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Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.



SECTION: C3.10.141

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Supersedes

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Fusion® Series Treatment Systems

OWNER'S MANUAL

SMALL COMMERCIAL MODELS ZFL1120 - ZFL2400

Thank you for choosing a Fusion® Series Treatment System. High quality workmanship and easy maintenance have been incorporated into the Fusion® system. The system will provide years of trouble-free service when maintained according to the manufacturer's recommendations. Please read this manual in its entirety before using the Fusion®, and follow all instructions to ensure proper operation. Keep this manual for future reference along with other important onsite documents. Should further assistance be necessary, please contact Zoeller Pump Company at 1-800-928-7867.

Warning Labels

You will find warning labels on the Fusion®, riser lids, blower, and the alarm control panel. It is very important to follow the information on these labels to ensure your safety. Please do not remove these labels.



SEE LIST AT RIGHT FOR WARNINGS

- 1. DO NOT attempt to service the Fusion® unit yourself. Contact your authorized maintenance provider for all service related issues.
2. There are buried electrical cables and piping near and around the Fusion®. Please consult your authorized maintenance provider to locate these utilities before excavation.
3. DO NOT bury or cover the Fusion® lids with soil or other debris. This is necessary to allow access for operation and maintenance of the unit.
4. The Fusion® blower must be unobstructed and vented for proper operation. Care must be taken that no grass clippings or other materials accumulate on or around the blower and block ventilation.
5. DO NOT place heavy objects over the Fusion® or drive heavy equipment over the Fusion®, as damage may occur. Damage of this kind is not covered by the warranty.
6. DO NOT plant trees within 15 feet (4.6 m) of the Fusion® Series Treatment System.

TABLE OF CONTENTS

Limited Warranty 1
Process Description 3
System Components and Care 3-4
Excavation and Installation 6
Blower 9
Start Up 10
Operation and Maintenance 13
Aeration Chamber Cleaning 14
Fusion® Pumping 15
Troubleshooting 16

Fusion® Model: [] ZFL-1120 [] ZFL-1440 [] ZFL-1680
[] ZFL-2000 [] ZFL-2400
Serial No. _____
Installing Contractor _____
Phone Number _____
Installation Date _____
Maintenance Provider's Name _____
Phone Number _____

LIMITED WARRANTY

Manufacturer warrants, to the purchaser and subsequent owner during the warranty period, every new product to be free from defects in material and workmanship under normal use and service, when properly used and maintained, for a period of two years from date of purchase by the end user. No allowance will be made for shipping charges, damages, labor or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to and there shall be no warranty for any material or product that has been disassembled without prior approval of Manufacturer, subjected to misuse, misapplication, neglect, alteration, accident or act of God; that has not been installed, operated or maintained in accordance with Manufacturer's installation instructions; that has been exposed to outside substances including but not limited to the following: sand, gravel, cement, mud, tar, hydrocarbons, hydrocarbon derivatives (oil, gasoline, solvents, etc.), or other abrasive or corrosive substances, wash towels or feminine sanitary products, etc. in all pumping applications. The warranty set out in the paragraph above is in lieu of all other warranties expressed or implied; and we do not authorize any representative or other person to assume for us any other liability in connection with our products. Contact Manufacturer at, 3649 Cane Run Road, Louisville, Kentucky 40211, Attention:

Customer Support Department to obtain any needed repair or replacement of part(s) or additional information pertaining to our warranty.

MANUFACTURER EXPRESSLY DISCLAIMS LIABILITY FOR SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES OR BREACH OF EXPRESSED OR IMPLIED WARRANTY; AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND OF MERCHANTABILITY SHALL BE LIMITED TO THE DURATION OF THE EXPRESSED WARRANTY.

Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

HOW A FUSION® SERIES TREATMENT SYSTEM WORKS

The Fusion® is simple in design, yet advanced in its wastewater treatment ability. The design has been refined over many years of intense research and development in an effort to perfect this superior treatment system. Fusion® systems are 90% - 95% efficient at treating wastewater. This is nearly twice as effective as a traditional septic tank, which is approximately 50% efficient. This high degree of treatment helps to protect both your personal property and the environment.

The Fusion® utilizes a combination of anaerobic (without oxygen) and aerobic (with oxygen) biological processes to treat wastewater. As wastewater enters the Fusion®, it is broken down and becomes food for biological organisms operating within the unit. The first chamber serves to separate grease and large solids from the liquid. In the second chamber, plastic media with large surface areas are used to increase contact between water and beneficial bacteria to optimize treatment. A single port blower is used to move air (oxygen) into the third chamber for the aerobic process. The final effluent leaving the system will have been treated to secondary quality effluent.

Figure 1 - The following diagram will help you to better understand the process:

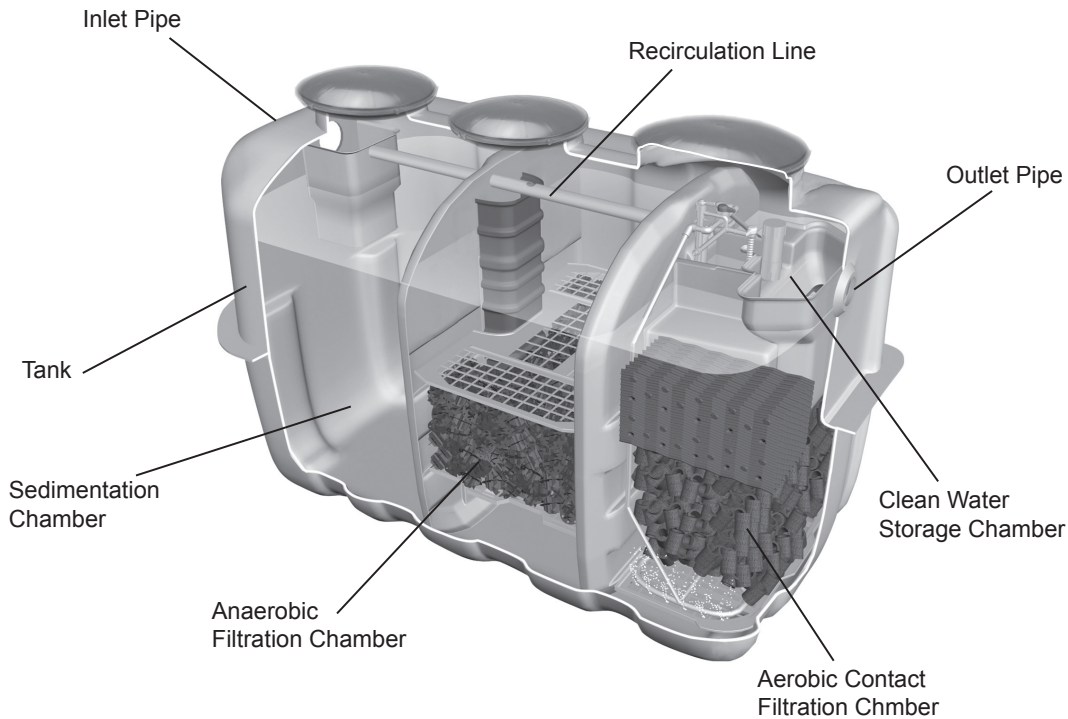
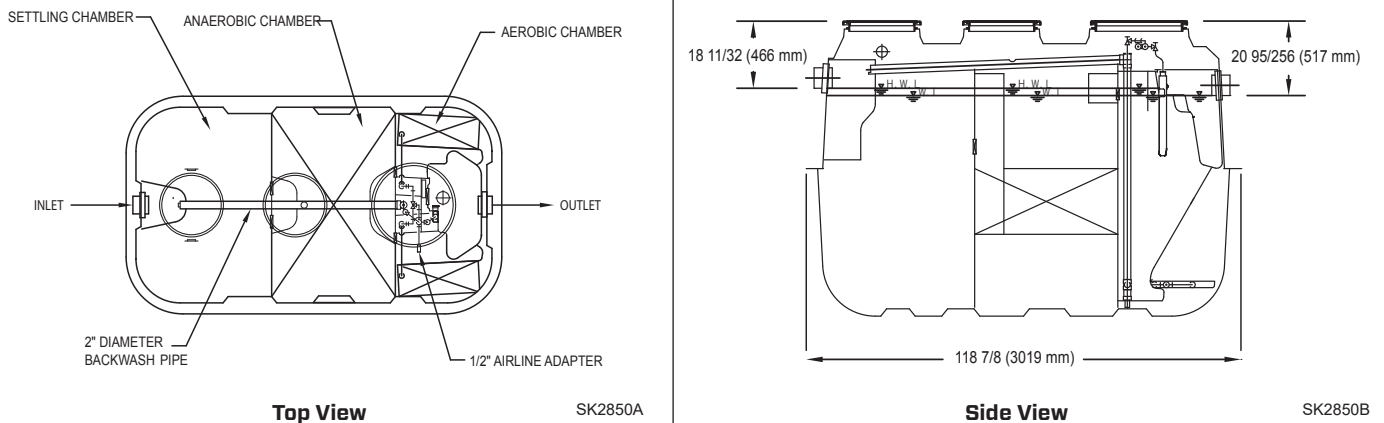


Figure 2 - Schematic diagram of the Fusion® Treatment System



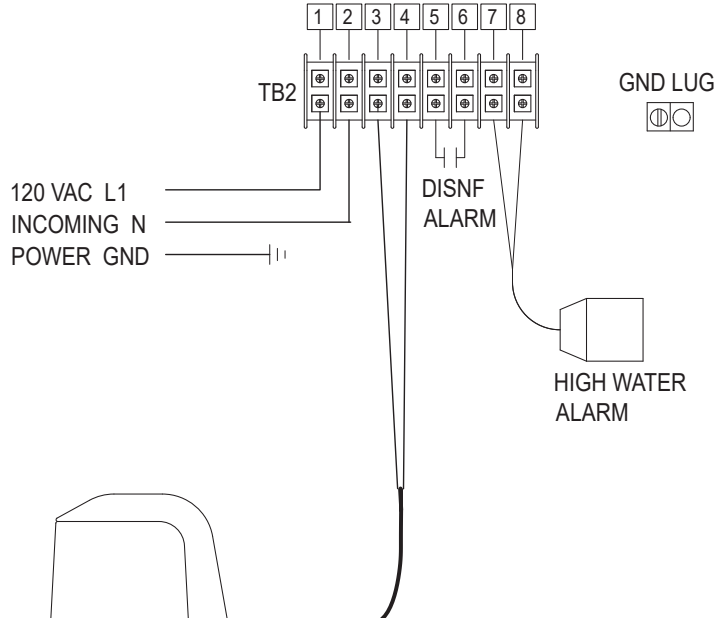
SYSTEM CARE

The Fusion® system is designed to continuously operate automatically with little direct maintenance from the owner. Periodically, a check of the blower area is recommended to ensure no debris obstructs the ventilation or intake areas of the blower. Also, periodically test the control panel as outlined under the alarm panel section. The owner should closely monitor the types and amounts of substances and products used. Water use should also be closely monitored to ensure proper operation of the Fusion® system.

Periodically, more extensive maintenance must be performed. Your authorized Fusion® maintenance provider will oversee this service. The name of the maintenance provider can be recorded on the front of this document and should also be located on the alarm panel. For more information see the Operation and Maintenance section of the manual.

The owner should only perform minimal routine maintenance on the Fusion® such as clearing debris from around blower housing (leaves, snow, and grass clippings). The Fusion® should also be protected from excessive weight such as vehicular traffic. Trees and bushes should not be planted in close proximity to the Fusion®. The Fusion® should be accessible to maintenance personnel and the riser lids must never be buried.

Figure 5



sk2933

HIGH USE WATER DEVICES

The draining of hot tubs and swimming pools into your Fusion® system could cause hydraulic overloading and may reduce the treatment efficiency. Please drain these devices to another location. Contact your local regulatory authorities or authorized Fusion® maintenance provider for more information. The use of large capacity single fill and drain whirlpool bathtubs may also cause hydraulic overloading of your Fusion®. Please limit the use of these types of tubs.

FLOODING

▲ NOTICE If flooding of the Fusion® occurs and the blower or the alarm panel is submerged, please disconnect power at the circuit breaker. DO NOT try to reconnect power to either the blower or alarm panel once it has been submerged. Immediately contact your authorized Fusion® maintenance provider to inspect the Fusion®, the blower, and the alarm panel. Your maintenance provider will repair or replace the components as needed.

LEAKY FIXTURES

It is very important to monitor all water fixtures in the home for leaks and drips and repair them immediately. Leaks can cause tremendous water use and use may hydraulically overload your Fusion® system and reduce its treatment efficiency. Excessive water use may also overload your soil absorption field and cause failure.

INTERMITTENT USE

The Fusion® system is designed to function even if wastewater does not enter it for extended periods of time. The power to the blower must remain on during this time for the system to function properly. Weekend use will not harm the system as long as the blower is on. Should seasonal use require a complete shut down of the property, then it is recommended that the blower be turned off. It is important to start up the system in advance of actual occupancy to allow for normal treatment to resume. Please contact your authorized Fusion® maintenance provider for further information concerning shut down and startup of the Fusion®. You may also contact your maintenance provider for the shut down and startup services.

HARMFUL SUBSTANCES

The Fusion® is designed to treat household type waste and can treat most common substances introduced into the system. However, certain harmful substances may reduce the efficiency or stop the treatment process by reducing or destroying the beneficial bacterial populations responsible for treatment. In general, if a chemical substance is considered harmful to humans then it should also be considered harmful to the Fusion® treatment system. If you have any questions concerning the use of any of these substances, please contact your Fusion® maintenance provider. **The introduction of any substance on the "Do Not List" into the Fusion® will void the warranty.**

- THE DO NOT LIST -

DO NOT introduce the following substances into the Fusion® treatment system:

- Motor oil
- Brake fluid
- Paint thinner
- Solvents
- Herbicides
- Strong caustic drain cleaners in excess
- Excess pharmaceuticals
- Antifreeze
- Paint
- Gasoline
- Pesticides
- Strong disinfectants
- Toilet tank disinfection chemicals
- Chemicals & chemical waste

Not Recommended: Trash and excess food products will likely increase frequency of pumping.

Trash

- Sanitary napkins and feminine products
- Diapers
- Paper products such as paper towels & baby wipes
- Condoms
- Cat litter
- Dental floss
- Cigarette butts
- Plastic/rubber products

Food Products

- Coffee filters and grounds
- Fruit and vegetable peels
- Meat products
- Garbage disposal waste
- Greases or lards
- Seeds
- Bones
- Egg shells

Limited Use Products

Certain products in small or moderate amounts should not disrupt the Fusion® treatment process. You should always use the minimum quantities of these substances as recommended by the manufacturer.

- Liquid laundry bleach only as needed per load
- Liquid laundry detergents without added bleach
- Liquid dishwashing detergents
- Household cleaners

WATER SOFTENERS

If water softeners are present in the home, Zoeller Pump Company recommends the use of water and salt conservative models that are installed and operated correctly. If you have questions about softeners, contact the Water Quality Association at www.wqa.org. Contact factory for installation details.

AUTHORIZED MAINTENANCE PROVIDER

Your authorized maintenance provider will perform many system checks and adjustments as needed during the maintenance inspection. Please see the Operation and Maintenance section of this manual for further details.

Should there be any operational deficiencies with your Fusion®, the maintenance provider will notify the owner in writing when the deficiencies will be corrected. If the maintenance provider does not correct the deficiencies or the service calls are not completed, please contact Zoeller Pump Company at 1-800-928-7867.

INSPECTION AND MAINTENANCE FREQUENCY

Fusion® Series systems are to be inspected and maintained every six months under normal usage. The inspection and maintenance are only to be performed by personnel trained and authorized by Zoeller Pump Company. A Maintenance & Service Report is to be completed for each inspection and maintenance visit.

EXTENDED MAINTENANCE POLICY

An extended maintenance policy is available for purchase from your authorized Fusion® distributor. The extended maintenance policy will include the same system checks, schedule, and adjustments as the initial maintenance policy. Please contact your Fusion® distributor or maintenance provider for further information regarding the extended maintenance policy.

ALARM CONDITION

If an alarm condition occurs, please check the air intake area around the blower and make sure no debris blocks the blower intake. Remove the air filter cap. Remove the foam filter and gently tap against your other hand. If it is very clogged wash it in warm, soapy water and dry well before replacing. Reassemble filter and cap on top of blower. Do not attempt to remove the blower housing or any other parts from the blower. If the blower is operating properly, there may be a high water condition within the Fusion®. It may be necessary to discontinue water use until the alarm condition has been resolved. If the buzzer continues to sound or the red light stays on, please contact your authorized Fusion® maintenance provider. The buzzer may be silenced by toggling the black switch on the side of the alarm panel to "silence". The red beacon light will remain on until the problem has been resolved.

POWER OUTAGE

Should you experience a power outage, the blower will not operate and air (oxygen) will not be supplied to the Fusion®. If the blower is off for more than 24 hours, the lack of fresh air will cause the treatment efficiency to decrease. During a power outage, the Fusion® will still allow effluent to flow, and will not create a backup in the home. You may, however, have a pump or dose tank with a pump on the outlet of the Fusion®, which requires power to pump the effluent to the soil absorption field. If you have a system such as this, please be aware of this condition and conserve water accordingly.

EXCAVATION AND INSTALLATION

1. Excavate an area large enough for the Fusion® Series unit to be installed. See Figure 6 and Table 2 for the actual dimensions of the unit. Excavation dimensions are calculated by adding 12-18" (305-457 mm) to the length and width of the Fusion®. This will allow sufficient room for proper backfilling.
2. Construct a 6" (152 mm) thick stone pad of either 1/4" - 1/2" (6-13 mm) diameter stone or concrete pad and level to within 1/8 inch (3 mm).
3. **▲ NOTICE** If the unit is not level, it will cause uneven water flow as well as unbalanced aeration, which will result in poor performance.
4. Gently lift the unit at all four lifting points with a harness and install it on leveled stone pad (Figure 8).
5. Check unit to make certain it is level by placing a level at several locations on the riser. (riser covers removed) (Figure 8).

BACKFILLING

1. If groundwater is present, anti-flotation measures must be used to stabilize the unit prior to backfilling. Please follow the procedures in the Anti-flotation section to properly anchor the Fusion®.
2. Fill the unit with clean water to the normal operating depth prior to backfilling. Partition walls between chambers are water-tight and will fill in succession beginning on the inlet side of the unit. Therefore, it is best to alternate chambers when filling with water so the unit remains level. Check for leakage around the unit.
3. See riser/conversion kit installation.
4. Backfill with good quality granular soil around the unit that is free of organic matter, rock, stone, tree roots, or other debris that could damage the unit.
5. Fill area around air port with gravel to prevent breakage due to settling of unit (See figure 7).
6. Tamp soil around perimeter of the unit as it is backfilled to stabilize the unit and to reduce settling.
7. Finalize backfill with a mounded contour so that surface water is shed away from the unit. Under no circumstances should surface water be allowed to accumulate around unit. Riser extensions are available for deeper burial.
8. **▲ CAUTION** MAXIMUM soil burial depth is 12" (305 mm).

COLD WEATHER INSTALLATION

When installing a Fusion® unit in cold climates, the designer should specify insulated lids and risers. In addition, the blower must be protected from snow drifts by installing it inside a garage, home, basement, crawlspace or riser. If installed in a riser, the blower must be protected from inundation and must have a vent pipe installed to above the maximum snow depth with a 180° angle at the end to prevent snow and water entry. Also, the top and the sides of the Fusion® unit must be insulated with insulation sheeting or other means to provide a minimum insulation value of R-8. Please contact the factory for further information.

ANTI-FLOTATION

It is necessary to anchor the Fusion® in high groundwater conditions to prevent flotation. If groundwater rises above the rock or concrete pad that the Fusion® sits on, anchoring is required. Please consult a design engineer, soil scientist or other qualified individual to determine high groundwater conditions.

1. Follow the procedures outlined in the Excavation and Installation sections, items 1 - 5 to properly prepare and level the Fusion® excavation.
2. Follow the procedures outlined in the Backfilling section, items 1 - 2 to properly fill the Fusion® with water.
3. Refer to Figure 9, Anchoring Schematic to determine the minimum amount of backfill to be placed around the Fusion® in the excavation. Tamp the fill to prevent settling.
4. Refer to Table 3, Concrete Anchoring Dimensions to determine the amount of concrete needed for the concrete anchor collar that is poured around the entire circumference of the Fusion®. Pour concrete to the specified dimensions to fully engage the mid-seam of the Fusion®, which will anchor it once the concrete cures. Make certain to pour the concrete in a manner to minimize trapped air within the concrete. Agitating or lightly mixing the concrete with a metal rod or other small device, once poured, will help release trapped air.
5. Allow the concrete to harden before final backfilling.
6. Complete the procedures outlined in the Backfilling Section, items 5 - 8.

Table 1

NUMBER OF ACCESS RISERS IN FUSION® SERIES					
	ZFL-1120	ZFL-1440	ZFL-1680	ZFL-2000	ZFL-2400
18" (457 MM) DIAMETER	2	2	2	2	2
24" (610 MM) DIAMETER	1	1	1	1	1

Figure 6 - Dimensions

NOTES:

1. Dimensions "I" and "E" are to the bottom of the inlet/outlet pipe.
2. The overall height dimension "H" is to the top of the unit.
3. Riser kits are purchased separately.

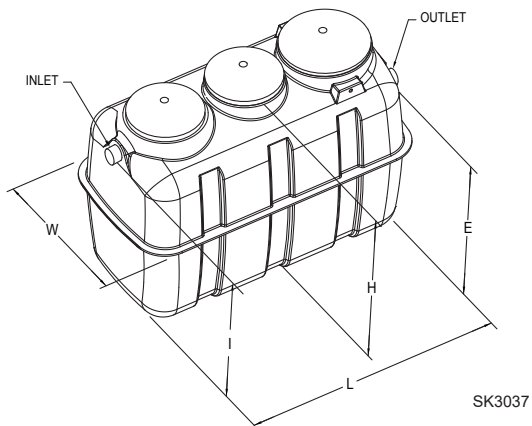
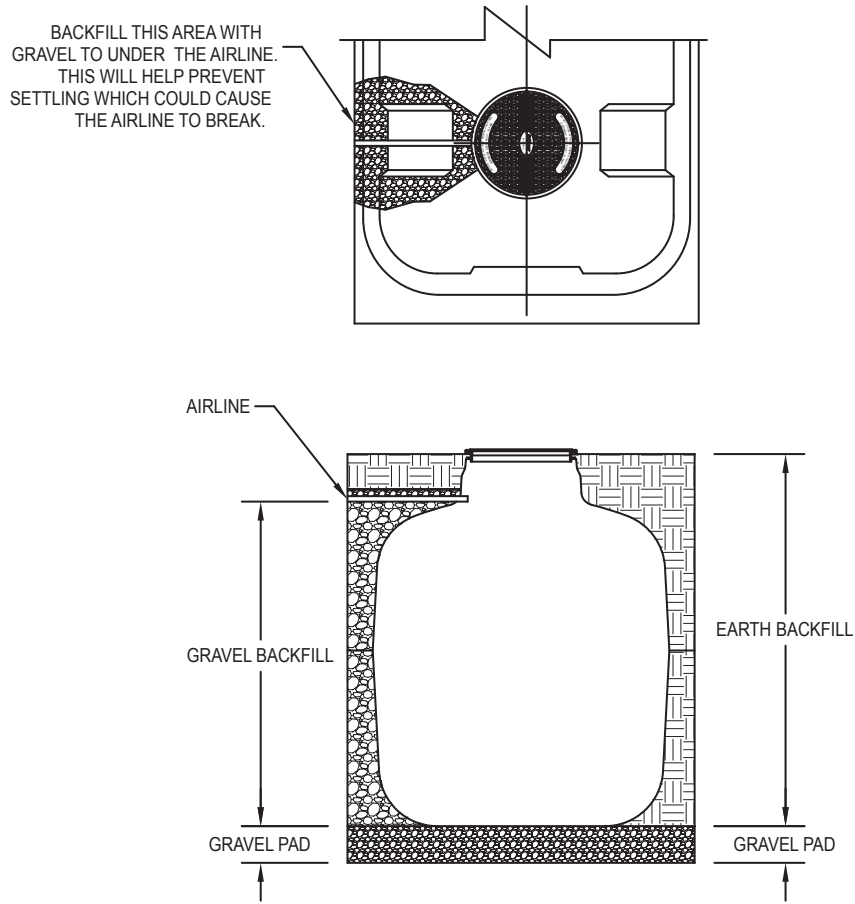


Figure 7



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Table 2

Fusion [®] DIMENSIONAL DATA							RISERS	
SYSTEM	L	W	H	I	E	Dry Weight	18"	24"
ZFL-1120	9' 11" (3.0 m)	5' 9" (1.8 m)	6' 6" (2 m)	5' 5" (1.7 m)	4' 11" (1.5 m)	924 LBS (419 KG)	2	1
ZFL-1440	11' 1" (3.4 m)	6' (1.8 m)	6' 9" (2 m)	5' 8" (1.7 m)	5' 2" (1.6 m)	1056 LBS (479 KG)	2	1
ZFL-1680	12' 9" (3.9 m)	6' (1.8 m)	6' 9" (2 m)	5' 8" (1.7 m)	5' 2" (1.6 m)	1166 LBS (528 KG)	2	1
ZFL-2000	13' (4.0 m)	6' 6" (2 m)	7' 3" (2.2 m)	5' 10" (1.8 m)	5' 4" (1.6 m)	1670 LBS (757 KG)	2	1
ZFL-2400	15' 4" (4.7 m)	6' 6" (2 m)	7' 3" (2.2 m)	5' 10" (1.8 m)	5' 4" (1.6 m)	1980 LBS (898 KG)	2	1

Table 3

Required Anchor Block Dimensions and Volume										
No Cover				6" Cover				12" Cover		
Z	W	H	CONCRETE VOLUME	W	H	CONCRETE VOLUME	W	H	CONCRETE VOLUME	
2' - 3"	2' - 0"	2' - 6"	197 ft ³ 8 yd ³	1' - 10"	2' - 6"	178 ft ³ 7 yd ³	1' - 8"	2' - 8"	169 ft ³ 7 yd ³	
2' - 4 1/2"	2' - 1"	2' - 10"	251 ft ³ 10 yd ³	2' - 0"	2' - 7"	218 ft ³ 8 yd ³	1' - 10"	2' - 7"	197 ft ³ 8 yd ³	
2' - 4 1/2"	2' - 2"	3' - 0"	301 ft ³ 11 yd ³	2' - 2"	2' - 4"	234 ft ³ 9 yd ³	2' - 0"	2' - 4"	213 ft ³ 8 yd ³	
2' - 7 1/2"	2' - 4"	3' - 1"	348 ft ³ 13 yd ³	2' - 4"	2' - 5"	273 ft ³ 11 yd ³	2' - 2"	2' - 5"	250 ft ³ 10 yd ³	
2' - 7 1/2"	2' - 6"	3' - 0"	403 ft ³ 15 yd ³	2' - 6"	2' - 5"	325 ft ³ 12 yd ³	2' - 4"	2' - 3"	279 ft ³ 11 yd ³	

Figure 8 - Positioning

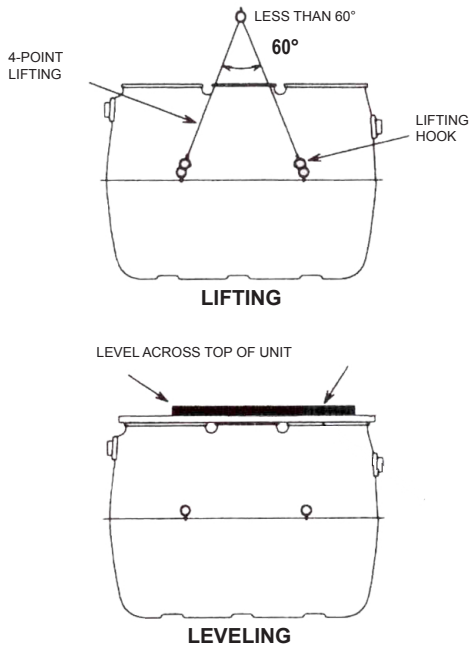
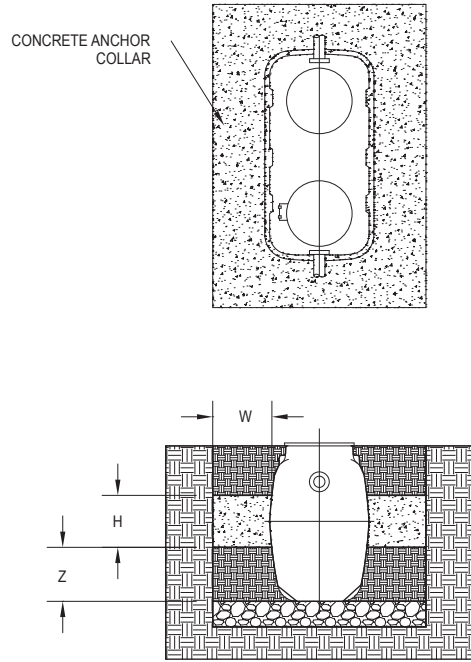


Figure 9



SK2931

RISER/CONVERSION KIT INSTALLATION

All large Fusion units are shipped without risers attached due to size restraints, therefore all units will need to have the chosen riser kit attached in the field. Please see the riser installation instructions below. Risers come in size ranging from 6" (152 mm) to 1' (305 mm), under no circumstances can the risers be extended more than 1' (305 mm) without consulting the factory.

Riser Installation Instructions - All Large Units

Install Fusion Unit in the ground and fill with water checking for any leaks. Back fill with dirt up to a reasonable working level for safety and easy of working on hub inserts and risers. Be careful not to get any back fill material into Fusion unit.

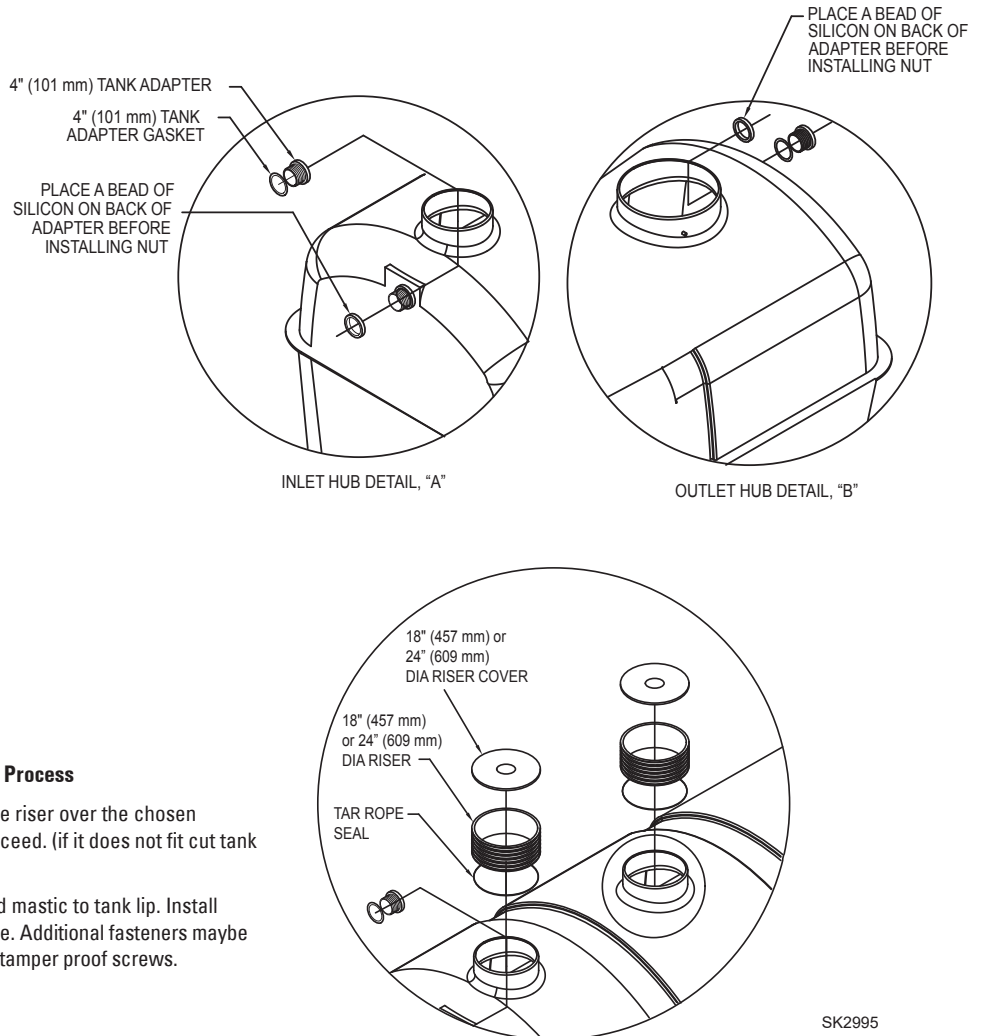
Hub Inserts for 4" (102 mm) Schedule 40 PVC (American Pipe Size)

Depending on where your Fusion Unit was shipped from, you may have the Japanese pipe size hub inserts. You may need to change them out to the American 4" PVC schedule 40 pipe size.

18" (457 mm) and 24" (610 mm) Riser Installation Process

Verify tank opening and riser match up by placing the riser over the chosen access hole. Once it is verified that the riser fits, proceed. (if it does not fit cut tank opening to match).

Clean tank lip of any dust and dirt and apply provided mastic to tank lip. Install riser by setting and pressing into the mastic adhesive. Additional fasteners maybe used to attach riser if needed. Install riser cover with tamper proof screws.



SK2995

BLOWER INSTALLATION AND PLACEMENT

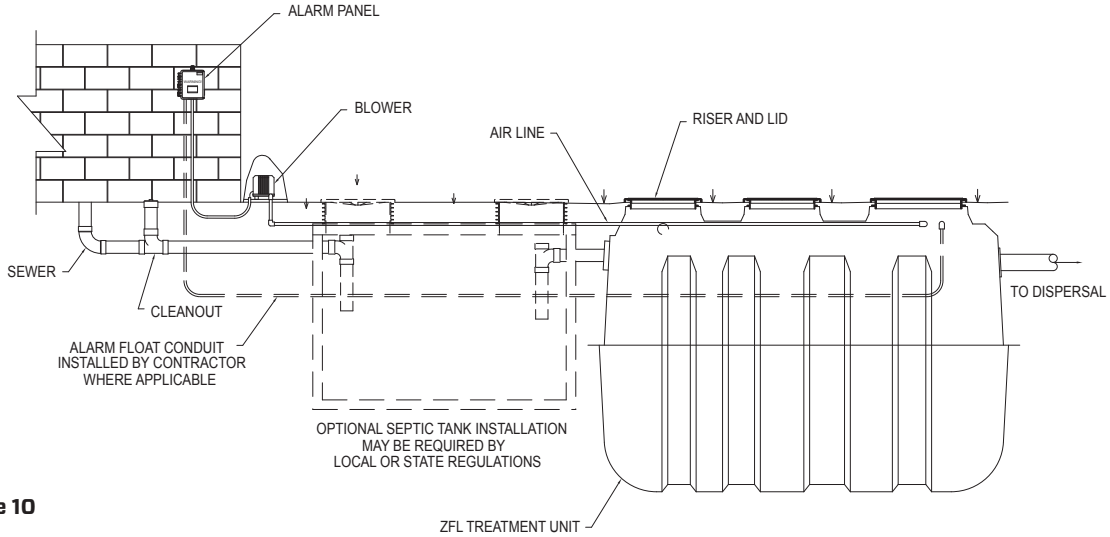


Figure 10

SK2928

1. This product must be connected to a grounded, metallic, permanent wiring system, or an equipment-grounding terminal or lead on the product.
2. Place the blower where it is easily accessible for maintenance and inspection.
3. Install the blower in an area where it will be protected from damage and inundation. Also make certain the location has good ventilation.
4. Install the blower on a foundation that is level and solid.
5. Excavate trenches for one air line from blower to the unit, and conduit from Fusion to control panel.
6. Install one air line from the blower to the unit. Length of piping must be less than 17' (5 m). If distances from 17' (5 m) to 33' (10 m) are required, upsize by one pipe size (Figure 11). If longer air lines needed, consult the factory.
7. The blower is provided with one discharge port. Attach the barbed end of the PVC tee (included in the blower box) to the blower using the rubber elbow.
8. Attach the small diameter black air tubing (included in the blower box) to barbed fitting on PVC tee. Black air tubing and blower cord should be routed to the control panel through conduit. Attach the black air tubing line to the air pressure sensor barbed fittings in the panel.
9. Connect the remaining end of the PVC tee to the airline installed in Step 6.

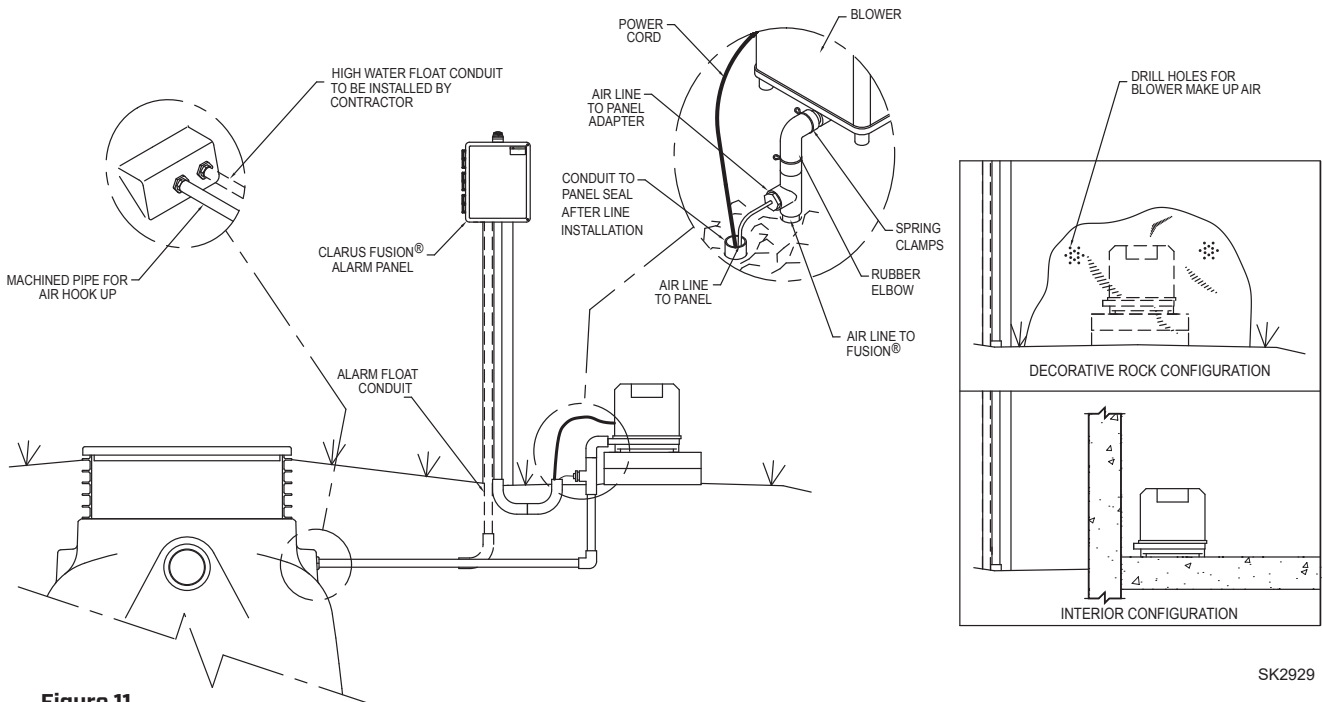


Figure 11

SK2929

PIPING INSTALLATION

1. Connect house sewer pipe or septic tank outlet, if required, to the unit inlet. Make certain only household waste enters the unit (no foundation drains, gutter drains, floor drains, etc.).
2. Connect the outlet pipe to the outlet of the unit.

HIGH WATER ALARM FLOAT INSTALLATION

The Fusion® alarm panel assembly includes a high water alarm float switch that is used to monitor the liquid level in the Fusion® unit. The switch should be tethered to the gray, vertical air line in the aeration chamber. With a 3" (76 mm) tether length, the cord should pass through the opening in the partition wall between the aeration and anaerobic filtration chamber and allow the float to hang in the outlet baffle of the anaerobic filtration chamber.

1. The float switch should be tethered to the gray, vertical pipe in the aeration chamber. When the float is in the horizontal position, the cord should be at least 1" (25 mm) below the top of the partition wall opening in the anaerobic chamber baffle.
2. Place the cord into the clamp and secure to gray aeration pipe. NOTE: Do not install the cord under the clamp.
3. Position the float with a 3" (76 mm) tether.
4. Tighten the clamp. Be careful not to overtighten as this may cause damage to the plastic clamp.
5. Make sure the float cord is not allowed to touch the excess clamp band during operation as this may cause damage to the cord.
6. The float switch cord should be installed in an electrical conduit connecting the alarm panel to the Fusion® unit. The electrical conduit must be rated for burial, and should be properly sealed to prevent gases from entering the alarm panel.
7. A 1/2" (13 mm) bulkhead fitting (supplied by others) should be used to connect the electrical conduit to the Fusion® unit. A hole must be drilled through the wall of the Fusion® unit next to the bulkhead fitting to facilitate this connection.
8. Please be certain that the bulkhead fitting for the electrical conduit forms a watertight connection with the wall of the Fusion® unit.
9. Electrical conduit from the Fusion® unit to the alarm panel can be buried in the same trench as the air line.
10. The control switch can be wired directly into the alarm panel. See Figure 5.

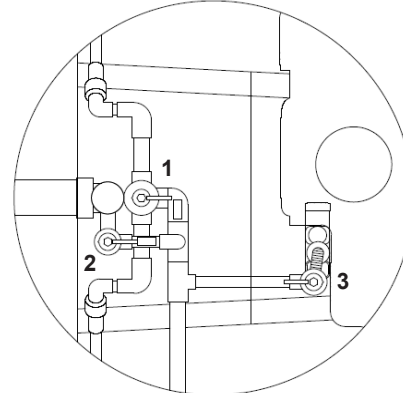
ELECTRICAL CONNECTIONS

1. **▲ NOTICE** All electrical installations must follow the National Electrical Code and/or your local/state electrical codes.
2. The blower should be directly wired into the alarm panel. The alarm panel must be located in a dry location that is accessible for maintenance. Please see Figure 8 and the wiring diagram and instructions enclosed with the alarm panel.

START UP

▲ NOTICE An installation and start-up check list is furnished with the information package in the blower box. Please use this as a guide and fill out all sections and return to your distributor.

Figure 12- Aeration Flow Adjustment



Top View from the Opening (outlet end)

Valve Legend:

- | | | |
|------------------|-------|------------------|
| 1. Aeration | Blue | Balance Aeration |
| 2. Recirculation | Gray | See Table 4 |
| 3. Effluent | White | See Table 4 |

Table 4 Valve Settings:

Fusion Model	1120	1440	1680	2000	2400
Recirculating flow rate (GPM)	0.9 - 2.1	1.3 - 2.6	1.5 - 3.2	1.8 - 3.7	2.1 - 4.5
Recirculating flow rate (sec/liter)	8 - 18	6 - 12	5 - 11	4 - 9	4 - 8
Suggested valve opening (%)	20 - 25	30 - 35	30 - 35	15 - 20	15 - 20
Effluent valve opening (%)	30	25	25	60	60

Procedure:

1. Rotate the effluent valve (White) to 0% (Closed) position.
2. Rotate the recirculation valve (Grey) to 70-80% position and keep it for one minute to transfer the accumulated sludge.
3. Adjust the recirculation valve (Grey) as set out in the table above.
4. Rotate the aeration valve (Blue) to 100% (A or B) for backwash.
5. Wait one minute, then rotate the aeration valve (Blue) to opposite 100% position to backwash the other side.
6. Wait one minute, then set the aeration valve to 50% (the normal setting).
7. Rotate the recirculation valve (Grey) to 70-80% position and keep it for one minute to transfer the accumulated sludge.
8. Repeat step 4 to 7 three times.
9. Adjust the recirculation valve (Grey) and the effluent valve (White) as set out in the table above

There are two aeration systems provided within the aeration chamber: normal aeration and backwash. Valves (1 and 3) are set at 50%. Observe the air flow on each side of the unit to verify equal flow. If there is an obvious discrepancy in air flow between the two sides, adjust the valves (1 and 3) so that the flow is equal.

RECIRCULATION FLOW ADJUSTMENT

The recirculation flow is designed to be 2-4 times that of the average design inflow. Table 5 indicates starting flow rates for each unit. However, fine adjustments may be necessary to ensure optimum performance.

The water level could get higher than the low water level (L.W.L.) mark by as much as 2". When the water level is high, recirculation flow rate will be higher than usual. Make sure that water level is at the L.W.L. position so that an accurate recirculation flow rate can be measured. Wait until the water level reaches the L.W.L. position or manually make it reach this position by increasing the effluent valve to 70-80%, then measure the recirculation flow rate once this is achieved. If the effluent airlift pump is not transferring water, water level should be in the L.W.L. position. Be sure to set the effluent valve (white) back to the table 4 effluent valve settings as found on page 10. Make sure there is no influent and water level is at L.W.L. position, then take the recirculation flow rate measurements.

Effluent Valve Settings:

1120 - 30%
1440 - 25%
1680 - 25%
2000 - 60%
2400 - 60%

Setting the flow rate:

- Adjust the flow using rates in Table 5.
- The flow rate is adjusted by rotating the gray recirculation valve (2) and observing the flow at the pipe end.
- There are prescribed lines at the outlet of the recirculation pipe to aid in approximating the correct flow.

Measuring the flow rate:

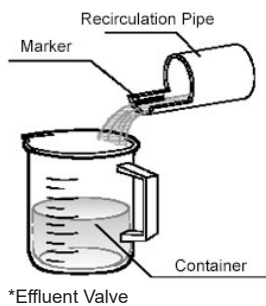
- The actual flow rates must be measured to verify flow after adjustment of the valve and observation at the pipe end.
- Measure the time in seconds required to fill a 1 Liter (0.3 Gallons) container.
- Compare the time to value ranges in Table 5.
- If necessary, adjust the valve again and collect another sample to verify the correct flow rates.

▲ NOTICE It is important not to set the flow rate too high because it can cause excessive agitation within the first chamber (Sedimentation Chamber). This could result in poor performance.

Table 5 - Recirculation Flow Rates

Fusion® Model	1120	1440	1680	2000	2400
Recirculating Flow Rate (GPM)	0.9-2.1	1.3-2.6	1.5-3.2	1.8-3.7	2.1-4.5
Recirculating Flow Rate (sec/liter)	8-18	6-12	5-11	4-9	4-8
Suggested Valve Opening (%)	20-25	20-25	30-35	15-20	15-20

Figure 13 - Flow Measurement



When properly adjusted, the water level should be near the standard line marked at recirculation outlet.

Table 5 - Effluent Valve Setting
Effluent valve (white) is set at shipping, which should not need adjusted in most cases.

Model	1120	1440-1680	2000-2400
Suggested Valve Setting (%)	30	25	60

- If the recirculation flow rate is excessively higher compared with the value measured at the last inspection, this may indicate that supplying pipe could be clogged. Clean the pipe following instructions below.
- Recirculation airlift pump head has a clean out. An airlift flow rate which is lower than usual, may indicate that bio-film has been formed on the pipe. Remove a cap from the head and clean the airlift pump with a brush and hose.
- If the recirculation flow rate is excessively small, the valve may be clogged. Rotate the valve to 0% and 100% position several times to flush.
- The recirculation pipe has a clean out. If excessive bio-film and/or sludge remain on the inside of the pipe, clean it with a brush and hose.

Cleaning the Aeration Pipe

If there are signs of clogging as described below, apply air flushing, water flushing or cleaning using a tool (e.g. pipe cleaner).

- Uneven aeration cannot be solved even after adjusting the valve. A bubble is not generated thoroughly.
- The recirculation flow is increased abnormally although the recirculation valve setting is the same as last inspection.

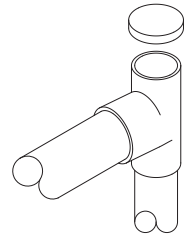


Figure 14 - Recirculation Pipe Clean Out

Air Flushing Procedure:

- Close gray recirculation valve (2) all the way (0%).
- Rotate blue aeration valve (1) back and forth from the 0% to the 100% position several times to flush.
- Set valves (1) and (2) back to the appropriate positions. (see page 10 Aeration Airflow Adjustment)

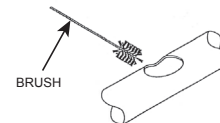
Water Flushing Procedure:

- Make sure the blower is off.
- Close valve (2) all the way.
- Connect a water line to the aeration line as shown in Figure 16.
- Gradually open the water faucet and introduce water into the system.
- Rotate valve (1) back and forth from 0% to the 100% position several times to flush.
- Turn off the water, remove the water line and reconnect the air line to the blower.
- Set valves (1) and (2) back to the appropriate positions.

Cleaning the Recirculation Line:

- Make sure the blower is in the aeration mode. If not, change the mode by pressing the Manual Backwash button.
- Open the gray recirculation valve (2) to 100%.
- Flush water through the recirculation line for several seconds.
- Turn off the recirculation by rotating the gray valve (2) to 0%.
- Make sure the blower is off. Allow the system to relax for a few seconds.
- Repeat this cleaning method three times. A hose or brush can also be used to clean the recirculation line. See Figure 15.
- Reset the gray valve (2) to its original position.

Figure 15



Foam Formation

Make sure there is not an excess amount of foam on the surface. If excessive foam is present it may indicate high detergent usage. Meet with owners to inform and educate them concerning excessive use.

Abnormal Water Level

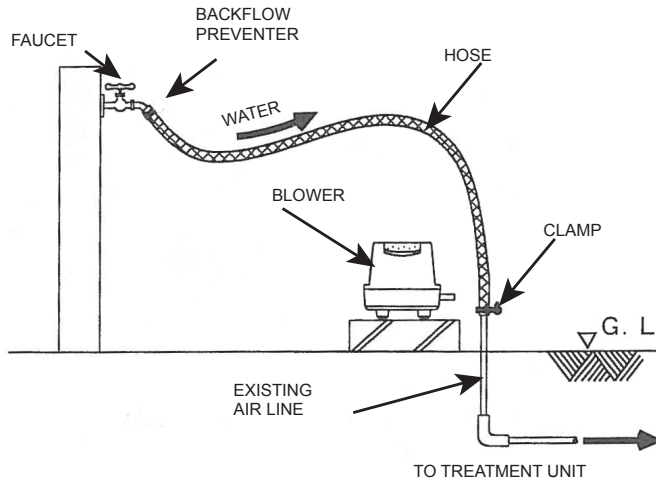
If the water level exceeds the partition wall, clean the plastic cage first with a brush, then check for possible clogging in the filter media section. Clogs may be cleared by using a manual backwash tool. The manual backwash tool may also be used to eliminate a clog in the anaerobic chamber media as well.

AEROBIC CONTACT FILTRATION CHAMBER CLEANING

Aeration

The aerobic system must be flushed every maintenance visit. There are two flushing methods: (A) Air flushing and (B) Water flushing. Air flushing must be done every maintenance visit. Water flushing may be done if there is a sign of clogging in the Aerobic Contact Filtration Chamber (e.g. abnormal increase in recirculation flow).

Figure 16



Tool (pipe cleaner) Cleaning Procedure

1. Close the recirculation valve (gray) and effluent valve (white).
2. Turn off the blower power.
3. Loosen the union and disconnect the aeration pipe from the air-supplying pipe.
4. Insert the tool (pipe cleaner) into the air supply line and clean piping.

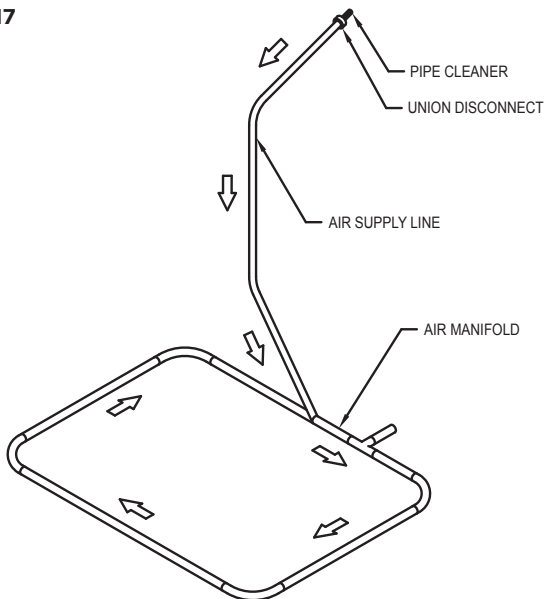
NOTE: refer to the chart below for the required pipe cleaner length.

5. Remove the pipe cleaner, put piping back together, and turn on the blower power.
6. Set all valves.

Table 7

Length	Models 1120-1680	Models 2000-2400
Pipe in. (mm)	71"-79" (1800-2000)	79"-87" (2000-2200)
Loop in. (mm)	59"-75" (1500-1900)	79"-83" (2000-2100)

Figure 17



Effluent Airlift Pump

Fusion® 1120-2400 models have the effluent airlift pump. By the effluent airlift pump, water in the aerobic contact filtration chamber is transferred to the clean water storage chamber until the water level rises by 2" (50 mm). See Figure 17.

Effluent Airlift Pump Inspection

Check that the effluent airlift pump transfers the water. To check when water level is low, push the effluent airlift pump down (or pour the water directly into the airlift pump using a beaker). The water goes into the airlift pump from the flow opening and should flow out the outlet to clean water storage chamber.

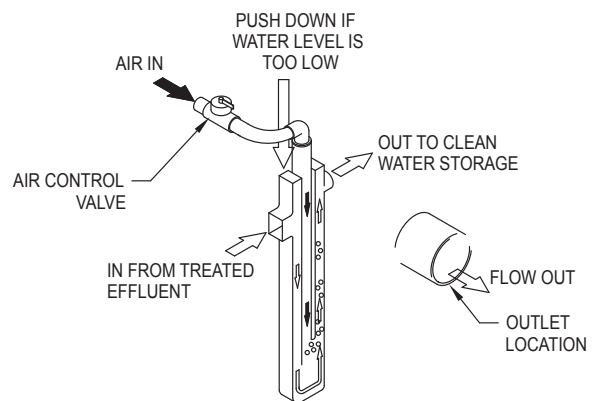
Effluent Valve Set Up

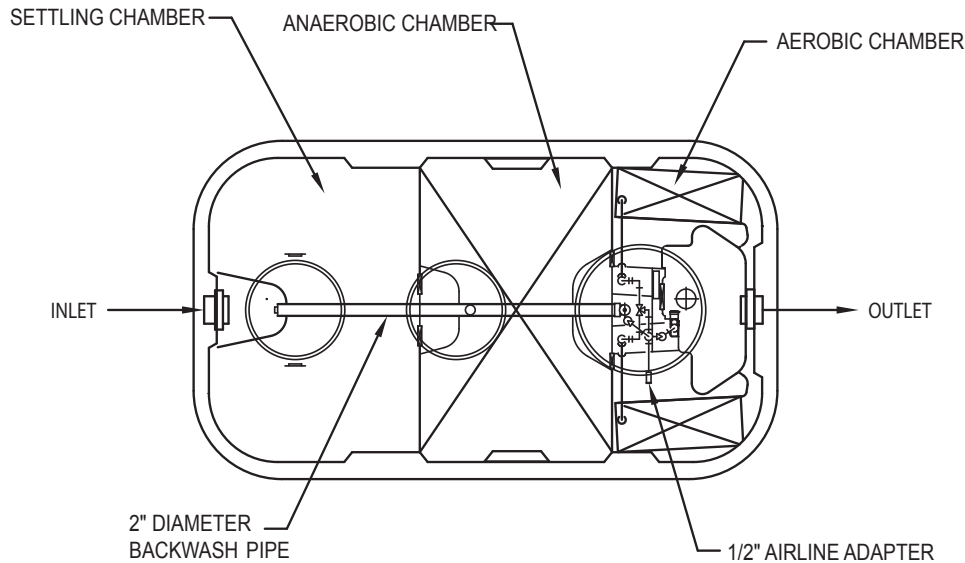
The effluent valve is attached to the airlift pump and is used to adjust the air volume. The valve is set when shipped. This will not need to be adjusted. If the airlift pump does not transfer the water, adjust the effluent valve.

Effluent Valve Inspection

To inspect the valve, rotate the valve from the 0% position to the 100% position several times. Set valve to the settings found on table 4 valve settings to prevent clogging.

Figure 18





SK2850A

Figure 19 - Inspection details

FUSION® OPERATION AND MAINTENANCE

The following steps are to be completed during each inspection. All information collected during the inspection is to be recorded on the Maintenance and Service Report CL0160.

Begin the inspection by recording the date, arrival time, weather conditions, purpose of the visit, water use, model number, serial number, the presence or absence of a septic tank, and the system owner and service provider information in the space provided on the report.

GENERAL OBSERVATIONS

1. **Are any odors present?** Typically there is no odor with the lids closed, if properly sealed. With lids removed, a septic or sewer-like odor is indicative of poor treatment and is common immediately after startup due to hydrogen sulfide and other gases. An active system will have a musty, earthy smell similar to wet peat moss.
2. **Are any insects present?** Typically, no insects are present in the cold weather months. In warmer months, sewage flies can be found inside risers, on the underside of lids, and larvae can be found in the scum layer of the sedimentation chamber.
3. **Is there evidence of high water?** Typically indicated by a water level above the black wall markings and above the "0" graduation on the partition wall stickers. May also be indicated by debris on partition walls.
4. **Is there excess foam formation?** Foam may be present during an inspection. Brown foam indicates bacterial buildup following startup. White foam is due to detergent use. Neither is a problem if occurring intermittently. Detergent-based foam will often be accompanied by low transparency readings.
5. **Is there residue build-up on piping?** Typically indicated by gray or black residue (dried foam) on aeration chamber piping.
6. **Is there even and vigorous bubbling?** Bubbles surfacing in the aerobic contact filtration chamber should be even across the entire chamber. If uneven, cleaning steps should resolve this issue.

REQUIRED WATER QUALITY ANALYSES

PART A: Clean Water Storage Chamber – collect samples from the clean water storage chamber to be used for the following analyses

1. **pH** – Measures the hydrogen ion-concentration and is determined with the use of the pH test strips included in the Fusion Maintenance Kit. Dip a test strip into the water sample for 1 second, remove, and read by comparing to the color chart provided on the container. A pH = 7.0 is neutral. The range suitable for biological activity is 6.5 to 7.5. Recurring results outside this range should be investigated – check the water source for the home or business, chemical use, etc.
2. **NO₂-N** – Determined with the use of the nitrite test strips included in the Fusion Maintenance Kit. Dip a test strip into the water sample for one second, remove, allow to react for 30 seconds and read by comparing to the color chart provided on the container. Nitrite-nitrogen is an intermediate step in the oxidation of ammonia to nitrate and the reduction of nitrate. The presence of nitrite is indicative of biological activity. The absence of nitrite could be due to a young system or a recirculation rate that is too high. To correct low nitrite readings in established systems, decrease the recirculation rate.
3. **Transparency** – Measures the ability of the water to transmit light. Using the ladle, fill the transparency tube with a water sample collected from the clean water storage chamber. Looking down through the water column, slowly drain the transparency tube using the valve on the flexible hose until you can first distinguish between the black and white colors on the secchi disk in the bottom of the tube. When the secchi disk is visible, close the valve and read the transparency (in centimeters) on the side. Dirty water samples transmit less light and result in a lower transparency. A transparency reading > 20 cm is preferred. Low transparency may be due to a lack of biological activity as in a young system, a recirculation rate that is too high, or a system influent high in detergent concentration. To correct low transparency readings not caused by detergent, decrease the recirculation rate. Detergent based problems may require consultation with owner.

FUSION® OPERATION AND MAINTENANCE, continued

1. **Scum** – Very small amounts of scum may accumulate in the corners on the outlet end of the system. This is normal. Scum, should not be present elsewhere in the clean water storage chamber unless the recirculation rate is too high or daily flow exceeds the design capacity. If present, use ladle to transfer to sedimentation chamber.
2. **Sludge** – Test the sludge depth using the sampling device included in the maintenance kit. The bottom section of the sampler includes a check valve, which opens as the unit is lowered into the liquid. When the sampler has reached the bottom of the chamber and the liquid level equilibrated at surface level, lift the sampler and this action will set the check valve and retain the sample in the tubing. Withdraw the sampler and note the depth of settled solids within the sample. To release the material in the unit, touch the stem extending from the bottom section against a hard surface such as the partition wall in the sedimentation chamber. This opens the check valve to drain the sample. Typically solids are brown and well flocced.

Sludge Descriptions:

Black – septic or sewer-like odor due to hydrogen sulfide and other gases

Brown – undigested sludge is light brown, becomes darker with digestion, lightly settled

Clear – may see a clear water layer beneath solids if gas carries solids upwards

Flocced - settled with texture similar to a tuft of wool

Grainy - gritty or sandy texture

Gray - partially digested sludge

Milky – light in color, cloudy, not transparent

Muddy – typically well settled, often present just after startup, may be due to infiltration

Mustard - an off-color, remnants of digestion are often yellowish in color

White - sometimes present after new construction often due to drywall mud

PART B: Anaerobic Filtration Chamber - collect samples from the outlet baffle of the anaerobic filtration chamber to be used for the following analyses:

1. **Transparency** – A transparency reading more than 20 cm is preferred.
2. **Scum** – Should not be present unless recirculation rate is too high or daily flow exceeds design capacity. To correct, reduce the recirculation and or backwash rate.
3. **Sludge** – A range of 0" to 25" (0 to 60 cm) is preferred. Typically brown and settled, becomes gray to black as depth and digestion increases.

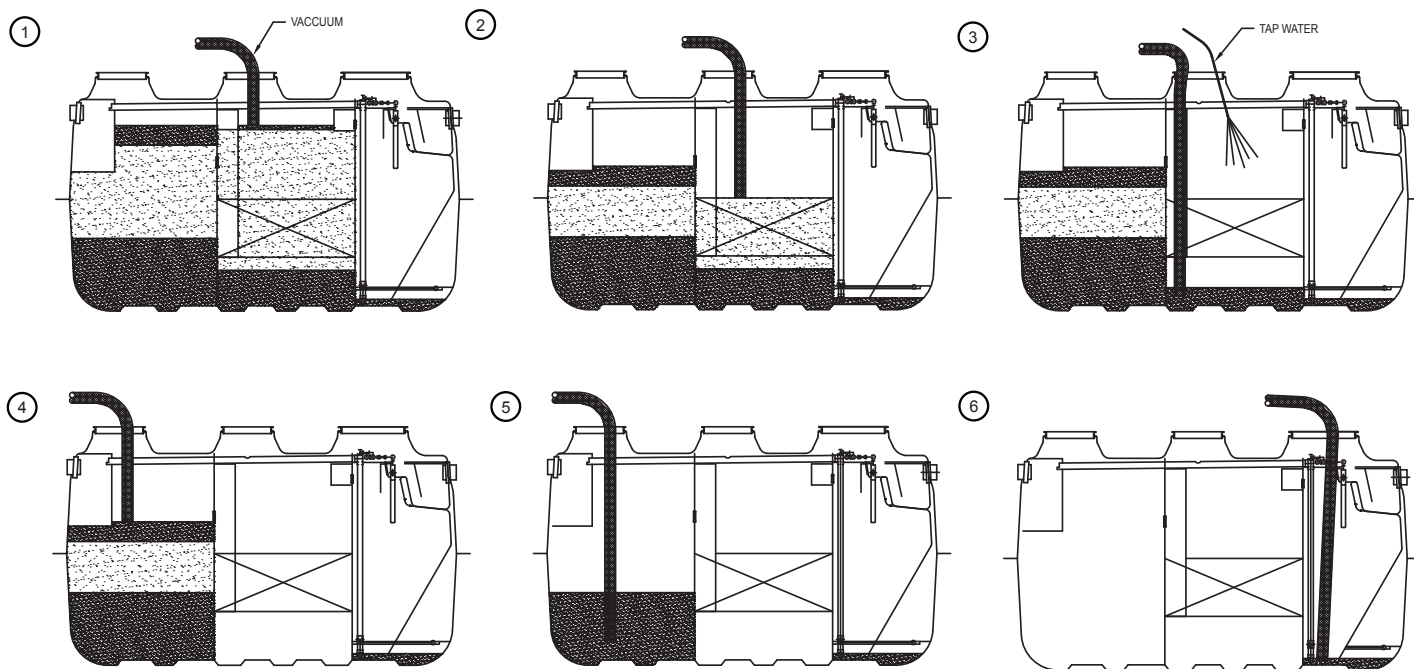
PART C: Sedimentation Chamber – collect samples from the outlet baffle of the sedimentation chamber for the following analyses:

1. **Scum** – rising above the partition wall. If so, punch down using ladle.
2. **Sludge** – A range of 0 - 50" (0 to 120 cm) is preferred. Typically brown and settled, becomes gray or black as depth and digestion increases.

FUSION® PUMPING

Wastewater entering the Fusion® contains organic and inorganic materials. If organic in nature, it is treated and decomposed by microorganisms during the treatment process. If inorganic in nature, it will be stored within the Fusion®. The stored materials accumulate as scum (floating) or sludge (solids on the bottom) and must be removed periodically to ensure the performance of the Fusion®. Please review the Operation and Maintenance sections part B and C to determine when the maximum depths of scum and sludge have been reached and pumping is required. Follow the procedures in Figure 20 to remove scum and sludge from the chambers shown below.

Figure 20 - Pumping Procedure



SK3002

Notice: If the sludge in the sedimentation chamber is pumped out first, the water level in the anaerobic chamber goes down simultaneously and the scum on the filtration will enter the filtration, which may cause clogging. Always pump out the scum and sludge in the anaerobic chamber first.

*Shut off blower before pumping.

1. Pump out the scum in the anaerobic chamber.
2. Pump out the sludge built up on the filtration media.
3. Pump out all the sludge at the bottom of the anaerobic chamber – put the suction hose from the cleaning baffle to the bottom, pump out all sludge while pressure water cleaning filtration media and chamber walls.

Sedimentation chamber

4. Pump out the scum by the suction hose while breaking the scum using a stick or equivalent.
5. Put the suction hose to the bottom and pump out all sludge.
6. Aerobic contact filtration chamber
Although the chamber may not need to be cleaned, it is possible to pump out the water in the chamber from the storage chamber if cleaning is needed. Put the suction hose from the storage chamber to the bottom, pump out sludge while pressure water cleaning contact media, filtration media and chamber walls. When the water in the storage chamber is pumped out, the water level in the aerobic contact filtration chamber goes down simultaneously since both chambers are connected at the bottom.
7. After cleaning
Refill water up to the standard level (prescribed line) in the unit. After refilling, restart the blower.

ALARM PANEL & BLOWER INSPECTION AND MAINTENANCE

Inspect the alarm panel for signs of water or odors inside. Toggle the test switch on the side of the box to check that both the alarm horn and the alarm beacon light are operational.

Inspect the blower for proper operation. If the blower is not functioning, refer to the troubleshooting section near the end of this guide.

1. Listen for loud rattling sounds. The blower should hum softly. If a rattle is heard, ensure that all four legs securely contact the ground or base medium.

2. Inspect the filter once the power has been disconnected by removing the filter retention screw. Then, remove the cover by snapping the filter cover off the top of the blower. Clean the filter by knocking the dust out or by rinsing with water to remove accumulated particles. Be sure the filter is dry before reinstalling.

TROUBLESHOOTING

1. Odor

Offensive odors are often the result of insufficient or inappropriate bacterial growth. Causes may include a young or unestablished system, insufficient air introduction, or the addition of detrimental chemicals or poisons into the system. Ensure the blower and air delivery systems are functioning. Check with the owner regarding chemical use and disinfection habits. Check all risers and lids to ensure an airtight seal.

2. Foam Formation

Foam formation is observed in the following situations:

1. In the early stage of operation when the aerobic bacteria colony is establishing itself.
2. When an excess amount of air is supplied for aeration.
3. When the difference between ambient temperature and water temperature is great.
4. When an excessive amount of detergent is introduced.

In most cases, foam will disappear with proper operation. When excessive amounts of detergent have been introduced to the system, remind the owner to use appropriate amounts of detergent.

3. Cloudy Treated Water

- Check the amount of scum and sludge:
If too much scum or sludge is observed, transfer them to the first chamber and adjust recirculation flow rate as well as backwash time, frequency and duration. (See backwash flow adjustment)
- Check the aeration situation:
If uneven bubble generation is observed, adjust valve (1). If aeration is weak, flush the aeration pipe with air or water.
- Check the recirculation flow rate:
If the recirculation flow rate has increased after the last inspection, the aeration pipe may be clogged. Flush the aeration pipe with air or water. If the recirculation flow rate has decreased after the last inspection, the airlift pump or recirculation pipe may be clogged. Clean them with a brush and running water.

- Check the color of the returning sludge from the backwash pipe:

If the color is abnormally dark, decrease the recirculation flow rate accordingly. If the TSS of the water from Anaerobic to Aeration Chamber is high, check the sludge accumulation. If the sludge accumulation reaches the upper limit, pump out the sludge. If not, backwashing the Anaerobic Chamber by using a manual backwash tool (Figure 17) may assist.

4. Blower

Blower motor does not run, with power connected:

- Check the electric supply to the panel, ensuring 120 volt service.
- Check that all breakers and fuses in the panels are on and intact.
- Refer to instructions supplied with blower.

Little or No Aeration / Backwash Air:

- Check the blower motor is running.
- Check the air line piping connectons at the blower.
- Check the air filter and clean or replace if necessary.
- Check the diaphragms and replace if necessary.
- Check the air piping for leaks, clogs, or dislocations and correct accordingly.
- Verify check valves (if installed) in supply lines are installed correctly.

Blower Inspection and Maintenance

Periodic blower maintenance is required for reliable continuous operation. Any maintenance of the blower other than those described herein this manual must be performed by an authorized service provider.

NOTICE: Always turn off the power and unplug from electrical terminal before any maintenance. Failure to observe this precaution can result in a serious accident.

Air Filter

Air filter, located under the filter cover, should be inspected and cleaned every 3 to 6 months. Wash the filter pad gently in mild, soapy water then rinse thoroughly. Allow filter pad to dry completely before reinstalling.

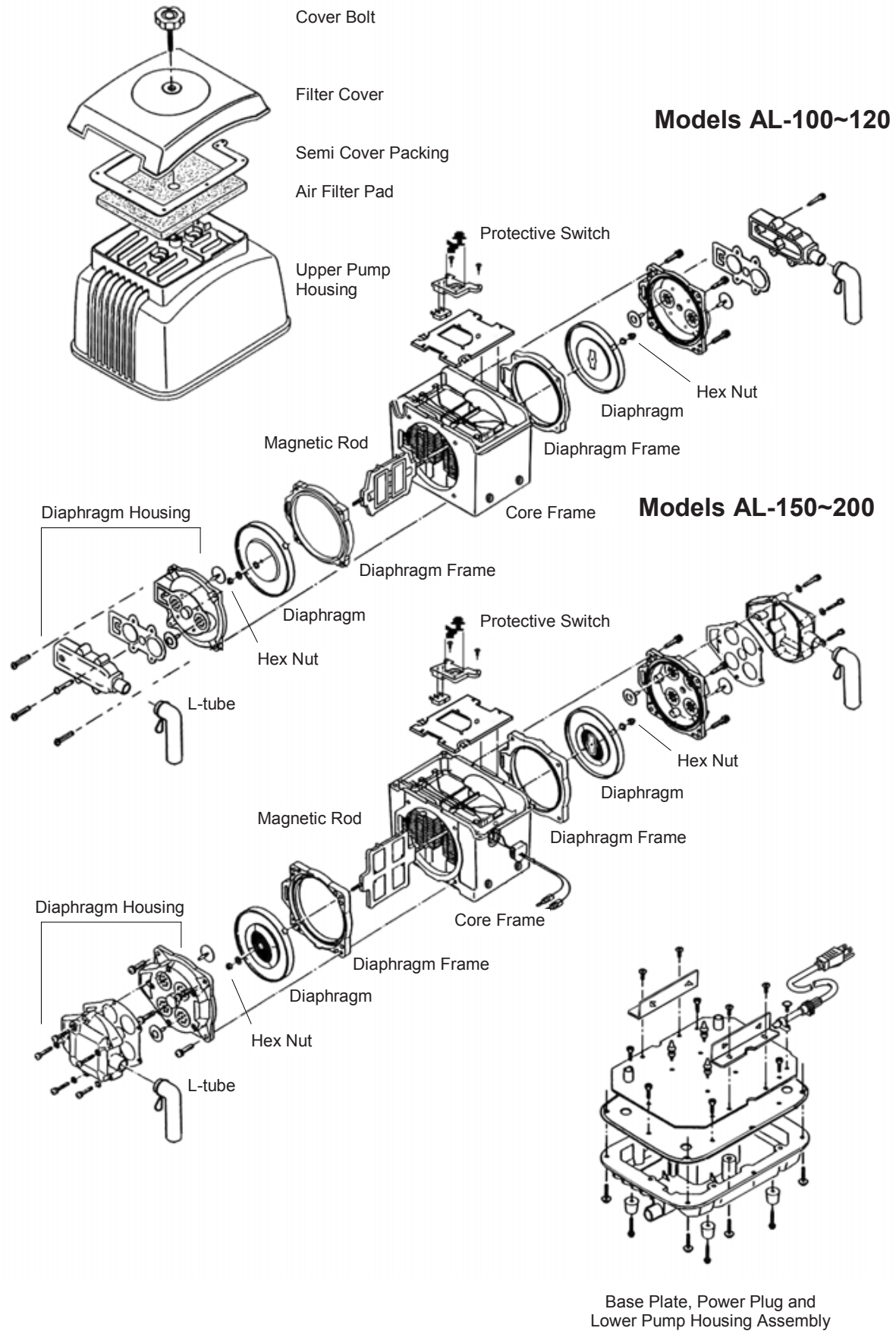
Diaphragm

Diaphragm module replacement is typically recommended for every 24 months of operation. Replacement cycle may differ from application to application, it is prudent to perform the replacement before any actual diaphragm failure. Diaphragm replacement kits are available.

1. Set blower upside down (remove filter cover for stability if needed), unscrew and remove all upper housing screws. Return blower to upright position and lift away upper housing. Number of housing screws: AL-100 ~ 200 (6x).
2. Detach the L-tube from discharge port of each diaphragm housing.
3. Select a diaphragm housing on core frame, remove its 4 corner screws, and then pull housing away. Proceed to remove the hex nut and washer from center of the diaphragm then pull and slide the entire diaphragm block away from magnetic rod and core frame.
4. Select a new diaphragm block from the replacement kit, align shape with core frame and magnetic rod then slide over the rod screw. Secure assembly firmly with washer and hex nut. Apply 1 to 2 drops of removable grade thread locker between the hex nut and protruded rod screw.
5. Install new diaphragm housing then secure with 4 corner screws.
6. Attach L-tube to the discharge port of the new diaphragm housing then secure with silicone band or wire hose clamp.
7. Repeat step #3 through #6 on opposite side. **IMPORTANT:** Do not mix old and new parts. For reliable operation, always replace both diaphragm modules in the blower at the same time.
8. If the blower includes a protective switch on top of the blower core, rotate and reset the switch to ON position.
9. Install upper housing and secure firmly with all housing screws.



Assembly Diagram for Models AL-100 ~ AL-200



TECHNICAL SPECIFICATIONS

ACTUAL VALUES VOLUME LITERS (GAL.)						
MODEL NUMBER	ZFL 1120	ZFL 1440	ZFL 1680	ZFL 2000	ZFL 2400	
CLARUS P/N	5250-0018	5250-0020	5250-0022	5250-0024	5250-0026	
SEDIMENTATION CHAMBER	2,112.3 (558)	2,725.5 (720)	3,168.4 (837)	3,766.5 (995)	4,519.8 (1,194)	
ANAEROBIC CHAMBER	2,104.7 (556)	2,717.9 (718)	3,176 (839)	3,758.9 (993)	4,512.2 (1,192)	
AERATION CHAMBER	938.8 (248)	1,215.1 (321)	1,430.9 (378)	1,676.9 (443)	2,006.3 (530)	
STORAGE CHAMBER	514.8 (136)	651.1 (172)	749.5 (198)	923.6 (244)	1,075.1 (284)	
TOTAL	5,670.5 (1,498)	7,309.6 (1,931)	8,524.7 (2,252)	10,126 (2,675)	12,113 (3,200)	
INFLOW IN LITERS/DAY (GAL./DAY)	4,239.7 (1,120)	5,451 (1,440)	6,359.5 (1,680)	7,570.8 (2,000)	9,085 (2,400)	
SIZE: WIDTH IN CM (IN.)	175.3 (69)	182.9 (72)	182.9 (72)	198.1 (78)	198.1 (78)	
LENGTH IN CM (IN.)	302.3 (119)	337.8 (133)	388.6 (153)	396.2 (156)	467.4 (184)	
HEIGHT IN CM (IN.)	198.1 (78)	205.7 (81)	205.7 (81)	221 (87)	221 (87)	
WEIGHT IN KG (LBS.)	419 (924)	479 (1,056)	529 (1,166)	758 (1,670)	898 (1,980)	
LIDS AND ACCESS						
18"	2	2	2	2	2	
24"	1	1	1	1	1	
BLOWER INFORMATION						
AL-100 (P/N 151433)	1					
AL-120 (P/N 151434)		1				
AL-150 (P/N 151435)			1	1		
AL-200 (P/N 151436)					1	
AIR LINE SIZE(S)						
1/2"	1					
3/4"		1	1	1	1	
INLET/OUTLET INFO						
INFLUENT INVERT CM (IN.)	165.1 (65)	172.7 (68)	172.7 (68)	177.8 (70)	177.8 (70)	
EFFLUENT INVERT CM (IN.)	149.9 (59)	157.5 (62)	157.5 (62)	162.6 (64)	162.6 (64)	
INLET/OUTLET PIPE SIZE	DN100 (4")	DN100 (4")	DN100 (4")	DN100 (4")	DN100 (4")	
BLOWER DETAIL INFORMATION	VOLTAGE	AMPS	SOUND (dB)	AIR FLOW(L/MINS)	WEIGHT KG (LBS.)	WATTS
AL-100 (P/N 151433)	120	2.1	41	100	8.3 (18.2)	126
AL-120 (P/N 151434)	120	2.2	42	120	8.3 (18.2)	132
AL-150 (P/N 151435)	120	2.3	44	135	10.1 (22.3)	138
AL-200 (P/N 151436)	120	3.2	45	150	10.1 (22.3)	250
FUSION SIZE	LENGTH	WIDTH	HEIGHT	I (INLET)	E (OUTLET)	
ZFL 1120	3.0 M (9' 11")	1.8 M (5' 9")	2.0 M (6' 6")	1.7 M (5' 5")	1.5 M (4' 11")	
ZFL 1440	3.4 M (11' 1")	1.8 M (6' 0")	2.1 M (6' 9")	1.7 M (5' 8")	1.6 M (5' 2")	
ZFL 1680	3.9 M (12' 9")	1.8 M (6' 0")	2.1 M (6' 9")	1.7 M (5' 8")	1.6 M (5' 2")	
ZFL 2000	4.0 M (13' 0")	2.0 M (6' 6")	7.3 M (7' 3")	1.8 M (5' 10")	1.6 M (5' 4")	
ZFL 2400	4.7 M (15' 4")	2.0 M (6' 6")	7.3 M (7' 3")	1.8 M (5' 10")	1.6 M (5' 4")	

NOTES



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