



INSTALLATION, OPERATION & MAINTENANCE MANUAL

For Non-NSF Model #: MCF3.0, MCF4.5, MCF9.0,
HSF1.0, HSF1.5, HSF3.0, HSF4.5, HSF9.0,
NTF0.5, NTF1.0, NTF1.5, NTF3.0, NTF4.5, NTF9.0

BIO-MICROBICS, INC. FAST® WASTEWATER TREATMENT SYSTEM

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

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INTRODUCTION

The Bio-Microbics, Inc. FAST® wastewater treatment system is an aerobic biological treatment unit that operates 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.

This process is protected by one or more of the following patents: 3,966,599; 3,966,608; 3,972,965; 5,156,742. Several other patents are pending.

DEFINITIONS

Some definitions are helpful in understanding how the biological process of wastewater 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: This 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.

HARDNESS: This is the concentration of multivalent metallic cations in solutions.

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.

MATERIALS REQUIRED FOR INSTALLATION

1. Septic tank with minimum dimension requirements shown on installation drawing and fabricated according to IAPMO, ANSI or appropriate standards.
2. Recognized, safe lifting mechanism for module.
3. Concrete joint sealant compound.
4. Anchor bolts or other commercially available anchoring system to secure module to septic tank and blower housing concrete base.
5. 2", 3", 4" and 6" PVC Schedule 40 pipe and fittings. Optional: 3" PVC Schedule 40 pipe and fitting: see Recommended Installation Procedure.
6. Pipe joint lubricant/soap
7. PVC primer and glue
8. Optional: small riser section with cover, minimum 15" inner diameter. See Recommended Installation Procedure.
9. Base (concrete preferred) for blower assembly. See Recommended Installation Procedure.
10. Mounting hardware for control panel.
11. Electrical underground conduit or wiring for connecting control panel to blower assembly.

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, installation or operation of your FAST® wastewater treatment system, contact your local FAST distributor or Bio-Microbics, Inc. at:

1-800-753-FAST(3278).



WARNING: *The installer must assure that the installation site is safe from hazards. These could include excavations left open overnight, debris left lying around, and tanks and equipment not properly blocked. Provisions must be made to eliminate the above potential hazards by roping off and proper shoring around the excavations, cleaning up at the end of each work day and proper storage of equipment. Failure to do so could result in severe bodily injury or death.*



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, and the collapse of the tank and entrapment of personnel. Always keep tank openings covered during storage and installation. Failure to do so could result in severe bodily injury or death.*



WARNING: *If any person comes in contact with any of the wastewater (influent or effluent), immediately remove all contaminated clothing and soak in a detergent solution with a disinfectant. The person who has come in contact with the wastewater should then thoroughly*

wash the exposed area with soap and water and immediately call his or her personal physician. Failure to do so could result in severe bodily injury or death.

LOCATION

The FAST® systems may be located in the same position relative to the house and water supply as any conventional septic system; however, some basic guidelines should be followed:



WARNING: *Always check with the local utility companies for the location of water lines, electrical and telephone cables or any additional hazards below grade prior to excavation. Failure to do so could result in severe bodily injury or death.*

1. The FAST system cover is only designed to withstand the weight of the soil up to a burial depth of 4 feet (1.2 meters). It is not designed to withstand loads from concrete slabs, vehicles, or buildings. Do not place the tank in a location where it could be subjected to additional weight.

CAUTION: *If the burial depth must be more than four feet or if the area is subjected to additional weight, such as from occasional standing water, contact Bio-Microbics, Inc. at 1-800-753-FAST.*

2. The FAST system must be located so that sufficient slope is provided for the influent and effluent lines. If either of these two lines becomes blocked, there is risk of excess water backing up into the house. A 2% slope is recommended for this. A 2% slope equates to a drop of two feet over a run length of one hundred feet. This also equates to 1/4 inch per foot.
3. The FAST system must be located so that vents and air intakes will be protected from snow drifts.
4. Avoid locating The FAST system in high groundwater areas where the tank could possibly float up and become dislodged.
5. The blower housing should be no more than 100 (30.5 meters) feet from the FAST system.
NOTICE: *The blower must be placed at an elevation higher than the flood plain..*
6. When installing a new septic tank, make sure the inlet is a minimum of 2 inches (5.08 cm) above the outlet.

Documentation must be maintained by installers verifying the minimum dimensions of the tank as well as its structural integrity.

If the tank is smaller than the minimum dimensional range specified, the FAST system will not operate properly. The effluent quality could suffer and may not meet the standards.

INSPECTION

The FAST system has been carefully manufactured, checked and tested at the factory before shipment. Upon receiving the unit, please do the following:

1. Before uncrating, check the packaging for signs of shipping damage. If there is evidence of damage or abuse, notify Bio-Microbics, Inc. at (913) 422-0707.
2. After uncrating, inspect the unit to ensure no components are missing. Also inspect for damage to the unit. If any discrepancies are found, notify Bio-Microbics, Inc. at (913) 422-0707.

THE FAST SYSTEM

FAST stands for Fixed Activated Sludge Treatment. In the FAST process, a colony of bacteria called the biomass breaks down biodegradable waste into carbon dioxide and water. The process occurs continuously as long as the biomass is supplied with food (incoming waste) and oxygen (air) in a suitable environment. Solid material that the biomass cannot process and bacteria that die settle in the septic tank for normal pump-out removal.

The FAST process consists of the treatment tank and the blower (air source). The blower provides continuous air to the treatment tank through the air supply pipe. The air supply pipe combines with the draft tube to create an air lift. This air lift is the means by which air and wastewater are mixed within the tank. The air lift lifts the wastewater to the splash plate. The wastewater is cascaded off the splash plate across the surface of the honeycomb media.

The honeycomb media is the heart of the FAST process and is suspended in the septic tank. The media contains the biomass, the colony of bacteria that stabilizes the wastewater. By growing on the honeycomb media and receiving food and air necessary for growth from the airlift, the biomass is allowed to stabilize (eat) the waste before it is discharged to the drain field. In a traditional septic tank and some other aerobic treatment systems, the biomass is allowed to suspend in the wastewater. Therefore, it has a greater opportunity to be discharged into the drain field. The Fixed Activated Sludge Treatment system keeps the active biomass on the media and not in the water. This allows for cleaner water to be discharged to the drain field.

The vent pipe allows for venting of air and non-harmful carbon dioxide created by the process.

Eventually, as the biomass dies, sloughs off the media and collects at the bottom of the tank, the tank will need to be pumped out.

The treatment tank is located below ground. Its rugged construction is designed to support the weight of four feet of burial depth. It is designed to resist deterioration and corrosion.

RECOMMENDED INSTALLATION PROCEDURE

The disposal method of the effluent wastewater can influence the performance of this unit. The method and arrangement for disposal must not cause a backup or any other interference with the treatment plant's operation. The technique and equipment used for the effluent disposal must be approved by the local or state health and environmental agencies.

Before installation of the module may begin, check the tank to ensure it is level within 1 inch from inlet to outlet and 1-1/2 inch from side to side.

Once the tank is in place, level and in compliance with local health, environmental and plumbing regulatory agencies, the installation of the module may begin.



WARNING: *Use recognized, safe lifting techniques to set module in tank. Make sure all lifting equipment is clear of overhead obstructions such as power lines, trees or rooftops when lifting apparatus near the excavation. Always be careful. Place the lifting equipment on solid, stable ground to prevent the ground from giving away beneath the equipment.*

ATTENTION: ALL PROCEDURES AND PERSONNEL MUST FOLLOW ALL APPLICABLE REGULATIONS AND GUIDELINES FOR SAFETY AS DEFINED BY OSHA AND/OR ANY OTHER APPROPRIATE ORGANIZATIONS.

1. **TREATMENT MODULE INSTALLATION:** There are 2 options available to insert the FAST module into the tank: hanging the module from its lid, or standing the unit on leg extensions.
- A. **LID INSTALLATION:** Place module liner through hole in top of tank. Place module lid on top of module liner, being careful to line up air line hole in module lid with coupling at top of draft tube inside module insert, and drill holes for anchoring module to tank using pre-formed holes in module lid.

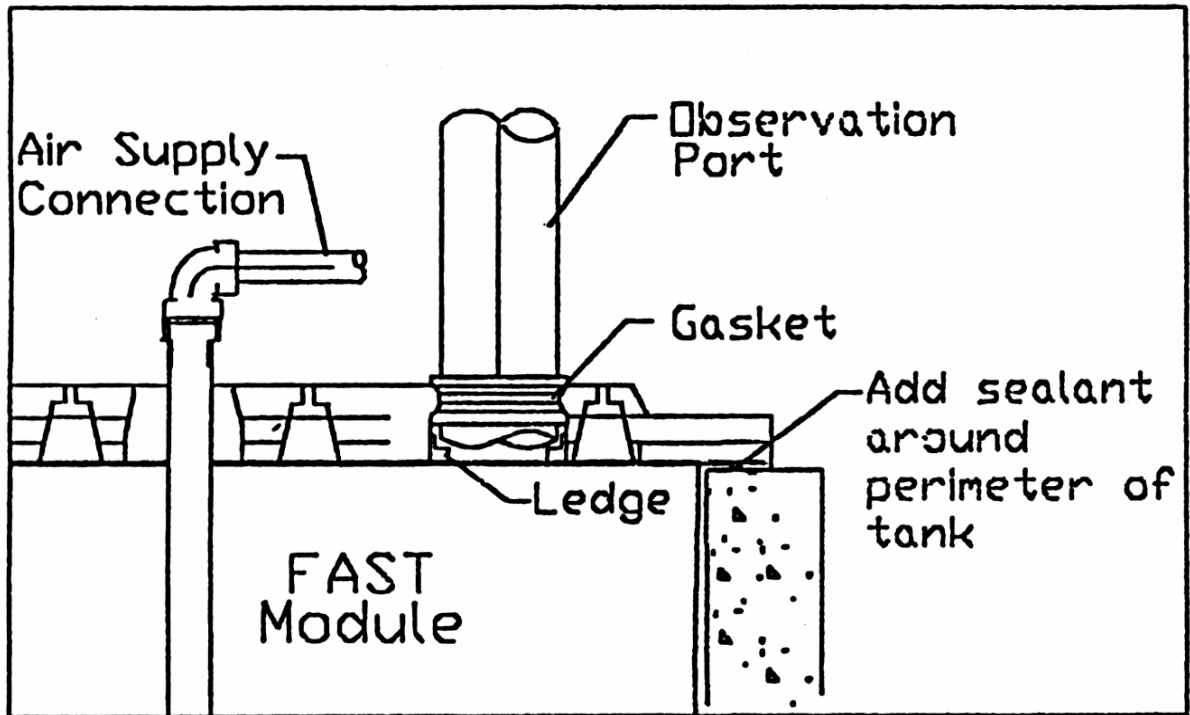


FIGURE 1

- B. **LEG EXTENSION INSTALLATION:** Leg extensions (see FIGURE 2) must be used with all 4.5 and 9.0 modules, and they are an option for all of the models that are smaller than the 4.5 and the 9.0. On those smaller models there would be an option to use 4 leg extensions attached to the 4 corner feet of each module. On the 4.5 and 9.0 models the leg extensions are attached to the 4 corner feet and to the very center foot directly beneath the center of the module.
- C. The leg extensions are attached to the feet of the modules using 8 self-tapping screws. For the 0.5 model only, 4 self-tapping screws are provided for each leg extension. Two methods exist to fix the module in place once the leg extensions have been attached and the module has been inserted into the tank.
- D. The leg extensions are attached to the base of the tank with anchor bolts provided by others. Only 2 anchor bolts are required for each leg extension. The recommended pattern for placement of the anchor bolts is in the 2 corners diagonal to one another. Note that on the 4.5 and 9.0 models, only the 4 corner legs need to be anchored, unless the leg extensions have been extended in height to 24" or greater. If the height has been extended to 24" or greater, the center leg directly beneath the module for the 4.5 and 9.0 must also be anchored with 2 anchor bolts to the base of the tank in a diagonal pattern.

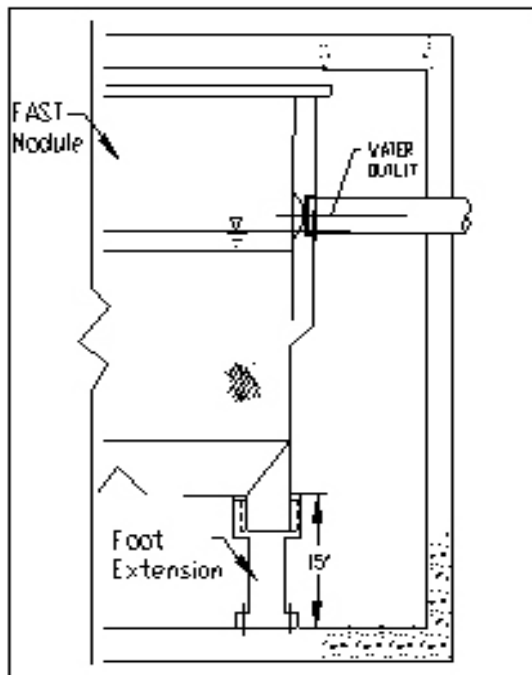


FIGURE 2

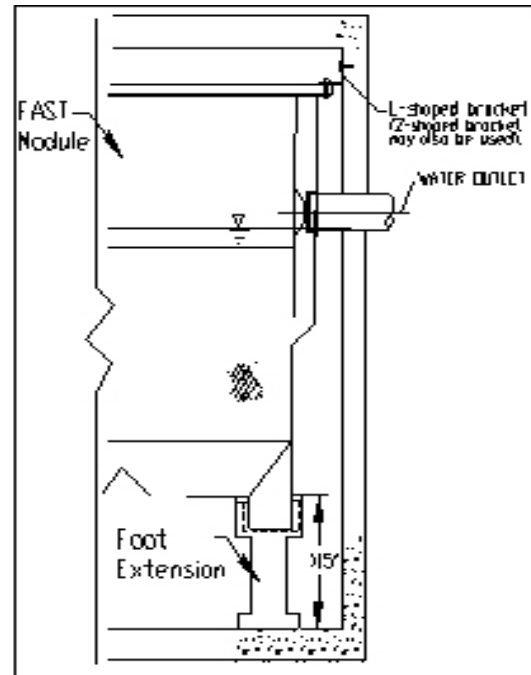


FIGURE 3

- E. If the tank is too small for a person to get inside with the unit to anchor/bolt the leg extensions to the floor, brackets may be used to attach the flange at the top of the liner to the tank (see FIGURE 3).
- F. The leg extensions may be adjusted in height up to 24" to increase the overall clearance between the floor of the tank and the bottom of the module. This is accomplished by cutting the leg extension in half and sliding a 4" Sch 40 PVC pipe over the bottom and top piece of each leg extension, then the base of the leg extension is attached to the bottom of the tank as described above, and the top of the leg extension is attached to the foot of the module also as described above.

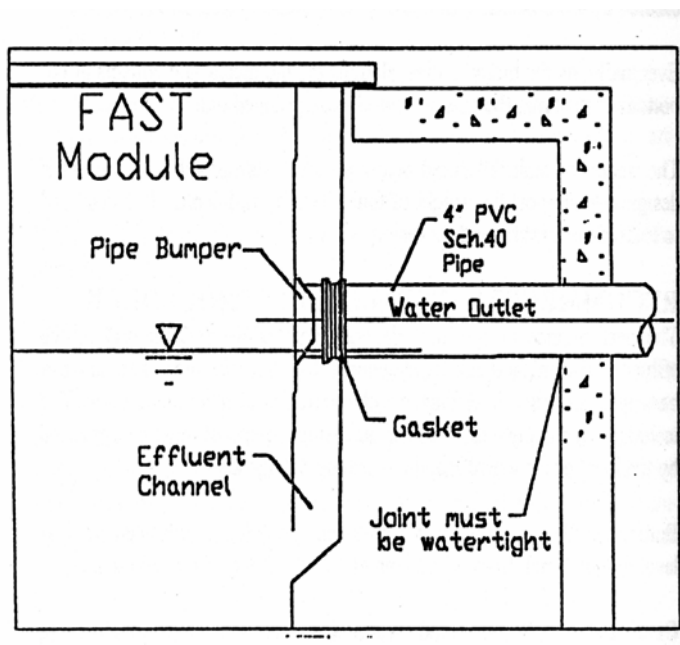


FIGURE 4

2. EFFLUENT-LINE

INSTALLATION: Bevel and soap the end of 4" Sch 40 PVC pipe to be used as effluent/outlet line. Insert through side of tank and into 4" gasket in outlet hole of module. Push pipe in ~ 2" until it stops. **(DO NOT USE EXCESSIVE FORCE WHEN INSERTING THE OUTLET PIPE INTO FAST MODULE!)** This will provide a water-tight seal around the outlet pipe on the Fast module. You will need to provide a water-tight seal around the outlet pipe where it exits the tank. See FIGURE 4 for reference.

3. **INITIAL AIR LINE INSTALLATION:** Cut a piece of 2" min. non-corrosive pipe (3" min. for all 4.5 and 9.0 modules) to be used as the air line entering module lid and insert, to the desired length (or longer). Refer to FIGURE 5 below.
4. **If using the module lid,** bevel and soap the air pipe. Insert factory provided gasket in air line hole in module lid. Insert beveled and soaped end of pipe through module lid. Using 6" hole in module lid, reach inside module and thoroughly clean all pipe soap from the lower 6" of air line or leave the cover up off of the liner to have access to clean and glue the pipe. When complete, slide cover down the pipe to the liner. Using PVC primer and glue, secure air line into coupling at top of draft tube in module insert. (Be sure to follow instructions on PVC primer/glue container(s)). If cover was left up, slide it down on the pipe to the liner. Refer to FIGURE 5 on page 14.
5. **If module lid is not used,** then permanently secure an appropriately-sized air supply line into the top of the FAST airlift with sufficient length to extend through the tank cover. Secure air line with non-corrosive clamp every 2' or greater, so as to prevent damage to the system from pipe vibration. Refer to FIGURE 5 for reference. Place tank cover in appropriate position, and cut air line pipe to desired length.
6. **OBSERVATION PORT INSTALLATION (without LID):** Bevel and soap the end of a 6" Sch 40 PVC pipe to be used as observation port/vent. Insert 6" factory provided gasket into observation port access hole in module lid. Insert pipe until it stops, which should be 2" inside module lid. (DO NOT PUSH ALL THE WAY DOWN TO MEDIA SURFACE!) (see FIGURE 5).

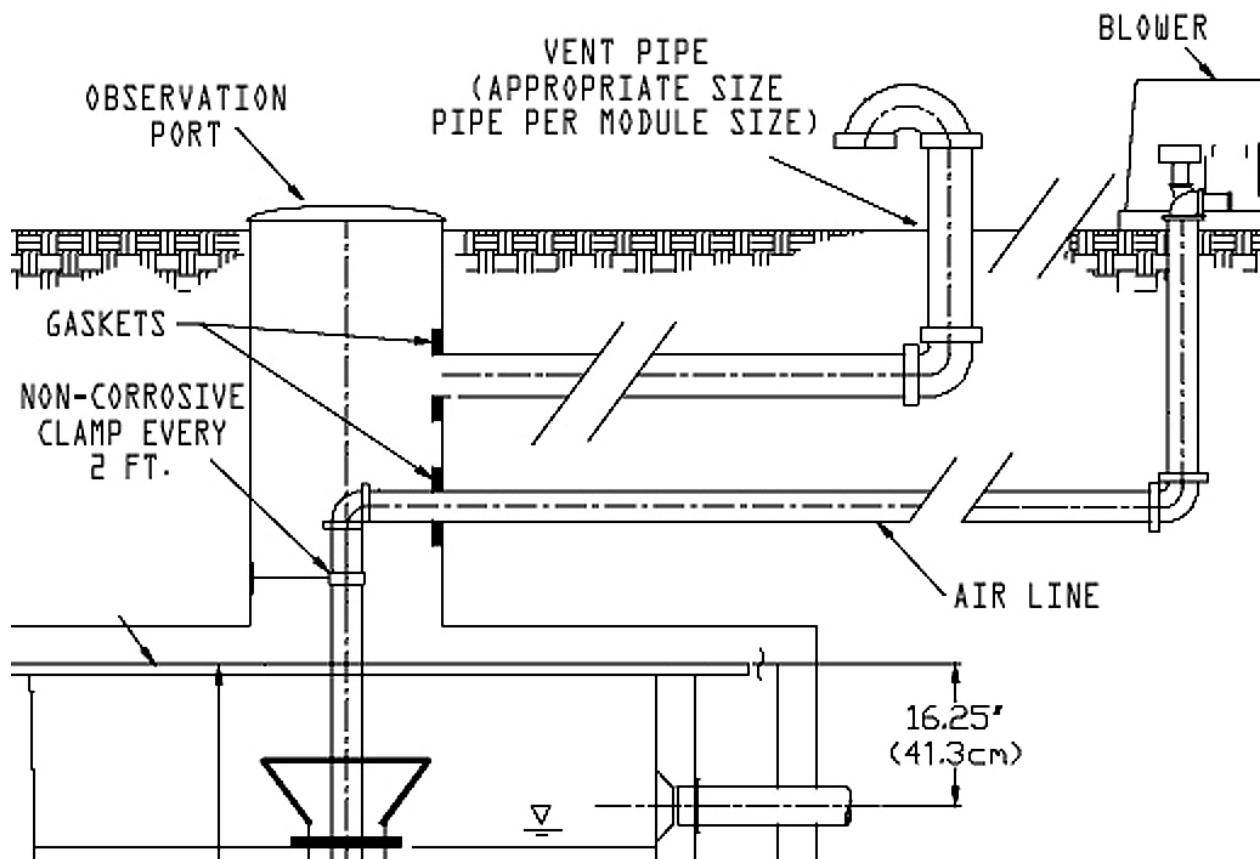


FIGURE 5

7. **VENTING OPTIONS:** When venting the FAST treatment module, installers have three options. **OPTION A** -- Direct venting utilizing the observation port/riser installed directly above the unit. **OPTION B** -- Remote venting, which gives the homeowner versatility to have the FAST system vented in a remote area. FAST® 4.5 and 9.0 units typically use vent option B. Regardless of which option is used, the vent pipe and vent opening must be sized properly to avoid excessive back pressure in the system (see table below for proper vent sizing).

Minimum Vent Pipe Size Per FAST Unit Size	
- 0.5, 0.75, 0.9 =	3" vent pipe
- 1.0, 1.5 =	4" vent pipe
- 3.0 =	6" vent pipe
- 4.5 =	8" vent pipe
- 9.0 =	10" vent pipe

- A. **OPTION A:** If the observation port/riser is located in a suitable area, not subject to local flooding, this port can double as the vent for the system. Reference the above chart for proper vent size. Vent opening should be constructed so that animals and debris cannot enter the system.
- B. **OPTION B:** Attach appropriately-sized vent pipe to FAST observation riser. Vent/riser connection should be water-tight seal. Run vent to desired location. See FIGURE 5 as reference of piping configuration.



WARNING: Always check with the local utility companies for the locations of water and gas lines, electrical and telephone cables or any hazard below grade prior to excavation. Failure to do so could result in severe bodily injury or death.

- C. **OPTION C:** The other venting option is to vent into a below grade chamber. For some installations, this option extends the vent into the actual leach field. By venting into the actual leach field, there is the added opportunity of providing additional aerobic activity to the soils. This method may require specific design by a qualified engineer. **CAUTION: Below grade leach field venting can only be done if there is no chance of siphoning the leach field moisture back into the treatment module.**
8. **AIR LINE INSTALLATION Cont'd:** Run a 2" minimum (3" minimum for models 4.5 and 9.0) non-corrosive air line from the chosen location for the blower and housing (up to 100 feet or 30.5 meters from the FAST system) to the FAST module. Connect to air line inserted in module in step 4. **BE SURE THAT ALL CONNECTIONS ARE AIR-TIGHT AND PERMANENT!** Care should be taken to keep all dirt and debris out of air line assembly!
9. **BLOWER INSTALLATION:** The blower housing should be placed on a concrete slab. Both the electrical conduit and air supply line should pass through the concrete slab from below grade. The electrical supply conduit should be run from the control panel to the desired blower location. A precast concrete slab can be used by drilling the appropriate holes for the air supply line.
10. Secure blower assembly to base using four (4) 14" x 1½" self-drilling screws. Drill screws directly into blower base.

NOTE: USE TEFLON SEALANT TAPE ON ALL PIPE CONNECTIONS.

11. **BLOWER INLET ASSEMBLY:** (All fittings below are factory provided)

- A. Screw a nipple into "inlet" port of blower.
- B. Screw an elbow into nipple.
- C. Screw inlet filter assembly into elbow.
- D. Inlet piping is now complete.

12. **BLOWER OUTLET ASSEMBLY:** (All fittings below are factory provided)

- A. Screw a close nipple into "outlet" port of blower.
- B. Screw reducer bushing onto nipple.
- C. Outlet piping is now ready for hookup.

13. Connect the air line to blower outlet assembly, using PVC primer and glue. (Be sure to follow instructions and PVC primer/glue container(s). It is recommended that a union be placed in this line for ease of disassembly. **BE SURE THAT ALL CONNECTIONS ARE AIR-TIGHT AND PERMANENT!** Care should be taken to keep all dirt and debris out of air line assembly!



WARNING: All electrical work should be performed by a qualified electrician and per all applicable codes. Failure to do so may result in severe bodily injury or death.

If you have questions regarding the safety, installation or operation of your FAST® Wastewater Treatment System, contact your local distributor or Bio-Microbics, Inc. at:

1-800-753-FAST (3278).

14. **ELECTRICAL INSTALLATION:** A dedicated breaker is required in the building's master electrical panel. Make connections between the master electrical panel and factory-provided blower control panel according to the electrical drawings provided with the panel and all applicable codes.

15. Make connections between the blower and blower control panel per the electrical drawing provided and all applicable codes. The control panel meets NEMA standards for indoor and outdoor use. It is rated for water-tight and dust-tight integrity and is constructed of corrosion-resistant materials. The location of the panel must be in compliance with all local codes.

16. Wire the blower to accept the proper voltage for your specific location according to the diagram provided with your blower. (Some of the blowers come pre-wired to accept 220V).

17. **FAST with SFR®:** Bio-Microbics FAST® wastewater treatment systems are now equipped with SFR® (Sequencing Fixed Reactor). This feature allows the FAST system's blower to be turned on and off at appropriate intervals. Consult your Bio-Microbics service representative when using this feature. (See FIGURE 6 below for SFR timer settings.)

TIMING MODES					BLOWER MINUTES	
DIP SW POS. (S1)						
5	4	3	2	1	ON	OFF
OFF	OFF	OFF	OFF	OFF	30	30
OFF	OFF	OFF	OFF	ON	60	30
OFF	OFF	OFF	ON	OFF	120	30
OFF	OFF	ON	ON	OFF	60	60
OFF	OFF	ON	ON	ON	120	60
OFF	ON	OFF	OFF	OFF	180	60
OFF	ON	OFF	OFF	ON	240	60
OFF	ON	ON	OFF	OFF	120	90
OFF	ON	ON	OFF	ON	180	90
OFF	ON	ON	ON	OFF	240	90
ON	ON	ON	ON	OFF	TEST	
ON	ON	ON	ON	ON	∞	
TEST = 15 SEC ON, 20 SEC OFF						
∞ = ALWAYS ON						

18. **FINAL INSTALLATION INSPECTION:** It is the responsibility of the installer to fill the tank to operating level prior to backfilling the excavation. If the tank is not filled, heavy rains after backfilling could cause the tank to float and damage the surrounding grounds. Your local FAST® Systems installer may provide installation inspection services. **BEFORE THE UNIT IS BACKFILLED:**

- A. Fill the tank to normal operating level.
- B. Check for leaks in all water-tight seals. If leaks are found, reseal leaking areas.
- C. Ensure that the air line is properly installed and connected to the tank and blower.
- D. Turn on the blower and observe the operation of the airlift through the observation port. (See figure 5).
- E. Replace the observation port lid and take note of any excessive back pressure. To determine if excessive back pressure is present, check all access points in the entire treatment system. If air is escaping through any of these access points, review the venting configuration and make the necessary modifications.
- F. If the unit is level, has no leaks, has even-flow dispersion of the water and no back pressure is evident, then backfill the excavation.

If you have questions regarding the safety, installation or operation of your FAST® Wastewater Treatment System, contact your local distributor or Bio-Microbics, Inc. at:

1-800-753-FAST (3278).

INTRODUCING SUBSTANCES INTO THE SYSTEM

Introduction of some substances into the treatment 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 Single Home FAST 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.

A. Prohibited Substances

Prohibited substances are those substances which, when present in even small amounts, will prevent the FAST from providing wastewater treatment. Substances that will not dissolve may clog and possibly damage the aeration unit. **Do NOT** introduce the following prohibited substances into your FAST:

- 1. Plastic or rubber products,
- 2. Petroleum products such as motor oil, paint, paint thinner, gasoline and solvents,
- 3. Non-biodegradable products such as sanitary napkins, wipes, condoms and disposable diapers,
- 4. Toxic substances such as pesticides, disinfectants and large amounts of strong caustic drain 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) unless flow equalized.

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.

B. Limited-Use Substances

Limited-use substances in large concentration will reduce or stop the treatment process. These same substances in smaller concentrations will have no harmful effect on the treatment process. You may use the following substances without harming your FAST if you use the substance according to the manufacturer's directions, use the substance 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:
 - ⇒ Pine oil (disinfectant used in general purpose liquid cleaners),
 - ⇒ N-alkyl dichlorobenzyl ammonium chloride (disinfectant used in detergents and spray cleaners),
 - ⇒ Sodium hydroxide (lye-chemical used in drain openers and cleaners),
 - ⇒ Sodium dichloro-s-triazinetrione (powdered bleach used in scouring powders and automatic dishwasher detergents),
 - ⇒ 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. This will not harm the FAST system, but frequent pump-out of the septic tank may be necessary. Therefore you should consider not disposing of these food items through the FAST system:

1. Animal bones
2. Melon rinds
3. Corn cobs
4. Pits and seeds
5. Eggshells
6. Any other non-edible food waste

C. Acceptable Substances

The following substances may be used regularly without harming your FAST 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 system, but its use may be restricted by local wastewater codes. Check with the appropriate authority before using products containing sodium borate.*

INTERMITTENT USE

Suggestions for intermittent use: (Check with local regulations before attempting): If the property is going to be used seasonably 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 is also shut down. The blower should be restarted 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 of use until an extended period of absence is anticipated. (Extended period being at least 5 weeks or more.)

PREVENTIVE MAINTENANCE

Little maintenance is required for the Bio-Microbics 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 or vent could also reduce the efficiency of the treatment process if the oxygen is not allowed to replenish for aeration.



DANGER: Electrical Hazard.

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

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 the 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 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 pumpout cover to the primary zone and insert a sludge measuring instrument and take samples. If the sludge depth in the primary zone is greater than 20 inches, it is necessary to pump the unit down. The sludge depth of the secondary zone (which contains the FAST system) must also be checked. Open up the pumpout 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 unit down. 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 out 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.*

1. Open the pumpout cover and insert the hose. Be sure to pump out both sections of the reactor.
2. Once the unit has been pumped out, immediately refill the tank with clean water to reduce the risk of the tank floating. Close the pumpout cover making sure it is watertight.

The disposal of the solids that have been removed must comply with local and state regulations.

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)

ALARM CIRCUIT

The FAST system is furnished with an alarm circuit that will monitor the mechanical aeration components. If the blower should fail, there is a visual and audible alarm.

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.

EVALUATION OF SYSTEM PERFORMANCE

The following basic checks that give an indication of the process quality can be made by the distributor or service personnel.

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.
	like that of a well-maintained compost pile. If other odors are noticed, the aeration process may not

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 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 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 will be noticed. This can be caused by insufficient air flow into the biological zone. A blockage in the air line or blower is the most probable cause.

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 air flow.
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 air flow 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).

There is a possibility that the air line from the blower could become blocked. If this condition is suspected, disconnect the air line from the blower and check for blockage. A drain auger can be used to check the entire length of air line.

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.

Problem	Possible Cause	Solutions
The failure indicator light on the control panel is on, and the alarm sounds.	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.
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.
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.

Problem	Possible Cause	Solutions
Wastewater is backing up into the home sewer piping.	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.
	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: Removal



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 1HP and above blowers use 220V commons or three phase power.*

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 the blower is planned to be disconnected for more than 48 hours, it may be necessary to prevent the discharge of wastewater into the drain field.
2. Remove blower housing cover by unscrewing the blower housing cover 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.
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 which require repair or maintenance, there is no need to gain manual access to any underground components of 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
1 unit	Blower
1 unit	Control Panel
1 unit	Air Filter

LIMITED WARRANTY

Bio-Microbics, Inc. warrants every new FAST® system against defects in materials and workmanship 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 shipping pre-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 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 EXPRESSED WARRANTIES. ANY WARRANTY IMPLIED BY LAW, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, IS IN EFFECT ONLY FOR THE WARRANTY PERIOD SPECIFIED ABOVE. 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.

Electrical Drawings & Diagrams for FAST® Wastewater Treatment Systems

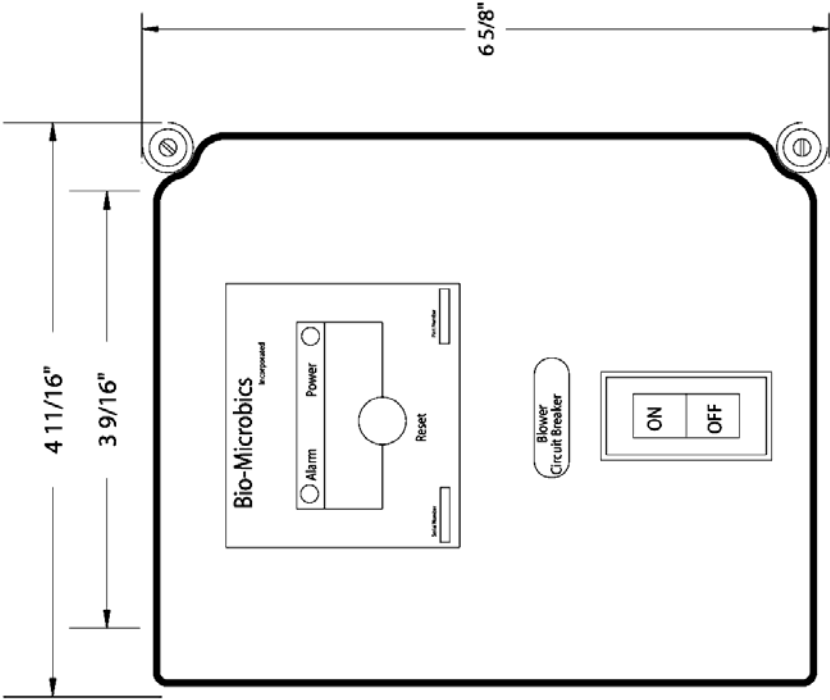
**Pg 22—Exterior and Interior Views of the
110-220v Control Panel**

**Pg 23—Wiring Diagram for the
110-220v Control Panel**

**Pg 24—FAST® SFR® Control Panel
For Use with Most Systems Greater Than 1500 gpd.**

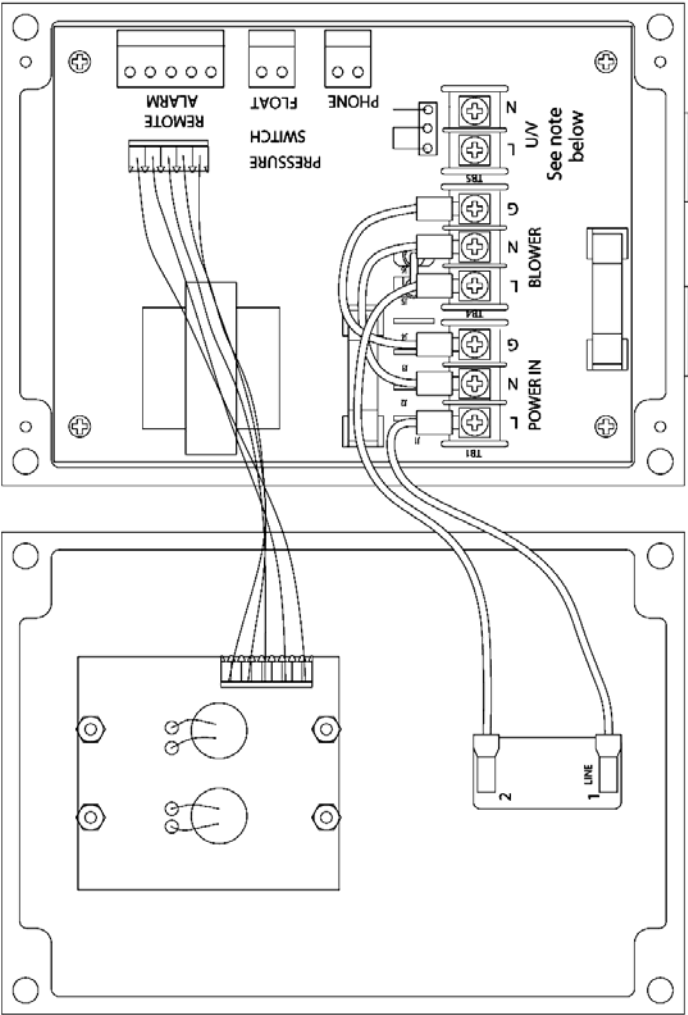
Pg 25— Typical FAST® Installation Components

110-220V Control Panel with U/V Option



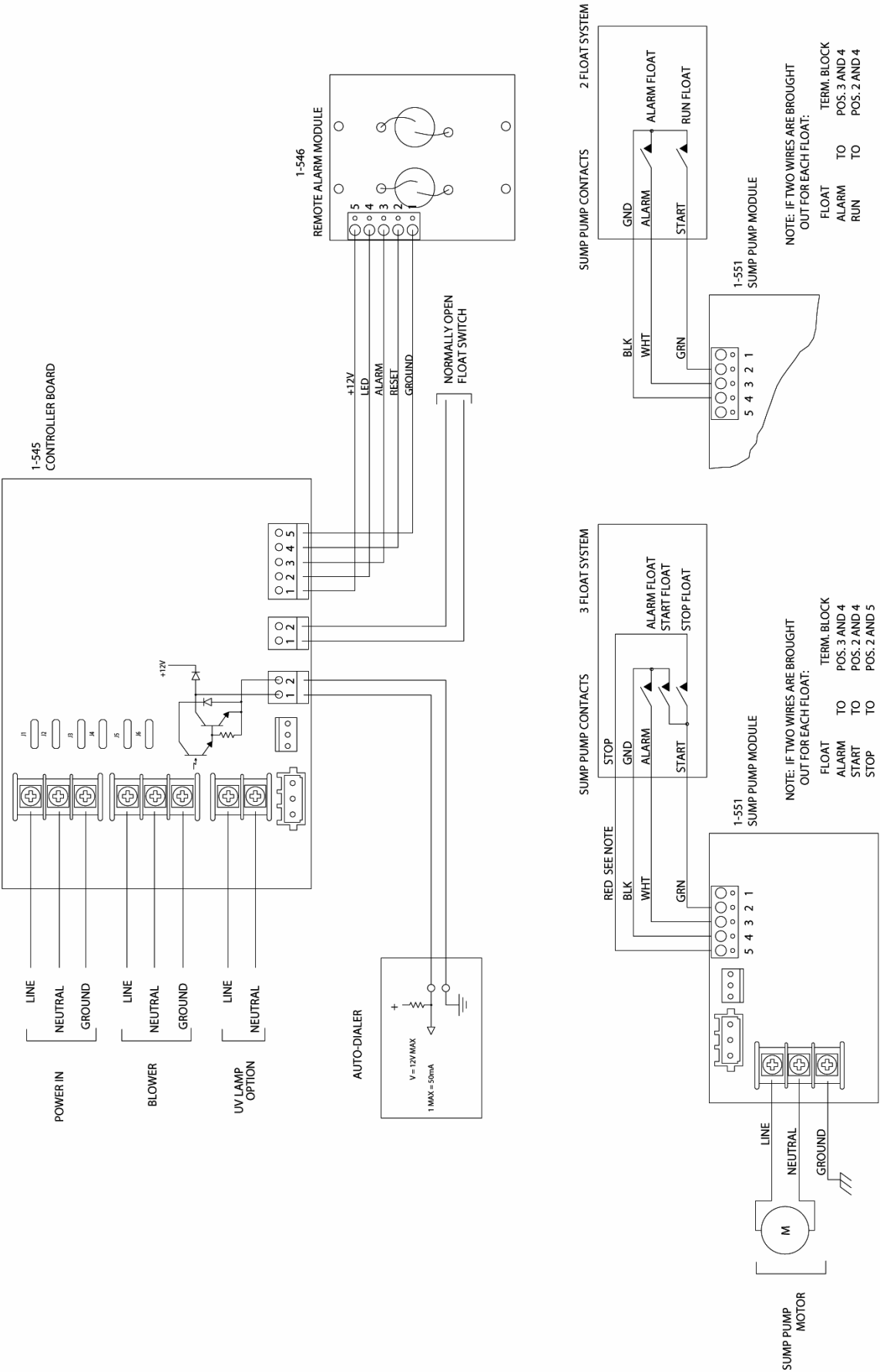
EXTERIOR VIEW

NEMA 4X POLYCARBONATE ENCLOSURE - 3" DEEP

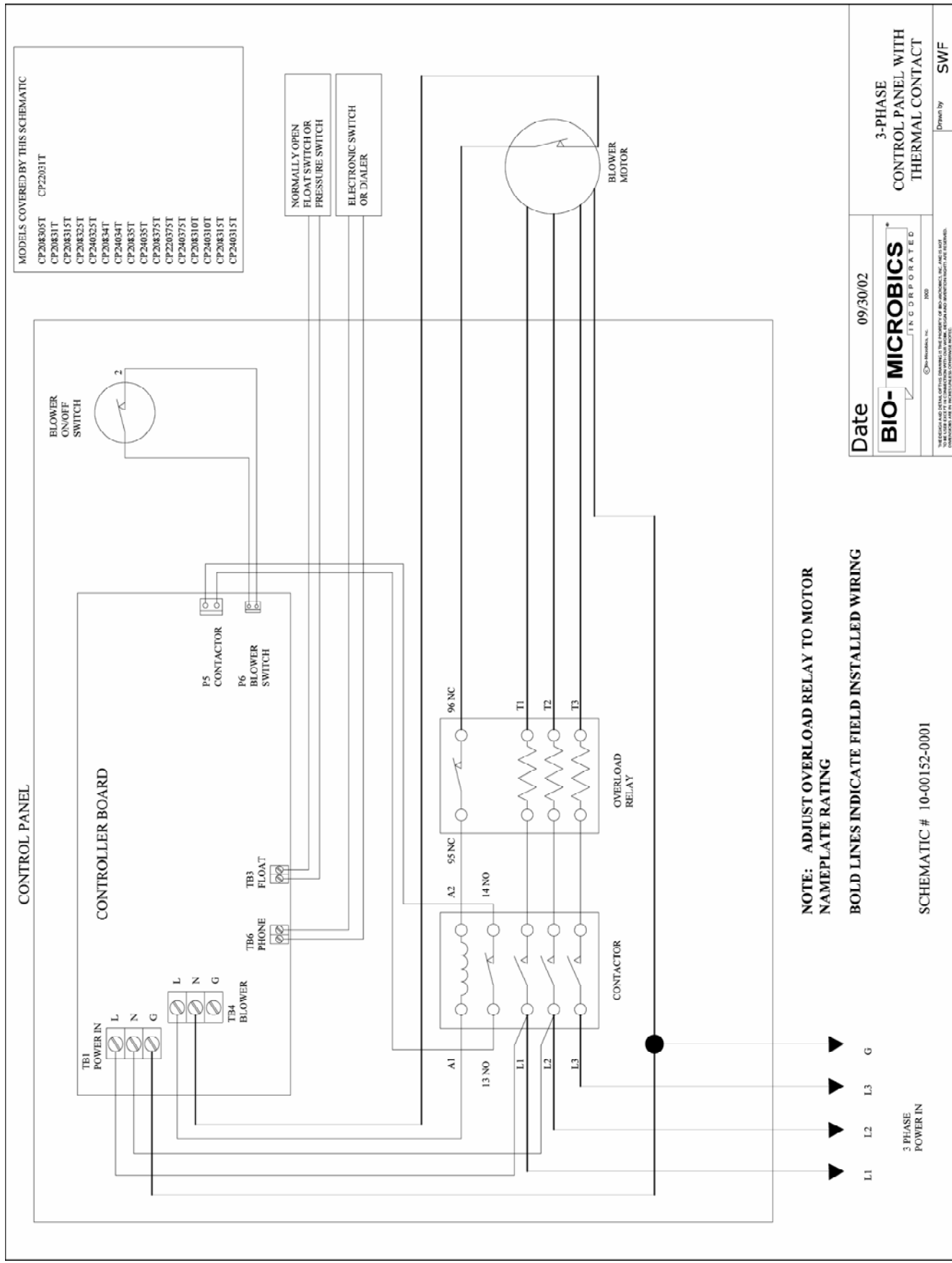


INTERIOR VIEW
DOOR REMOVED FOR CLARITY

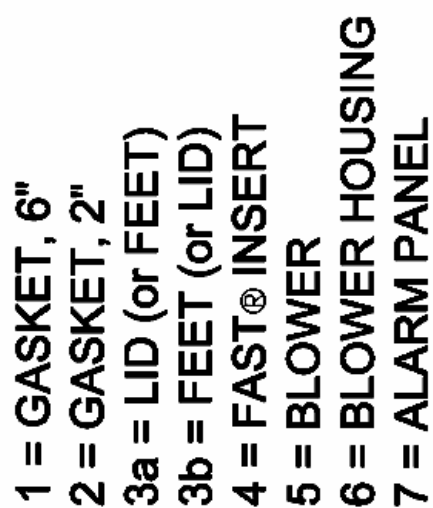
110/220VAC CONTROL PANEL WIRING DIAGRAM WITH AVAILABLE OPTIONS



FAST® SFR® CONTROL PANEL FOR USE WITH MOST SYSTEMS LARGER THAN 1500 gpd.



(Actual installed components subject to design specifications)



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