

DECENTRALIZED WASTEWATER TECHNOLOGIES



ENVIRO-DRIP MODELS: ED-10A, ED-15A, AND ED-20A.

**SUBSURFACE DRIP DISPOSAL DESIGN, INSTALLATION,
OPERATION & MAINTAINANCE MANUAL**

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ENVIRO-FLO, INC.
Subsurface drip disposal
Design, Installation, Operation, and Maintenance Manual

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INTRODUCTION

The Enviro-Drip Subsurface Disposal System has been designed to protect, monitor, and maximize the efficiency of the drip dispersal field. Before disposal the wastewater from a home or commercial establishment must be treated in the wastewater treatment plant to less than 30 BOD. The Enviro-Drip is designed to not only filter the effluent before it is discharged to the drip tubing but it is designed to monitor what is happening within the drip tubing (field) itself, thus providing for a reliable long-lasting drip field. Proper installation of the Enviro-Drip will provide years of dependable service for the owner. The Enviro-Drip utilizes Netafim's BIOLINE® drip tubing, which is .570" pressurized polyethylene tubing. It is designed utilizing the grid concept with supply and return flush manifolds at each end creating a close loop system. The object with effluent dispersal is usually to disperse the effluent utilizing the minimum area as quickly and safely as possible at an approximately uniform rate throughout the year. Subsurface drip is a highly efficient method to dispose of effluent. Small precise amounts of water are uniformly applied under the soil surface from multiple points. The main advantages of a subsurface drip system for effluent dispersal are... Human and animal contact with effluent is minimized, reducing health risks. Correctly designed systems will not cause ponding or runoff. Subsurface disposal can be used under difficult circumstances such as high water tables, various soil types, rocky terrain, and steep slopes, around existing buildings, trees, or other vegetation. Disposal of water is maximized by means of transpiration. The system requires no gravel, and is easy to install directly into indigenous soils, maintaining the natural landscape. Subsurface disposal minimizes deep percolation while consumption of nitrates by plant life is increased. Systems are durable with a long expected life. It allows use of yard space for activities while operating.

Note: Please follow your state and county regulations for onsite wastewater dispersal. This manual is intended to be a guide to users of the Enviro-Drip utilizing Netafim's drip tubing and should be used only as a supplement to your local regulations.

Process Description

Raw Domestic Wastewater from a residential dwelling or commercial establishment enters the properly sized Enviro-Flo wastewater treatment system where it is treated before entering the pump tank. The pump tank may be separate or connected with our all in one unit. The pump tank is equipped with a properly sized pump and float switches. The float switches in the tank and the micro-dosing timer control the pump. The Enviro-Drip model ED-10A, 15A, and 20A Wastewater Headworks System may be mounted in the riser of the pump tank. The Enviro-Drip includes a Spin Filter; filter flush valve, field flush/recycle valve, four unions, and associated piping and hose. When the treated effluent level in the pump tank engages the on/off float switch and the micro dosing timer sends power to the pump, the pump engages, discharging treated effluent into the Spin Filter where all particles larger than 100 microns are removed. The filtered effluent then proceeds to the supply header and on to the drip field causing each emitter to emit effluent into the soil with a portion returning to the pump tank via the field flush return. This valve closes after a momentary flush and the drip field maintains 10 to 45 PSI as recommended by Netafim). In doing this, particles are never allowed to build in the drip tubing, keeping the field clean. Any trace amounts of particles that enter the pump tank in this way are re-filtered by the Spin Filter thus keeping the pump tank clean. After a preset number of cycles the filter flush valve momentarily opens and allows cleaning of the Spin filter; returning filtered debris to the pretreatment tank. So automatically, every time the pump cycles on, the effluent is filtered, the drip field is pressurized, the emitters emit effluent into the soil, each drip tube run is field flushed back to the pretreatment tank, and debris in the filter is flushed to the pretreatment tank.

ENVIRO-DRIP ED-20 A SYSTEM COMPONENTS

1. E SERIES TREATMENT SYSTEM

- a) Class I NSF Aerobic Treatment System with pretreatment tank equivalent of treatment unit's rated capacity.
- b) Treatment system must include an air compressor to feed an aeration tank with air diffuser bars.
- c) Clarification chamber with flow equalization baffle wall.
- d) Pump tank.

2. ENVIRO-DRIP WASTEWATER SUBSURFACE DISPOSAL SYSTEM

- a) **Properly sized water pump and timer** (allows small frequent doses of effluent throughout the day at two to four hour intervals).
The Enviro-Drip requires one of four models below.
 - ½ HP high flow
 - ½ HP high head
 - 1 HP high flow
 - 1 HP high head
- b) **Four float switches**
 - Low H₂O
 - Shutoff
 - Timer Override
 - High Water Alarm
- c) **Audio and visual alarm system**
The following categories monitored are Normal, cycles, override cycles, high level cycles, elapsed time meter, alarm condition, no alarm condition, override cycle to short (override float stayed up after cycle was finished) high level.
- d) **Model #ED41AN-150 1" Spin Filter**
The Enviro-Drip uses a self cleaning 1" Spin Filter with a stainless screen 150 mesh/100 micron filter element. The self cleaning action is efficient over a range of flow rates. Screened solids are returned to the pre-treatment tank. Incoming dirty water is forced through directional nozzle plate onto the inside of the stainless steel screen. Debris is flushed out via timed solenoid valve spinning action keeps more of the screen area clean, minimizing pressure losses caused by excessive dirt build up. For optimum self-cleaning action, the filter should be operated at a flow rate that will create a 5 to 8 psi pressure drop across the filter.
- e) **Filter Flush Valve**
Used to flush debris from the Spin Filter back to the pre-treatment tank. Rugged PVC construction to withstand constant 150 psi pressure and 2 to 150 gpm flows. Double filtered pilot flow resist debris and clogging of solenoid ports. Slow closing to prevent water hammer. Manual internal bleed operates the valve without allowing water into valve box. One piece solenoid design with captured plunger and spring. Non rising flow control handle adjust water flows as needed.
- f) **Field Flush/Recycle Valve**
Used to systematically flush the drip field. Rugged PVC construction to withstand constant 150 psi pressure and 2 to 150 gpm flows. Double filtered pilot flow resist debris and clogging of solenoid ports. Slow closing to prevent water hammer. Manual internal bleed operates the valve without allowing water into valve box. One piece solenoid design with captured plunger and spring. Non rising flow control handle adjust waster flows as needed.

3. BIOLINE® DRIP LINE

Bioline® drip lines carry the water into the dispersal/reuse area. The drip line is connected to the supply and return manifolds with insertion fittings. Typical spacing between each drip line and between drip emitters is 24" on center. 12" spacing is used regularly for soils with very low or high permeability. The pipe has no joints that may pull apart during installation and is ideal for tractor mounted burying machines. Bioline® is a low-volume dripperline with integral and evenly spaced pressure compensating drippers at specified intervals. Bioline® emitters have a discharge rate of 0.6 gallons per hour. Bioline® is sold in rolls of 1,000' coils. The Ed-20A requires 2 rolls of Bioline® Drip Tubing.

4. SUPPLY MANIFOLD

The supply manifold carries the effluent from the dosing tank to the dispersal field. Rigid PVC is used and must be designed to slope back to the pump tank in freezing conditions. The velocity in the manifold should be between 2 ft. per second and 5 ft. per second. Refer to the PVC 40 FRICTION LOSS CHART on page 22 to determine the best diameter for your application.

5. RETURN MANIFOLD

The return manifold connects the ends of the drip lines together. The return manifold carries flushed materials back to the headworks for further treatment. Rigid PVC is used to accomplish this. The return manifold should be designed to slope back to the pump tank in freezing conditions.

6. AIR VACUUM BREAKER

Air Vacuum breakers are installed at the high points to prevent soil from being sucked into the emitters due to the back siphoning or backpressure. This is an absolute necessity with underground drip systems. They are also used for proper draining of the supply and return manifolds in freezing conditions. One is used on the high end of the supply manifold and one on the high point of the return manifold. Additional air vents may be required in uneven terrain. Freezing conditions require the air vacuum breaker be protected with insulation.

7. ZONE VALVES

Used to divide single dispersal fields into multiple zones. These should be hydraulic activated index valves. Index valves can operate 2 to 6 zones effectively.

Design and Calculation Worksheet

Wastewater Discharge (X)-_____

Soil Conditions-_____

Design loading rate (DLR)-_____ (see table page 16)

I. Field area required (X/DLR)-_____

II. Emitter line spacing = 2 feet (standard spacing, but 12" possible in high permeable soils)

III. Emitter line required (A/B)=_____ (C)(If C is greater than 2000 ft. it is recommended that the fields be split into equal zones.)

IV. Emitter spacing = 2 feet.

V. Total number of emitters = (C/D)=_____ emitters.

VI. Emitter flow rate @ 10-45 psi = 0.6 GPH

VII. Total emitter flow = (E x F) = _____ emitters x 0.6 GPH = _____ GPH/60 minutes = _____ GPM.

VIII. Total pumping time = (X/G) = _____ GPD / _____ GPM x 60 = _____ seconds.

IX. Doses per day = _____ (every _____ hour x 60 = _____ minutes x 60 = _____ seconds.

X. Gallons per dose = (X / I) = _____ GPD / _____ doses/day = _____ gallons per dose.

XII. Pumping time per dose + (J / G) = _____ gallons / _____ GPM = _____ min x 60 = _____ seconds.

XIII. Set control box cycle timer for _____ seconds "ON" and _____ seconds "OFF".

NOTE: It will take a few seconds for the field to totally pressurize once the timer activates. It may be necessary to adjust the cycle dose time slightly to compensate for this delay. This amount of time should be checked with a test run after adjustment.

Vertical slope of drip line should not exceed 40 feet.

SYSTEM INSTALLATION

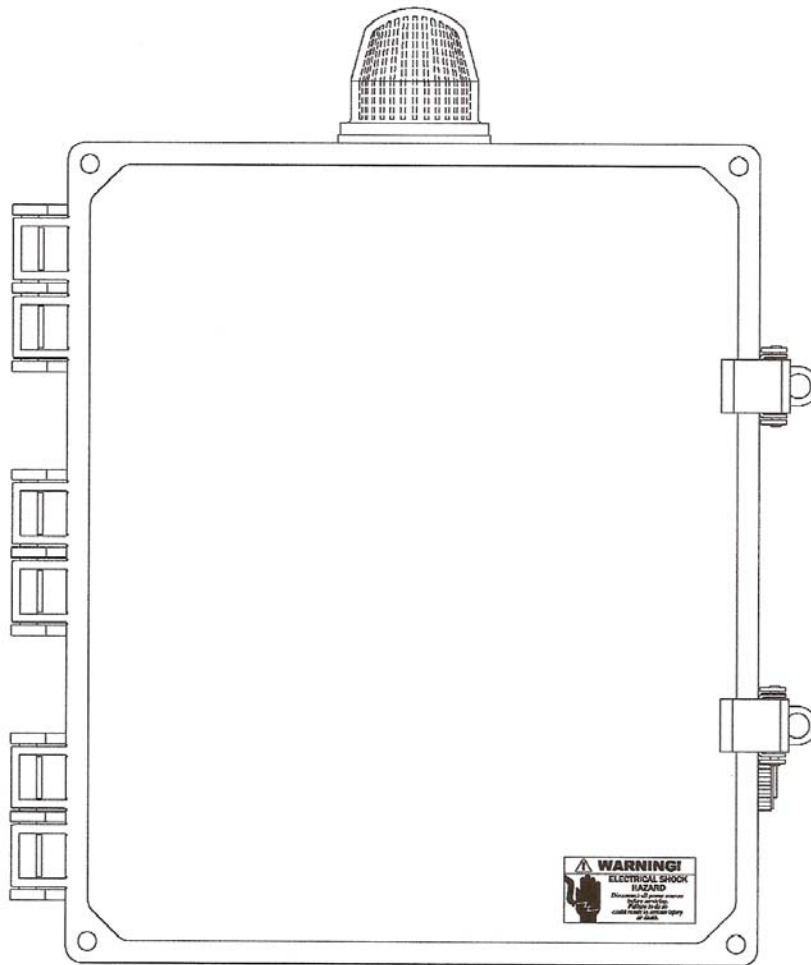
The Enviro-Drip Headworks is mounted on the pump tank of the All In One System. For installation of the All In One, refer to the Enviro-Flo Inc. E-Series Installation Manual. When you have installed the All In One, you have installed the Headworks system. All that is left is to install the drip dispersal field and connect the field supply and return lines to the Headworks.

1. All drip field construction should be done in accordance with local rules and regulations.
2. No utilities, cable wire, drain tile, etc. shall be located in the drip field.
3. Mark off entire drip field prior to any construction.
4. System is not to be installed when ground is wet or frozen.
5. Divert all down spouts and surface waters away from drip field or into curtain drains.
6. Excavation, filling and grading should have been finished before installation of the subsurface drip system.
7. Be sure you have everything required for the installation before opening trenches. Pre-assemble as many components as practical above ground. Slip-lock adapters should be glued to PVC tees, the supply and return manifolds with tees can be pre-assembled and used to mark the beginning and end of BIOLINE® lines.
8. For particularly tough soil conditions, moisten the soil the day before opening trenches or installing BIOLINE®. Remember it is much easier to install the system in moist soil. The soil should be moist but still should allow the proper operation of the installation equipment and not cause smearing in the trenches. The soil surface should be dry so that the installation equipment maintains traction.
9. Mark the four corners of the field. The top two corners should be at the same elevation and the bottom two corners should be at a lower elevation. In freezing conditions the bottom drip line must be higher than the supply and return line elevation at the pretreatment tank. (See page 24)
10. Install a watertight pump tank.
11. Determine the proper size for the supply and return manifolds. (SEE Page 25)
12. Install the PVC supply line from the pump tank, up hill through one lower and one upper corner stake of the dispersal field. Please refer to your state guidelines for depth of burial.
13. Paint a line between the two remaining corner stakes.
14. Install the Netafim Bioline® drip line from the supply line trench to the painted line. Upon reaching the painted line, pull the plow out of the ground and cut the drip line 1' above the ground. Tape the end of the drip line to prevent debris from entering. Continue this process until the required footage of pipe is installed. Netafim Bioline must be spaced according to specification (2 ft. is standard). Depth of burial of drip line must be consistent throughout the field. Take care not to get dirt into the lines.
15. Install the supply header with tees lined up at each Netafim line. Hook up the lines to the supply header. Do not glue Bioline® drip line. (See page 24)
16. Dig the return manifold ditch along the line painted on the ground and back to the pump tank.

On designs requiring supply and return manifolds to be in the same ditch, use painted line. Ditch line must have slope back to the pump tank.

17. Install the return manifold and connect all of the Netafim lines. Care must be taken not to kink the drip line.
18. Install air vacuum breakers at the highest points in the dispersal field. Use pipe dope or Teflon tape and hand tighten.
19. Connect the supply and return line to the Enviro-drip Headworks.

Instructions for 50A807B Control Panel



Instructions for Setting Timer on 50A807-B Drip Panel

The following instructions cover the changing and viewing of timer parameters for the 50A807-B drip panel. These parameters are stored and controlled by the programmable timer contained in the control panel (see figure 1 below). This programmable timer has a LCD display to allow for viewing parameters as well as setting timer values. The default screen will display the time of day and the date.

Viewing/Modifying Timer Settings

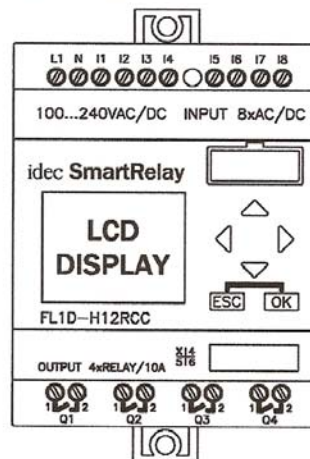
- 1) To view the default settings and parameter, the “ESC” key located on the lower right of the programmable timer must be pressed. Once this is done a series of options should appear on the LCD screen.
- 2) Once the options screen appears, press the arrow keys located at the middle right up or down to scroll thru the available options.
- 3) Select the “Set Param” option by high lighting it with the cursor and then pressing the “OK” key located next to the “ESC” key. Once this is done a series of timer settings will be visible by using the up or down arrow keys. A list of the available timer setting are below.

(See pages 3 & 4 for screen details).

Available Timer Settings:

- “OFF TIME” – This setting controls how long the “OFF” cycle will be for the standard timer. (Default Setting: 10:00 s)
- “ON TIME” – This setting controls how long the “ON” cycle will be for the standard timer. (Default Setting: 00:40 m)
- “OVR OFF” – This setting controls how long the “OFF” cycle will be for the secondary or override timer (i.e. if the override float is “ON”). (Default Setting: 30:00 m)
- “OVR ON” – This setting controls how long the “ON” cycle will be for the secondary or override timer. (Default Setting: 00:40 m)
- “MINOCYCL” – This setting controls how many cycles will be run on the “Override Timer” settings before returning to the standard timer settings. (Default Setting: 3 cycles)
- “SFV-DLY” – This setting controls the amount of time you want to wait before opening the spin filter valve after the pump has started to run. (Default Setting: 10:00 s)
- “SFV-ON” – This setting controls how long the spin filter valve will remain open before closing again. (Default Setting: 10:00 s)
- “FV-CYCLE” – This setting controls how often you want to open the flush valve (i.e. after how many pumping cycles do you want to flush the system). (Default Setting: 6 cycles)

TOP VIEW OF THE PROGRAMMABLE TIMER



Available Timer Settings (cont.):

“FV ON” – This setting controls how long the flush valve will stay open to flush the system.
(Default Setting: 01:30 m)

Changing Timer Settings

- 1) To change a timer setting; first scroll thru the settings list using the up and down arrow keys on the middle right of the programmable timer, until the timer setting to change is displayed on the LCD screen. Then press the “OK” key and a small cursor should appear on the screen.
- 2) Once the cursor appears simply use the left and right arrow keys to move the cursor. To change a setting use the up and down arrow keys until the desired setting is displayed.

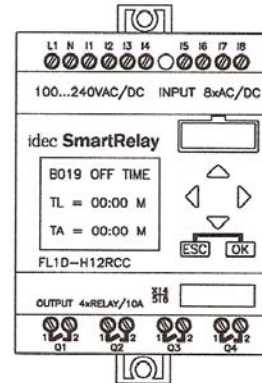
For example if we wanted to change to the standard timer “OFF” time.

First - press the “ESC” key to display the option menu.

Second – Use the up and down arrow keys to scroll the options list until the “SET PARAM” option is high lighted, then press the “OK” key.

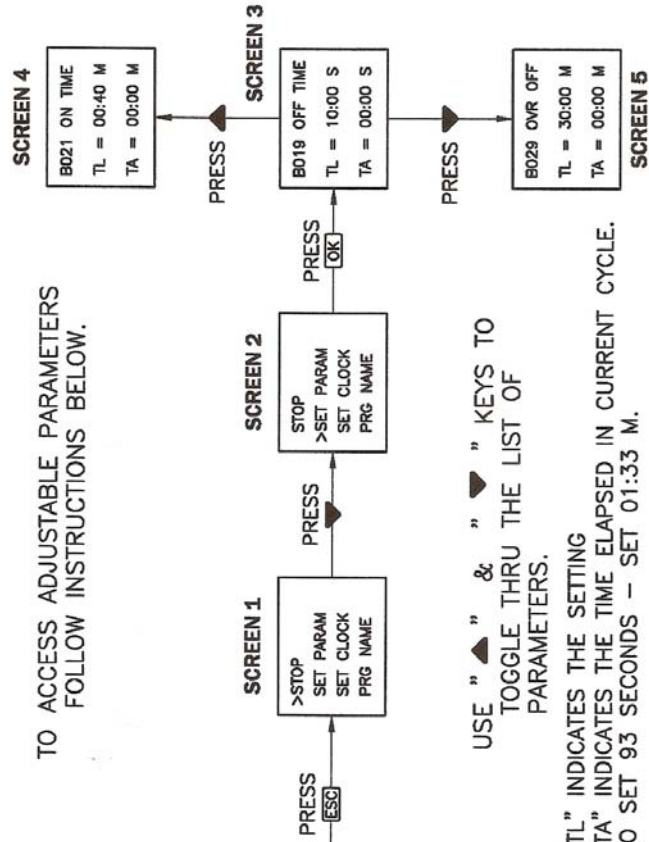
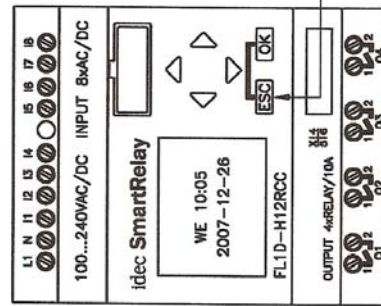
Third – Use the up and down arrow keys to locate the setting you would like to change.
In this case “OFF TIME”. After locating the setting press the “OK” key to begin changing the setting. A sample screen is shown below.

Fourth – A flashing cursor should appear on the screen. In the example the cursor would appear over the first “0” after “TL”. The “M” displayed on the right indicates “Minutes” (H = Hours, S = Seconds). To set the “OFF” time to 35 minutes, use the up arrow key until “3” appears then press the right arrow key to move the cursor over one position. Again use the up arrow key until “5” appears. The Screen should display “TL = 35:00 M” The next two numbers are seconds and would remain “00” in this case. After setting the desired “OFF” simply press the “OK” key to change the setting.



Follow the above procedure to change any of the existing timer parameters. The programmable timer has 30 day battery back-up feature to protect the program and settings in the case of power failure. After 30 days if the power is not restored all saved settings and data will be lost.

TO ACCESS SETTINGS

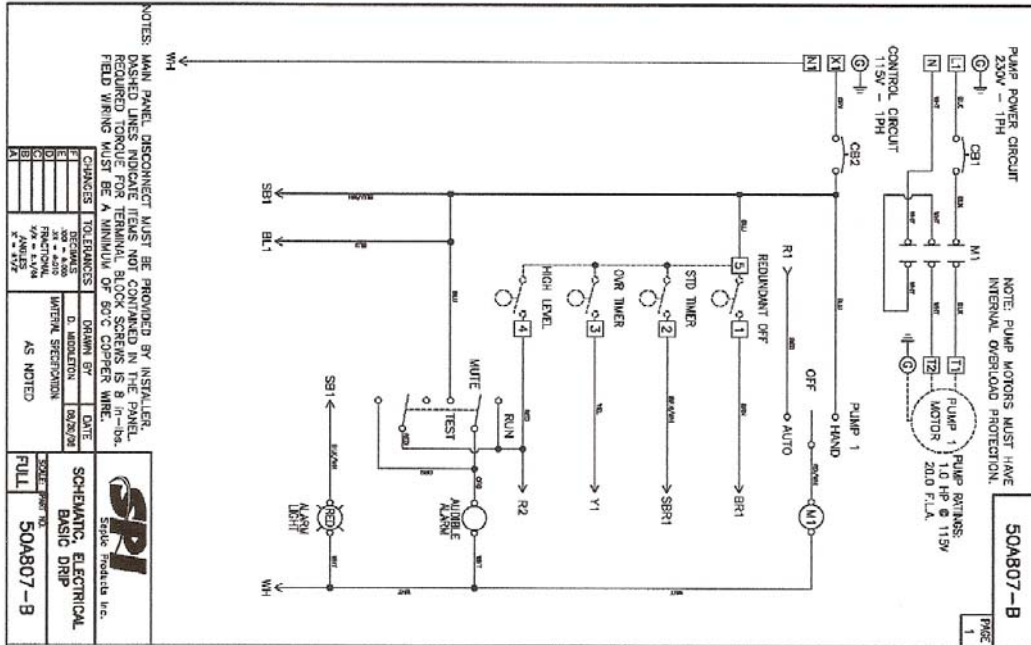


TO ACCESS ADJUSTABLE PARAMETERS
FOLLOW INSTRUCTIONS BELOW.

USE "▲" & "▼" KEYS TO
TOGGLE THRU THE LIST OF
PARAMETERS.

NOTE: "TL" INDICATES THE SETTING
"TA" INDICATES THE TIME ELAPSED IN CURRENT CYCLE.
TO SET 93 SECONDS – SET 01:33 M.

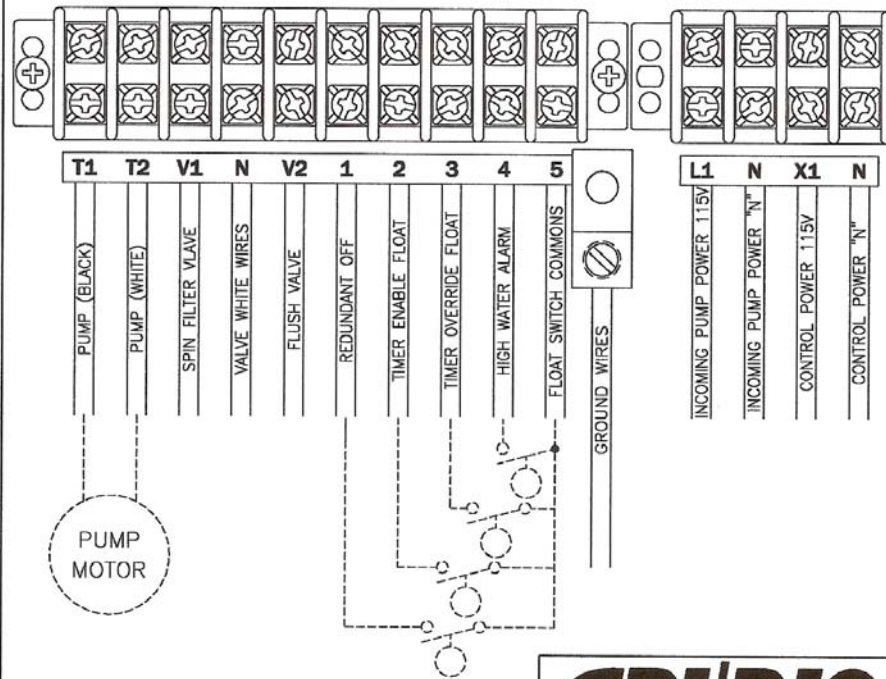
Panel Schematic



TIGHTENING TORQUE FOR TERMINAL BLOCK IS 9 in-lbs.

50A807-B

CONNECTION DIAGRAM PUMP, VALVES & FLOAT SWITCHES



ALL INFORMATION CONTAINED IN THIS DRAWING IS
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SPI/BIO
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CHANGES	TOLERANCES	DRAWN BY	DATE	POWER CONNECTION BASIC DRIP PANEL	
F	DECIMALS .XXX = ± 0.005 .XX = ± 0.010	D. MIDDLETON	5/20/04		
E	FRACTIONAL X/X = $\pm 1/64$	MATERIAL SPECIFICATION: AS NOTED		SCALE:	PART NO.
D	ANGLES X' = $\pm 1/2^\circ$			FULL	50A807-B
C					
B					
A					

INITIAL STARTUP AND OPERATION

The Enviro-Drip Subsurface disposal System has been designed and built to provide dependable service and to protect and monitor the drip dispersal field. For the Enviro-Drip to do its job effectively, however, the E-Series treatment system must be installed properly and maintained on a regular basis

BLOWING OUT DEBRIS

Disconnect flush/recycle valve and filter flush valve and fill the pump tank with enough water to engage the water pump. Run the water pump (pump on/off float should be covered with water and manually engage the micro-dosing timer in the control panel) long enough to blow any dirt or debris out of the drip field and supply and return manifold that may have entered during installation. Turn the pump off (manually disengage the micro-dosing timer) and connect the field return at the field flush line Headworks. Repeat this procedure if multiple zones are used.

RECORDING OPERATION DATA

As the drip disposal system enters operation record the operating pressure of the system for future reference. This should be recorded as optimum operation pressure of the system. Note: This pressure is expected to change slightly after the soil compacts and vegetation is established.

CONTROL PANEL SETTINGS

The Enviro-Drip control panel is pre set from the factory. There should be no initial need to change the preset settings. This panel is a complicated piece of equipment and should only be adjusted by factory-trained personnel. See page 8 for controller diagram

DRIP ZONES

Check each drip zone for leaks. If any leaks are detected they should be repaired immediately. After leak is repaired recheck the pressurized field.

ROUTINE INSPECTION & MAINTENANCE

Although the Enviro-Drip Subsurface disposal System is totally automated, routine inspection and preventative maintenance will ensure years of trouble-free operation for your entire system, including the drip dispersal field. Initial start-up data should be compared to ensure that the filters or field are in optimum operating condition. When the service provider services the E-Series treatment unit; routine inspection and preventative maintenance should be performed on the Enviro-Drip. Enviro-Flo Inc. recommends a monthly service contract with a certified maintenance provider to reduce risk of failure.

FILTER RESTORATION

At times it may be necessary to manually clean the filter screen. This is accomplished by removing the screen from the housing. The screen should be soaked in a bleach solution for 30 minutes. After soaking flush the screen with water and reinstall.

FIELD RESTORATION

Over time performance data may indicate a need to restore the drip field. This is done chemically with a Hydrogen Peroxide solution. Only certified technicians should perform this activity. The Peroxide will dissolve any organics that are present in the lines. This solution may be flushed back into the pretreatment chamber when done.

VACUUM BREAKERS

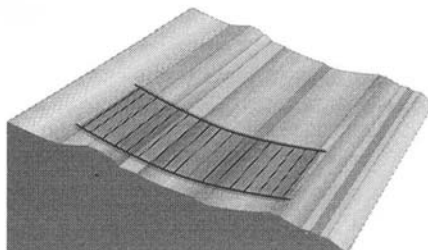
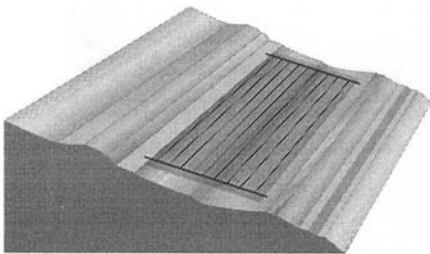
The air vacuum relief valve provides instant and continuous vacuum relief and non-continuous air relief. The vacuum breakers should be kept in a breathable enclosure and protected from dirt and vegetation.

SITE CONSIDERATIONS

Before doing any detailed design specification, it is necessary to evaluate specific site features.

1. **Site Boundaries:** Most state rules will have regulations as to how close dripperlines may be placed to property lines, home foundations, and other permanent property features. Follow local rules for set backs from these boundaries
2. **Prior Land Use:** Research should be conducted to determine if there were any prior activities on the proposed site that would affect soil characteristics. These effects include compaction, foreign soils, buried materials, etc.
3. **Future Land Use Restrictions:** The drip field can be installed under a permanent lawn, among trees, or other landscape features, provided set backs are allowed. Any future permanent structures that will affect soil texture and water flow through the soil must be avoided over a drip field, including but not limited to the following: out-buildings, parking areas, swimming pools, tennis courts, home additions, decks, etc. The designer should consult with the property owner regarding any anticipated improvements to the property and avoid these areas.
4. **Precipitation and Landscape Position:** If the site is an area that experiences seasonal, intense, or even short duration precipitation events which cause collection of water from surrounding areas or ponding of water on the soil surface, then special attention should be directed toward regarding the soil surface to encourage direct precipitation run off.
5. **Slopes:** Drip dispersal encourages lateral, not just vertical movement throughout the soil. This does not restrict dispersal fields to level areas, especially with the use of pressure compensating emitters and flow zoning.

More Desirable Layout



Less Desirable Layout

Slopes (continued)

However, it may increase the amount of land needed depending on the severity of the slope. The “Suggested Absorption Area Increase” chart, below, adapted from the State of Virginia, demonstrates that considerations of slope should include information about the soil depth.

Additional considerations about slopes include:

1. Whether there is a natural or artificial barrier down-slope from the proposed site that might provide opportunities for water to surface (such as hillside cuts or walls)
2. Whether the drip tubing can be laid out on the contours of the slope.
3. Whether system geometry can be used that minimizes linear loading rate
4. Whether the design can incorporate air release valves, check valves, zones, and other means to equalize flow and to prevent drainbacks.

With consideration of the above issues, and similar issues that the designer believes may affect soil absorption rates, the designer is now ready to evaluate the specific soil characteristics.

SUGGESTED Absorption Area Increase On Slopes

Depth to Impervious Strata		
<i>Slope of Site</i>	<i>Shallow</i>	<i>Deeper Soil</i>
10% to 20%	15%	0%
20% to 30%	35%	15%
30% to 40%	50%	35%
40% to 50%	65%	50%

SOIL CONDITIONS

After the drip dispersal area has been identified, the designer must undertake a thorough study of the specific soil characteristics of the proposed field. Particular focus must be given to:

- Texture
- Site Uniformity
- Compaction
- Native vs. disturbed soils
- Soil depth to restrictions or water table
- Clay mineralogy

SAMPLE COLLECTION

An accurate representation of the overall site conditions requires a determination of the underlying soil characteristics. A minimum of two samples per proposed zone is strongly recommended. The sample should be a three dimensional soil core sample which if possible extends into the soil a minimum of two feet deeper than the proposed location for the drip tubing. The analysis of the soil core must establish the morphology, structure and texture, as well as the determination of the presence of ground water, seasonal high water table, restrictive layers, etc. USDA/NRCS Soils Maps or other locally available geological maps should be consulted to determine consistency between observed and referenced conditions. Any inconsistencies should lead the designer to undertake further investigations of the site particulars and history.

DETERMINING SOIL TEXTURE

Accurate analysis of several samples collected across the proposed site area is critical to determining the absorption capacity of the soil. If the samples from the different locations of the proposed site are different, the design must be based on the most restrictive sample. The system designer should always consult with a registered soil scientist, site evaluator or soils structure laboratory for assistance in determining an accurate soil texture classification. The following USDA Soil Texture Triangle Chart should serve as an outline to determine soil composition and texture, leading to suggested loading rates.

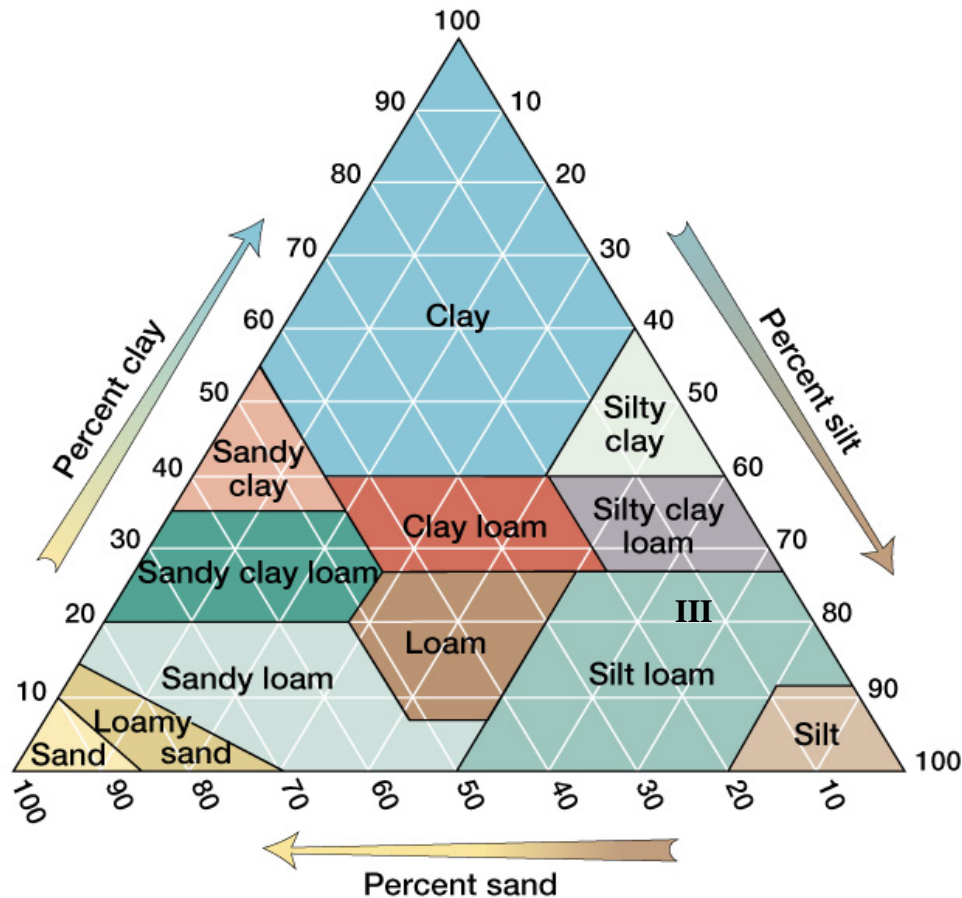
RESTRICTIVE LAYERS

Many soil environments are surrounded by other soils with less desirable characteristics. It should be recognized that water movement through multiple soil types will be determined by the characteristics of the most restrictive types. Therefore, whenever these restrictive types are encountered in a proposed drip field, they should provide the operative design criteria. In particular, soil absorptive capacities should be based on those of restrictive layers rather than those of more absorptive soils. If restrictive layers are present within two feet below the dripperline, then the designer should use the reduced loading rates of the restrictive layer. The greater the soil depth to a restrictive layer, the better. Considering the area two to four feet below the tubing, if there is a soil classification change of one or more, or if a restrictive boundary exists (rock, tight clays, etc.), then the dispersal area should be increased.

NATIVE VS. DISTURBED SOILS

Native, non disturbed soils are always the most desirable medium for drip application. However, if the soils are very poor, or the site conditions (e.g., available space) are so limited, then the designer may consider the introduction of fill material, if regulations permit.

SOIL TEXTURE TRIANGLE



SOIL HYDRAULIC LOADING RATE

The success of a drip dispersal system is largely due to how accurately the dose rate is matched to the ability of the wastewater to be hydraulically conveyed through the soil. The maximum hydraulic loading per unit area of soil should be determined by many different factors, including structure, slope, depth to restriction, and soil texture. Different soil textures have different porosities and therefore enable different quantities of water to pass through the soil. In drip dispersal, the goal is shallow dispersal, not deep percolation or surfacing. Therefore, soil textures both at the surface and below are important to enable wastewater flow both horizontally and vertically. Load the soil at an even rate in the biologically active zone near the surface. This will improve treatment, and enhance plant uptake.

Some states have regulations specifying loading rates that are sometimes more and sometimes less restrictive than the soil loading chart listed on the following page. The designer must follow regulations, but otherwise should opt for more conservative designs.

SOIL LOADING RATE

SOIL TEXTURE	SOIL STRUCTURE	Maximum Monthly Average Loading Rate (gallons/ft ² /day)	Area Required (ft. ² per 1,000 GPD)
Coarse Sand, Loamy Course Sand	N/A	1.50	667
Sand	N/A	0.80	1,250
Loamy Sand, Fine Sand	Moderate to Strong Massive or Weak	0.80	1,250
Loamy Fine Sand		0.50	2,000
Very Fine Sand			
Loamy Very Fine Sand			
Sandy Loam	Moderate to Strong Weak to Massive	0.50	2,000
		0.30	3,333
Loam	Moderate to Strong Weak, Weak Platy Massive	0.50	2,000
Silt Loamy		0.20	5,000
Sandy Clay Loam	Moderate to Strong Weak, Weak Platy Massive	0.30	3,333
Silt Clay Loam		0.20	5,000
		0.15	6,667
Sandy Loam	Moderate to Strong Weak to Massive	0.10	10,000
		0.05	20,000

The basic rule for drip dispersal area is:

Application Area = Daily Flow/ Loading Rate

The designer should take into account that the proposed loading rates are for optimal soil conditions and any site-specific special circumstances including but not limited to: specific features, precipitation, slopes, prior and adjacent land uses, impervious boundaries, depth to limitation, vegetation, etc., must be considered in the design.

HOMEOWNERS GUIDE FOR CARE AND MAINTENANCE OF DRIP DISPERSAL FIELD

A drip dispersal system has been installed on your property for the subsurface dispersal of the effluent from your home.

The drip dispersal system consists of a series of drip tubing installed at a shallow depth below the ground surface. It is designed to effectively disperse of the treated effluent in the ground with a combination of soil absorption and plant uptake. Your Drip dispersal system will function for many years with only minimum maintenance being required provided the following recommendations are followed:

- Establish landscaping (preferably a grass cover) immediately. This will stabilize the soil and allow for the vegetation to take up the water.
- Do not discharge sump pumps, footing drains or other sources of clear water to the system, except for the effluent discharge from your treatment system.
- Maintain all plumbing fixtures to prevent excess water from entering the dispersal system.
- Do not drive cars, trucks, or other heavy equipment over the drip dispersal field (or the treatment unit itself). This can damage the drip components or the soil and cause the system to mal-function. Lawn mowers, rubber wheeled garden tractors and light equipment may be driven over the drip field.
- Do not drive tent stakes, golf putting holes, croquet hoops etc., into the dispersal field.
- Contact your service company if your high water alarm should sound. The pump chamber is sized to allow additional storage after the high alarm sounds but you should refrain from excessive water usage (i.e., laundry) until the system has been checked.

Contact your service company if you notice areas of excessive wetness in the field. In most cases, this is usually caused by a loose fitting or a nicked drip line and can be easily repaired.

Note: There may be some initial wetness over the drip lines following the system's installation. This should cease once the ground has settled and a grass cover is established.

TROUBLE SHOOTING GUIDE

Symptom: High water alarm activates periodically (1-2 times per week). During other times, the water level in the pump chamber is at normal level.

- ❖ **Possible cause:** Peak water usage (frequently laundry day) is causing a temporary high water condition to occur.
 - ✓ **Remedy:** Set timer to activate the pump more frequently. Be sure to not exceed the total design flow. To avoid this, reduce the duration of each dose.
 - ✓ **Remedy:** Provide a larger pump tank to accommodate the peak flow periods

Symptom: High water alarm activates during or shortly after periods of heavy rainfall.

- ❖ **Possible cause:** Infiltration of ground/surface water into system.
 - ✓ **Remedy:** Identify sources of infiltration, such as tank seams, pipe connections, risers, etc.

Symptom: High water alarm activates intermittently, including times when it is not raining or when laundry is not being done.

- ❖ **Possible cause:** A toilet or other plumbing fixture may be leaking sporadically but not continuously. Check water meter readings for 1-2 weeks to determine if water usage is unusually high for the number of occupants and their lifestyle. Also determine if water usage is within design range.
 - ✓ **Remedy:** Identify and repair fixture

Symptom: High water alarm activates continuously on a new installation (less than 3 months of operation). Inspection of the filter indicates it is plugged with a gray colored growth. Water usage is normal.

- ❖ **Possible cause:** Slow start up of treatment plant resulting in the presence of nutrient in the effluent sufficient to cause a biological growth on the filter. This is typical of lightly loaded treatment plants that receive a high percentage of gray water (i.e., from showers and laundry).
 - ✓ **Remedy:** Remove and clean filter cartridge in a bleach solution. Add a gallon of household bleach to pump tank to oxidize organics. Contact treatment plant manufacturer for advice on speeding up the treatment process possibly by “seeding” the plant with fresh activated sludge from another treatment plant.

Symptom: Water surfaces continuously at one or more isolated spots, each one foot or more in diameter.

- ❖ **Possible cause:** Damaged drip line or a loose connection is allowing water to be discharged under pressure and therefore at a much greater volume than intended.
 - ✓ **Remedy:** Dig up drip line. Activate pump and locate leak. Repair as required.

Symptom: A portion of the drip field closest to the feed manifold is saturated while the rest of the field is dry.

- ❖ **Possible cause:** Insufficient pump pressure. A pressure check at the return manifold indicates pressure of less than 10 psi.
 - ✓ **Remedy:** Check filter and pump intake to insure they are not plugged. If they are, clean as required.
 - ✓ **Remedy:** Leaks in the system may be resulting in loss of pressure. Check for water leaks in connections and fittings or wet spots in the field. Also check air vents to insure they are closing properly. Repair as necessary.
 - ✓ **Remedy:** Pump is worn or improperly sized. Pressure at feed manifold is less than 15 psi. Verify pressure requirements of system and provide a new or larger pump. As an alternate approach, the drip field may need to be divided into two or more zones.
- ❖ **Possible cause:** The duration of each dose is of insufficient length to allow the drip field to become pressurized before the pump shuts off (or runs for only a brief time before turning off).
 - ✓ **Remedy:** Increase the pump run time and decrease the frequency of doses. Always calculate how long the system takes to fully pressurize and add this time to the design dosing duration.

Symptom: High water alarm begins to activate continuously after a long period (1-2 years) of normal operation. Inspection of the filter indicates it is plugged with a heavy accumulation of sludge.

- ❖ **Possible cause:** A buildup of solids in the pump tank due to carryover from the treatment plant.
 - ✓ **Remedy:** Replace the filter cartridge with a clean cartridge. Check the pump tank and if an accumulation of solids is noted, pump the solids out of the pump tank. Also, check the operation of the treatment plant to insure it is operating properly.

Symptom: Water surfaces at several spots in drip field during dosing periods. Installation is recent, less than 6 months of usage and soil is a moderate to heavy clay.

- ❖ **Possible cause:** Smearing of the soil may have occurred during installation of drip line. Also, the “cut” resulting from installation allows an easy path for the water to surface during dosing.
 - ✓ **Remedy:** In most cases the sod will compact naturally around the drip line and the surfacing will diminish and ultimately cease. To help, reduce the duration of each dose and increase the number of doses per day. Also, it will help to seed the area to encourage the development of a good root zone.

Symptom: Entire area of drip field is wet, soft, and spongy. It appears to be totally saturated with water. Situation occurs during dry season when there is little rainfall.

- ❖ **Possible cause:** Water being discharged to drip field exceeds design. Excess water may be a result of infiltration, plumbing leaks or excessive water usage.
 - ✓ **Remedy:** Check water meter, elapsed time meter, pump counter, override counter or high level alarm counter to determine if water usage is in excess of design. Check for leaks or infiltration. Repair leaks as required. Reduce water usage by installing water saving fixture.
 - ✓ **Remedy:** If water usage cannot be reduced, enlarge drip field as required.
- ❖ **Possible cause:** Area of drip field was inadequately sized and is too small.
 - ✓ **Remedy:** Provide additional soil analysis to verify sizing and enlarge as required.

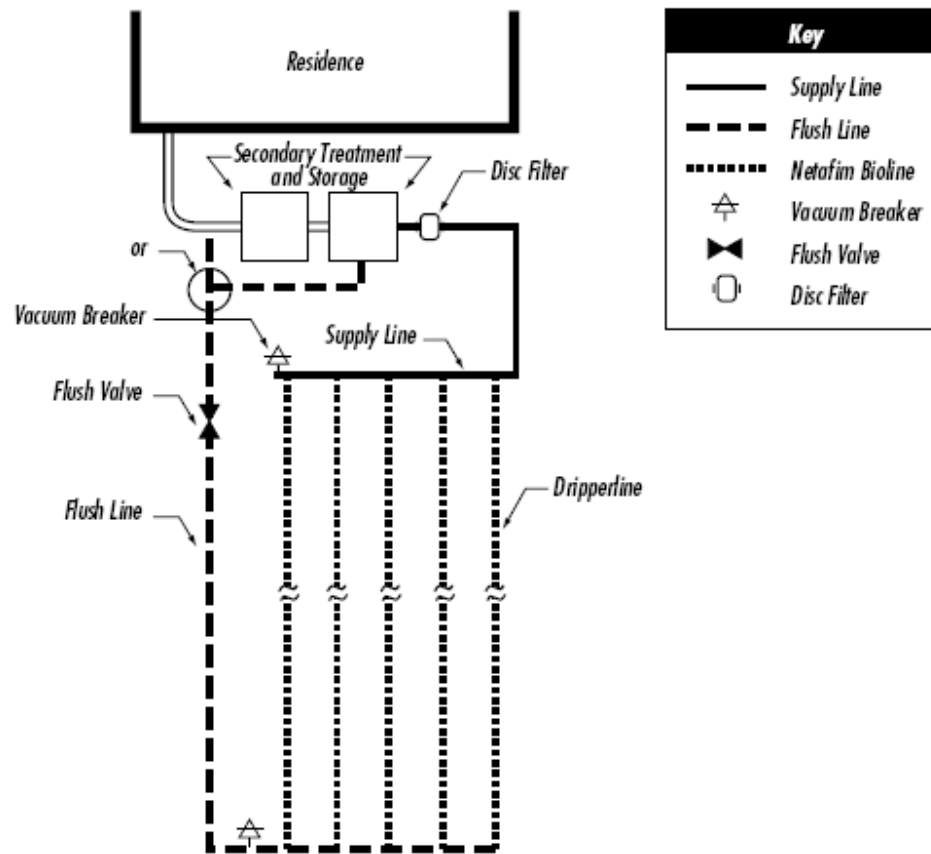
Pressure Friction Head Loss (ft/100 ft)													
Volume Flow		Pipe Dimension (inches)											
Gallons Per Minute (GPM) ¹⁾	Gallons Per Hour (GPH) ²⁾	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	6	
1	60	4.3	1.4	0.4	0.1	0.1							
2	120	15.1	4.84	1.2	0.4	0.2							
4	240	55.0	17.1	4.2	1.3	0.5	0.2						
5	300	84.4	25.8	6.3	1.9	0.7	0.2						
6	360		36.3	8.8	2.7	1.2	0.3	0.1					
8	480		63.7	15.2	4.6	1.8	0.6	0.2					
10	600		97.5	26.0	6.9	3.6	0.8	0.3	0.1				
20	1200			86.9	25.1	9.7	2.9	0.9	0.4	0.1			
30	1800					18.7	6.3	1.8	0.8	0.3			
40	2400					29.4	10.7	3.1	1.3	0.4	0.1		
50	3000						16.5	4.7	1.9	0.7	0.2		
60	3600						23.5	6.6	2.7	0.9	0.3		
70	4200							8.8	3.7	1.2	0.3		
80	4800							11.4	4.7	1.6	0.4		
90	5400							14.3	5.8	2.0	0.5		
100	6000								7.1	2.4	0.6	0.1	
125	7500								10.8	3.8	1.0	0.1	
150	9000									5.2	1.3	0.2	

¹⁾ GPM = gallons per minute

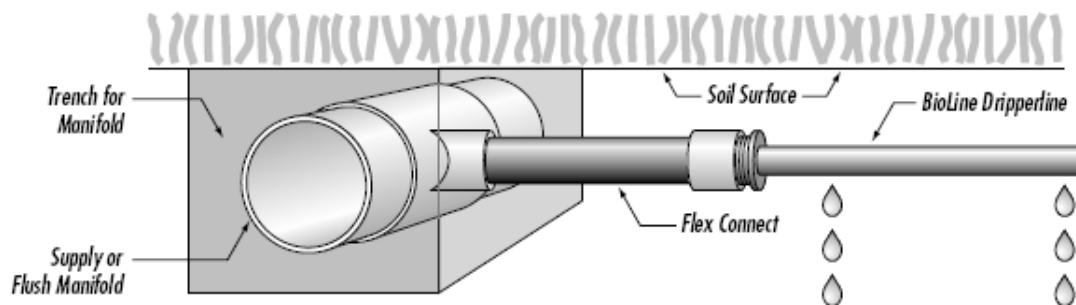
²⁾ GPH = gallons per hour

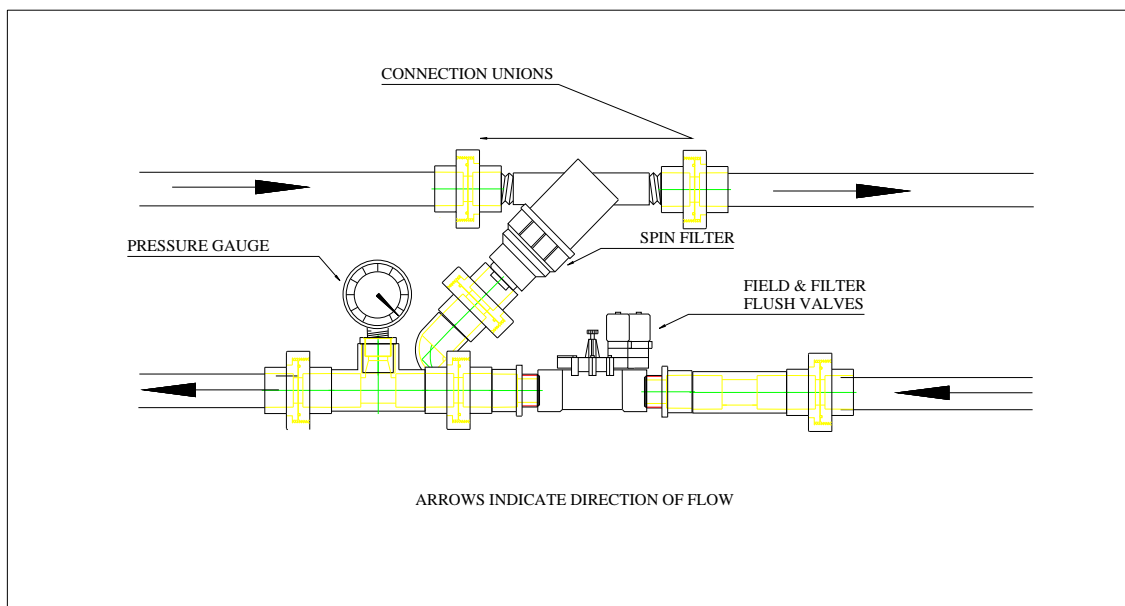
AS-BUILT SYSTEM DESCRIPTION:

1. Site Name: _____
2. Site Address including state: _____
3. Dripfield Designed by: _____
4. Dripfield Installed by: _____
5. Date of Installation: _____
6. Daily design flow: gpd _____
7. Soil percolation rate: _____
8. Number of zones in dripfield _____
If more than 1 zone, please describe valve (size, manufacturer, part number, type)
9. Amount of dripline installed in each zone
Zone 1 _____ ft. Zone 2 _____ ft. Zone 3 _____ ft. Zone 4 _____ ft.
10. Flow rate per zone.
Zone 1 _____ gpm Zone 2 _____ gpm Zone 3 _____ gpm Zone 4 _____ gpm
11. Pump manufacturer, model number and number of pumps _____
If more than one zone, do the zones (a) share one filter or (b) each have their own filter?
12. Pressure in each zone:
Zone 1 _____ psi Location pressure measured _____
Zone 2 _____ psi Location pressure measured _____
Zone 3 _____ psi Location pressure measured _____
Zone 4 _____ psi Location pressure measured _____
13. Size of feed manifold _____ inches. Depth of feed manifold _____ inches.
14. Size of flush manifold _____ inches. Depth of flush manifold _____ inches.
If more than one zone, do the zones (a) share one flush valve or (b) each have their own flush valves?
15. Was any fill material supplied on the dripfield?
If "yes" to above please describe fill quality and quantity added. _____
16. Please provide owner with as-built drawings, including but not limited to direction of drip lines, location of air vents, location of pressure regulators if applicable, location of Headworks (filter and valves) and location of pump tank.

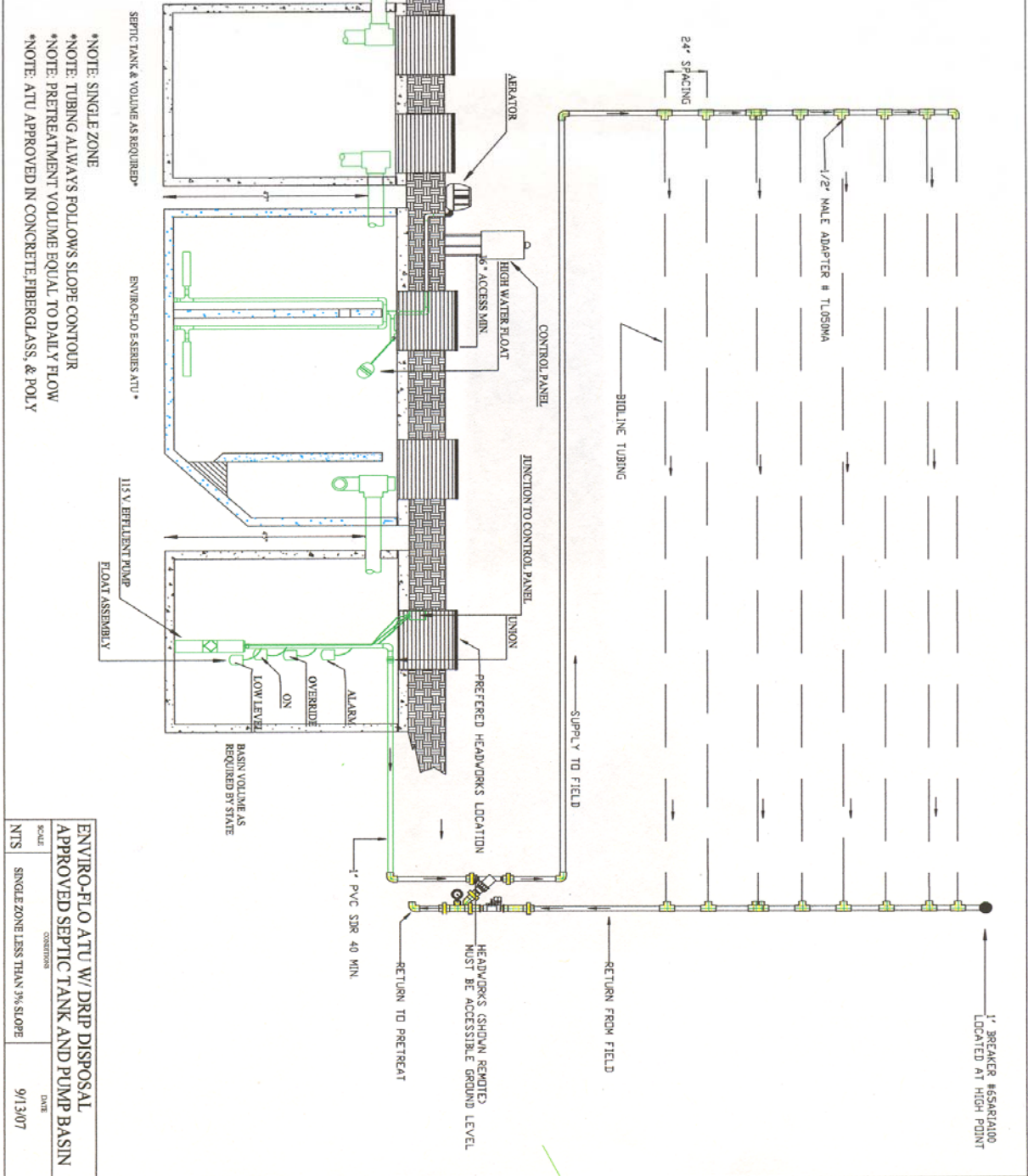


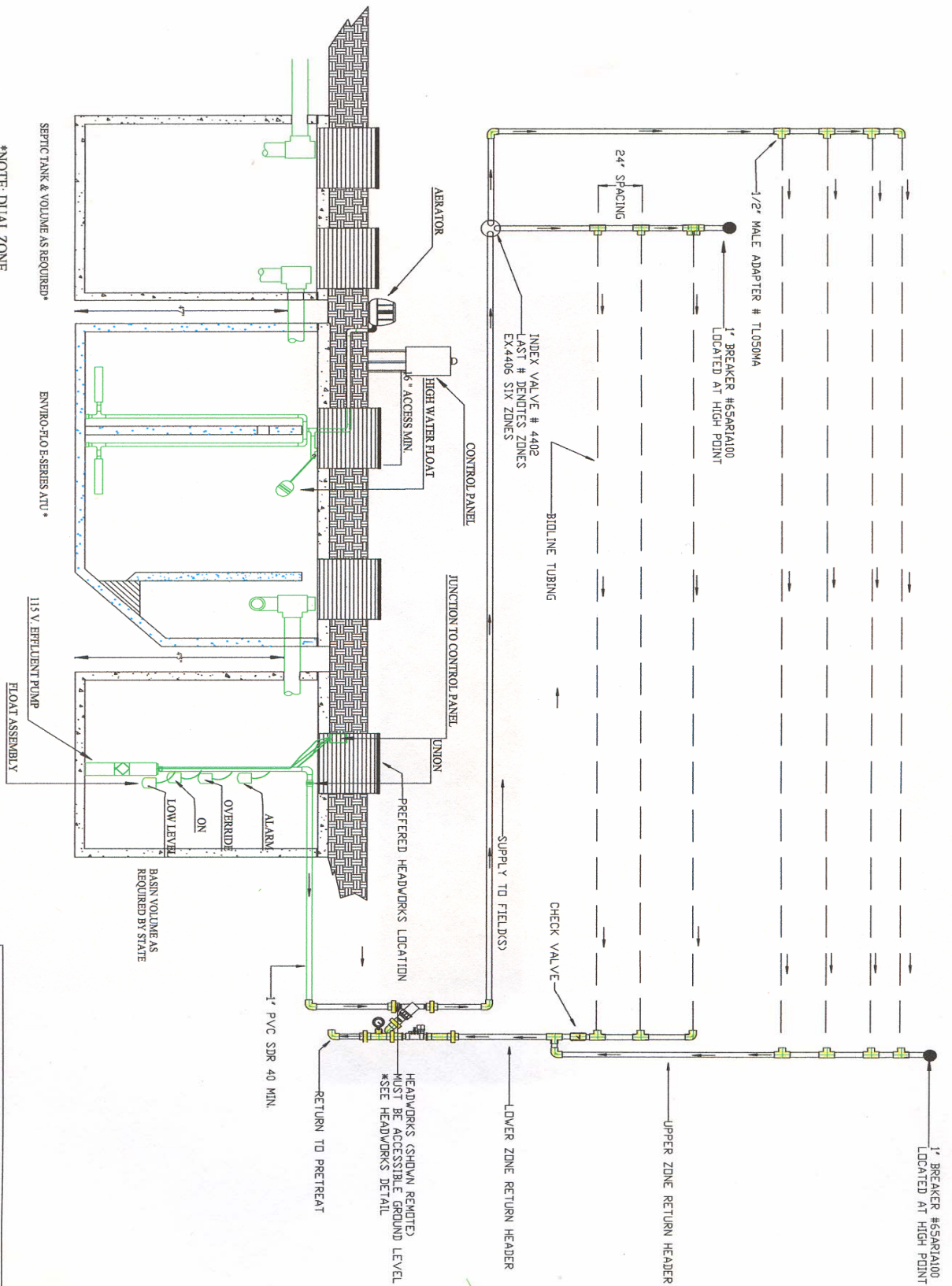
Bioline Connection to Supply Manifold





Enviro-Flo Drip Headworks Assembly





- *NOTE: DUAL ZONE
- *NOTE: TUBING ALWAYS FOLLOWS SLOPE CONTOUR
- *NOTE: PRETREATMENT VOLUME EQUAL TO DAILY FLOW
- *NOTE: ATU APPROVED IN CONCRETE, FIBERGLASS, & POLY

ENVIRO-FLO ATU W/ DRIP DISPOSAL		
APPROVED SEPTIC TANK AND PUMP BASIN		
SCALE	CONDITIONS	DATE
NTS	DUAL ZONE 8% or GREATER SLOPE	9/13/07

WARRANTY

Except as to products described in Subsections (B), (C), (D), and (E) below, products sold and/or manufactured by Enviro-Flo, Inc. are warranted to be free from original defects in material and workmanship for a period of one (1) year from the date of delivery to the buyer unless (i) otherwise specified by and subject to the terms and conditions of any Warranty Supplements pertaining to specific products or, (ii) expressly disclaimed in writing by Enviro-Flo. Within the warranty period, Enviro-Flo at its sole discretion shall have the option to repair or replace part or all of a defective product, or refund part or all of the original purchase price, if any part proves to be defective in material or workmanship after return of such product at customers expense and after such return has been authorized in writing by Enviro-Flo, Inc.

THIS BASIC MANUFACTURERS LIMITED WARRANTY IS SUBJECT TO THE TERMS AND PROVISIONS IN SUBSECTION (F), (LIMITATION OF REMEDIES AND DISCLAIMER OF WARRANTIES) SET FORTH BELOW IN THE EVENT OF ANY INCONSISTENCY BETWEEN SUBSECTION (A) AND SUBSECTION (F) OF THIS PRODUCT WARRANTY, THE PROVISIONS OF SUBSECTION (F) SHALL PREVAIL.

(B) DRIPPERLINES:

Bioline dripperlines are warranted to be free from original defects in materials and workmanship for a period of five (5) years and seven (7) years for environmental stress cracking. Further, the Bioline warranty against emitter clogging due to root intrusion will be for a period of ten (10) years. This warranty shall apply only to products with a wall thickness of 35 mil or greater.

(C) FILTERS:

Disc filters are warranted to be free from original defects in materials and workmanship for a period of five (5) years. This warranty specifically excludes gaskets, seals and o-rings, which are subject to the basic one (1) year warranty. Techfilter Limited Lifetime Warranty carries a 2-year to-a-lifetime warranty. Proper use and timely replacement of cartridge will keep the lifetime extended warranty in force.

(D) VALVES:

Valve bodies are warranted to be free from original defects in materials and workmanship for a period of five (5) years. Valve diaphragms are warranted for a period of two (2) years.

(E) AIR VENTS:

Air vent bodies are warranted to be free from original defects in materials and workmanship for a period of five (5) years. Polypropylene air vent bodies are warranted for two (2) years. This warranty specifically excludes internal seals, gaskets or o-rings which are subject to the basic one (1) year warranty.

(F) LIMITATION OF REMEDIES AND DISCLAIMER OF WARRANTIES

EXCEPT AS EXPRESSLY PROVIDED HEREIN, ALL WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE HEREBY EXCLUDED AND DISCLAIMED. THE REMEDIES PROVIDED HEREIN SHALL BE THE EXCLUSIVE AND SOLE REMEDY OF THE BUYER NO OTHER EXPRESS WARRANTY IS GIVEN

AND NO AFFIRMATION BY ENVIRO-FLO, BY WORDS OR ACTION, WILL CONSTITUTE A WARRANTY. NO OTHER EXPRESS WARRANTY NOR ANY OTHER REMEDY SHALL BE AVAILABLE TO THE BUYER AND ENVIRO-FLO SHALL NOT BE RESPONSIBLE OR LIABLE FOR ANY DAMAGES, INCLUDING ANY LOSS OF PROFIT, LOST SAVINGS, LOSS OF SALES, OR OTHER DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, INJURY OR DAMAGES TO ANY PERSON OR PROPERTY ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCTS OR THE BREACH OF ANY EXPRESS WARRANTY, EVEN IF ENVIRO-FLO HAS BEEN ADVISED OF THE POSSIBILITY OF THOSE DAMAGES OR CLAIMS. ENVIRO-FLO SHALL NOT BE RESPONSIBLE FOR THE AFORESAID DAMAGES, CLAIMS OR LOSSES DUE TO LATE DELIVERY OR DELIVERY OR NON-DELIVER, OR OTHERWISE. THERE ARE NO WARRANTIES, WHICH EXTEND BEYOND THE DESCRIPTION AS SET FORTH HEREIN. IF ENVIRO-FLO SHALL FURNISH TECHNICAL ADVICE OR ASSISTANCE WITH RESPECT TO THE PRODUCTS SOLD HEREUNDER, IT SHALL BE GIVEN WITHOUT CHARGE TO BUYER AND SHALL BE GIVEN AND ACCEPTED AT BUYERS SOLE RISK WITHOUT ANY EXPRESS OR IMPLIED WARRANTY AND ENVIRO-FLO SHALL NOT BE RESPONSIBLE OR LIABLE FOR THE ADVICE OR THE RESULTS THEREOF BUYER ASSUMES ALL RISK AND LIABILITY RESULTING FROM USE OF THE PRODUCT PURCHASED.

This warranty is expressly conditioned upon proper storage, installation, application and normal wastewater use and service as recommended by Enviro-Flo. Such recommendations may be updated from time to time. Any misuse, neglect, modifications, unauthorized repairs or replacement or uses of the product and/or any of its components for non-greenhouse or nursery purposes not recommended by Enviro-Flo, including but not limited to the following, shall completely void this warranty:

(I) Irrigation water, which has not been filtered or treated to the levels, specified for individual components of the product by Enviro-Flo.

(II) Chemical concentrates, used or applied internally or externally to the product, or mechanical abuse, which is harmful to the product or its components.

(III) Operating pressures greater than those specified by Enviro-Flo's individual component specifications.

(IV) Damage or plugging caused by insects, rodents, other animals, improper installation or other mechanical damage.

THE EXPRESS WARRANTY PROVIDED HEREIN IS EFFECTIVE ONLY IF CLAIM IS MADE BY WRITTEN NOTICE WITHIN THE APPLICABLE WARRANTY PERIOD AND POSTMARKED WITHIN THIRTY (30) DAYS AFTER DISCOVERY OF THE DEFECT ON WHICH THE CLAIM IS BASED. SUCH NOTICE SHALL BE DELIVERED TO ENVIRO-FLO AT THE FOLLOWING ADDRESS:

**Enviro-Flo Inc.
PO Box 321161
Flowood, Ms. 39232**

The buyer shall, together with its notice of claim, offer Enviro-Flo in writing prompt opportunity to examine the defective product and correct the defect, if possible. This warranty shall be void unless buyer delivers the defective product to Enviro-Flo at buyers sole cost and in accordance with Enviro-Flo's instructions.

BIOLINE DOSING CHART Maximum Length (feet) of a Single Lateral

Dripper Spacing		12"			18"			24"		
Dripper Flow Rate (GPH)		0.4	0.6	0.9	0.4	0.6	0.9	0.4	0.6	0.9
Inlet Pressure (psi)	15	292	233	175	410	322	247	510	405	308
	25	397	312	238	558	438	335	660	550	423
	35	486	365	279	656	514	394	760	649	497
	45	520	407	311	732	574	439	880	725	555

Lateral lengths are calculated for operation while dosing, and allow for the pressure at the end of the dripperline to be 7 psi or greater. These data do not take scouring velocity into account.

BIOLINE FLUSHING CHART Maximum Length of a Single Lateral (feet) Allowing for 2 fps Scouring Velocity

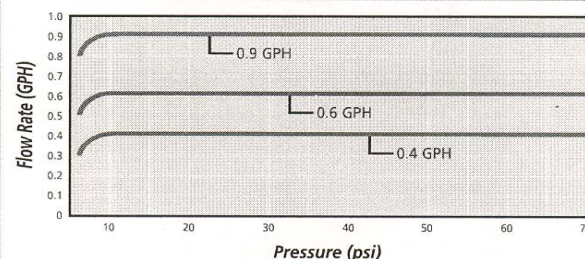
Dripper Spacing		12"			18"			24"		
Dripper Flow Rate (GPH)		0.4	0.6	0.9	0.4	0.6	0.9	0.4	0.6	0.9
Inlet Pressure (psi)	15 Inlet 8Δ	115	100	85	160	140	120	210	190	170
	25 Inlet 18Δ	200	170	140	270	230	200	360	320	280
	35 Inlet 28Δ	260	210	180	360	300	250	470	410	350
	45 Inlet 38Δ	310	250	210	420	350	290	560	490	420

Lateral lengths are calculated to achieve 2 fps scouring velocity and pressure at the distal end of the lateral to be 7 psi.

BIOLINE Flow per 100 Feet

Dripper Spacing	0.4 GPH Dripper		0.6 GPH Dripper		0.9 GPH Dripper	
	GPH	GPM	GPH	GPM	GPH	GPM
12"	40.0	0.67	61.0	1.02	92.0	1.53
18"	26.7	0.44	41.0	0.68	61.0	1.02
24"	20.0	0.34	31.0	0.51	46.0	0.77

BIOLINE Dripper Flow Rate vs. Pressure

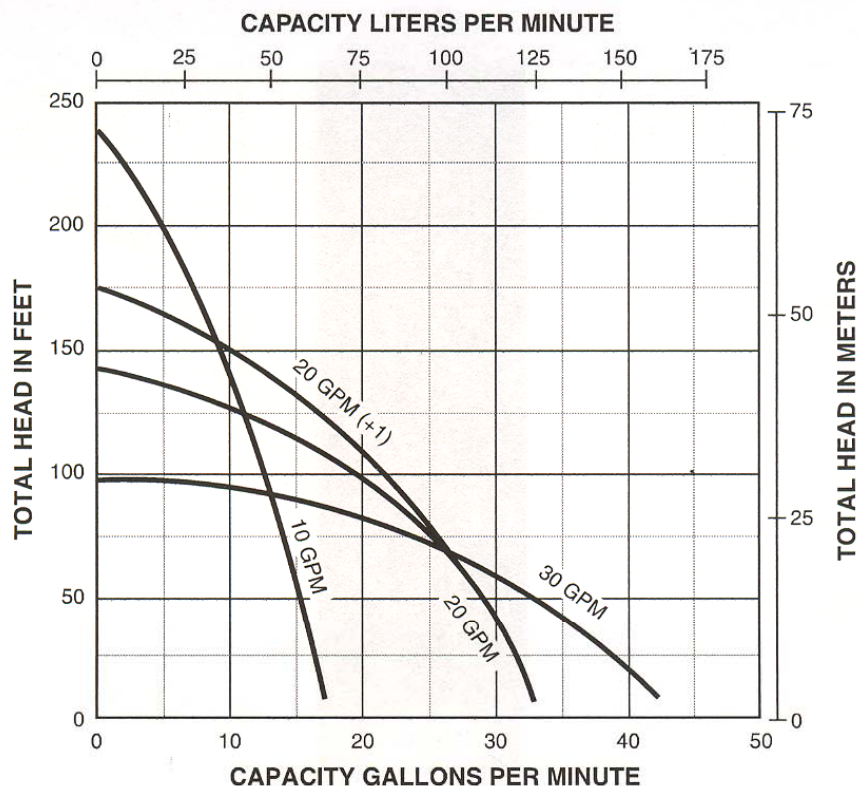


Between 0 and 7 psi, the dripper functions as a turbulent flow emitter, ensuring that the nominal design flow is not exceeded at system start-up.



4" multi-stage submersible pump

PUMP PERFORMANCE



PUMP PERFORMANCE (Capacity in Gallons per Minute)

Pump Model	Flow Rate (GPM)	PSI											
		0	10	20	30	40	50	60	70	80	90	100	110
10DOM05221	10			15.0	13.7	12.7	11.5	10.2	8.4	6.5	4.3	1.0	
10DOM05121	10			15.0	13.7	12.7	11.5	10.2	8.4	6.5	4.3	1.0	
20DOM05221	20			30.0	26.0	21.5	14.2	4.4					
20DOM05121	20			30.0	26.0	21.5	14.2	4.4					
30DOM05221	30		38.5	33.3	25.8	16							
30DOM05121	30		38.5	33.3	25.8	16							
20DOM05221+I	20 + 1			30	27.5	24	20	13.5	6				
20DOM05121+I	20 + 1			30	27.5	24	20	13.5	6				

PUMP PERFORMANCE (Capacity in Liters per Minute)

Pump Model	Flow Rate (LPM)	Bar											
		0	.69	1.38	2.07	2.76	3.45	4.13	4.82	5.51	6.20	6.89	7.58
10DOM05221	37.85		56.8	51.9	48.1	43.5	38.6	31.8	24.6	16.3	3.8		
10DOM05121	37.85		56.8	51.9	48.1	43.5	38.6	31.8	24.6	16.3	3.8		
20DOM05221	75.7		113.6	98.4	81.4	53.7	16.7						
20DOM05121	75.7		113.6	98.4	81.4	53.7	16.7						
30DOM05221	113.55	145.7	126.0	97.7	60.6								
30DOM05121	113.55	145.7	126.0	97.7	60.6								
20DOM05221+I	75.7 + 1			113.4	103.9	90.7	75.6	51.0	22.6				
20DOM05121+I	75.7 + 1			113.4	103.9	90.7	75.6	51.0	22.6				

THREE YEAR INITIAL SERVICE POLICY

Date:_____

_____ will and inspect and service your Enviro-Flo System for the first three years from the date of installation. There will be 2 inspections made each year for this initial period. Effluent quality inspections will include a visual inspection for color, turbidity, sludge build up, scum overflow, and odor. Mechanical and electrical inspections and service include: inspecting aerator, air filter, and alarm panel. This will include replacing or repairing any component not found to be functioning correctly.

Upon expiration of this policy, our firm will offer a continuing service policy on a yearly basis to cover labor for normal maintenance, and repairs on a year by year basis.

Violations of warranty should be thoroughly examined throughout the manuals. Violations are not covered and may involve an expense to repair.

PUMPING AND CLEANING OF THE SYSTEM ARE NOT COVERED UNDER THIS SERVICE POLICY

Service Dealer:

Owner:

