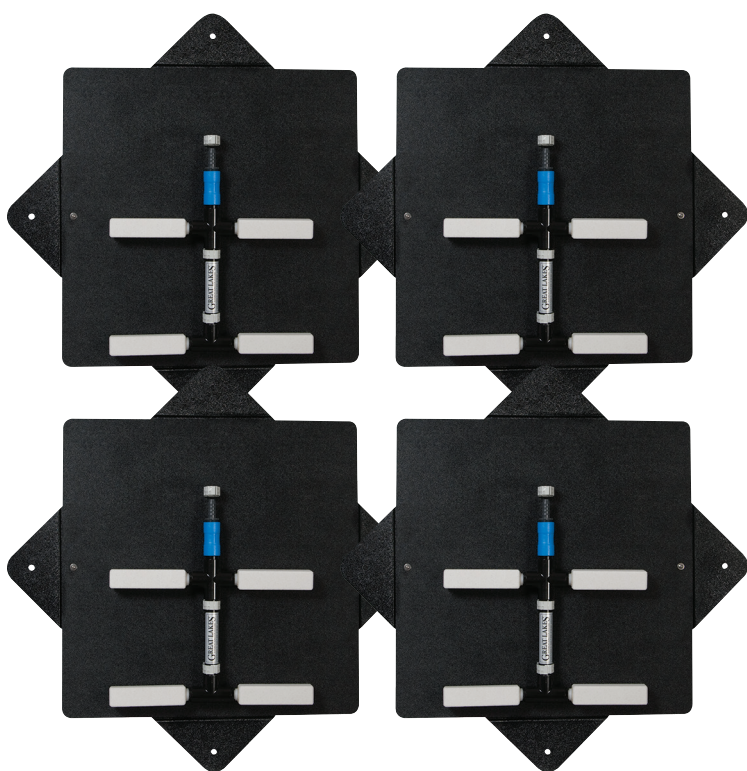




***Installation, Start-Up and
Troubleshooting Manual***
(4GL and SL Series)



AQUATIC ECO-SYSTEMS™

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Safety Message

Safety is important to us. Please read and follow all directions for your own protection.



ELECTRICAL SHOCK HAZARD

Disconnect electrical power at the circuit breaker or fuse box before installing this product. Install where it will not come into contact with water or other liquids. Electrically ground this product. Failure to follow these instructions can result in death, fire or electrical shock.

Installation

Inspect the equipment upon receipt. Check the packing list against the delivered items to ensure that all the components have arrived (occasionally, carriers separate shipments of more than one box, so allow another day if all the pieces have not been received. If all of the items are not received, please contact Pentair AES).

Items that should be included:

Compressor cabinet—A green 1/8" thick steel cabinet. The cabinet houses the air compressor, air outlet assembly, ventilation fan and electrical components. Check for damage to cabinet and components.

Compressor, inlet check valve, glass jar muffler, compressor outlet.

Air diffuser manifolds—Verify the correct number of diffusers are present: either four 6" diffusers or six 9" diffusers per manifold.

Substrate barrier (one per complete diffuser assembly).

Tubing (unweighted or weighted).

Tie wraps, clamps (for unweighted or weighted tubing) and couplings.

Tools and Materials Needed

Shovel (and possibly pick).

Four common bricks, pavers or flagstones on which to place the four cabinet feet.

Conduit sweep.

Thin (1/8") nylon rope or clothesline, 25-ft long (depending on depth).

Nut driver (5/16") or flat blade screwdriver, open end wrench (7/16"), level and knife sharp enough to cut tubing.

Three-hole clay bricks to attach at 7-ft intervals along submersed, unweighted tubing (if required).

Boat and motor.

Cabinet/Compressor Installation on Concrete Pad

1. Using the appropriate wooden form in Figure 1 as an outline, dig out a 3" deep section of soil. The concrete's finished height should be 1" above ground level.
2. Place one common brick in each corner of the dug-out area, taking care to position them under each cabinet leg. Place the cabinet on the bricks, using a level to ensure they are truly level.

Diffuser Assembly Instructions

The Sweetwater® diffusers included as part of the assembly are made of glass-bonded silica, are virtually indestructible and will give many years of service. The diffuser manifold comes with a polyethylene underlay (24" x 24" x 1/4") to prevent the disturbance of sediments. The manifold is attached to the underlay with polyethylene cable ties (included) and is equipped with a check valve to prevent backflow of water into the air line in case the compressor is turned off or temporarily loses power.

1. Assembly components:

PVC Diffuser Manifolds with Check Valves and 1/2" Barb Adapters
Sweetwater® Glass-Bonded Silica Diffusers
24" x 24" x 1/4" Polyethylene Underlays
15 1/2" Plastic Cable Ties

2. Completely submerge the diffusers in water. Take them out and hold them upside down to let any residue from the manufacturing process drain out. Repeat until the water leaving the diffusers is clear.
3. Screw the diffusers into the manifold finger tight —
DO NOT OVERTIGHTEN.
4. Place the manifold with the diffusers in the center of the polyethylene underlay and barb adapter on the opposite end of the two corner holes in the underlay.
5. Use the cable ties to secure the manifold to the underlay. Cut off excess tie.
6. The assembly can then be connected to the air line tubing and lowered into the water with a rope through the corner holes.

Unrolling Tubing and Attaching Bricks (Unweighted Tubing Only)

Prior to unrolling the polyethylene tubing, please read and review the following instructions.

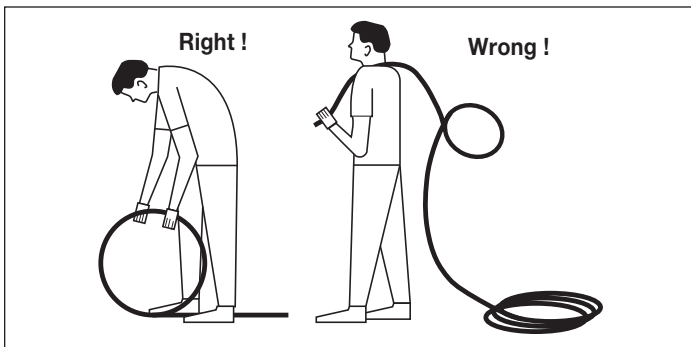
Two basic rules must be followed for continuous, year-round operation in cold weather areas:

1. The land-based run of tubing must be buried below the area's frost depth, and the air line must be insulated between the compressor and the ground.
2. The air line must enter the water in a trench below the area's average winter ice depth.

Allow enough tubing to reach attachment point (flexible discharge hose of the compressor) and bury land-based portions prior to proceeding. This will allow an anchorage for one end of the air supply line prior to installing the water-based portion of the line. The easiest method to place the bricks and lower the air line is for two people in a boat to work together. One person provides movement and direction while the other (in the rear of the boat) slowly unrolls tubing and attaches common 3-hole bricks with ties as illustrated. If installing the system on a windy day, lower the diffuser first for extra weight, and work from shore out to the diffuser end. When the end of the air line tubing is reached, attachment of the manifold and underlay will be required.

Uncoiling Tubing

When uncoiling tubing, always roll the coil like a hoop. If a loop pops out during uncoiling, re-roll to return the loop to the coil to avoid kinking. NEVER lay the coil down and throw the tubing out in loops. This procedure will almost invariably result in kinking.



Attaching Weights to Polyethylene Air Distribution Lines

This method of attachment will prevent bricks from sliding during and after installation and is **only required for use on unweighted polyethylene tubing**.

Step 1

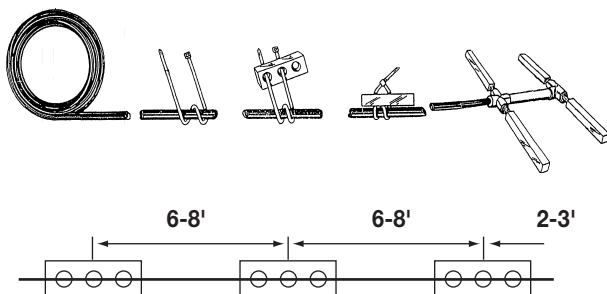
Double loop tie around air line.

Step 2

Insert tie through two adjacent holes of brick.

Step 3

Tighten securely by wiggling brick and pulling on tie until brick does not slide. **IT MUST BE TIGHT!**



Common bricks (about 3 lbs each) should be spaced approximately six to eight feet apart on 1/2" tubing. Space the first brick about 2 feet from the diffusers.

Diffuser Assembly Placement and Installation

Placement is crucial to how quickly and efficiently the Great Lakes® aeration system is able to aerate a lake. Please consult with a Pentair AES technician for the correct placement. If placing more than one diffuser assembly in a lake, we suggest that some sort of buoy be placed in those areas to aid installation.

1. After determining the placement site (buoy) for a diffuser, attach the tubing to the diffuser manifold and clamp tightly. Before lowering, check to see that the blue check valve and male adapter are tight.
2. Thread a piece of nylon rope about 25–30 feet long through the top of one installation hole on the underlay and back up through the bottom of the other installation hole.
3. Lower the diffuser assembly into the water. As the diffuser assembly and tubing are lowered into the water, paddle away from shore. When the end of the rope is reached, let go of one end and pull the rope back into the boat. Installing the diffuser assembly in this manner will ensure that it does not flip over during installation. Note: The underlay should be on the lake bottom with the diffusers on top.
4. Installation of the diffuser assembly is complete. Follow the same procedure if you have more than one diffuser assembly to install.
5. Upon returning to shore, attach the air line tubing to the rubber heat reduction tubing that is attached to the valve assembly. Clamp tightly.
6. Have a certified electrician bring power to the cabinet.
7. The unit is ready to start, but prior to the start-up procedure, the pressure relief valve on the valve assembly manifold must be properly set. To do so, the compressor must be running with all the valves, tubing and manifolds in operation. The pressure relief valve should then be opened to allow air to escape. Adjust the setting of the relief valve by slowly turning the valve clockwise just enough until no air is escaping, then add one more full 360-degree turn for the proper setting. Tighten locking ring to keep the adjustment knob in place.

The polyethylene underlay prevents silt from being picked up and moved through the lake. Two sets of predrilled holes are available to use plastic ties (included) to make this attachment. The air line is attached to the manifold by 1/2" clamps. By looping a small diameter line through the diffuser manifold, it can be lowered to the bottom. The compressor will compensate for any depth encountered, but it is important that the diffuser is flat and has the manifold above the underlay. Remove the line used to lower the manifold, and return to shore for the final connection.

Note: The line can be left attached to a float for future retrieval if it is not a liability to boaters, fishermen and swimmers.

Attaching All Components Together

Upon returning to shore, attach the air line to the compressor discharge air line by another 1/2" stainless steel clamp (don't forget insulation of the air lines below the frost line). The compressor is equipped with a male electrical plug. A simple extension cord with a standard female termination will be adequate for an electrical source. When the compressor is plugged in, the installation is complete.

Start-Up of Aeration System in Stratified Lakes

The circulation of water by an aeration system produces two benefits. One is the thermal destratification of the lake, causing a fairly uniform temperature throughout. The second is the increasing of oxygen levels within the water column, top to bottom.

At the same time that the circulation is producing these benefits, it can be producing a problem. The circulation of the fouled bottom water up to the surface allows this water to obtain oxygen, but the water may also contain dissolved gases and by-products that are produced as a result of the anaerobic (no oxygen) condition on the bottom. These products, when mixed with the upper layers of water, may foul the surface layer, thus making it unfit for aquatic life, and could result in a fishkill.

Although a fishkill is possible, it can be prevented by exercising care when first turning on the system. A slow-start break-in period is advised.

The following are recommendations for start-up:

1. After the diffusers have been positioned and the unit is turned on, take a position downwind of the diffuser boil. If a strong odor (rotten eggs, etc.) is noticed, this indicates that the bottom water is fouled. Place the diffuser manifold in its final desired position and proceed with a slow-start break-in period. The first day the compressor is turned on, the boil should be observed for dark/dischored water or a rotten eggs smell. If either is present, let the compressor run for only 15 minutes the first day before turning off. The next day turn the compressor on and let run for 30 minutes, then turn off. Each successive day double the running time from the previous day until the system is running continuously, 24 hours a day (eight days). If the smell is not present, let the compressor run for one hour the first day, two hours the second day, four hours the third day and so on until the system is running 24 hours a day (six days).
2. A second approach is similar to the previous one, but instead of a slow-start break-in period, the diffusers should be moved to a shallow area of the lake. Allow the system to run in this area for a few days, thoroughly mixing this portion of the lake. Next, move the diffusers to deeper water and run them there for a few days. Continue this until reaching the desired position of the diffusers. This process should take approximately 1–2 weeks depending on the size and depth of the lake.
3. Another method to start up in a stratified condition is to lower the diffuser down via rope from a flotation device. The initial turn-on should be two feet below the low or no oxygen level, provided this area doesn't represent more than 25 percent of the total lake volume. This process should take approximately 1–2 weeks depending on the size and depth of the lake.
4. A final approach to use if multiple diffusers are needed is to run only a few diffuser manifolds until the thermocline is lowered. This will mix the water at a slower rate.

Remember: These are recommended start-up methods and times. If you are unsure about your lake in particular, please contact Pentair AES for further assistance.

Note: If the system has been shut off for more than four weeks, the start-up procedure must be followed to prevent a fishkill.

Troubleshooting Guide

Visually check surface boils. Use binoculars, if necessary. If the airflow is reduced, remove the air filter from the glass jar muffler and check the boil again to see if there is a restoration of airflow. If there is an increase, clean the inlet filter or replace it with a new one. If there is no increase, check for leaks in and around the compressor, and check the air valve manifolds for tightness. Place a wet finger over the pressure relief valve to be sure no air is escaping. Check the area around the cabinet outlet tubing between the cabinet and the water's edge for leaks. If no leaks are present, the cause of reduced airflow might be clogged diffusers (this problem is more common than one might guess). If the system has been in continuous service for less than two years, it is doubtful that the diffusers are clogged, depending upon water hardness and general biological activity.

Pull the diffuser manifold up from the bottom (while the compressor is running), and inspect by blowing into each individual diffuser. If you can blow through the diffuser, then the compressor can, indicating that the diffusers are clean. If they are clogged, see "Maintenance of Air Diffusers" on

page 5 for instructions on how to properly clear them of clogging material. After the clogging material has been dissolved, rinse thoroughly with water before reuse.

Note: Under continuously running applications, diffusers should be checked at least every two years. In situations where the compressor has been left off for several months, it may be necessary to inspect and replace the diffusers prior to start up.

1. If the compressor is shutting off and on, there may be a thermal overload (faulty connections causing overheating), too much pressure on the compressor or low line voltage.
2. If the compressor shuts off and stays off, check for proper voltage at the cabinet. Check the breaker; if it has tripped, reset it and it should restart.

Should the above fail to start the motor (and the unit is new), check internal wiring for the correct wiring pattern (voltage). Check the cooling fan assembly for operation; if it is defective, it may allow the compressor to overheat.

Great Lakes® Aeration System

What we hope to achieve by using the synergistic airlift technique in our lake aeration system is an improvement in the overall condition of a body of water.

Prior to the installation of an aeration system, general water quality parameters should be measured for a period of time. These parameters include temperature and dissolved oxygen throughout the water column, the redox potential and phytoplankton abundance. Some of the signs that a body of water is in poor condition are distinct variations in temperature and dissolved oxygen from the surface of the water to the bottom (with the bottom dissolved oxygen being less than one ppm), a negative redox potential and an extreme over-abundance of phytoplankton. An abundance of phytoplankton is usually the result of a constant release of nutrients from the bottom sediments due to very low to zero dissolved oxygen level.

How do we determine the success of one of our aeration systems? The result should be destratification, not just in a small area of the body of water, but in at least 90–95 percent of the total volume, depending upon the shape.

How can it be determined if this has been achieved? First, look for a breakup in the stratification, which is identified by a minimal variation in temperature from surface to bottom. This is also identified by a minimal variation in dissolved oxygen levels from surface to bottom, with levels about 3–5 ppm at the bottom. This increase in bottom dissolved oxygen levels eventually results in a shift from a negative redox to a positive redox reading. Another result of the increased bottom dissolved oxygen level is that nutrients are now bound in the lake sediments and can't be released to feed the phytoplankton. Therefore, a decrease in the phytoplankton abundance is observed, but not necessarily totally eliminated.

These results can only be achieved when the entire water volume (not just an isolated area) is addressed. We feel that our technique and equipment are the most efficient and cost effective method to accomplish this. Not only is the system relatively easy to install, but also it is simple to maintain.

Maintenance of Air Diffusers

The only maintenance normally required for Sweetwater® air diffusers is periodic cleaning. The frequency of cleaning will be determined by the mineral and organic content of the water in which the air diffusers are used. In clean, cold, soft water, cleaning may only be necessary every 2 or 3 years. In very hard water or water high in organics, it could be necessary as often as every 2 months.

1. Remove from service and blow out excess water. If fouled with barnacles or other foreign material, scrape or hose off.
2. If you have a white 1/2" NPT fitting on the end of your diffuser, then immerse the diffuser portion, not the fitting, in undiluted muriatic acid for a sufficient time to dissolve the clogging material. This may take from one minute to eight hours in the most extreme cases. Be very careful when using acid! Wear eye, face and hand protection and have clean water available for rinsing and acid diluting in the case of an acid splash or spill.
3. After the clogging material has been dissolved, rinse thoroughly before reuse.
4. Discard the used acid after reducing its strength to a neutral pH by diluting with at least ten times as much water as acid. Add acid to water; never add water to acid.

Maintenance of Great Lakes® Aeration Systems

Visually inspect the diffuser boils in the lake daily or weekly to ensure that the system is in operation.

Filters should be cleaned or replaced quarterly. Check that cooling fans are operational. Check pressure gauge and record the reading.

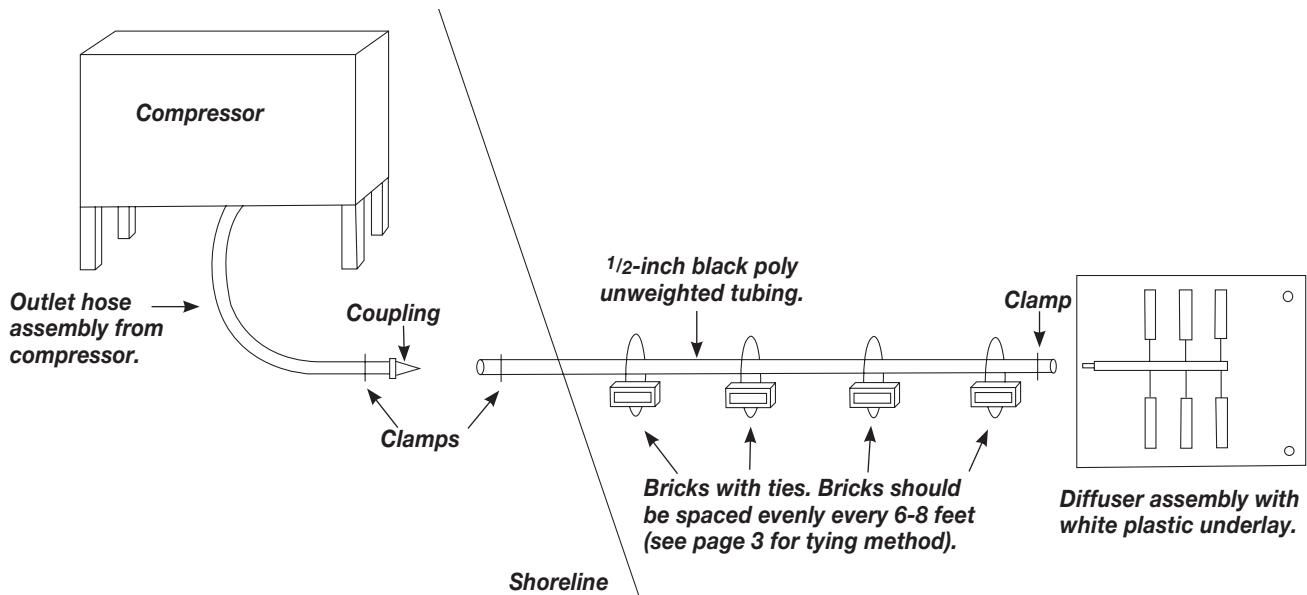
Remove leaf litter from around the bottom of the cabinet to ensure proper ventilation.

Carbon vanes should be replaced every **nine to 18 months**.

Bearings should be replaced about every three years.

Diffusers should be cleaned or replaced about every two years or as needed depending on the hardness of your water.

Example of Installed Great Lakes® Aeration System



Maintenance Log

Date:	Notes:
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AQUATIC ECO-SYSTEMS™