDIA
NOTE
Bypass can be plumbed a number of ways.
Plumbing shown is for visualization.
INLET BALL VALVE
Open valve to allow water to enter unit.
Close valve to redirect water to bypass unit.
TEE FITTING OUTLET ON BYPASS
TEE FITTING INLET TO BYPASS
OUTLET BALL VALVE
Open valve to allow water to exit unit.
Close valve to prevent water from entering unit during bypass.
LSB DRAIN
Only open if you want to discharge the volume of water in the unit.
Should be closed for normal operation

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