



SERVICE MANUAL

FOR USE WITH MODEL #s
MICROFAST 0.5, 0.75, 0.9, 1.5 (NSF STD. 40 CERT.)

BIO-MICROBICS, INC. FAST® WASTEWATER TREATMENT SYSTEMS

IMPORTANT: *All work must conform to local electrical plumbing, and building codes.*

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IMPORTANT INFORMATION

Please read and follow the cautionary notes given below and those found elsewhere in this manual. If you have questions regarding the safety or operation of your FAST® Wastewater Treatment System, contact Bio-Microbics, Inc. at:

1-800-753-FAST (3278)



WARNING: *Hazards exist in confined spaces such as a new or used, buried septic tank. No one should be allowed to enter the tank under any circumstances. The hazards include presence of dangerous or fatal gases, insufficient oxygen, or the collapse of the tank and entrapment of personnel.*



WARNING: *Anyone coming in contact with wastewater must remove any contaminated clothing and thoroughly wash all body areas and clothing exposed to wastewater with soap and water, then consult a physician to minimize the risk of illness.*

INTRODUCTION

The Bio-Microbics, Inc. FAST® wastewater treatment system is an aerobic biological treatment system. The unit will operate on a continuous treatment basis (versus a batch type process). The entire treatment process consists of a primary sedimentation zone and the secondary aerobic biological zone.

The acronym, FAST, stands for Fixed Activated Sludge Treatment. This describes the method of fixing a bacteria colony in the treatable fluid. A honeycomb type media block is submerged in the wastewater in the aerobic zone. The bacterial colony will attach itself to the surface of the media.

One or more of the following patents protects this process: 3,966,599; 3,966,608; 3,972,965; 5,156,742.

The treatment plant is designed to operate on standard household current. The input power required for the motor is 120 VAC, 1 phase, 60 or 50 Hz. The input power to the alarm circuit is also 120 VAC, 1 phase, 60 or 50 Hz.

DEFINITIONS

Some definitions are helpful in understanding how the biological process of waste treatment occurs.

AEROBIC: Living or occurring only in the presence of oxygen.

ALKALINITY: The quantity of ions in the solution that will react to neutralize hydrogen ions. It is thus a measure of the ability of the solution to neutralize acids.

ANAEROBIC: A condition where the supply of oxygen is negligible.

BIOMASS: The bacteria colony that establishes itself in the secondary zone of the treatment plant. This colony utilizes the sewage and oxygen as food. Its waste is primarily carbon dioxide and water.

COLLOIDS: These are very small particles that are, by definition, suspended solids, but have characteristics of dissolved solids such as passing through filters.

DISSOLVED SOLIDS: consists of molecules and ions that are held in suspension by the molecular structure of the solution medium.

EFFLUENT: The treated waste that is discharged from the reactor. The Bio-Microbics, Inc. FAST® utilizes part of the reactor tank for primary treatment. The secondary treatment is achieved in the aerobic zone inside the insert.

FLOCCULATION: The action of suspended and colloidal solids to collect together into a larger mass.

INFLUENT: This is the raw waste that enters the reactor for treatment.

PRIMARY TREATMENT: The purpose of the primary treatment of wastewater is to remove the solid materials from the incoming stream. It is generally done by screens and/or settling zones.

REACTOR: The physical vessel or container plus all of its related components where the treatment processes take place.

SECONDARY TREATMENT: This usually consists of the biological conversion of dissolved and colloidal organics to biomass that will settle to the bottom of the reactor.

SUSPENDED SOLIDS: Particles larger than molecular size that are supported by the buoyant and viscous forces of the solution medium.

TERTIARY TREATMENT: This most often involves further removal of suspended solids and/or nutrients.

TURBIDITY: This is a measure of the extent that light is either absorbed or scattered by suspended material in the solution medium.

PROCESS DESCRIPTION

The primary treatment zone can be called the anaerobic zone and is the area from the inlet to the septic tank baffle. In this zone, primary settling takes place. Heavy solids will readily settle out. Most suspended solids in wastewater are “sticky” and flocculate naturally. The flocculation will aid the suspended solids in settling. In the primary treatment zone, there are no chemical coagulants or mechanical mixing to aid in flocculation. There is no type of skimmer in the primary zone to remove greases, oils or foam. Any floating material is prevented from passing from the primary to the secondary zone by placing the inlet to the secondary zone 24 inches above the floor.

Several biological processes and physical operations take place in the aerobic or secondary treatment zone of the FAST system. The addition of oxygen and food, plus the circulation of the fluid, allows biological cells to grow and attach themselves to the fixed media. Because of the wide variety of organics in the waste stream, a wide variety of organisms or a *mixed culture* biomass is formed. The most predominant biological reactions involve the degrading of organic matter such as proteins, carbohydrates, and lipids to carbon dioxide.

Once the biomass has established itself, several external factors may affect the rate of biomass reproduction and food utilization. The rate of biomass reproduction generally increases with increasing temperatures within the range of 0° C (32° F) to 32° C (90° F). The biological reaction rate increases with increasing temperatures. A rule of thumb for this rate is the reaction rate will double with every 10° C temperature increase up to a maximum temperature of 32° C.

The microorganisms that degrade the wastewater organics function best in the pH range of 6 to 9. This is the typical pH range of domestic waste, but it should be verified.

Although the microorganisms are capable of adjusting to a wide range of environmental factors, sudden changes and shocks may damage the existing biomass.

The physical operations that take place in the secondary treatment zone are the aeration and circulation of the wastewater by a blower and airlift. This is a method of providing the biomass with a continuous fresh food and oxygen supply.

WATER QUALITY

The effluent quality standards of this unit have been found to be in compliance with and exceed the EPA standard for secondary wastewater treatment (40CFR, part 133.102) and NSF Standard 40, Class 1, which are as follows:

Parameter	Limit
CBOD ₅	25 mg/L
	40 mg/L
TSS	30 mg/L
	45 mg/L
pH	6-9

Other factors that can be used for evaluation are the clarity of the effluent sample and a non-offensive odor.

COLLECTION OF EFFLUENT SAMPLE

If an effluent sample is required for regulatory purposes, it should be taken at a free flowing point after the discharge from the FAST® system. (See Company Sampling Protocol)

INTRODUCING SUBSTANCES INTO THE SYSTEM

Introducing harmful substances into the system may reduce the efficiency of the system or stop the treatment process by destroying the biomass. These substances that reduce the efficiency or stop the treatment process can be grouped into two groups, prohibited substances and limited-use substances. While the FAST wastewater treatment system will process most waste produced by the average household, the following information will maximize the system’s efficiency and reduce the time period between septic tank pump-outs. In general, if a substance is harmful to humans, or is anti-biotic in nature, it should not be put into any septic system including FAST. If you have a question regarding the effect of a particular substance on the FAST system, call your Bio-Microbics service technician.

NOTICE: *Introducing harmful or damaging chemicals into your FAST system may void the warranty.*

A. Prohibited Substances

Prohibited substances are those substances which, when present in even small amounts, will prevent the FAST system from providing wastewater treatment. Substances that will not dissolve may clog and possibly damage the aeration unit. The following is a partial list of prohibited substances; common sense should be used for other substances not on this list:

1. Plastic or rubber products
2. Petroleum based products, such as motor oil, paint, paint thinner, gasoline, and solvents
3. Non-biodegradable products, such as sanitary napkins, wipes, condoms, diapers and cat litter

5. Eggshells
6. Any other non-edible waste

C. Acceptable Substances

Substances that are considered to be typical domestic wastewater are human waste, bath and dish water, edible food waste, and coffee and tea grounds.

The following substances may be used regularly without harming your FAST® wastewater treatment system:

1. Laundry detergents without bleach
2. Dishwashing detergents without bleach
3. Toilet paper
4. Household cleaners containing sodium bicarbonate, sodium carbonate and sodium borate.

NOTICE: *Sodium borate is found in some household cleaners. It will not harm the FAST wastewater treatment system, but its use may be restricted by local wastewater codes. Check with the appropriate authority before using products containing sodium borate.*

INTERMITTENT USE

The FAST wastewater treatment system will function normally even if wastewater does not enter the system for an extended period of time. The power to the system should be left on during short periods when there is no wastewater flow to the system.

Suggestions for intermittent use (Check with local regulations before attempting): If the property is going to be used seasonally and shut down completely for an extended period of time (i.e. summer use only and then abandoned for the winter), we suggest that the blower be shut down. The blower should be re-started upon return to the property. Your local service provider may be contacted to perform these functions (It is also possible to arrange for the re-starting of the blower a week or two in advance of return through your local service provider.). If the property will be used on weekends only, it is best to leave the blower on continuously throughout the season for use until an extended period of absence is anticipated (extended period being at least 4 weeks or more). A slight odor may be detected for a couple of days while the system returns to normal operation.

PREVENTIVE MAINTENANCE

Little maintenance is required for the Bio-Microbics, Inc. FAST system. The treatment plant is designed to be as maintenance-free as possible. However, some routine preventive maintenance should be performed to ensure a long, reliable life of the plant according to the following preventive maintenance schedule.

As Needed

Clean the screens located on the blower housing as well as the openings of the vent. Blockage of air to the inlet of the blower or the vent could result in damage to the blower or reduction in efficiency of the system due to lack of oxygen for the biomass.



DANGER: Electrical Hazard.

Disconnect power before servicing. Failure to do so may result in electrical shock causing serious bodily injury or death.

4. Toxic substances such as pesticides, strong disinfectants strong caustic drain cleaners, paint or anything else that would be toxic to humans. This includes quaternary ammonia compounds (found in some commercial cleaners).
5. Large amounts of paper products, such as paper towels and synthetic fiber-reinforced products advertised as having "wet strength,"
6. Animal fats, such as bacon grease or lard (normal cleaning of pots and pans is acceptable).
7. Liquid fabric softeners
8. Water softener waste (from regeneration) without flow equalization

Chemicals

The following chemicals are prohibited substances and should not be poured into the FAST® system tank or leach field:

1. Herbicides
2. Pesticides
3. Paint thinner
4. Motor oil (including transmission oil and hydraulic fluid)

NOTICE: *Contact your Bio-Microbics, Inc. service technician immediately if a substantial spill occurs in the area of the treatment system.*

B. Limited-use Substances

Limited-use substances, in large concentrations, will reduce or stop the treatment process. These same substances in smaller concentrations will have no harmful effect on the treatment process (in general, a small concentration is defined as being the product's recommended dosage, per the manufacturer's directions). You may use the following substances without harming your FAST system if you use the substance according to the manufacturer's directions, use the substances sparingly, and do not introduce concentrated doses into the system.

1. Laundry bleach
2. Detergents with bleach
3. Household cleaners containing sodium bactericides such as:
 - a. Pine oil (disinfectant used in general purpose liquid cleaners),
 - b. N-alkyl dichlorobenzyl ammonium chloride (disinfectant used in detergents and spray cleaners),
 - c. Sodium hydroxide (lye-chemical used in drain openers and cleaners),
 - d. Sodium dichlor-s-triazinetrione (powdered bleach used in scouring powders and automatic dishwasher detergents),
 - e. Ortho-phenylphenol (bactericide used in tub and toilet bowl cleaners).

Food Waste

Some food waste, whether or not it is run through a garbage disposal, will not be treated by the FAST system, but will remain in solid form and fall to the bottom of the septic tank. Large quantities of organic material introduced into the FAST system from the garbage grinder may organically overload the FAST system and cause more frequent pump-out of the septic tank. Therefore, you should consider not disposing of these food items:

1. Animal bones
2. Melon rinds
3. Corn cobs
4. Pits and seeds

Annually

Check and clean the blower inlet filter when it is dirty. If this is left unchecked, damage to the blower may result and treatment quality may also suffer.

Remove the nut on top of the filter and lift off the cover. The filter element is inside. If it is necessary, replace it with a new one if it cannot be cleaned.

Check for vibration and the amperage draw of the blower to be sure it is within acceptable limits as noted on the blower nameplate.

As Required by Measurement of Sludge Depth

As the FAST® system processes the raw domestic waste, sludge and sloughed-off bacteria will collect on the bottom of the reactor. This will have to be pumped out periodically. This time interval will change with changing load conditions. The time interval is also dependent on the size of the reactor.

To accurately determine the sludge depth, open up the pump out cover to the primary zone and insert a sludge-measuring instrument and take samples. The tank should be pumped out if sludge is 18 inches deep in the settling compartment, or takes up 75% of the volume of the settling compartment below the port connecting settling chamber to FAST chamber. All stricter, applicable regulations supercede these operational directions.

The sludge depth of the secondary zone (which contains the FAST system) must also be checked. Open up the pump out cover to the secondary zone and measure the sludge depth. If the sludge depth in the secondary zone is greater than 14 inches, it is necessary to pump the bio-solids out. Always pump out both sections of the reactor even though only one zone may require it.

To pump the bio-solids out, follow this recommended procedure:

NOTICE: *Avoid pumping the unit down after periods of heavy rain or when the ground water is likely to be above the bottom of the concrete tank. Emptying the tank under these conditions could cause the tank to float up and become dislodged.*

Open the pump out cover and insert the hose. Be sure to pump out both sections of the reactor. Once the unit has been pumped out, immediately refill the tank with clean water to reduce the risk of the tank floating. Close the pump out cover making sure it is watertight. The disposal of the solids that have been removed must comply with local and state regulations.

EVALUATION OF SYSTEM PERFORMANCE

The FAST wastewater treatment system operates automatically. There are no operating procedures for the user of the FAST wastewater treatment system to perform. However, as with any home appliance or machine, simple periodic checks should, and can be made to aid in the prevention of costly repair problems. Generally, the FAST wastewater treatment system unit can be checked by sight and by smell.

SOUNDS	During normal operation, a uniform humming sound emanates from the system. If unusual noises are heard, it is possible the blower could need maintenance or repairs. Inspection of the treatment chamber should reveal a vigorous splashing sound within the chamber.
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SMELL	FAST® is an aerobic system. During normal operation, the system has an earthy smell like that of a well-maintained compost pile. If other odors are noticed, such as a sulfuric “rotten eggs” smell, the aeration process may not be operating or the system may be overloaded. Check the blower for proper operation and make sure the airlift is operating by viewing through the observation port.
SIGHT	The FAST system should produce effluent that is virtually as clear as tap water; however it is NOT fit for consumption. If the system is producing wastewater that is not clear contact the local Bio-Microbics service technician.

CONTROL PANEL OPERATION

The FAST system is furnished with several alarm components that will monitor the mechanical operation of the system. If the blower loses power, the lamp will flash and the audible alarm will sound.

If the blower should fail and trip the circuit breaker, a relay will then sense no load to the motor and to go into the alarm mode. If a high water condition exists, the alarm will activate.

SYSTEM FAILURES

This section is a summary of the different types of failures that are the most likely to occur in the Bio-Microbics, Inc. FAST wastewater treatment system. The consequences of, and the steps taken to prevent these failures are also explained.

Several types of failures can occur in a unit with the wide variety of components and systems present in this plant. Mechanical, electrical and process failures are the predominant concerns. Some components are subjected to more than one type of failure. Any mechanical or electrical failure will result in a process failure.

A. Mechanical Failure of the blower

The prime opportunity for failure of the blower is the internal bearings. They can fail from lack of lubricant or contaminated lubricant. Another opportunity for failure is excessive wear of the impeller resulting in lower volumes of air delivery.

1. To avoid failure, the blower selected for the unit is equipped with double sealed bearings to maximize their life.
2. Excessive wear of the impeller has been avoided by installing an inlet filter to take out any debris that could pass through the inlet screen.

B. Electrical failure of the blower

This may take place in the form of overheating or shorting out because of moisture or dirt. Both of these modes of failure have been addressed by using a TEFC motor. With the motor being totally enclosed, the problem of dirt and moisture collecting on the windings to shorten insulation life has been eliminated. The fan cooling will help the motor maintain an allowable running temperature. The totally enclosed rating helps maintain the internal cleanliness of the motor.

C. Process failure from oxygen starvation of the biomass

If the biomass is starved of oxygen, the typical odors associated with anaerobic bacterial treatment could develop. This is caused by insufficient airflow into the biological zone. A blockage in the airline or blower is the most probable cause. Listed below are a few areas that may create blockage.

1. The inlet screens have been located on each end of the blower housing. If one screen becomes blocked by debris, the opposite screen should still be sufficient. The suggested routine

preventative maintenance calls for brushing off the screen as needed. The configuration of the inlet screens and the required maintenance will protect the unit from oxygen starvation due to insufficient airflow.

2. The blower is equipped with an inlet air filter. If this filter becomes blocked with debris it could cause oxygen starvation of the biomass. The blower inlet filter should be checked every 6 months and replaced as needed.
3. The vent pipe could also become blocked, causing insufficient airflow out of the reactor. The vent option B screen should be checked for debris, and if the pipe is blocked, a drain auger can be used to clean out the line. (Vent option A - holes in pipe should be clean of debris).
4. **There is a possibility that the airline from the blower could become blocked. If this condition is suspected, disconnect the airline from the blower and check for blockage. A drain auger can be used to check the entire length of airline.**

D. Improper Operation of the Electrical Panel

Testing the Control Panel Alarm Circuit:

1. Depress the white breaker switch (rocker type switch) labeled "Blower Circuit Breaker" on the front of the panel to the "OFF" position. The red alarm light and buzzer should activate after an 8 second delay period. Red alarm light should flash.
2. While buzzer is activated, depress "Reset" switch on front of panel. Buzzer should immediately silence and remain silenced for duration of alarm event, but alarm light should continue flashing.
3. Depress the white breaker switch to the "ON" position. After an 8 second delay period the alarm light and buzzer should discontinue.
4. If the alarm behaves as described above, then the panel is set to properly detect blower current draw.

Testing the Alarm Pressure Switch (low voltage):

1. Assure the "normally open" pressure switch is wired properly at panel and the switch:
2. Create enough pressure in switch to close its contact. (Turn the blower on and restrict the air line outlet beyond the switch for at least the 8 second panel delay period.)
3. Once the alarm sounds, the pressure can be released from the switch and the panel's alarm should deactivate following the 8 second delay.
4. If the pressure switch causes alarm activation all the time or periodically while the FAST® system is properly working, then the switch may be adjusted. Check for normal turbulence in the FAST® tank before adjusting switch.
5. Adjust the pressure switch just enough that normal operating pressure does not close the switch and activate the alarm. The pressure adjustment allen screw is opposite the switch's electrical prongs. Rotate the screw clockwise to require more pressure for alarm activation, and counter-clockwise to require less pressure.

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Solutions
The failure indicator light on the control panel is on, and the alarm sounds.	The air intake is blocked.	Clean intake screens on blower housing. Check air filter on blower for blockage.
	The air discharge line or vent line is blocked.	Check discharge line and vent line visually or with drain cleaning equipment for obstructions,
	The FAST system is flooded and a high water alarm was installed.	Determine cause of flooding (e.g. line obstruction, lateral field pump failure, high flows, etc.) and correct.
	The blower has failed.	Determine if blower failure was caused by an obstructed intake or discharge line.
	The blower has failed.	Investigate overheating (i.e. internal thermal overload protection), short-circuiting, or other electrical failure, and mechanical failure (i.e. bearing failure) and correct.
	The blower has failed.	Check to see whether circuit protection device for blower has tripped.
	The power cable to the blower has been damaged or is not connected properly.	Have a certified electrician check the wiring to the blower.
	The original cause for alarm has been corrected, but the flashing circuit for the indicator light has not been reset by technician.	Reset flash circuit.
The audible alarm is on.	An alarm condition has occurred. See troubleshooting items under flashing alarm indicator	Push reset button to silence alarm if provided.
Problem	Possible Cause	Solutions
Blower motor is making a loud whining or grinding noise.	Blower motor bearing has failed.	Remove blower and have blower motor serviced.

	A foreign object has entered blower housing.	Remove blower for service and check condition of air filter.
The blower is flooded.	Water has entered the blower housing	The blower should be located in an area where water does not accumulate and be located at least two feet above the treated water outlet pipe from the FAST system.
Wastewater is backing up into the home sewer piping.	There is an obstruction in the home sewer piping.	Check the piping lead to the FAST system visually or with drain cleaning equipment for an obstruction and correct.
	There is an obstruction in the discharge line from the FAST system.	Check the effluent piping and lateral field piping visually or with drain cleaning equipment for an obstruction and correct.
	The lateral field pump has failed.	Check the operation of the lateral field pump per the pump manufacture's specifications.
	The flow rate to the FAST system is too high.	Check the maximum flow rate to the FAST system to see that it is within normal limits.
Wastewater is backing up into the home sewer piping.	The tank requires cleaning and/or a pump out is required.	Check the sludge depth in all chambers of the tank to see if it is below required levels. If the depth is too great, have the tank pumped out and, if necessary, cleaned.
There is an unpleasant odor emanating from FAST unit.	The blower and air piping are not operating correctly.	Check the blower, vents, and air piping for proper operation.
	The system is overloaded.	Check the maximum flow rate BOD load rate to the FAST unit to see that it is within normal limits.
		Check the quality and contents of the flow into the FAST unit for any abnormal or prohibited substances.

REPAIRING AND REPLACING SYSTEM COMPONENTS

A. Blower Assembly



DANGER: Electrical Hazard.

Disconnect power before servicing. Failure to do so may result in electrical shock causing serious bodily injury or death.

NOTICE: *All electrical work should be performed by a qualified electrician and per all applicable electrical codes. All blowers 1hp and above use 220V or 460V power (exceptions are possible).*

*Please note: The blower should not be placed more than 100 feet from the unit and should have no more than 4 elbows installed in the air line. Electrical components should not be placed more than 150 feet from the unit.

Removal:

1. Remove power from the blower assembly by switching the circuit breaker in the FAST® system control panel to the OFF position. Also, switch off the circuit breaker in the building's main service panel. If blower operation is discontinued for more than 48 hours, it may be necessary to prevent the discharge of wastewater into the drain field.
2. Remove the blower housing cover by unscrewing its mounting bolts and lifting the lid off the blower housing base.
3. Remove the motor conduit box cover on the blower motor by unscrewing the screw(s) securing it to the conduit box.
4. Check with an appropriate measuring device to determine if there is power to the electrical wire leads in the conduit box before proceeding.
5. If there is no power at the wire leads, disconnect the power leads from the motor leads noting the connections for proper re-connection during installation. Insulate and support the wires out of the way of the blower so they won't interfere with the blower removal process.
6. Disconnect the outlet piping of the blower either by disconnecting the union (if used), unscrewing the pipe from the blower, or cutting a section of the outlet piping. If the piping needs to be cut, be sure to cut the pipe in an area such that a coupling or union (preferred) can be installed at the cut when the blower is re-installed.
7. Cover the openings in the pipe where the separation has occurred to prevent any foreign material from entering the piping.
8. Remove the mounting bolts securing the blower flange to the blower housing base. (May need to remove blower base from concrete pad).
9. Lift the blower assembly off the blower housing base.



DANGER: Electrical Hazard.

Disconnect power before servicing. Failure to do so may result in electrical shock causing serious bodily injury or death.

NOTICE: *All electrical work should be performed by a qualified electrician and per all applicable electrical codes.*

Installation:

1. Make sure the circuit breaker in the FAST system control panel and the main circuit breaker to the building are in the OFF position.
2. Set the blower assembly on the blower housing base.
3. Attach the blower flange to the blower housing base.
4. Connect the blower outlet piping to the air line by connecting the union (if used), screwing the air line into the blower, or installing a coupling at the cut, depending on the method of removal.
5. Check the power leads coming into the blower housing with an appropriate measuring device to determine if there is power at the leads.
6. If there is no power at the leads, connect the leads to the blower using the correct scheme as noted on the inside of the motor conduit box cover or name plate.

7. Insulate the wires and fit them inside the conduit box in a professional manner.
8. Attach the conduit box cover to the conduit box using the two screws removed during the removal procedure.
9. Test the blower for correct operation by switching the circuit breakers in the control panel and the building to the ON position.
10. Put the blower housing cover on the blower housing base by matching the cover bolt holes with the base bolt holes. Bolt the cover to the base using the bolts removed during the removal procedure.

B. Underground Components

As there are no components underground that require repair or maintenance, there is no need to gain manual access to any underground components of the FAST system.

RECOMMENDED SPARE PARTS

The following is a list of factory recommended spare parts and the quantity that should be kept in stock per the number of units sold. The quantities listed are minimums. If field experience suggests additional components or quantities are required, this list may be expanded.

QUANTITY	DESCRIPTION
2 units	Blower
2 units	Control Assembly
1/10 units	Air Filter

For more information about the FAST systems, or for purchase of spare parts, contact:



8450 Cole Parkway
 Shawnee, KS 66227
 Ph: (913) 422-0707
 Toll Free: (800) 753-FAST
 Fax: (913) 422-0808

LIMITED 24-MONTH WARRANTY

Bio-Microbics, Inc. warrants every new Residential FAST® system against defects in materials and workmanship for a period of two years after installation subject to the following terms and conditions, (Commercial FAST system for a period of one year after installation or eighteen months from date of shipment, whichever occurs first, subject to the following terms and conditions):

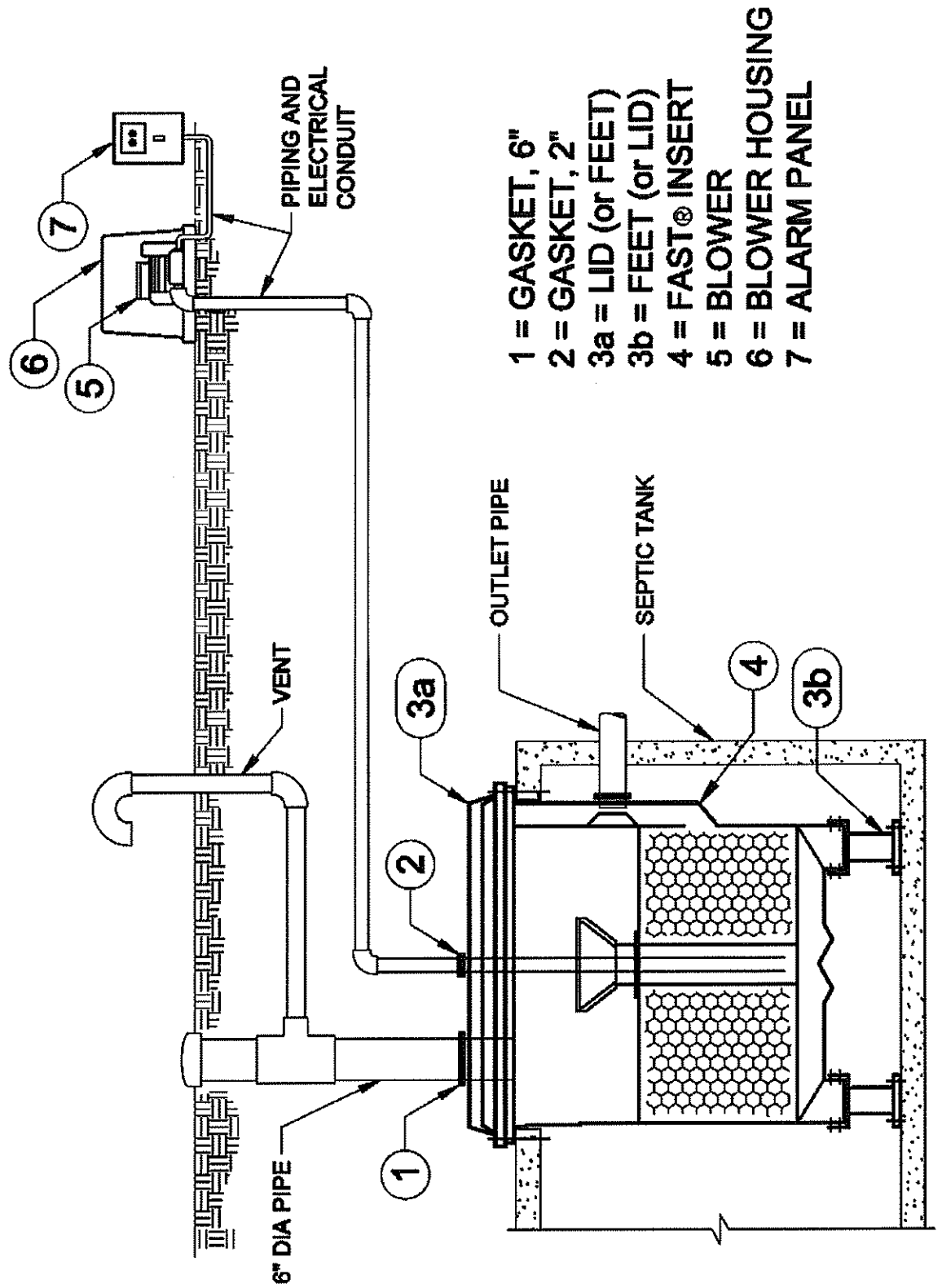
During the warranty period, if any part is defective or fails to perform as specified when operating at design conditions, and if the equipment has been installed and is being operated and maintained in accordance with the written instructions provided by Bio-Microbics, Inc., Bio-Microbics, Inc. will repair or replace at its discretion such defective parts free of charge. Defective parts must be returned by owner to Bio-Microbics, Inc.'s factory postage paid, if so requested. The cost of labor and all other expenses resulting from replacement of the defective parts and from installation of parts furnished under this warranty and regular maintenance items such as filters or bulbs shall be borne by the owner. This warranty does not cover general system misuse, aerator components which have been damaged by flooding or any components that have been disassembled by unauthorized persons, improperly installed or damaged due to altered or improper wiring or overload protection. This warranty applies only to the treatment plant and does not include any of the house wiring, plumbing, drainage, septic tank or disposal system. Bio-Microbics, Inc. reserves the right to revise, change or modify the construction and/or design of the FAST system, or any component part or parts thereof, without incurring any obligation to make such changes or modifications in present equipment. Bio-Microbics, Inc. is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defect in design, material, or workmanship, or delays in delivery, replacements or repairs.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED. BIO-MICROBICS SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

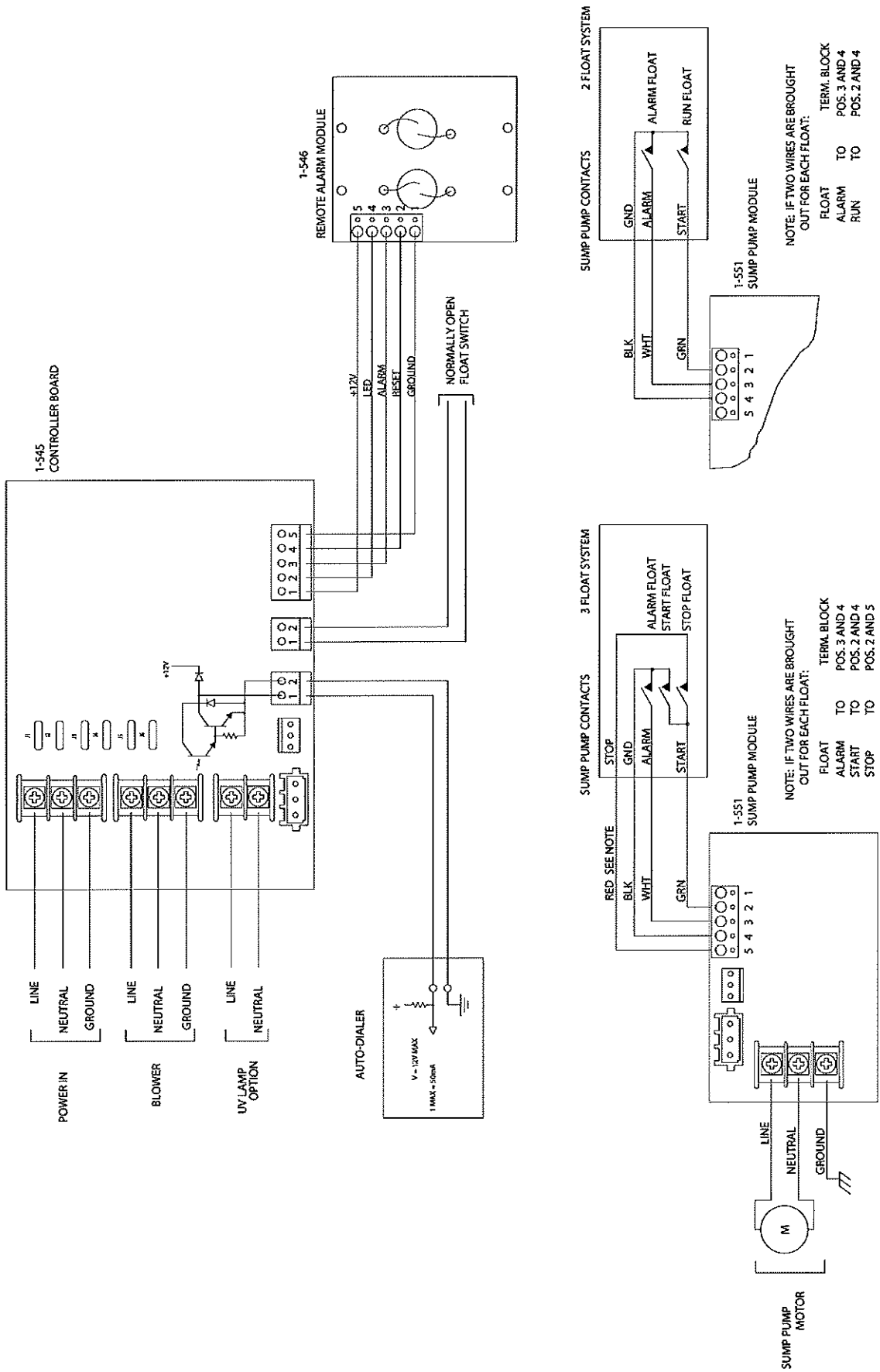
NO REPRESENTATIVE OR PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME FOR BIO-MICROBICS, INC., ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS. Contact your local distributor for parts and service.

Typical FAST® Installation Components

(Actual installed components subject to design specifications)



110/220VAC CONTROL PANEL WIRING DIAGRAM WITH AVAILABLE OPTIONS



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