Kudlik Construction Ltd.
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WASTE WATER TREATMENT

CAM-E Remediation Project

Keith Bay, Nunavut

Presented to

Public Services and Procurement Canada

Review: November 2017

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November 2017

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1. INTRODUCTION

The purpose of this document is to present the methods that will be used to treat the camp waste water and the contaminated water that might be generated during the remediation activities in Keith Bay, Nunavut.

The environmental remediation project was awarded to Kudlik Construction Ltd. in May 2016. In September 2016, heavy equipments, camp facilities, material and all consumables were delivered by sealift to Kugaaruk. All equipment, material and consumables required to achieve the remediation project was transported by CAT train during the winter 2017 from Kugaaruk to Keith Bay.

Figure 1: Site location

2. CAMP WASTE WATER TREATMENT FACILITY

2.1 TREATMENT FACILITY DESIGN AND CAPACITY

The total capacity of the camp selected for this project was established for a maximum of 30 people. From our past experiences on remote sites, the daily water consumption for such a camp can be estimated to 3,000 litres which represents an average of 100 liters /person/day. As explained in the document presented at the Appendix 2, the wastewater treatment plant was designed for a capacity of 6,000 L/day.

2.2 FRESH WATER SOURCE

All camp water (Potable water, wash basins, toilets, laundry & showers) will be taken from the fresh water lake located nearby the north airstrip. The water will be pumped from the lake into the water truck, transported to the camp and transferred into the 4,000 liters retention tank.

2.3 WASTE WATER COLLECTION AND TREATMENT

All camp wastewater will be sent by gravity sewer pipes to a receiving pond made with liner. All the wastewater from the kitchen will pass through a grease trap before going ending into the receiving pond. A submersible trash pump equipped low/high level floats will be used to transfer the wastewater from the receiving pond to the lined pond no.2 from where it will be transferred to the Bionest treatment facility, as shown on figures 1.2 and 1.3 of Appendix 1.

A Bionest Kodiak will be used for the treatment of waste water generated from the camp operations. It has been successfully used on CAM-D and Ennadai Lake projects. The design and operational details are present at the Appendix 2.

The following picture shows the Bionest we used at the CAM-D project.

Insulated Bionest used at the CAM-D project, Simpson Lake

According to the contractual specifications the following discharge criteria must be met:

Parameter	**Maximum Allowable Concentration**
pH	6 to 9
Mineral oil and grease	5 mg/L and none visible
Total Suspended solids	100 mg/L
BOD	80 mg/L
Fecal coliforms	10,000 CFU/dL
Residual Chlorine	0,1 mg/L

The Bionest offers a stable treatment performance throughout the entire season with treatment performance well below the maximum allowable level for this project:

Parameters	Treatment level capacity
Total Suspended Solids	3 mg/L
BOD	4 mg/L
Fecal Coliforms	4,000 CFU/dL

2.4 TREATED WATER DISCHARGE

Before being released, the treated water will be accumulated alternatively in 3 lined ponds. Ponds no.1 and Pond no.3 have a capacity of about 22 m^3 each and Pond 4 capacity is 53 m^3. When the first pond will be filled to the 90% mark, the Bionest effluent will be evacuated into the second pond. Water samples will be collected from the first pond immediately or as soon as possible and sent to the laboratory for analysis for the parameters listed in discharge criteria table above. Until the reception of the water analysis (estimated to a 10 lab workdays turnaround time), the second pond will be used to collect the treated water. In the case where the analytical results are showing that the water samples do not meet the discharge criteria, additional treatment will be done and another sample will be collected. Pond number 3 will serve as a buffer and will be used if extended delays are required.

Once the results become available and meet the criteria, the treated water will be slowly discharged nearby.

At the end of the camp operations, the sludge accumulated in the bottom of the ponds will be treated, neutralised and according to the analytical results, disposed into the non-hazardous waste facility or into the Tier II facility.

2.5 CONTINGENCY

In the case where a major breakdown would be experienced with the Bionest treatment plant, 1 of the 3 lined ponds would be used to temporarily store untreated wastewater. Kudlik will have enough liner on site to build a retention pond that could hold additional untreated water, if needed. The treatment plant is made with simple components and comes with spare parts. No major breakdown was experienced during the 3 summers of operation.

Kudlik also has on hand lime and alum to treat and neutralise chemically wastewater if required.

3. TREATMENT OF WASTE WATER GENERATED FROM REMEDIATION ACTIVITIES

3.1 PROCESS WATER

The barrel processing will generate most of the process water on site. This includes the contaminated water (mixed with fuel, and sludge) contained in the barrels found on site and the water used to washed the barrels.

The barrel processing and water treatment plant will be located at the main station area on the former warehouse concrete pad.

In order to minimize the quantity of clean water to be used during the barrel wash process, wash water will be collected and recycled in the process.

The water collected from the barrel processing will be passed through an oil water separator made of 3 polyethylene tote tanks, 2 at the base and 1 on top. The water collected from each barrel will be drained in a tub. The tub content will be pumped into the top tote tank of the separator and left to settle for a few hours. During this time, 4 distinct layers will develop in the separator as follow:

Layer 1 – The PHC layer consists of hydrocarbon (diesel, fuel, stove oil…);

Layer 2 – The interface between oil and water;

Layer 3 – The water layer (free of sludge and hydrocarbon);

Layer 4 – The sludge (mud containing dirt, sand, rust, etc., and entrapped PHC) at the bottom of the separator.

Layers 1 and 2 will be siphoned in the PHC tote tank and left to stand for further separation. Care must be taken to siphon only PHC with less water as possible. Once the PHC tote tank is full, the clean, water free, fuel will be pumped to clean 205 litres drums. The drums will be filled to 90% capacity. A composite sample will be collected from the fuel barrels extracted from the water processing process. The non PHC portion (water, interface and residual sludge) left in the tote tank will drained and returned to the oil and water separator.

Layer 4 – The sludge at the bottom of the separator will removed before the clarified water is siphoned. The sludge will be drained in barrels for consolidation and

thickening. As the solids precipitate and concentrate, the liquid phase (oily water) will rise to the surface of the barrel. This liquid will be removed (scooped out) and returned to the oil and water separator for further processing. Sludge barrels will be filled to the 2/3 of their capacity with thickened sludge. A composite sample will be collected from the 4 to 6 sludge barrels extracted from the process. Disposal of the sludge will be done based on the analysis results.

Layer 3 – The clarified water layer (free of sludge and of free phase PHC) will be drained and consolidated in the (clean water) holding tank containing hydrocarbon absorbent material to remove residual PHC. Once the holding tank is full, the water will be sampled to determine the chemical treatment required to meet the discharge criteria. If needed, we have on site, the chemicals required to remove suspended solids, dissolved organics and inorganics, and to adjust pH.

3.2 CONTACT WATER

If analytical results demonstrate that contact water does not meet the discharge criteria, the option of treating the water directly into the excavation will be prioritised, when possible, by adding chemicals to promote the sedimentation of the contaminants. Otherwise, the contact water will be pumped into retention tanks and treated as per the process water treatment explained in the previous section.

APPENDIX 1

Figure 1.2: Camp layout
Figure 1.3: Camp Sewage Treatment

FIGURE 1.2: CAMP LAYOUT

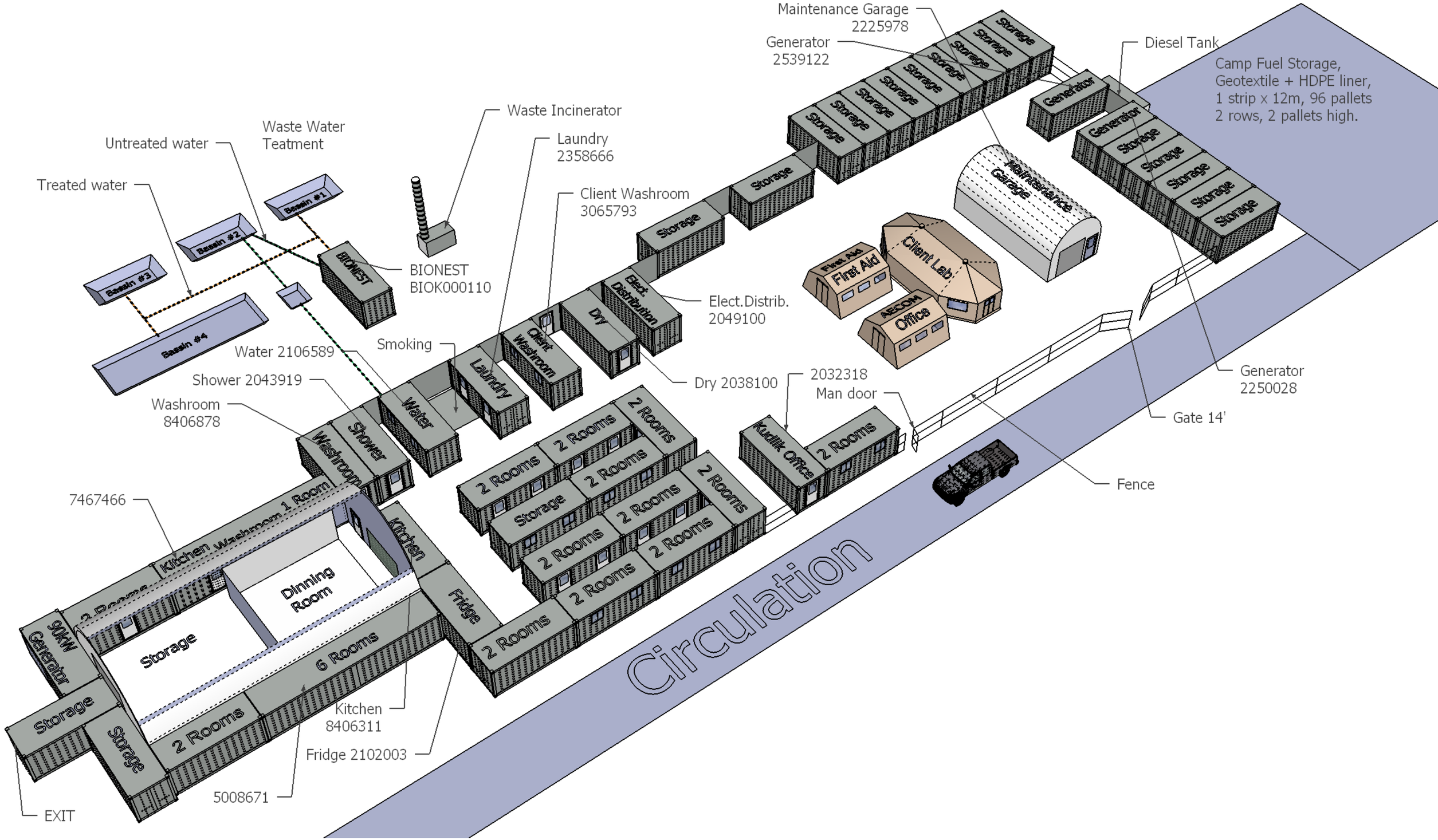
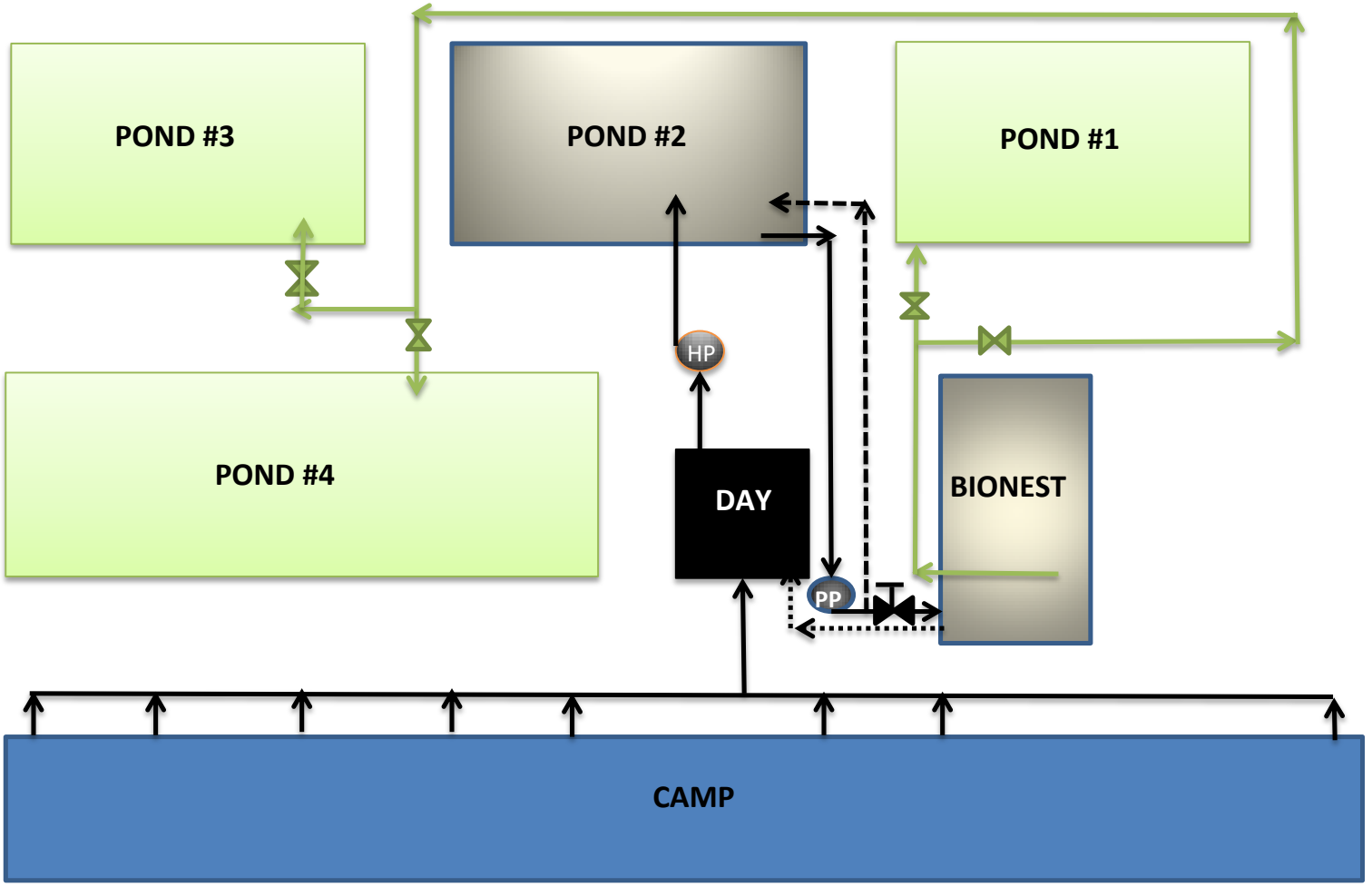


Figure 1.3 Camp Sewage Treatment



UNTREATED SEWAGE
UNTREATED SEWAGE RECIRCULATION TO POND #2
UNTREATED BIONEST OVERFLOW TO DAY POND
TREATED SEWAGE FROM BIONEST TO PONDS #1, #3 OR #4

HP HONDA GAS PUMP TO TRANSFER UNTREATED SEWAGE LIQUID FROM DAY POND TO POND #2

PP HAYWARD POOL PUMP FEEDING SEWAGE LIQUID TO BIONEST AND RECIRCULATION TO POND #2

APPENDIX 2

Bionest Operation and Maintenance Manual

Contact information

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1 BIONEST KODIAK CONTACTS

Customer Service: 1-866-477-5203

1.1 Bionest Kodiak project manager

Name	Office phone number	Fax number	E-mail Address
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2 OTHER CONTACTS

2.1 Consultant

Name	Company	Office phone number	Fax number	E-mail Address
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2.2 Contractor

Name	Company	Office phone number	Fax number	E-mail Address
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KODIAK Technology

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1 DESCRIPTION AND OPERATION PRINCIPLE OF THE KODIAK TREATMENT SYSTEM

KODIAK systems are ready-to-use BIONEST™ advanced secondary wastewater treatment. They are treatment solution units that can easily be moved from one location to another. All treatment components are prepared and assembled at our production plant to ensure optimum quality, quick and simple onsite installation with long durability and low maintenance. KODIAK unit includes two different sections; the BIONEST™ system (conventional septic tank followed by a bioreactor) and a mechanical room. Once units are in place, tanks need to be filled with clean water. Once inlet/outlet pipes are connected, treatment may begin.

Illustration 1 : KODIAK unit

1.1 Grease interceptor (if required)

If a large proportion of wastewater comes from food preparation, a grease interceptor must be installed between the kitchen sewage pipe and the KODIAK unit. The grease interceptor is a tank similar to a septic tank, but is not divided into sections. It is intended to receive wastewater coming from food preparation, to retain fats, oils and greases to the surface and allow the liquid on the bottom of the trap to flow into the advanced treatment system.

1.2 Primary treatment

The primary treatment consists in the removal of floating material and settling of heavier particles. This is carried out in the septic tank portion of the KODIAK unit. This step also plays a role in the advanced treatment process.

The septic tank is divided into 2/3 and 1/3 sections by a partition wall. This helps to separate the solids from the liquid in the first section, allowing the liquid to flow to the second section, which is equipped with an effluent filter. It is important that routine maintenance is carried out. It is the owners' responsibility to have the septic tank pumped out at frequencies established upon local regulation or on a recommendation from the Kodiak maintenance technician. Please note that the pumping of the septic tank must be performed by a specialised firm and the tank must be filled with clean water after pumping.

1.2.1 EFFLUENT FILTER

The septic tank is equipped with an effluent filter with openings of 1,6mm or less. The effluent filter must be cleaned every time the septic tank is inspected and pumped out. It is recommended that you inform the person emptying the septic tank about the presence of the effluent filter.

Illustration 2 : Effluent filter

1.3 ADVANCED TREATMENT SYSTEM

Primary effluent leaves the septic tank and flows to the second section of the KODIAK unit: The BIONEST^{MD} reactor wastewater is put in contact with microbiological cultures naturally fixed on a synthetic material. This synthetic material is our patented non-biodegradable media called «BIONEST^{TM} Media».

1.3.1 BIONEST™ BIOREACTOR

The BIONEST™ bioreactor is a tank similar to the septic tank divided into 2/3 and 1/3 sections. The first section is aerated with fine air bubble diffusers while the 1/3 section is non aerated to create a non turbulent environment where biosolids will be degraded and filtered out.

1.3.2 MÉDIA

The very low volume occupied by the media reduces the risk of unlikely blockage: less than 2% of the BIONEST™ bioreactors' volume is occupied by the media while it still offer a huge surface for bacteria development. The media is distributed evenly in the tank. A surface of 92,5m² of the media is used per cubic meter of wastewater. The texture of the BIONEST™ media, as developed after several years of research, provides strong adhesion and allows for faster growth of bacterial mass. The synthetic media is a non-biodegradable polymer and therefore, it does not deteriorate over time and does not need replacement.

Illustration 3 : Media

1.3.3 AERATION

Air is an essential element in any biological treatment system (BIONEST™, biofilter, sand filter, leaching field, etc.). Temperature and winds vary continuously during the year, thus varying performances of system using passive aeration. The BIONEST™ system provides consistent air quality and temperature year round, regardless of the season, allowing the performances of the system to be constant. Aeration in the first compartment of the bioreactor is made possible with air pumps and fine air bubble diffusers. The air comes from air pumps which are inside the mechanical room.

Illustration 4 : Fine air bubble diffuser

Illustration 5 : Air Pump

1.3.4 RECIRCULATION

Recirculation of treated water back to the reactor inlet ensures several contacts with bacteria enhancing the transformation of nitrogen. The KODIAK system reduces not only ammonia, but also nitrates. Treated wastewater recirculating continuously in the treatment chain is beneficial in the treatment of BOD, the reduction of coliforms and in the reduction of biosolids production. To prevent water cooling, the recirculation pipe is insulated.

1.3.5 SLUDGE REMOVAL APPARATUS

The BIONEST^{TM} Wastewater treatment system has been designed so that only the septic tank section requires periodic pump outs. Even though most biosolids generated in the BIONEST^{TM} reactor are degraded, some will accumulated with time in the last section (1/3). Biosolids removal in the reactor may be required after ± 2000 days of operation or based on a recommendation from a maintenance technician. A sludge removal apparatus has been integrated into the 1/3 section of the bioreactor to ensure easy sludge removal or in the event that toxic and/or prohibited products are released of in the residence's water facilities.

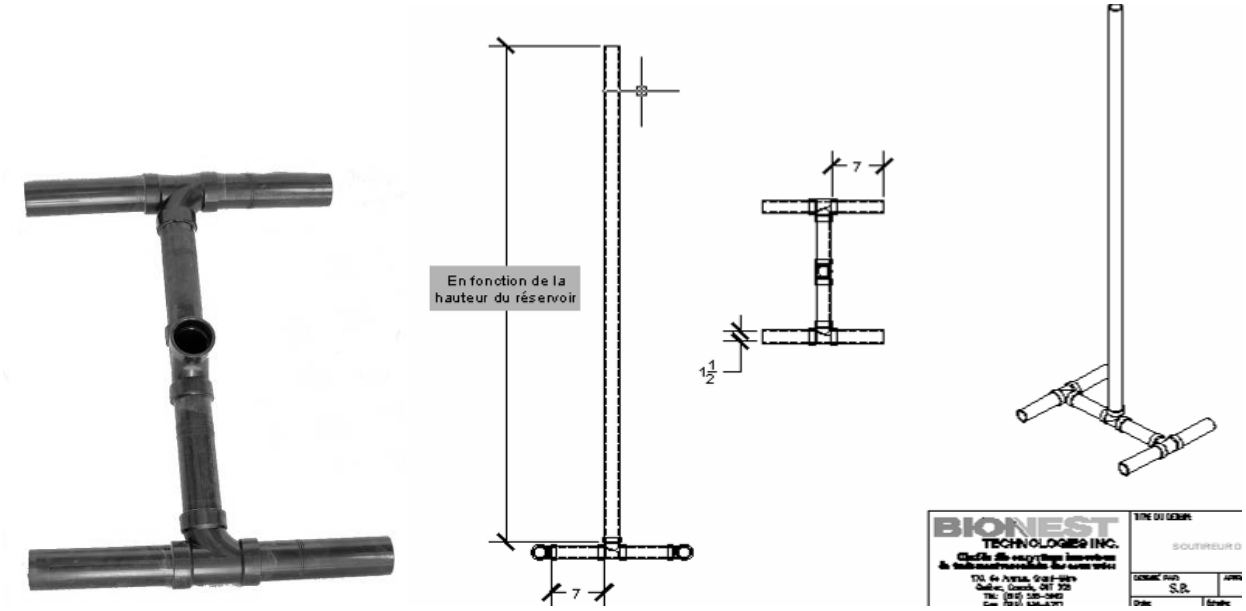


Illustration 6 : Sludge removal apparatus

1.4 TERTIARY TREATMENT

The expression «tertiary treatment » can mean different kinds of treatments depending on the local regulations, but always refers to the requirement for a higher treatment level. A tertiary treatment usually refers to the removal of either fecal coliforms, phosphorous or total nitrogen.

1.4.1 ULTRAVIOLET DISINFECTION

The ultraviolet rays can penetrate the cell core of the coliform bacteria and deactivate their reproductive capacity, thus, bringing on their death. This process however requires an environment where light can freely travel, which means as colourless as possible and free of suspended matter. As the BIONEST^{TM} system's effluent is very clear, the UV rays can freely travel within the treated waters and destroy bacteria and parasites as to reach a quality level superior to swimming regulations. The exceptional quality of a BIONEST^{TM} system's effluent also reduces dirt accumulation on the UV lamp, thus preserving the disinfection unit's effectiveness.

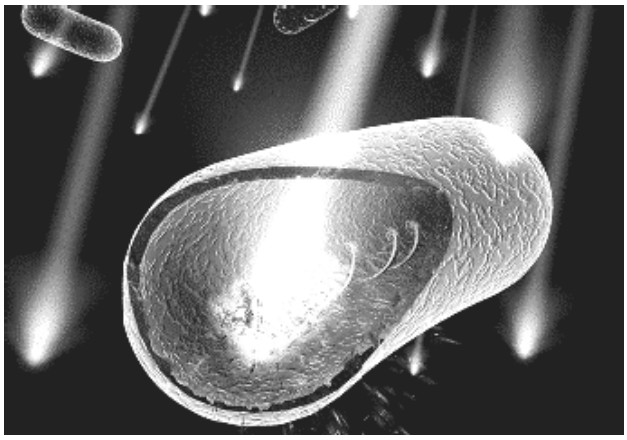
To maintain the effluent quality produced by this treatment unit, the UV lamp has to be inspected and cleaned after 6 months and replaced every year.

To get optimal disinfection results and to prevent an early fouling of the UV lamp, the influent of the UV treatment system should not exceed these concentrations;

- Total suspended solids : 15 mg/l
- Total iron : 0,3 mg/l
- Manganese : 0,05 mg/l
- Total hardess ($CaCO_3$) :120 mg/l

The ultraviolet treatment unit is located in the KODIAK's mechanical room. Its location allows for an easy sampling.

Illustration 7 : bacteria DNA damaged by ultraviolet ray



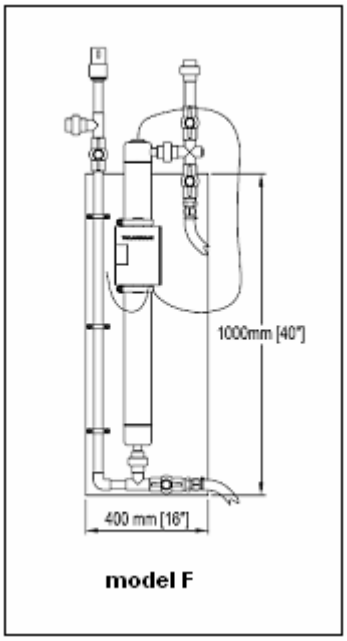


Illustration 8 : Disinfection units

1.5 Sampling

The KODIAK unit is designed so that a sample of the influent and the treated effluent can be easily taken. In order to do this, different sampling valves are installed in the mechanical room.

1.6 Alarms

To ensure your peace of mind, different alarms are installed in the KODIAK unit monitoring the key components. The Bionest module monitor the following components: recirculation pump, air pumps and effluent filter clogging sensor.

Illustration 9: BIOLARM™

An alarm is also built in the ultraviolet disinfection unit. This one is activated when the uv lamp is burned or when 375 days have elapsed since the replacement of lamp.

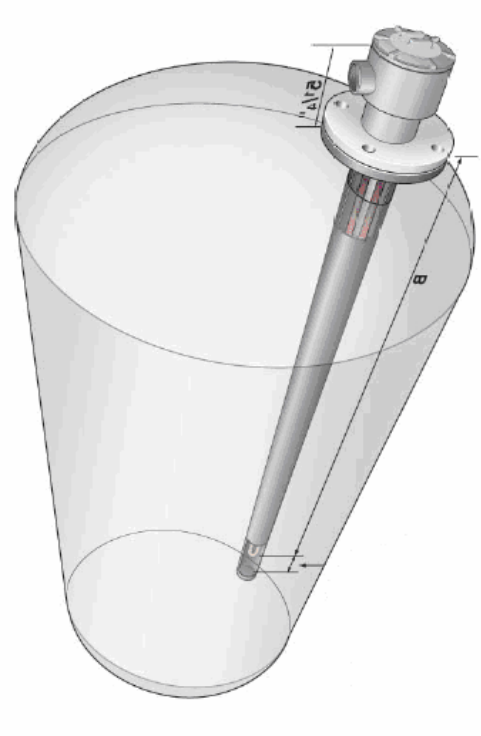
The BIOLARM^{TM} , the uv alarm and the different thermostats (mechanical room air temperature, effluent temperature) are located in the mechanical room, which is secured heated and ventilated. The alarm signals are connected to an exterior alarm (tank alert XT). A visual and audible signal is emitted by the tank alert XT when any alarms is activated.

Illustration 10 : Tank alert XT

1.6.1 TEMPERATURE ADJUSMENT DEVICE (OPTION)

In conditions where the influent wastewater may average a temperature less than 10°C, it is required to warm the water up to keep the bacteria population efficient. This is done by a heating element installed in the septic tank. To ensure a good control, a temperature probe is installed in the bioreactor section. Any temperature detected below 12ºC will activate the heating element.

Illustration 11 : Pipe insert heater (option)



To avoid freezing of stagnant water in the pipe, a ceiling fan heater is installed to maintain a warm temperature in the mechanical room.

Illustration 12 : Ceiling fan heater (option)

To prevent ice formation inside the ventilation system, a heat vent is installed on the container.

Illustration 14 : Artic vent (option)

1.7 FINAL DISCHARGE

The treated water is discharged into an outfall sewer designed by the consultant.

1.8 PERFORMANCES

BIONEST[MD] treatment system purifying capacity is exceptional. BIONEST[MD] system active area/ occupied volume rapport is impressive; presently one of the biggest on the market. For each cubic meter relative to the bioreactor, an active area of 92,5 square meter (92,5 m^2 of média/m^3) supply a sustainable habitat to the essential bacteria culture. High concentrations of biomass allow an effective reduction of the amount of toxic organic matter. Beside, water recirculation ensures an effective nitrogen release, preventing water table pollution by nitrates and ammonia.

Illustration 13: Table of official results to the BNQ test

BNQ test bench: Mission accomplished!	Advanced econdary (class III)			Tertiary (class V)
	BOD_5	TSS	Fecal coliforms	Fecal coliforms
	(mg/L)	(mg/L)	(UFC/100mL)	(UFC/100mL)
Quebec requirements	15	15	50000	200[a]
Average[1] after 12 months of certification (Annex A and B)[2]	3	3	4000	2[b]

Source : Sommaires analytiques complets et officiels des 52 semaines – BNQ Norme 3680-910/2000-06-16 M_1 (2004-0910)

[1] averages are calculated from the official results of Appendices A and B in accordance with the standard 3680-910/2000- 06-16 M_1 (2004-0910)
[2] explanations about data interpretations are found in the BNQ report
[a] after photoreactivation
[b] before photoreactivation

Design

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1.0 DESIGN MANUAL

DESIGN AND CALCULATION

CAM-D Simpson Lake Site (30 workers)
80 km west of Kugaaruk, Nunavut

Presented to: Mr. François Bourassa
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July 20th, 2009

1.0 Project description

This design booklet sizes a KODIAK system for the wastewater treatment of the CAM-D Simpson Lake site, where 30 workers will stay for a period of 3 months for three consecutive years.

The type of sewage to treat is considered of domestic strength. The treated water will be discharged into an outfall sewer designed by the consultant.

The design flow rate has been evaluated to 6,000 liters by day. A 20 feet KODIAK WWTP will be installed on the decontamination site, located 80 km west of Kugaaruk, Nunavut.

2.0 Design Criteria

The BIONEST™ system is an advanced generation of onsite wastewater treatment systems. It combines all the advantages of a natural, simple yet robust process and brings that peace of mind that a permanent system can offer. The BIONEST™ system consists of two reactors installed in series.

The first tank's primary role is a digestion/settling reservoir equipped with an effluent filter. The second tank, the bioreactor, is split in two compartments (2/3 – 1/3). The biological BIONEST™ media. The biomass is mostly fixed to a ribbon type media (polymer). The second compartment of the bioreactor is not aerated, but the oxygen level is still adequate, thus ensuring treatment completion.

The BIONEST™ Wastewater Treatment System has successfully obtained NSF Standard 40, Class 1 and BNQ certifications.

3.0 Design Flow rate

Wastewater design flow and organic load:

- Design flow rate: 6 000 L/d
    - 30 workers x 200 L/person.day[1] = 6 000 L/d
- Organic load: the BIONEST™ system initially treats wastewater in a two-compartement septic tank equipped with a conventional effluent filter. The septic tank is followed by a two-compartment BIONEST™ reactor. System is intended to treat domestic-like wastewater. Table below represents typical concentration of domestic sewage as presented in the USEPA Onsite Wastewater Treatment Systems Manual (tables 3-7 from pages 3-11; 2002; http://www.epa.gov/owm/septic/pubs/septic_2002_osdm_all.pdf).

Table 1: Constituent mass loadings and concentrations in typical residential wastewater

Constituent	Concentration (mg/L)
Total solids (TS)	500-880
Volatile solids	280-375
Total suspended solids (TSS)	155-330
Volatile suspended solids	110-265
5-day biochemical oxygen demand (BOD_5)	155-286
Chemical oxygen demand (COD)	500-660
Total nitrogen (TN)	26-75
Ammonia (NH_4)	4-13
Nitrites and nitrates (NO_2-N; NO_3-N)	< 1
Total phosphorous (TP)	6-12
Fats, oils and grease	70-105
Volatile organic compounds (VOC)	0.1-0.3
Surfactants	9-18
Total coliforms (TC)[d]	10^8 - 10^{10} MPN/100 mL
Fecal coliforms (FC)[d]	10^6 - 10^8 MPN/100 mL

- Temperature: < 12°C

1 As provided by Mr. François Bourassa, P. Eng. and based on «Sewerage system standard practice manual » issued by the Ministry of Health Services of British Columbia and published at http://www.bcossa.com/images/Sewage_System_Standard_Practice.pdf for "construction camps with flush toilets (189 l/worker/d).

4.0 Equipment sizing

4.1 Grease interceptor

A properly sized in-ground grease interceptor offering a minimum effective volume of 4 500 L is required in order to reduce the fats, oils and greases (FOG) concentrations to domestic levels. Table 3-7 from the USEPA Onsite Wastewater Treatment Systems Manual (table 3-7 from pages 3-11; 2002; http://www.epa.gov/owm/septic/pubs/septic_2002_osdm_all.pdf) presents typical concentrations of different constituents found in domestic sewage. FOG normally ranges between 70-105 mg/L leaving a house and its concentration falls around 20-25 mg/L in the septic tank's effluent (USEPA Onsite Wastewater Treatment and Disposal Systems, 1980, page 99; http://www.epa.gov/owm/septic/pubs/septic_1980_osdm_all.pdf). Therefore, the grease interceptor shall be designed by the consultant and operated by the owner to find a concentration of 20-25 mg/L at the inlet of the BIONEST™ bioreactor. The grease interceptor is an inexpensive, but yet a very important equipment to assure proper functioning of the treatment chain.

It shall be equipped with at least one Polylok PL-625 effluent filter (0.8 mm [1/32''] openings). Only kitchen sewage can be sent to the grease interceptor. The grease interceptor shall be designed in accordance with the following study on restaurant pre-treatment from the TOWTRC or

equivalent:http://www.towtrc.state.tx.us/common/FOG%20report%20reduced%20with%20reduced%20appx.pdf (page 5). Its main function is to offer enough detention time to allow the effluent to cool off and cause dissolved oils and greases to float.

4.2 KODIAK Unit

4.2.1 Septic tank

The septic tank will have an effective volume of 9 000 L. The working volume of the septic tank is separated at its 2/3 – 1/3 interface and offers a retention time of 1.5 days.

The tank will be equipped with a Polylok PL-525 effluent filter (1.6 mm [1/16"] openings)

Effluent leaving the septic tank is considered having a BOD of around 200 mg/L.

4.2.2 BIONEST™ Bioreactor

The Bioreactor shall offer a detention time of 1.5 days at design flow. Therefore, a tank with a working capacity of 9 000L is provided.

The density of the BIONEST™ media in the bioreactor shall be 92,5 m^2/m^3 (effective liquid volume). The media will be evenly distributed in the tank for a total of 1 620 m^2 of media for the entire system.

Permanent aeration of the first compartment of the bioreactor is assured by linear diffusers. Therefore, 10 diffusers connected to 5 small diaphragm air pumps (model HP-80 from Hiblow or equivalent) will be installed. Each air diffuser will provide 35 L/min, for a total of 350 L/min.

The effluent from the bioreactor is recirculated back into the aerated section of the bioreactor at a rate of 2.5 times the daily flow. One recirculation pump will recirculate the effluent at a flow rate of 10.4 L/min.

To maintain wastewater temperature above 12°C, two (2) pipe insert heaters (5 kW) are installed in the 1/3 section of the septic tank.

4.2.3 UV disinfection

An ultraviolet disinfection unit is required to disinfect the effluent prior to surface discharge. The following table is used to select the model and number of units required.

Table 2: TrojanUVmax's maximum instantaneous flow rate per model.

Model UVMAX	Max flow
« D »	6,8 L/min
« E »	16 L/min
« F »	27 L/min

A maximum hourly peak factor (HPF) of 6 at the end of the bioreactor is assumed. (http://www.mddep.gouv.qc.ca/eau/eaux-usees/domestique/chapitre2.htm#2-1). Therefore, the maximum instantaneous flow rate will be:

$$Q_{daily} = \frac{Q_{daily}}{24hrs * 60\,\text{min}} = \frac{6000L}{24hrs * 60\,\text{min}} = 4.16L/\text{min}$$

$$Q_{inst} = Q_{daily} * HPF = 4.16L/\text{min} * 6 = 25.0L/\text{min}$$

One (1) UVmax model F unit disinfecting at a rate of 27 L/min will be required. The unit shall be installed inside the mechanical room to facilitate access and maintenance.

5.0 Effluent criteria

The proposed design will meet the following values.

Parameters	Concentrations
$CBOD_{5,C}$[1]	<15 mg/L
TSS[2]	<15 mg/L
Faecal coliforms	<200 CFU[3]/100 ml

[1] Carbonaceous biochemical oxygen demand (5 days)
[2] Total suspended solids
[3] Colony forming unit

4 Maintenance of the KODIAK unit

Bionest provides an operation manual of the KODIAK unit to the owner and a copy for the Nunavut water. The operation manual details the requirements related to the Kodiak unit and the BIONEST™ treatment system.

Plans

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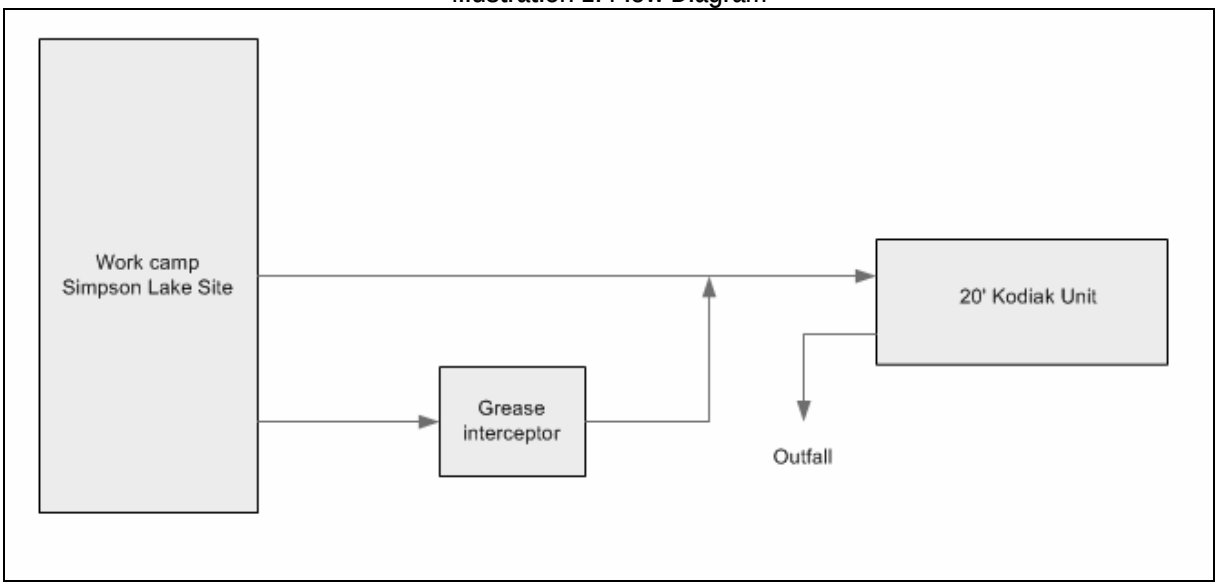
1 FLOW DIAGRAM

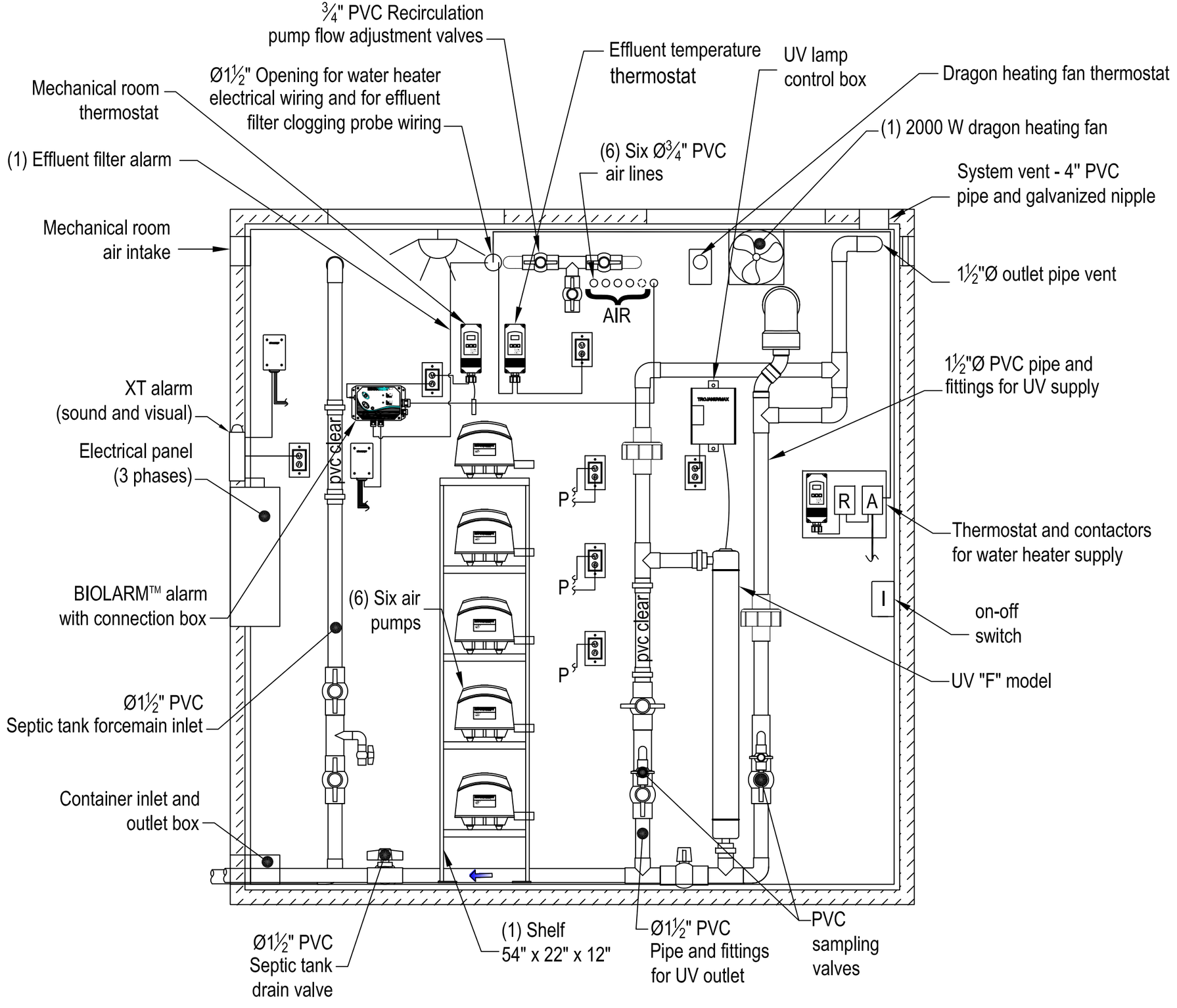
Here is the flow diagram of the treatment system.

Illustration 1: Flow Diagram



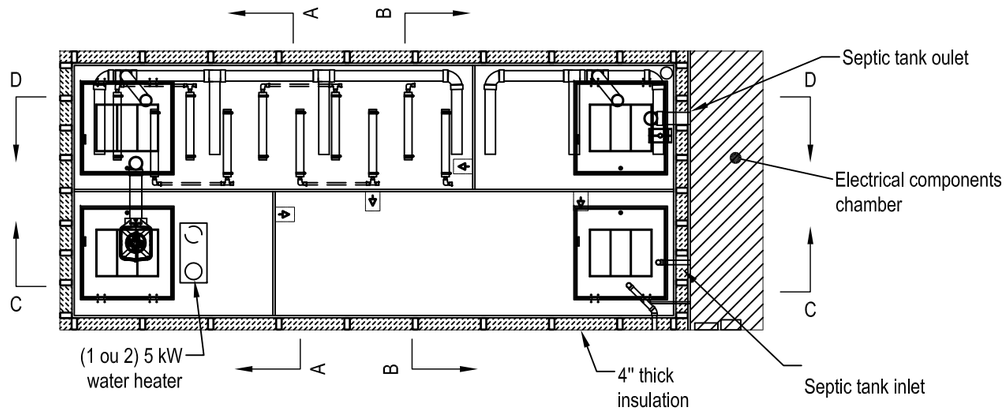
2 WORKSHOP DRAWING

Here are the drawings of the 20 feet KODIAK unit.

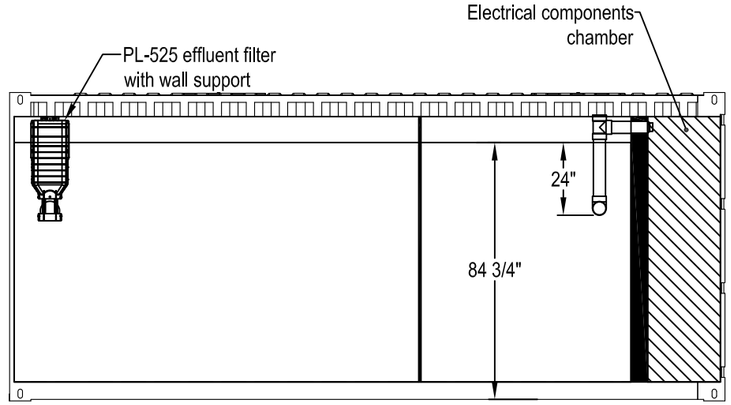


BIONEST
KODIAK
55, 12th Street, Grand-Mère
Québec, Canada, G9T 5L4
Tel.: (819) 538-5662
Fax: (819) 538-5707
www.bionest.ca

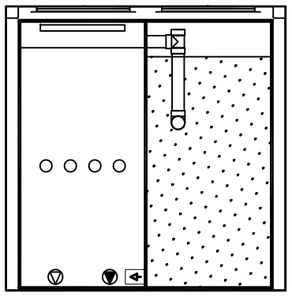
PROJECT: CAM-D Simpson Lake Kudlik Construction Ltd.		
DRAWING TITLE: MECHANICAL ROOM		
# PROJECT: NU-P09-1010	APPROVED BY: Serge Baillargeon	
DRAWING NAME: NU-P09-1010_04_V2		
DRAWN BY: Frédéric Allaire	DATE: 04/06/2009	VERSION: 1
REVIEWED BY: Audrey Moisan	DATE: 17/07/2009	VERSION: 2
SCALE: NTS	FORMAT: A3-L	SHEET: 1/3



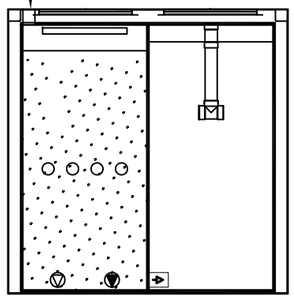
PLAN VIEW



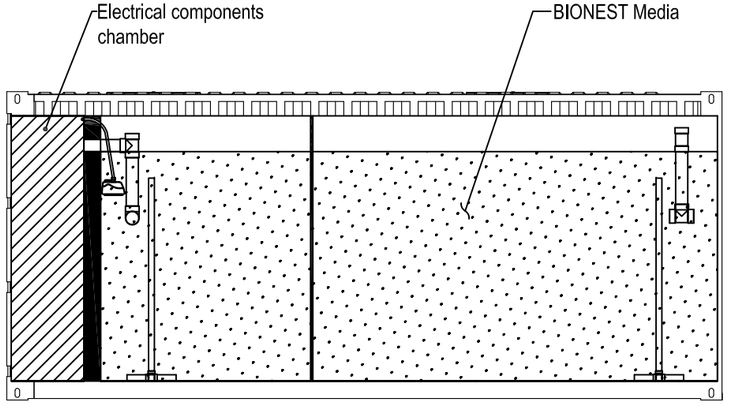
SEPTIC TANK
ELEVATION VIEW
SECTION C-C



SIDE VIEW
SECTION A-A



SIDE VIEW
SECTION B-B

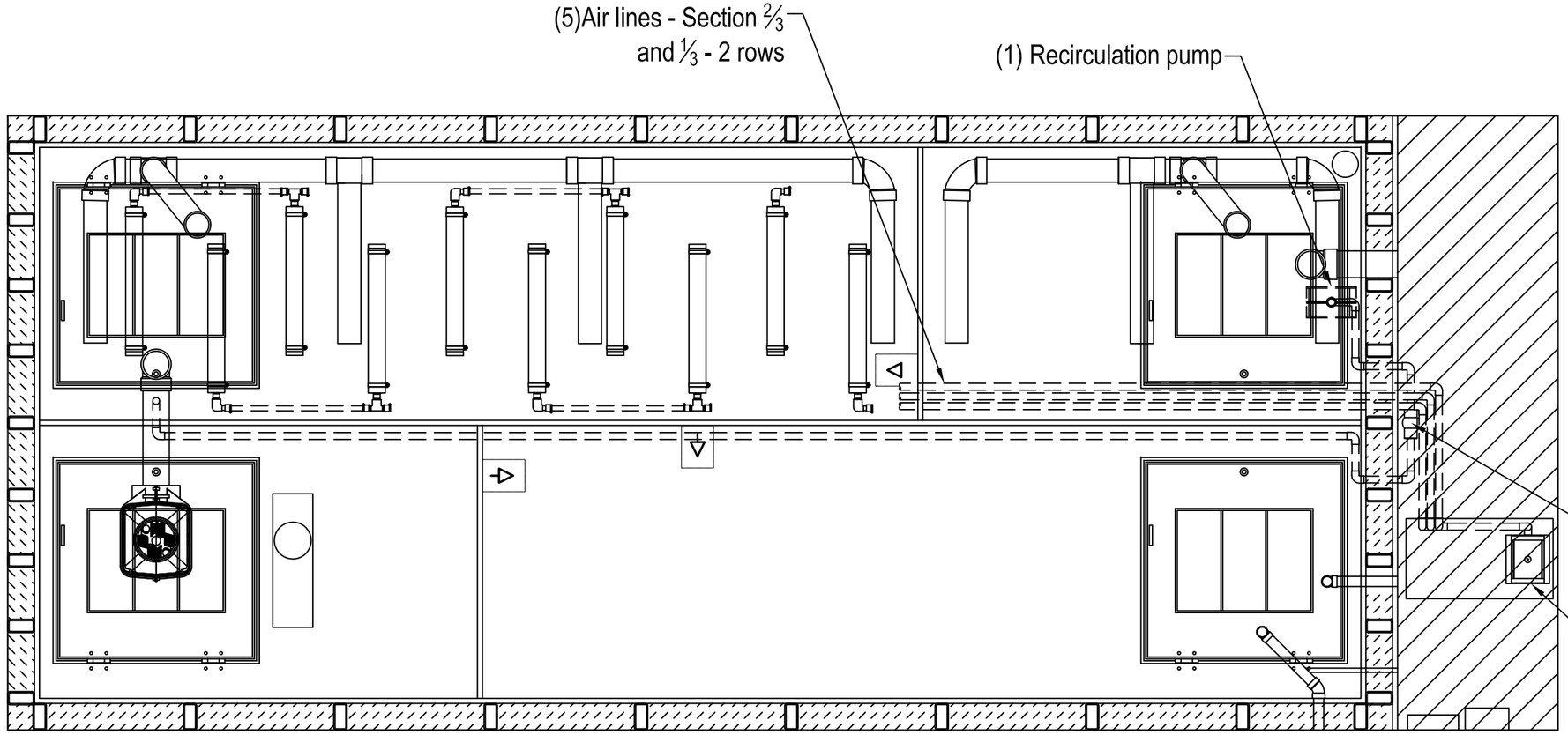


BIONEST REACTOR
ELEVATION VIEW
SECTION D-D

BIONEST KODIAK
55, 12th Street, Grand-Mère
Québec, Canada, G9T 5L4
Tel.: (819) 538-5662
Fax: (819) 538-5707
www.bionest.ca

PROJECT: CAM-D Simpson Lake Kudlik Construction Ltd.		
DRAWING TITLE: Kodiak unit Section and plan view		
# PROJECT: NU-P09-1010	APPROVED BY: Serge Baillargeon	
DRAWING NAME: NU-P09-1010_04_V2		
DRAWN BY: Frédéric Allaire	DATE: 04/06/2009	VERSION: 1
REVIEWED BY: Cynthia Dion -B.	DATE: 10/09/2009	VERSION: 2
SCALE: 1:50	FORMAT: A3-L	SHEET: 2/3

Location: Z:_Ingénierie_PROJETS_PROJECTS_KODIAK_Canada_Territoire du Nunavut_NU-P09-1010-KOD-KUDLIK - SITE DE DÉCONTAMINATION_2.CONNU-P09-1010_04_V2.dwg



BIONEST
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PROJECT:
CAM-D Simpson Lake
Kudlik Construction Ltd.

DRAWING TITLE:
Kodiak unit
Treatment components

# PROJECT:	APPROVED BY:
NU-P09-1010	Serge Baillargeon

DRAWING NAME:
NU-P09-1010_04_V2

DRAWN BY:	DATE:	VERSION:
Frédéric Allaire	04/06/2009	1
REVIEWED BY:	DATE:	VERSION:
Cynthia Dion -B.	10/09/2009	2
SCALE:	FORMAT:	SHEET:
NTS	A3-L	3/3

SUMMARY OF WARRANTY

In order for the warranty to stay valid, the customer must immediately notify Bionest Kodiak of any apparent abnormality, irregularity, or malfunction of the KODIAK unit. Neglecting to inform Bionest Kodiak within a reasonable timeframe can result in the cancellation of the warranty. Bionest Kodiak is committed to responding to and to taking appropriate measures to correct the situation, as long as the system is used properly.

Table1 : Summary of Warranty

Warranty	Warranty period
Binest Kodiak warranties all BIONEST™ KODIAK system parts and components	For TWO (2) years
Bionest Kodiak warranties its media will not deteriorate	For TWENTY (20) years following the purchase date

Warnings

TABLE OF CONTENTS

1.0 SAFETY INFORMATION

To ensure the best performance of your KODIAK wastewater treatment system unit,

DO NOT use or discard any of the following products into the sinks, toilets, or other water facilities in your building:

- Caustic products used to unclog pipes such as: Liquid Plumr®, Liquid Drano®, etc.
- Paint, solvent, petroleum based products, etc.
- Pesticides
- Backwash effluents of a water softening system
- Large quantities of household cleaning products
- Oil and grease (engine, cooking, etc.)
- Septic tank treatment products
- All non-biodegradable objects (cigarette butts, sanitary napkins/products, etc.)

Please respect manufacturers' recommended usage for domestic cleaning products and avoid all antibacterial products. Do not use automatic toilet cleaners. Do not use a waste disposal unit in the sink (e.g. In-Sink-Erator).

Do not connect drain pipes or gutters to the septic installation.

Do not modify the configuration of the treatment system installation.

2.0 WARNINGS

The discharge of any of the aforementioned products into the system may destroy the bacterial culture responsible for treating the wastewater and therefore cause the system to be non-operational.

Always disconnect the power supply cord before servicing any unit. Failure to do so may result in electrical shock causing serious bodily injury or death.

If contact with wastewater occurs, please remove any contaminated clothing and thoroughly wash all body areas and clothing exposed to wastewater with soap and water. To minimize any risk of illness, consult a physician.

Please ensure that the KODIAK unit has been filled with water before starting the system. Water filling has to be done on the reactor side. On the opposite, drainage must be done on the septic tank side. Serious problem can result from the non respect of this procedure.

The use of your system when the air pump is not in function can result in serious consequences (e.g. cancellation of your warranty).

For intermittent use and extended non-use periods please refer to section 4.0 of this manual. Always advise Bionest Kodiak before shutting down your system.

In the event the septic tank has not been serviced for sludge removal within the timelines required by local regulations, or if there is abnormal sludge accumulation noticed in the effluent filter when sludge is being removed, please contact Bionest Kodiak.

3.0 SERVICING THE KODIAK UNIT

KODIAK systems operate automatically and require no individual/specific intervention. When the system is functioning properly, no odours should be present. If odours do occur, make sure the air pump is functioning normally. If not, please call Bionest Kodiak.

➔ DO NOT attempt to service any of the KODIAK system components yourself.

4.0 INTERMITTENT USE AND EXTENDED NON-USE PERIODS

Even if wastewater does not enter the BIONEST™ system for an extended period of time, the system will function properly. The power should be left on during short periods of non-use when there is no water flow to the system (intermittent use).

If the property is going to be used seasonally (i.e. summer use only and closed for winter) and if the system is not in use for periods extending over 6 consecutive weeks, please refere to the shut down procedure (Maintenance manual).

5.0 CONFINED SPACE

Please note that KODIAK's different tanks (septic tank and bioreactor) are considered to be confined space and are hazardous to your health.

➔ DO NOT ENTER ANY TANK OR MANHOLE AT ANY TIME.

Please refer to the following document for more information:
http://www.labour.gov.on.ca/english/hs/pdf/confined.pdf.

Components

TABLE OF CONTENTS

1 Recirculation Pump

The recirculation pump is a Jebao model WPG 550. All information pertaining to this pump is available in the appendix.

2 Effluent Filter

The effluent filter used is a Polylok, model PL-525. All information pertaining to the effluent filter is available in the appendix.

3 Pipe insert Heater

The water heater used is a ASB Heating elements model SPHK (5 kW). All information pertaining to the pipe insert heater is available in the appendix.

4 Ceiling fan heater

The ceiling fan heater used is a Stelpro Dragon model DRI0321W. All information pertaining to the ceiling fan heater is available in the appendix.

5 Thermostat

The thermostat chosen is a RANCO model ETC-211000-000. All information pertaining to the thermostat is available in the appendix.

6 Diffuser

The diffusers used are Sunmines model 550. All information pertaining to the diffusers is available in the appendix.

7 Air Pump

The air pump chosen is a Hiblow model HP-80. All information pertaining to the air pump is available in the appendix.

8 UV Lamp

The UV lamp chosen is a Trojan UV max model F. All information pertaining to the UV lamp is available in the appendix.

9 Alarm

All information pertaining to the alarms are available in the appendix. The alarms used are:

- Bionest BIOLARM™
- Tank alert XT from SJE Rhombus

沃易泵业

WATEREASY PUMPS

Pond - Fountain Pumps—>Pond Pumps —>WPG Type

Specifications

Model	Flow Rate	Max. Head	Voltage/Frequency	Power	Approvals
WPG-160	600L/h(160g/h)	110cm(3.6ft)	220-240V/50Hz 120V/60Hz	8w	UL/CUL/GS/SAA/CE
WPG-200	750L/h(200g/h)	160cm(5.2ft)		12w	
WPG-275	1000L/h(275g/h)	190cm(8.5ft)		16w	
WPG-400	1500L/h(400g/h)	250cm(8.2ft)		25w	
WPG-550	2000L/h(550g/h)	320cm(10.5ft)		45w	
WPG-900	3500L/h(900g/h)	400cm(8.5ft)		60w	UL/CUL/GS/CE
WPG-1000	4000L/h(1000g/h)	300cm(10ft)		70w	UL/CUL/GS/SAA/CE
WPG-1500	5500L/h(1500g/h)	420cm(13.2ft)		99w	UL/CUL/GS/CE
WPG-1600	6000L/h(1600g/h)	550cm(18ft)		190w	UL/CUL/GS/SAA/CE
WPG-2000	8000L/h(2000g/h)	470cm(15.8ft)		190w	

Interest in Products

Name : *

Tel : *

Fax :

Email : *

Text :

Interest

BIONEST
Incorporé à l'environnement MD

Préfiltres Polylok

PL-525

SPÉCIFICATIONS

- Capacité de 37 860 litres (8 350 gal. imp.) par jour
- Bille d'obstruction automatique pour entretien
- Déflecteur de gaz
- Compatible avec les conduites de 75 mm et 100 mm (3" et 4") de cédule CPV 40
- Alarme de colmatage optionnelle
- Poignée pour entretien

RÉV : 07/05/2008-6

Préfiltres Polylok PL-525

Applications

Le préfiltre PL-525 convient aux projets BIONEST[MD] commerciaux, institutionnels et communautaires.

Description :

Le préfiltre PL-525 est une composante installée à l'intérieur d'une fosse septique sur la conduite de sortie. Son rôle est de retenir les particules solides plus grosses que ses orifices de filtration. Ceci permet de protéger le système de traitement en aval contre un colmatage prématuré.

Le PL-525 possède des orifices de filtration de 1,6 mm (1/16") et peut traiter un volume d'eau de 37 860 litres (8 350 gal. imp.) par jour.

Le préfiltre Polylok PL-525 est muni d'une bille d'obstruction automatique laquelle, lorsque l'on retire la cartouche du préfiltre pendant l'entretien, bloque l'orifice de sortie de la fosse septique empêchant ainsi les particules solides en suspension dans l'eau de quitter la fosse septique.

Certification

Le préfiltre Polylok de modèle PL-525 est certifié à la norme NSF/ANSI 46.

Bionest
55, 12e Rue, C.P. 697, Grand-Mère, QC
Canada G9T 5L4
Téléphone : 819 538-5662
Télécopieur : 819 538-5707
Courriel : info@bionest.ca
www.bionest.ca

ASB Heating Elements Ltd.

Pipe Insert Heater

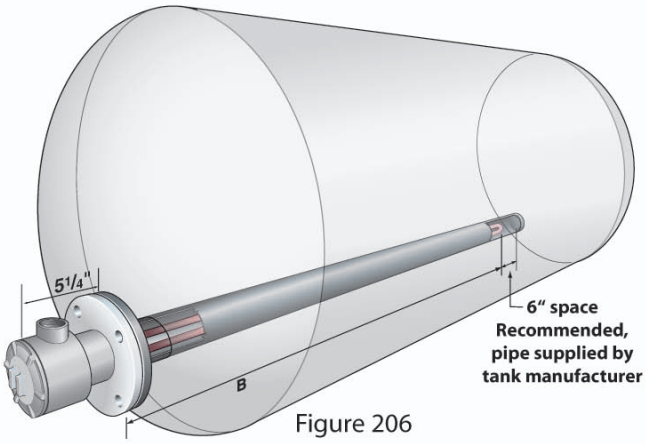


Figure 206

Pipe Insert Heaters offer you the advantages of direct immersion heat, and the ability to service the heater without draining the tank. The Incoloy sheathed element inside the pipe is carefully deigned for this application, and transfers its heat to the inside pipe wall by convection and radiation. The large surface area of the pipe in contact with your liquid greatly reduces the watt density (watts/in^2), making the pipe insert heaters ideally suited for heating:

- very viscous materials like Bunker C Fuel Oil,
- temperature sensitive materials like glucose, liquid sugar
- bulk storage of corrosive material

Pipe inside the tank supplied by the tank manufacturer

Low Liquid Protection

To prevent Low Liquid failure, one of multiple heaters should have a built-in thermocouple, series PFHK, and this heater must be mounted slightly higher than other heaters in the tank. When a Low Liquid event happens the air temperature inside the pipe rises dramatically and the thermocouple sends the temperature signal to your remote mounted high limit control for shutdown.

3" 150 psi flange mounting

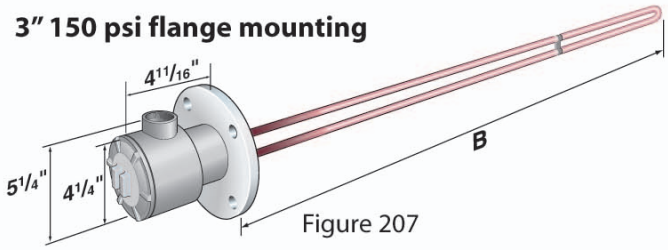


Figure 207

2" NPT screw plug mounting

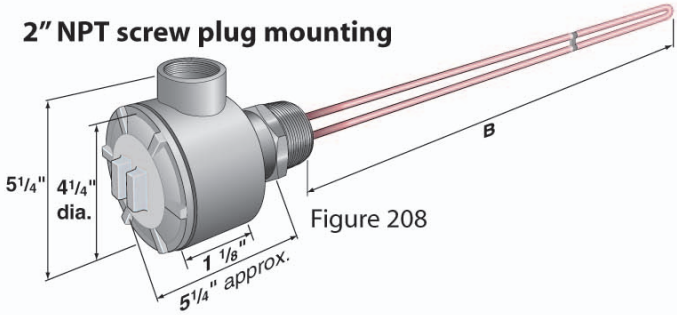


Figure 208

Typically to heat:

Incoloy element(s) — asphalt, tar, starch, glucose, sugar,
Up to 600 volts — large storage tanks, corrosive liquid

(specifiy voltage when ordering)

1 element 1phase

kw	(B) insert length (ft) into pipe	catalogue number Fig. 207 standard	Fig. 207 with "K" thermocouple	net weight (lb)
1	2 1/2	PFH-1001MR	PFHK-1001MR	15
2	4 1/2	PFH-1002MR	PFHK-1002MR	17
3	6 1/2	PFH-1003MR	PFHK-1003MR	19
4	8 1/2	PFH-1004MR	PFHK-1004MR	21
5	10 1/2	PFH-1005MR	PFHK-1005MR	23
6	12 1/2	PFH-1006MR	PFHK-1006MR	25
7	14 1/2	PFH-1007MR	PFHK-1007MR	27
8	16 1/2	PFH-1008MR	PFHK-1008MR	29
9	18 1/2	PFH-1009MR	PFHK-1009MR	31
10	20 1/2	PFH-1010MR	PFHK-1010MR	33
11	22 1/2	PFH-1011MR	PFHK-1011MR	35
12	24 1/2	PFH-1012MR	PFHK-1012MR	37
13	26 1/2	PFH-1013MR	PFHK-1013MR	39

3 elements (specify 1 or 3 phase)

kw	(B) insert length (ft) into pipe	catalogue number Fig. 207 standard	Fig. 207 with "K" thermocouple	net weight (lb)
2.0	2 1/2	PFH-3002MR	PFHK-3002MR	16
3.5	4 1/2	PFH-3003MR	PFHK-3003MR	18
5.0	6 1/2	PFH-3005MR	PFHK-3005MR	20
7.5	8 1/2	PFH-3007MR	PFHK-3007MR	22
9.5	10 1/2	PFH-3009MR	PFHK-3009MR	25
11	12 1/2	PFH-3011MR	PFHK-3011MR	27
13	14 1/2	PFH-3013MR	PFHK-3013MR	29
15	16 1/2	PFH-3015MR	PFHK-3015MR	31
17	18 1/2	PFH-3017MR	PFHK-3017MR	33
19	20 1/2	PFH-3019MR	PFHK-3019MR	35
21	22 1/2	PFH-3021MR	PFHK-3021MR	37
23	24 1/2	PFH-3023MR	PFHK-3023MR	39
25	26 1/2	PFH-3025MR	PFHK-3025MR	41

1 element 1phase

kw	(B) insert length (ft) into pipe	catalogue number Fig. 208 standard	Fig. 208 with "K" thermocouple	net weight (lb)
1	2 1/2	SPH-1001MR	SPHK-1001MR	8
2	4 1/2	SPH-1002MR	SPHK-1002MR	10
3	6 1/2	SPH-1003MR	SPHK-1003MR	12
4	8 1/2	SPH-1004MR	SPHK-1004MR	14
5	10 1/2	SPH-1005MR	SPHK-1005MR	16
6	11 1/2	SPH-1006MR	SPHK-1006MR	18

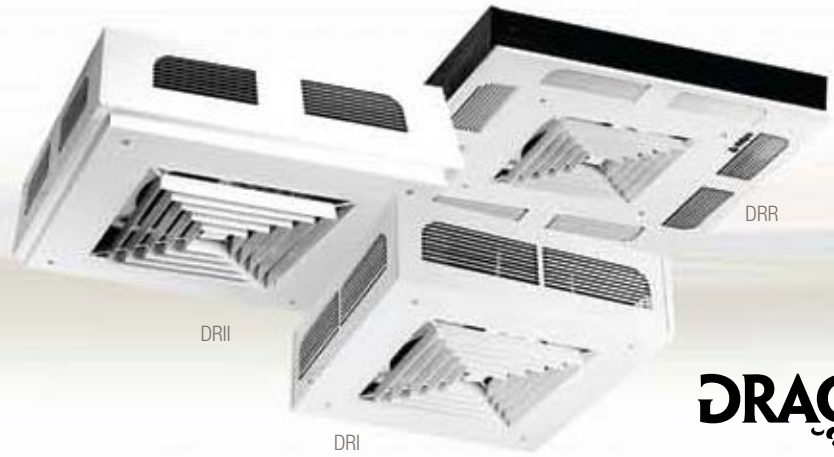
2 elements 1 phase

kw	(B) insert length (ft) into pipe	catalogue number Fig. 208 standard	Fig. 208 with "K" thermocouple	net weight (lb)
1.5	2 1/2	SPH-2001MR	SPHK-2001MR	9
3.0	4 1/2	SPH-2003MR	SPHK-2003MR	11
4.0	6 1/2	SPH-2004MR	SPHK-2004MR	13
6.0	8 1/2	SPH-2006MR	SPHK-2006MR	15
7.5	10 1/2	SPH-2007MR	SPHK-2007MR	17
8.5	11 1/2	SPH-2008MR	SPHK-2008MR	19

A must-have heating unit

This innovative electrical heater has been designed specifically for a ceiling installation. As a result, it is sheltered from potential mishandling and abusive treatment and will remain aesthetically pleasing for years to come. With its state-of-the-art design and energy-efficient performance, this heater recycles residual warm air accumulated at the ceiling and redirects it towards the floor. Our three different models with their distinctive heating capacities ensure quick heating.

Note that the 250 cfm models are extremely quiet!



DRAGON

{features}

color	white (W) or almond (A)
finish	epoxy-polyester powdercoat
manufacturing	· 20-gauge steel cabinet · quiet helicoidal fan · thermal protection with automatic reset · totally enclosed, permanently lubricated motor
wattage & voltage	see the selection table
element	nichrome element producing instant heat
control	· fan-only mode for continuous air circulation, controlled by built-in selection switch · heating-mode, confirmed by pilot light when in function · wall-mounted switch for fan-only mode [OFS] (available upon request only)
installation	· ceiling recessed in a T-bar (DRR model) · ceiling surface-mounted with bracket to support unit during wiring (DRI & DRII models) (included) · minimum distance from adjacent walls : - 12 in. (DRR or DRI models) - 24 in. (DRII models) · mounting heights : - 8 ft (2 or 3 kW units) - 10 ft (4 or 5 kW units) - 12 ft (7.5 or 10 kW units)
warranty	· 10 years (element) · 1 year (unit)

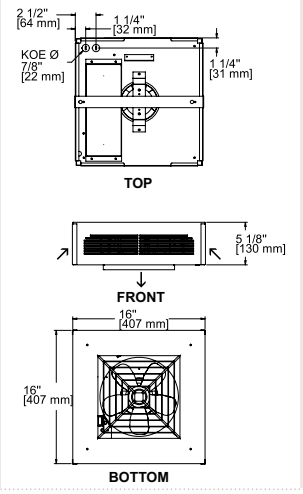
{accessories}

code	description
DRT1	built-in tamper-proof single pole thermostat (DRR, DRI or DRII models)
DRTBA1*	T-bar adapter (DRI or DRII models)

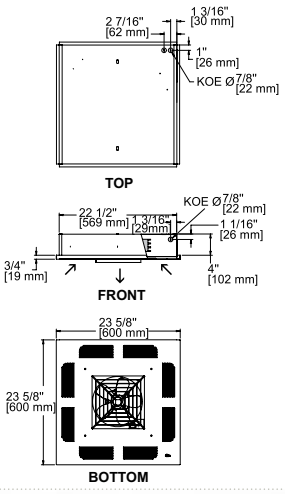
***** add **W** for white or **A** for almond

{technical drawings}

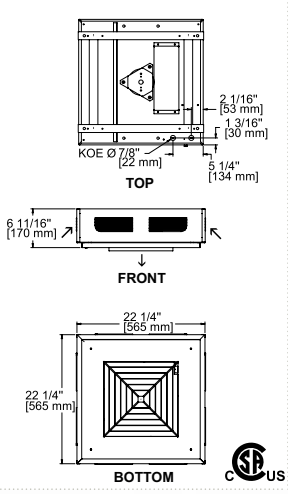
DRI model



DRR model



DRI model



heating from the ceiling — *increase comfort, safety and security*

fan — *250 cfm models are extremely quiet!*

pages 82 to 87 — *wall thermostats & accessories*

{selection table}

(DRI/DRR)

without control	built-in thermostat	240 V contactor	contactor & built-in th.	24 V control					
code	**code**	**code**	**code**	**code**	**watts**	**volts**	**cfm**	**kg**	**lb**
DRI0281	**DRI0281T**	---	---	**DRI0281C24**	2000	208	250	7.2	16
DRI0221	**DRI0221T**	---	---	**DRI0221C24**	2000	240	250	7.2	16
DRI0381	**DRI0381T**	---	---	**DRI0381C24**	3000	208	250	7.2	16
DRI0321	**DRI0321T**	---	---	**DRI0321C24**	3000	240	250	7.2	16
DRI0481	**DRI0481T**	---	---	**DRI0481C24**	4000	208	450	7.2	16
DRI0421	**DRI0421T**	---	---	**DRI0421C24**	4000	240	450	7.2	16
---	**DRI0581T**	---	---	**DRI0581C24**	5000	208	450	7.2	16
DRI0521	**DRI0521T**	---	---	**DRI0521C24**	5000	240	450	7.2	16
DRR0281	**DRR0281T**	**DRR0281C**	---	**DRR0281C24**	2000	208	250	7.2	16
---	---	**DRR0283C***	**DRR0283CT***	**DRR0283C24***	2000	208	250	7.2	16
DRR0221	**DRR0221T**	**DRR0221C**	---	**DRR0221C24**	2000	240	250	7.2	16
---	---	**DRR0271C**	**DRR0271CT**	**DRR0271C24**	2000	277	250	7.2	16
---	---	**DRR0231C**	**DRR0231CT**	**DRR0231C24**	2000	347	250	7.2	16
---	---	**DRR0251C**	**DRR0251CT**	**DRR0251C24**	2000	480	250	7.2	16
---	---	**DRR0253C***	**DRR0253CT***	**DRR0253C24***	2000	480	250	7.2	16
---	---	**DRR0261C**	**DRR0261CT**	**DRR0261C24**	2000	600	250	7.2	16
---	---	**DRR0263C***	**DRR0263CT***	**DRR0263C24***	2000	600	250	7.2	16
DRR0381	**DRR0381T**	**DRR0381C**	---	**DRR0381C24**	3000	208	250	7.2	16
---	---	**DRR0383C***	**DRR0383CT***	**DRR0383C24***	3000	208	250	7.2	16
DRR0321	**DRR0321T**	**DRR0321C**	---	**DRR0321C24**	3000	240	250	7.2	16
---	---	**DRR0371C**	**DRR0371CT**	**DRR0371C24**	3000	277	250	7.2	16
---	---	**DRR0331C**	**DRR0331CT**	**DRR0331C24**	3000	347	250	7.2	16
---	---	**DRR0351C**	**DRR0351CT**	**DRR0351C24**	3000	480	250	7.2	16
---	---	**DRR0353C***	**DRR0353CT***	**DRR0353C24***	3000	480	250	7.2	16
---	---	**DRR0361C**	**DRR0361CT**	**DRR0361C24**	3000	600	250	7.2	16
---	---	**DRR0363C***	**DRR0363CT***	**DRR0363C24***	3000	600	250	7.2	16
DRR0481	**DRR0481T**	**DRR0481C**	---	**DRR0481C24**	4000	208	450	7.2	16
---	---	**DRR0483C***	**DRR0483CT***	**DRR0483C24***	4000	208	450	7.2	16
DRR0421	**DRR0421T**	**DRR0421C**	---	**DRR0421C24**	4000	240	450	7.2	16
---	---	**DRR0471C**	**DRR0471CT**	**DRR0471C24**	4000	277	450	7.2	16
---	---	**DRR0431C**	**DRR0431CT**	**DRR0431C24**	4000	347	450	7.2	16
---	---	**DRR0451C**	**DRR0451CT**	**DRR0451C24**	4000	480	450	7.2	16
---	---	**DRR0453C***	**DRR0453CT***	**DRR0453C24***	4000	480	450	7.2	16
---	---	**DRR0461C**	**DRR0461CT**	**DRR0461C24**	4000	600	450	7.2	16
---	---	**DRR0463C***	**DRR0463CT***	**DRR0463C24***	4000	600	450	7.2	16
---	**DRR0581T**	**DRR0581C**	---	**DRR0581C24**	5000	208	450	7.2	16
---	---	**DRR0583C***	**DRR0583CT***	**DRR0583C24***	5000	208	450	7.2	16
DRR0521	**DRR0521T**	**DRR0521C**	---	**DRR0521C24**	5000	240	450	7.2	16
---	---	**DRR0571C**	**DRR0571CT**	**DRR0571C24**	5000	277	450	7.2	16
---	---	**DRR0531C**	**DRR0531CT**	**DRR0531C24**	5000	347	450	7.2	16
---	---	**DRR0551C**	**DRR0551CT**	**DRR0551C24**	5000	480	450	7.2	16
---	---	**DRR0553C***	**DRR0553CT***	**DRR0553C24***	5000	480	450	7.2	16
---	---	**DRR0561C**	**DRR0561CT**	**DRR0561C24**	5000	600	450	7.2	16
---	---	**DRR0563C***	**DRR0563CT***	**DRR0563C24***	5000	600	450	7.2	16

add **W** for white or **A** pour almond.
* three-phase unit
--- not available

(DRII)

built-in thermostat	240 V contactor	contactor & built-in th.	24 V control					
code	**code**	**code**	**code**	**watts**	**volts**	**cfm**	**kg**	**lb**
DRII0281T	**DRII0281C**	---	**DRII0281C24**	2000	208	450	20.4	45
---	**DRII0283C***	**DRII0283CT***	**DRII0283C24***	2000	208	450	20.4	45
DRII0221T	**DRII0221C**	---	**DRII0221C24**	2000	240	450	20.4	45
---	**DRII0271C**	**DRII0271CT**	**DRII0271C24**	2000	277	450	20.4	45
---	**DRII0231C**	**DRII0231CT**	**DRII0231C24**	2000	347	450	20.4	45
---	**DRII0251C**	**DRII0251CT**	**DRII0251C24**	2000	480	450	20.4	45
---	**DRII0253C***	**DRII0253CT***	**DRII0253C24***	2000	480	450	20.4	45
---	**DRII0261C**	**DRII0261CT**	**DRII0261C24**	2000	600	450	20.4	45
---	**DRII0263C***	**DRII0263CT***	**DRII0263C24***	2000	600	450	20.4	45
DRII0381T	**DRII0381C**	---	**DRII0381C24**	3000	208	450	20.4	45
---	**DRII0383C***	**DRII0383CT***	**DRII0383C24***	3000	208	450	20.4	45
DRII0321T	**DRII0321C**	---	**DRII0321C24**	3000	240	450	20.4	45
---	**DRII0371C**	**DRII0371CT**	**DRII0371C24**	3000	277	450	20.4	45
---	**DRII0331C**	**DRII0331CT**	**DRII0331C24**	3000	347	450	20.4	45
---	**DRII0351C**	**DRII0351CT**	**DRII0351C24**	3000	480	450	20.4	45
---	**DRII0353C***	**DRII0353CT***	**DRII0353C24***	3000	480	450	20.4	45
---	**DRII0361C**	**DRII0361CT**	**DRII0361C24**	3000	600	450	20.4	45
---	**DRII0363C***	**DRII0363CT***	**DRII0363C24***	3000	600	450	20.4	45
DRII0481T	**DRII0481C**	---	**DRII0481C24**	4000	208	450	20.4	45
---	**DRII0483C***	**DRII0483CT***	**DRII0483C24***	4000	208	450	20.4	45
DRII0421T	**DRII0421C**	---	**DRII0421C24**	4000	240	450	20.4	45
---	**DRII0471C**	**DRII0471CT**	**DRII0471C24**	4000	277	450	20.4	45
---	**DRII0431C**	**DRII0431CT**	**DRII0431C24**	4000	347	450	20.4	45
---	**DRII0451C**	**DRII0451CT**	**DRII0451C24**	4000	480	450	20.4	45
---	**DRII0453C***	**DRII0453CT***	**DRII0453C24***	4000	480	450	20.4	45
---	**DRII0461C**	**DRII0461CT**	**DRII0461C24**	4000	600	450	20.4	45
---	**DRII0463C***	**DRII0463CT***	**DRII0463C24***	4000	600	450	20.4	45
DRII0581T	**DRII0581C**	---	**DRII0581C24**	5000	208	450	20.4	45
---	**DRII0583C***	**DRII0583CT***	**DRII0583C24***	5000	208	450	20.4	45
DRII0521T	**DRII0521C**	---	**DRII0521C24**	5000	240	450	20.4	45
---	**DRII0571C**	**DRII0571CT**	**DRII0571C24**	5000	277	450	20.4	45
---	**DRII0531C**	**DRII0531CT**	**DRII0531C24**	5000	347	450	20.4	45
---	**DRII0551C**	**DRII0551CT**	**DRII0551C24**	5000	480	450	20.4	45
---	**DRII0553C***	**DRII0553CT***	**DRII0553C24***	5000	480	450	20.4	45
---	**DRII0561C**	**DRII0561CT**	**DRII0561C24**	5000	600	450	20.4	45
---	**DRII0563C***	**DRII0563CT***	**DRII0563C24***	5000	600	450	20.4	45
---	**DRII0781C**	**DRII0781CT**	**DRII0781C24**	7500	208	700	20.4	45
---	**DRII0783C***	**DRII0783CT***	**DRII0783C24***	7500	208	700	20.4	45
---	**DRII0721C**	**DRII0721CT**	**DRII0721C24**	7500	240	700	20.4	45
---	**DRII0771C**	**DRII0771CT**	**DRII0771C24**	7500	277	700	20.4	45
---	**DRII0731C**	**DRII0731CT**	**DRII0731C24**	7500	347	700	20.4	45
---	**DRII0751C**	**DRII0751CT**	**DRII0751C24**	7500	480	700	20.4	45
---	**DRII0753C***	**DRII0753CT***	**DRII0753C24***	7500	480	700	20.4	45
---	**DRII0761C**	**DRII0761CT**	**DRII0761C24**	7500	600	700	20.4	45
---	**DRII0763C***	**DRII0763CT***	**DRII0763C24***	7500	600	700	20.4	45
---	**DRII1081C**	**DRII1081CT**	**DRII1081C24**	10000	208	700	20.4	45
---	**DRII1083C***	**DRII1083CT***	**DRII1083C24***	10000	208	700	20.4	45
---	**DRII1021C**	**DRII1021CT**	**DRII1021C24**	10000	240	700	20.4	45
---	**DRII1071C**	**DRII1071CT**	**DRII1071C24**	10000	277	700	20.4	45
---	**DRII1031C**	**DRII1031CT**	**DRII1031C24**	10000	347	700	20.4	45
---	**DRII1051C**	**DRII1051CT**	**DRII1051C24**	10000	480	700	20.4	45
---	**DRII1053C***	**DRII1053CT***	**DRII1053C24***	10000	480	700	20.4	45
---	**DRII1061C**	**DRII1061CT**	**DRII1061C24**	10000	600	700	20.4	45
---	**DRII1063C***	**DRII1063CT***	**DRII1063C24***	10000	600	700	20.4	45

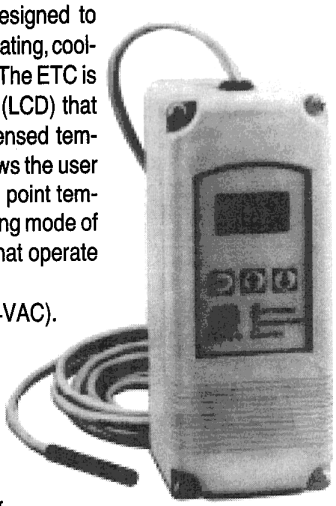
add **W** for white or **A** pour almond.
* three-phase unit
--- not available

Form No. 7515004-001 Rev. B

ETC TWO STAGE ELECTRONIC TEMPERATURE CONTROL

PRODUCT DESCRIPTION

The Ranco ETC is a microprocessor-based family of electronic temperature controls, designed to provide on/off control for commercial heating, cooling, air conditioning and refrigeration. The ETC is equipped with a liquid crystal display (LCD) that provides a constant readout of the sensed temperature, and a touch keypad that allows the user to easily and accurately select the set point temperature, differential and heating/cooling mode of the operation. Models are available that operate on either line voltage (120/208/240 VAC) or low voltage (24VAC).



APPLICATIONS

With its wide temperature setpoint range and selectable heating or cooling modes, the ETC can be used for a wide variety of applications including multiple compressor control, two stage heating, ventilation control, automatic changeover, condenser fan cycling, space and return air temperature control, water cooled condensers and control with alarm funtion.

FEATURES

- Wide setpoint temperature range (-30°F to 220°F) and differential adjustment (1°F to 30°F).
- Simple keypad programming of setpoint temperature, differential and cooling/heating modes.
- Two individually programmable stages for heating and/or cooling.
- LCD readout of sensor temperature, control settings, relay status and onboard diagnostics.
- Remote temperature sensing up to 400 feet.
- Two SPDT output relays.
- User-selectable Fahrenheit/Celsius scales.
- Lockout switch to prevent tampering by unauthorized personnel.
- Choice of line voltage and low voltage models available.
- Optional 0 to 10 volt analog output available for remote temperature indication.

SPECIFICATIONS

Input Voltage	120 or 208/240 VAC (24 VAC optional), 50/60 Hz
Temperature Range	-30°F to 220°F
Differential Range	1°F to 30°F
Switch Action	SPDT
Sensor	Thermistor, 1.94 in. long x 0.25 in. diameter with 8 ft. cable
Power Consumption	120/208/240 VAC : 100 milliamps 24 VAC : 2-6 VAC

Relay Electrical Ratings

	120V	208/240V
NO Contact		
Full-load amps	9.8 A	4.9 A
Locked rotor amps	58.8 A	29.4 A
Resistive amps	9.8 A	4.9 A
Horsepower	1/2 hp	1/2 hp
NC Contact		
Full-load amps	5.8 A	2.9 A
Locked rotor amps	34.8 A	17.4 A
Resistive amps	5.8 A	2.9 A
Horsepower	1/4 hp	1/4 hp

Pilot Duty: 125 VA at 120/208/240 VAC

Control Ambient Temperature	
Operating	-20°F to 140°F (-29°C to 60°C)
Storage	-40°F to 176°F (-40°C to 80°C)
Ambient Humidity	0 to 95%, RH, Non-condensing
0 to 10 V Output Impedance	1K
Enclosure	NEMA 1, Plastic
Agency Approvals	UL Listed, File E94419, Guide XAPX CSA Certified, File LR68340, Class 4813 02

ETC ORDERING INFORMATION

Code Number	Input Voltage	No. of Stages	0 - 10 V Output
ETC-211000-000	120/240	2	No
ETC-211100-000	120/240	2	Yes
ETC-212000-000	24	2	No
ETC-212100-000	24	2	Yes

OPERATION

Liquid Crystal Display (LCD)

The LCD display provides a constant readout of the sensor temperature and indicates if either of the two output relays is energized. When the **S1** annunciator is constantly illuminated during operation, the Stage 1 relay is energized. Likewise, when the **S2** annunciator is constantly illuminated during operation, the Stage 2 relay is energized. The display is also used in conjunction with the keypad to allow the user to adjust the setpoint temperatures, differentials and heating/cooling modes for each stage.

Control Setup

The temperature setpoint refers to the temperature at which the normally open (NO) contacts of the output relay will open. Determine the loads to be controlled and the operating modes required for each stage, cooling or heating.

- When the cooling mode is chosen, the differential is above the setpoint. The relay will de-energize as the temperature falls to the setpoint.
- When the heating mode is chosen, the differential is below the setpoint. The relay will de-energize as the temperature rises to the setpoint.

The ETC two stage control can be set up for two stages of heating, two stages of cooling or one stage cooling plus one stage heating. Refer to Figures 1, 2 and 3 for a visual representations of different control setups.

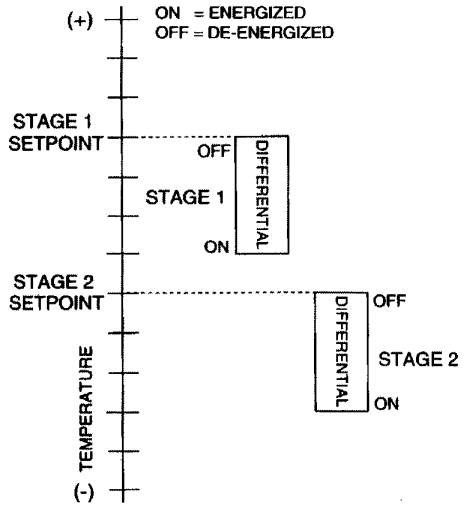


Figure 1: Two Stage Heating Example

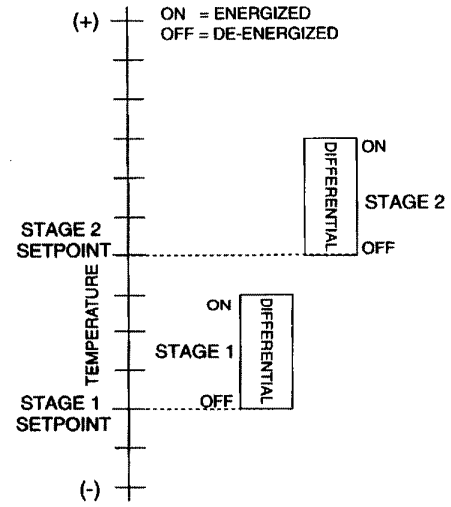


Figure 2: Two Stage Cooling Example

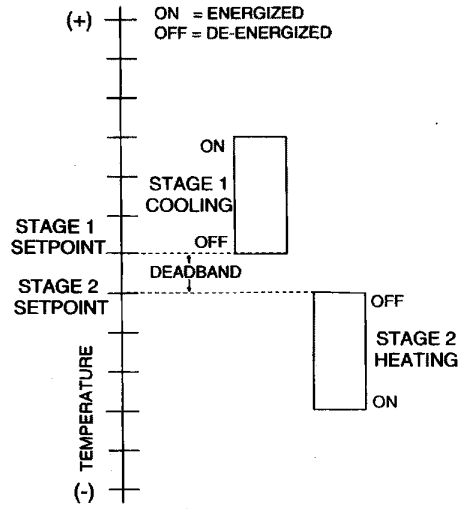


Figure 3: One Stage Cooling and One Stage Heating Example

Programming Steps and Display

The ETC two stage can be programmed in seven simple steps using the LCD display and the three keys on the face of the control.

Step 1- To start programming, press the **SET** key once to access the Fahrenheit/Celsius mode. The display will show the current status, either **F** for degrees Fahrenheit or **C** for degrees Celsius. Then press either the up ⬆ or down ⬇ arrow key to toggle between the **F** or **C** designation.

Stage 1

Step 2- Press the **SET** key again to access the stage 1 setpoint. The LCD will display the current setpoint and the **S1** annunciator will be blinking on and off to indicate that the control is in the setpoint mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the setpoint to the desired temperature.

Step 3- Press the **SET** key again to access the stage 1 differential. The LCD will display the current differential and the **DIF 1** annunciator will be blinking on and off to indicate that the control is in the differential mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the differential to the desired setting.

Step 4- Press the **SET** key again to access the stage 1 cooling or heating mode. The LCD will display the current mode, either **C1** for cooling or **H1** for heating. Then press either the up ⬆ or down ⬇ key to toggle between the **C1** or **H1** designation.

Stage 2

Step 5- Press the **SET** key again to access the stage 2 setpoint. The LCD will display the current setpoint and the **S2** annunciator will be blinking on and off to indicate that the control is in the setpoint mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the setpoint to the desired temperature.

Step 6- Press the **SET** key again to access the stage 2 differential. The LCD will display the current differential and the **DIF 2** annunciator will be blinking on and off to indicate that the control is in the differential mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the differential to the desired setting.

Step 7- Press the **SET** key again to access the stage 2 cooling or heating mode. The LCD will display the current mode, either **C2** for cooling or **H2** for heating. Then press either the up ⬆ or down ⬇ key to toggle between the **C2** or **H2** designation. Press the **SET** key once more and programming is complete.

Refer to Page 3 for an illustrated guide to programming the ETC.

NOTE: The ETC will automatically end programming if no keys are depressed for a period of thirty seconds. Any settings that have been input to the control will be accepted at that point.

All control settings are retained in non-volatile memory if power to ETC is interrupted for any reason. Re-programming is not necessary after power outages or disconnects unless different control settings are required.

Step	Annunciator	Description	Display
1	**F** or **C**	Fahrenheit or Celsius Scale	F
2	**S1** (blinking)	Stage 1 Setpoint Temperature	S1 70
3	**DIF 1** (blinking)	Stage 1 Differential Temperature	DIF 5
4	**C1/H1**	Stage 1 Cooling or Heating Mode	C1
5	**S2** (blinking)	Stage 2 Setpoint Temperature	S2 65
6	**DIF 2** (blinking)	Stage 2 Differential Temperature	DIF2 10
7	**C2/H2**	Stage 2 Cooling or Heating Mode	C2

TROUBLESHOOTING ERROR MESSAGES

Display Messages

E1- Appears when either the up ⬆ or down ⬇ key is pressed when not in the programming mode.
To correct: If the **E1** message appears even when no keys are being pressed, replace the control.

E2- Appears if the control settings are not properly stored in memory.
To correct: Check all settings and correct if necessary.

EP- Appears when the probe is open, shorted or sensing a temperature that is out of range.
To correct: Check to see if the sensed temperature is out of range. If not, check for probe damage by comparing it to a known ambient temperature between -30°F and 220°F. Replace the probe if necessary.

EE- Appears if the EEPROM data has been corrupted.
To correct: This condition cannot be field repaired. Replace the control.

CL- Appears if calibration mode has been entered.
To correct: Remove power to the control for at least five seconds. Reapply power. If the **CL** message still appears, replace the control.

Lockout Switch

The ETC is provided with a lockout switch to prevent tampering by unauthorized personnel. When placed in the **LOCK** position, the keypad is disabled and no changes to the settings can be made. When placed in the **UNLOCK** position, the keypad will function normally.

To access the lockout switch, disconnect the power supply and open the control. The switch is located on the inside cover about 2 inches above the bottom. (see Figure 4). To disable the keypad, slide the switch to the left **LOCK** position. To enable the keypad, slide the switch to the right **UNLOCK** position. All ETC controls are shipped with this switch in the **UNLOCK** position.

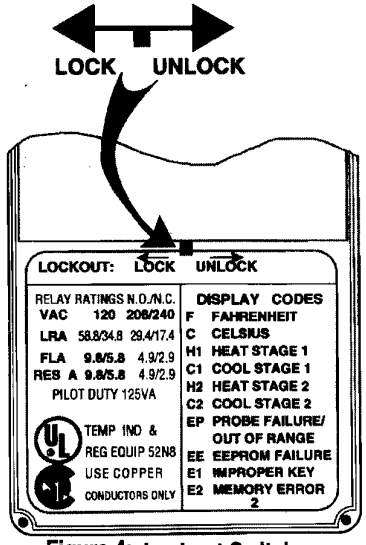


Figure 4: Lockout Switch

INSTALLATION INSTRUCTIONS

IMPORTANT

1. All ETC series controls are designed as operating controls only. If an operating control failure could result in personal injury or loss of property, a separate safety control and/or alarm should be installed.

2. The schematic drawings and other information included in these installation instructions are for the purpose of illustration and general reference only.

3. These instructions do not expand, reduce, modify or alter the Ranco Terms in any way; and no warranty or remedy in favor of the customer or any other person arises out of these instructions.

4. Ranco ETC controls have been approved by Underwriters' Laboratories as UL Listed; however, approval does not extend to their use for any other purpose. Ranco assumes no responsibility for any unconventional application of its control unless such application has been approved in writing by Ranco.

5. It is the responsibility of the installer and the user to assure that his or its application and use of all Ranco products are in compliance with all federal, state and local requirements, including, without any limitation, all requirements imposed under the National Electric Code and any applicable building codes.

CAUTION

To prevent possible electrical shock or equipment damage, disconnect electrical power to the unit before and during installation. **DO NOT** restore electrical power to unit until the control is properly installed and the cover is assembled. **DO NOT** locate the control in an explosive atmosphere as a safety hazard can result due to possible spark generation in the control. Controls are not to be located in areas of significant moisture, dirt or dust, or in a corrosive explosive atmosphere. Use of control in such environments may result in injury or damage to the persons or property (or both) and are likely to shorten the control life;
Ranco assumes no responsibility for any such use.

CONTROL MOUNTING

Mount the ETC to a wall or any flat surface using a combination of any two or more of the slotted holes located on the back of the control case. The control's components are not position sensitive, but should be mounted so that they can be easily wired and adjusted. Avoid excessive conditions of moisture, dirt, dust and corrosive atmosphere.

The ETC has provisions for 1/2 inch conduit connections. The conduit hub should be secured to the conduit before securing the hub to the plastic housing of the control. When using the conduit entry in the rear of the case, a standard plug should be inserted into the conduit hole in the bottom. Caution should be exercised not to damage the control circuit board or wiring when installing a conduit connector.

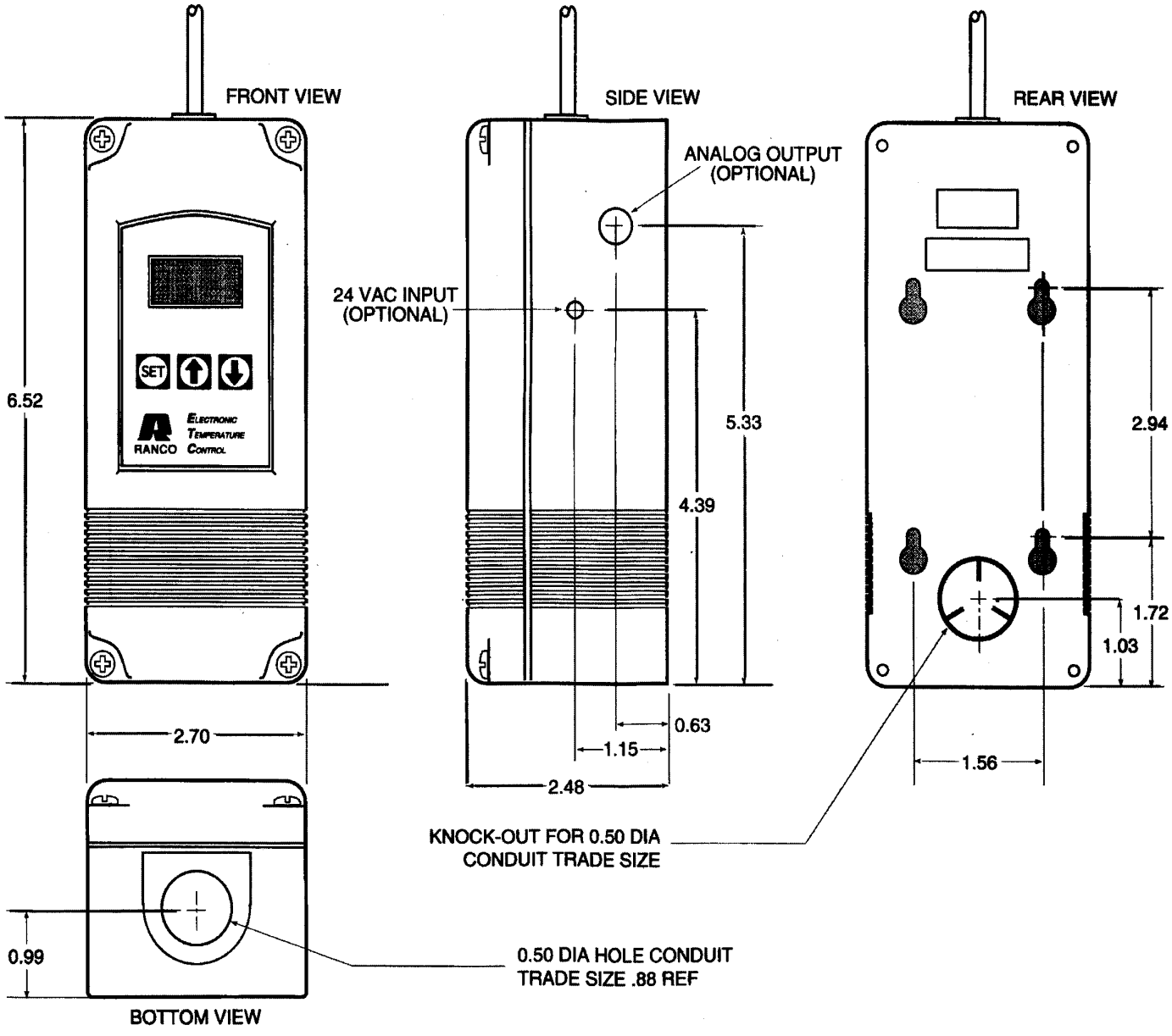


Figure 5: Dimensions (Inches)

CONTROL WIRING

General

- All wiring should conform to the National Electric Code and local regulations.
- The total electrical load must not exceed the maximum rating of the control (see Specifications).
- Use copper conductors only.
- Electrical leads should not be taut; allow slack for temperature change and vibration.

Input and Output Wiring

For typical wiring diagrams, refer to Figures 6 and 7.
All connections are made to the power (lower) circuit board. When using the 24 VAC powered models, the 24 VAC input lines must enter through the sidewall of the case. Refer to Figure 5 for location of the entry hole.

Analog Output

ETC models are available with an optional 0 to 10 volt analog output. This signal is a linear representation of the sensor temperature with 0 volts = -30°F and 10 volts = 220°F. See figure 8 for wiring information and Figure 5 for location of the entry hole. The reference for this output is designated by the "-" symbol on the wiring diagram. The output signal is designated by the "+" symbol.

Sensor Wiring

The temperature sensor leads are soldered to the circuit board so no additional connections are necessary. However, splicing is required when extending the sensor cable length beyond the standard 8 foot length supplied with the ETC. The sensor cable can be extended up to 400 feet.

A damaged sensor can be replaced by splicing a new Ranco sensor onto the sensor leads from the circuit board. The sensor is not polarity sensitive.

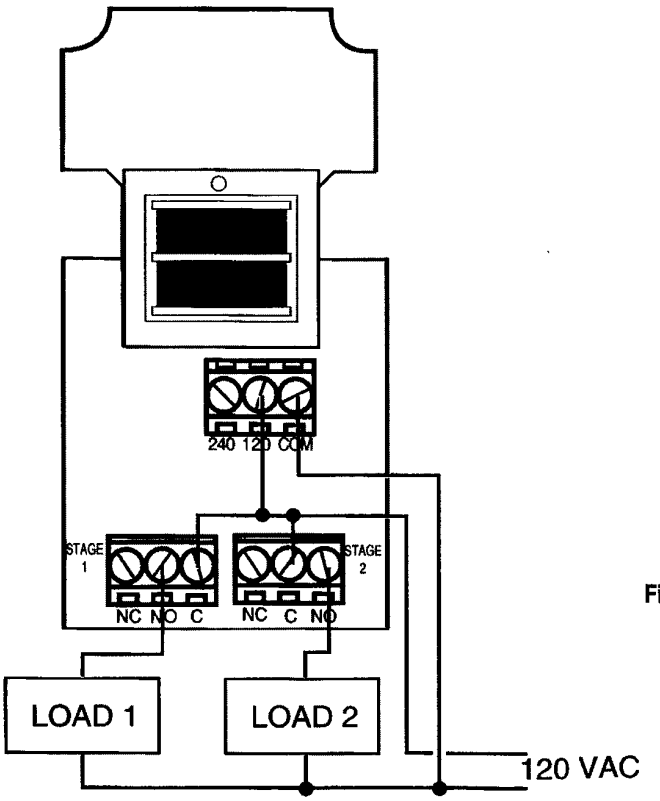


Figure 6: Typical Line Voltage Wiring Diagram.

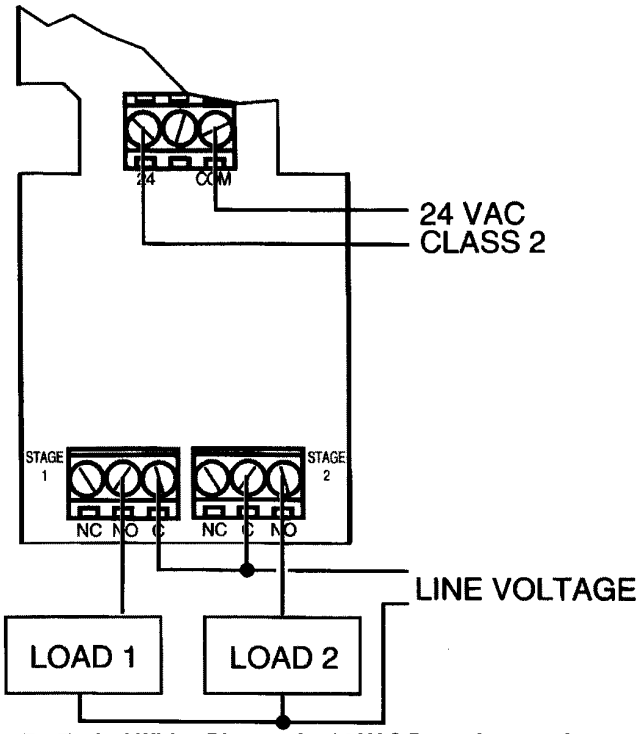


Figure 7: Typical Wiring Diagram for 24 VAC Power Input and Line Voltage Switching.

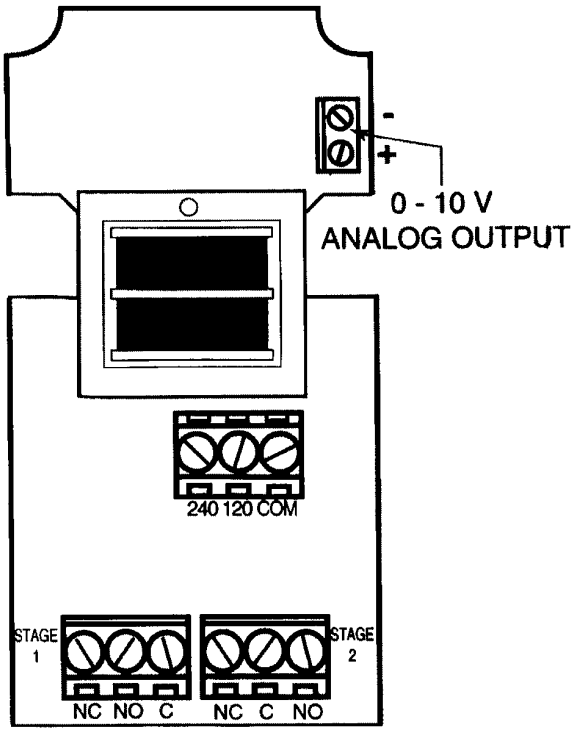


Figure 8: 0-10 V Analog Output Located on Power (Lower) Circuit Board.

FIELD REPAIRS

Field calibrating or repairs to the ETC control must not be attempted. Sensors and replacement controls are available through Ranco wholesalers

SENSOR MOUNTING

For space sensing, mount the sensor where it will be unaffected by heat/cool discharge or radiated heat sources. Spot sensing requires the sensor to be in good contact with the surface being sensed. The sensor can be inserted in a bulb well for immersion sensing.

EXTENDING SENSOR

CAUTION: Sensor wiring splices may be made external from the control. **DO NOT** attempt tyo unsolder the sensor at the control circuit board!

CAUTION: Disconnect power to control before wiring to avoid possible electrical shock or damage to the controller.

Additional cable can be spliced to the sensor cable to increase the length beyond the standard 8 feet. It can be extended up to 400 feet. The cable should be at least 22 AWG or larger to keep additional resistance to a minimum.

All splices and wire lengths added to the sensor cable should be made according to acceptable wiring practices and should conform to the National Electrical Code and local regulations. Use copper conductors only. Shielded cable is not required.

Checkout Procedure

1. Before applying power, make sure installation and wiring connections are correct.
2. Apply power to the control and observe one or more cycles of operation.
3. If performance indicates a problem, check sensor resistance to determine if sensor or control is at fault.
4. To check sensor resistance, disconnect sensor and measure the resistance across the leads while measuring temperature at the sensor.

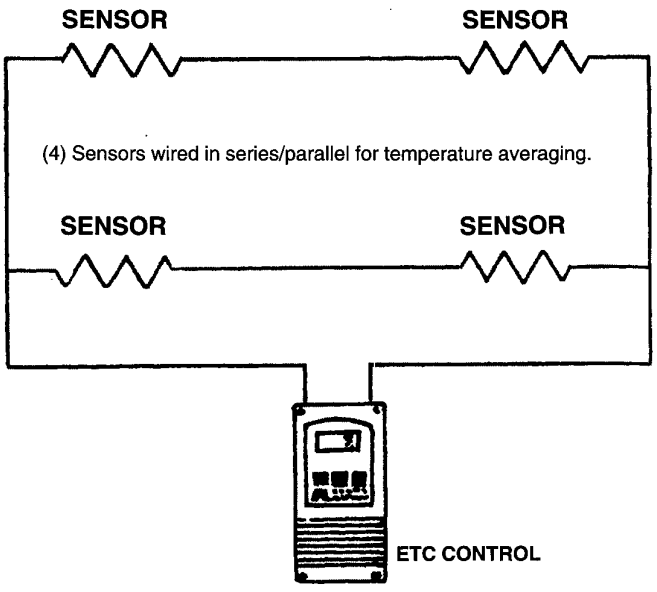


Figure 9

Replacement Sensor - Order Part No. 1309007-044

SPECIFICATIONS

The 1309007-044 sensor is a negative temperature coefficient (NTC) thermistor sensor. The sensor resistance decreases with temperature increase. It is .25 x 1.94 long with 8 feet #22 AWG cable. The termistor has a reference resistance of 30,000 ohms at 77°F (25°C).

IMPORTANT

The schematic drawings and other information included in these instructions are for the purpose of illustration and general reference only. Ranco assumes no responsiblity for any unconventional application of this control, unless such application has been approved in writing by Ranco.

Deg. C.	Deg. F.	RES. Nom.
-40	-40	1,010,000
-30	-22	531,000
-20	-4	291,200
-10	14	166,000
0	32	97,960
10	50	59,700
20	68	37,470
25	77	30,000
30	86	24,170
40	104	15,980
50	122	10,810
60	140	7,464
70	158	5,200
80	176	3,774
90	194	2,753
100	212	2,036
110	230	1,531

Figure 10:
Resistance vs Temperature of 1309007-044. Sensor including 8 foot cable.

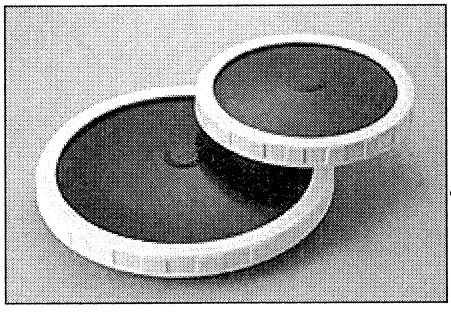
RANCO
8115 U.S. Rt. 42 N. • Plain City, Oh 43064
Invensys
An Invensys Company

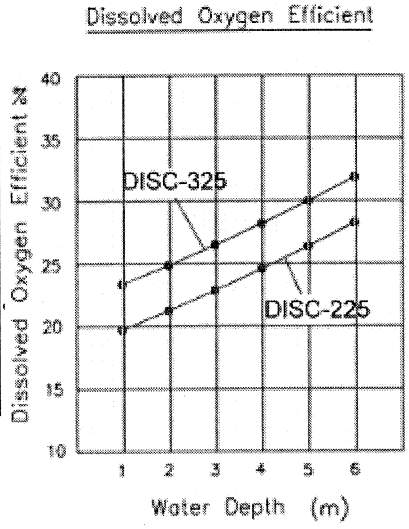
SUNMINES

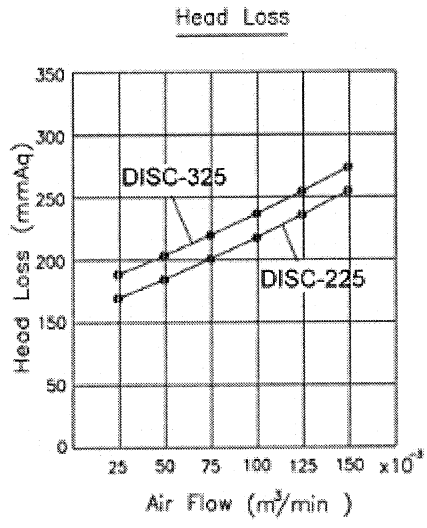
SUN MINES ELECTRICS CO.,LTD.

TEL : +886-2-27586060(REP) FAX : +886-2-27587575

MEMBRANE DIFFUSER



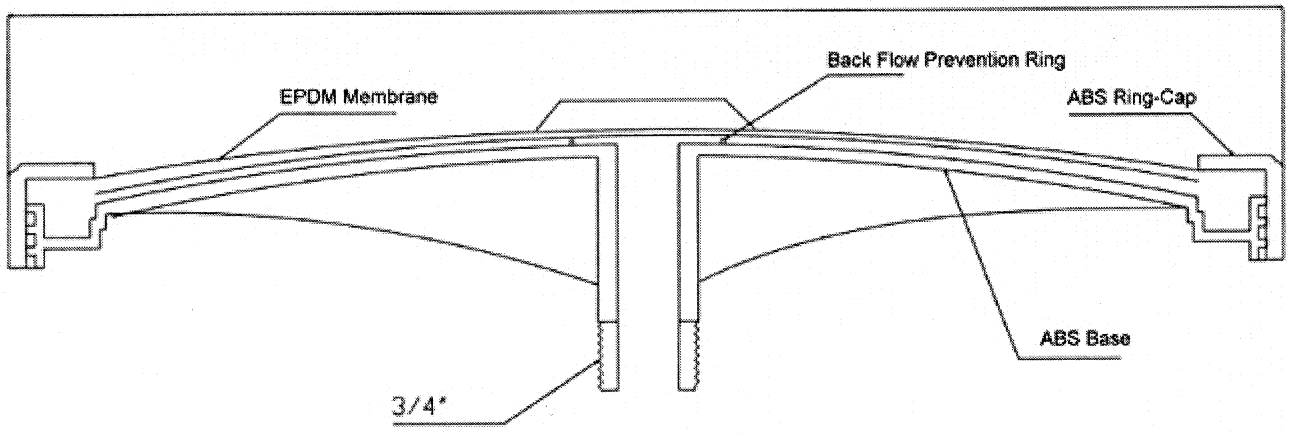




DISC-325(225)

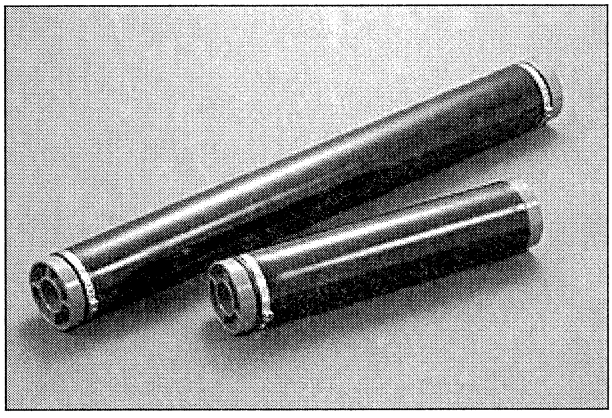
DISC-325 DISC-225

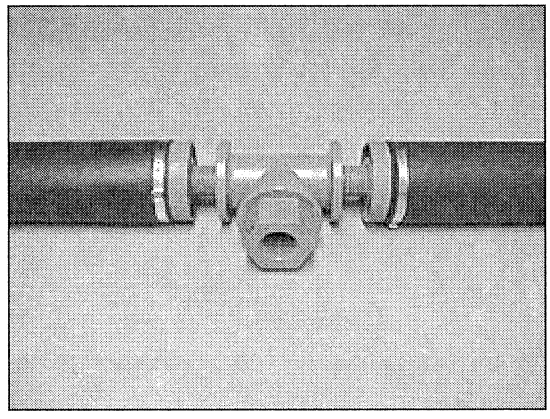
325 mm 250 mm



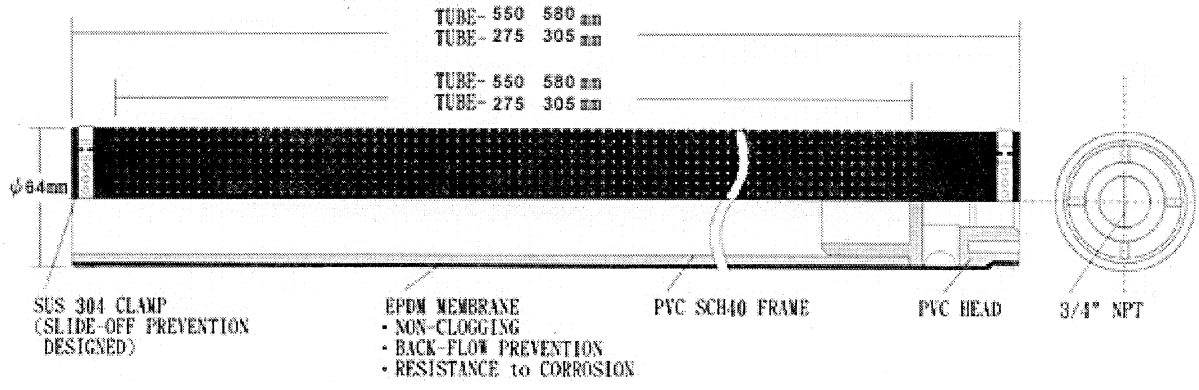
DISC SERIES SPECIFICATIONS		
Type/Diamerer	DISC-225	DISC-325
Holder disc	Reinforced ABS or PP	Reinforcod ABS or PP
Gasket"O"ring	ABS or PP	ABS or PP Combined inseparably within

MATERIAL			membrane
	Circular cover	Reinforced ABS or PP	Reinforced ABS or PP
	Membrane	High grade EPDM or TPE	High grade EDPM or TPE 2.5 m/m thickness
	Air flow	0.02~0.12CMM	0.02~0.2CMM
OPERATION	Connection	R3/4"NPT male	R3/4"NPT male
	Dissolved oxygen efficient	26%4.7M water depth,0.05 SCMM air flow,20°C	29%4.7M waler deplh,0.05 SCMM air flow,20°C
	Head loss	200mm H_2O 20°C ,0.075 SCMM air flow	250mm H_2O 20°C ,0.12 SCMM air flow





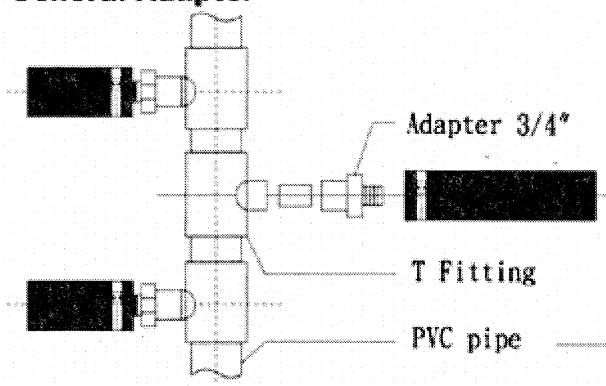
TUBE-550(275)



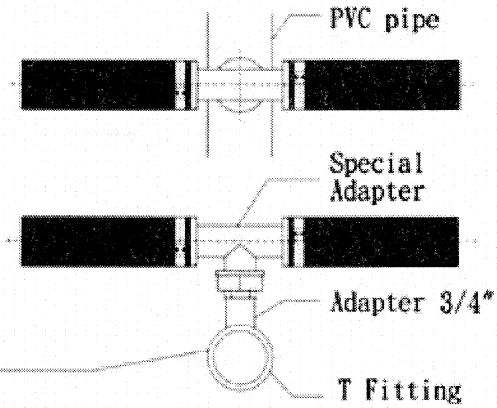
Type	Slots length (mm)	Volume (L/min)	Max Volume(L/min)
TUBE-275	250	10~125	300
TUBE-550	500	10~200	500

Installation

General Adapter



Special Adapter



Structure

- Membrane with EPDM rubber compound.
- Base with Glass Reinforced Nylon high pressure.
- Membrane with I-shaped slits to prevent clogging and back flow with flexibility of air volume.
- Reinforced membrane rim sealed with the base with stainless screw for prevention of side leakage.

Advantage

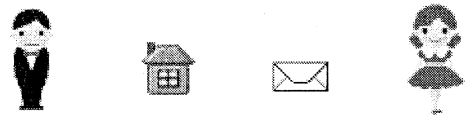
- High oxygen transfer efficiency.
- High resistance to clogging.
- High resistance to corrosion.
- Large diameter of air bubble.
- Wide air flow range.
- Low pressure loss.
- Low energy cost.
- Easy installation.
- Water-stirring effect.
- Back flow prevention.
- Self cleaning operation.
- Self cleaning operation.
- Intermittent operation capability.

Application

- Manicipal wastewater treatment.
- Intermittent operation capability.
- Clean water treatment.
- Sludge stabilization.
- Aeration of fish ponds.
- Aeration of streams and lakes.

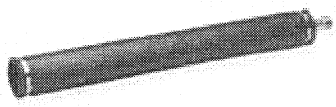
TUBE SERIES SPECIFICATIONS					
Type	Material	Air flow	Dimension	Connection	Weight
TUBE-550	Membrane:EPDM	50~250 L/min	578xø64mm	PT-1 or 3/4female	750g

TUBE-275	Base:ABS or PP	30~150 L/min	304xø64mm	PT-1 or 3/4female	400g



GO HOME E-MAIL

SUN MINES ELECTRICS CO.,LTD.
No.15,Alley 3, Lane 391, Juangjing Rd.,Taipei,Taiwan 110
TEL: +886-2-2758-6060(Rep)
FAX: +886-2-2758-7575



View Performance Specs

U.S. Filter Flex Line Diffuser includes membrane-Enviroquip

In Stock

Accessory: 49781

Stock #: 4978

Catalog #116 Page 45 (PDF)

Catalog Price

Ite

Shopping Cart reflects possible Quantity Breaks. View PDF Page for product details & alternatives.

Notes:
USFilter FlexLine Membrane Tube Diffuser

Formerly EnviroQuip

Non-buoyant design reduces pipe stress

Retrofit for Wyss Flex-A-Tube

The USFilter FlexLine fine bubble diffuser is for installations requiring high oxygen trans efficiency and for replacement of coarse bub other fine bubble tube type diffusers. The Fl produces micro-fine bubbles that increase th surface contact area with the water, greatly increasing the oxygen transfer efficiencies, in lower air volume requirements and lower utility costs. Ideal for use in municipal and i aeration tanks, post aeration tanks and oxid ditches.

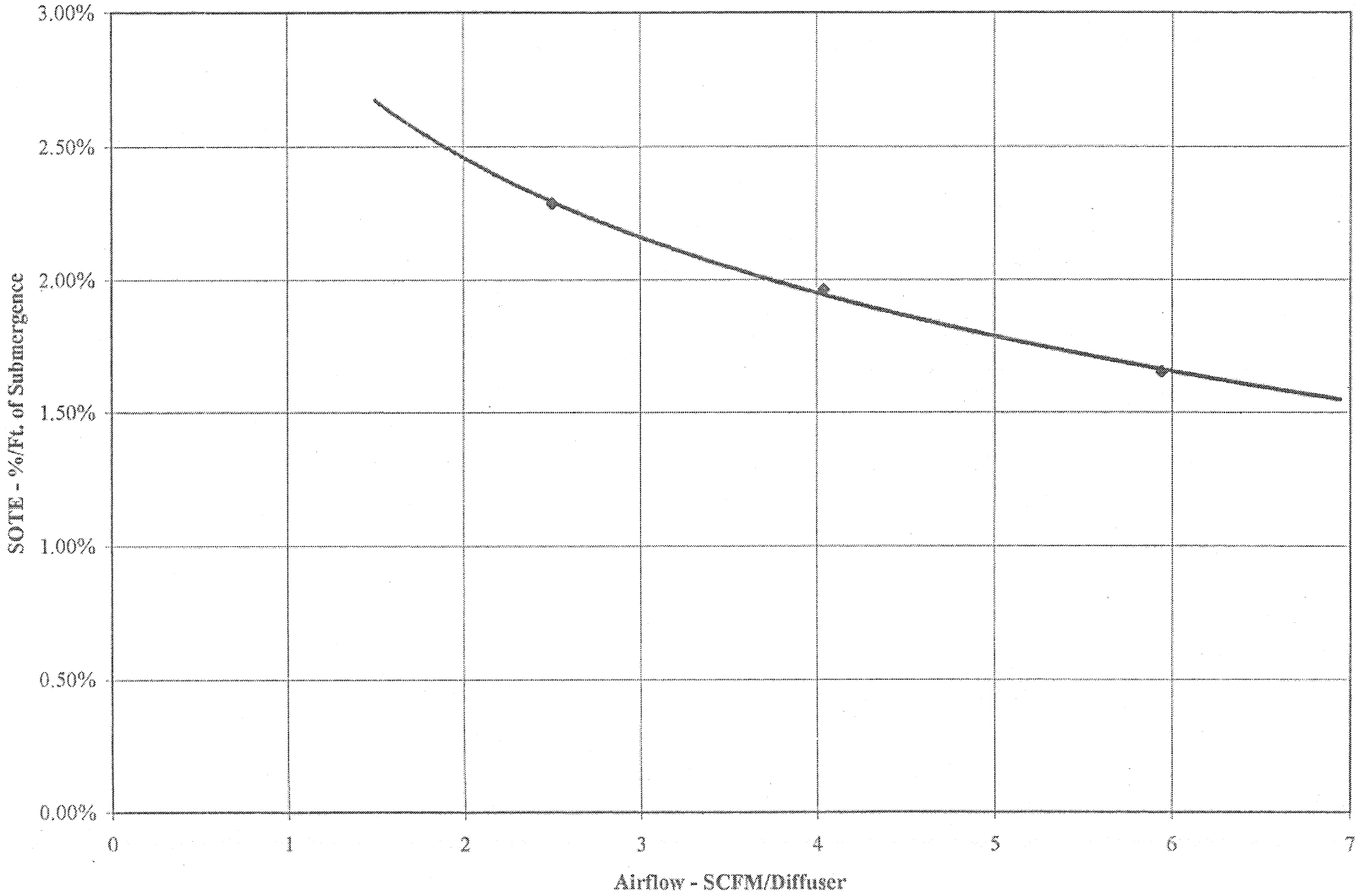
FlexLine provides a non-buoyant design that eliminates movement of the diffuser during and reduces buoyant uplift stress on the pipi systems and supports. The flexible EPDM me sleeve has precision perforated I slits that e under pressure to produce fine bubbles then to seal the diffuser when the air supply is st This check valve action reduces the chance f backflow of solids to clog the diffuser. The d supplied with a 3/4" NPT, 304SS nipple. The 24" long, and has an air flow range of 1 to 7

10" to 14" H2O of headloss, respectively. If replacement clamps are required, order one size per diffuser.

EnviroQuip International, Inc.

FlexLine Diffuser Performance

(2 1/2" Diameter x 24" Long)

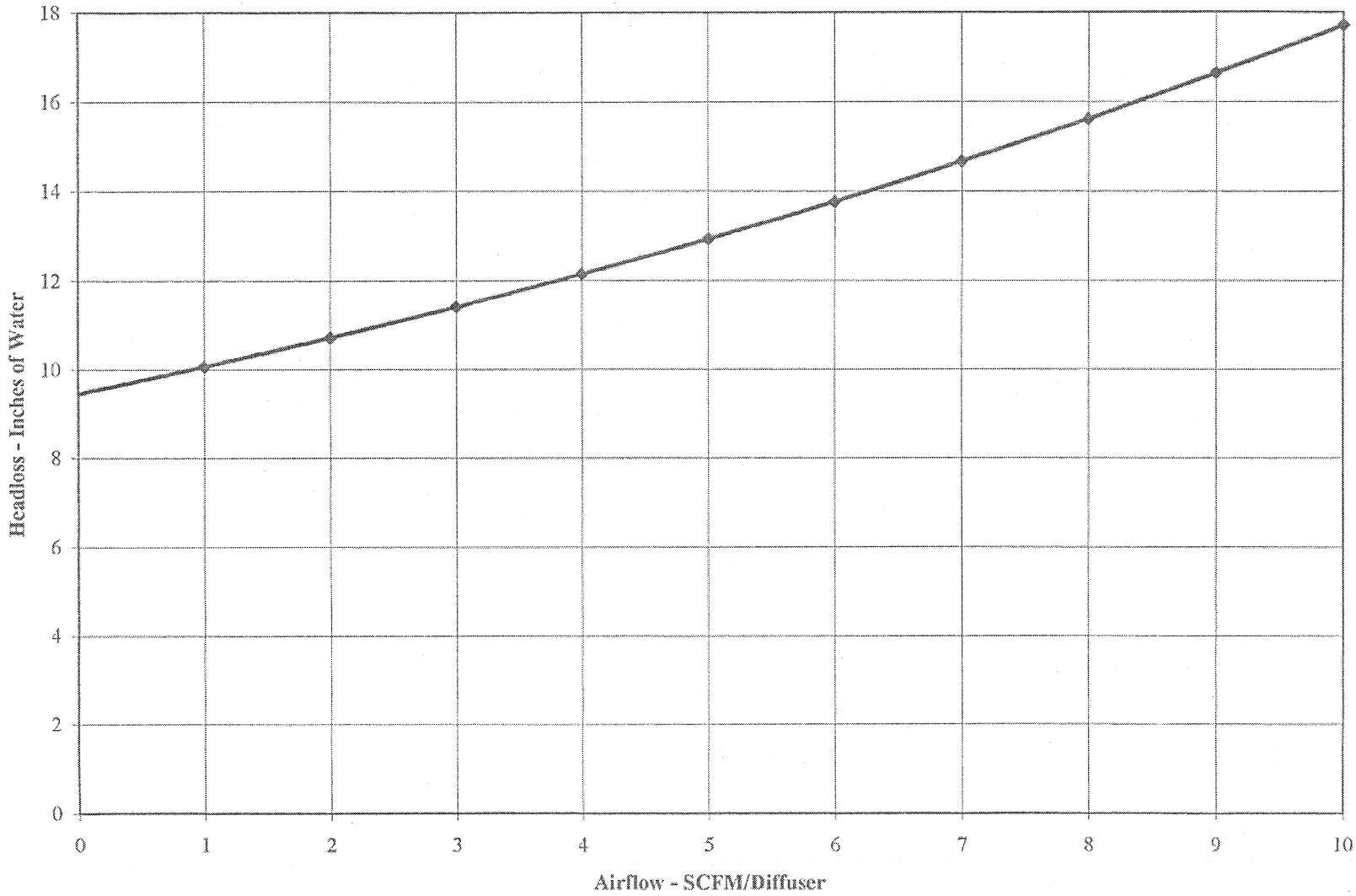


Item 49783

EnviroQuip International, Inc.

FlexLine Diffuser Performance

(2 1/2" Diameter x 24" Long)



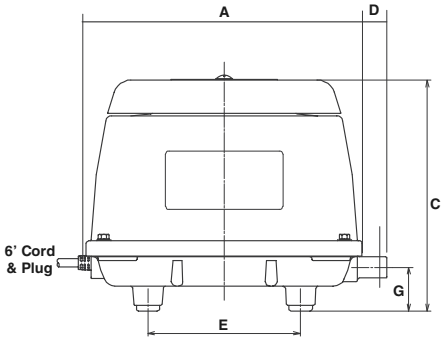
ITEM 4783

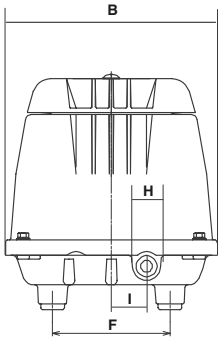
HP Series Linear Pumps

Models HP20, 40, 60 and 80

Model Number	HP20-0110	HP40-0110	HP60-0110	HP80-0110
Voltage (VAC)	120	120	120	120
Frequency (Hz)	60	60	60	60
Max. Cont. Pressure (psig)	3.5	3.5	4	4
Max. Inter. Pressure (psig)	3.6	5.5	6.5	6.5
Open Flow (c.f.m.)	1.25	2	3.1	3.7
Power Consumption (amps)	0.3	0.8	1.3	1.6
Sound Level (dBA@3 ft.)	31	32	35	36
Weight (lbs.)	7	13	15.5	15.5
Service Kit # Chamber Blck.	10PC000010	40PC000030	80PC000041	80PC000041

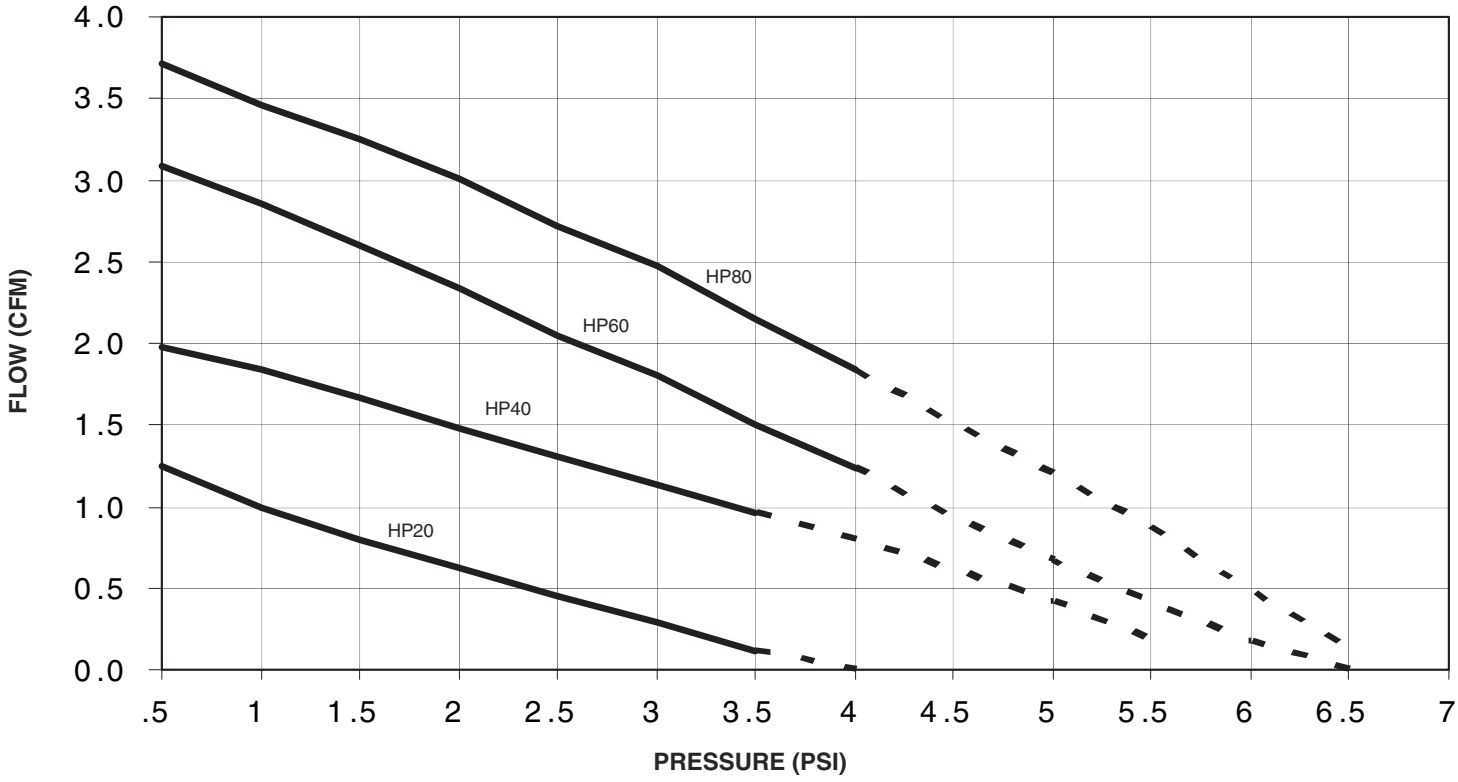
Performance data noted is representative of typical values. Specifications and performance data are subject to change without notice. Purchaser is responsible for determining suitability for product applications.





Model	Dim.	A	B	C	D	E	F	G	H	I
HP60/80	Inches	9.3	7.1	7.8	0.8	5.1	4	1.5	0.7	1.2
	Millimeters	235	180	197	21	130	100	37	18	30
HP40	Inches	8.2	6.8	7.5	0.8	4.8	3.5	1.5	0.7	1.2
	Millimeters	208	171	190	21	120	90	37	18	30
HP20	Inches	7.2	5.4	6.7	0.8	3.6	3.1	1.5	0.7	0.8
	Millimeters	182	138	170	21	92	78	37	18	20

HP20, 40, 60 & 80 PERFORMANCE



1300 Tefft Court, Suite 8
Saline, Michigan 48176

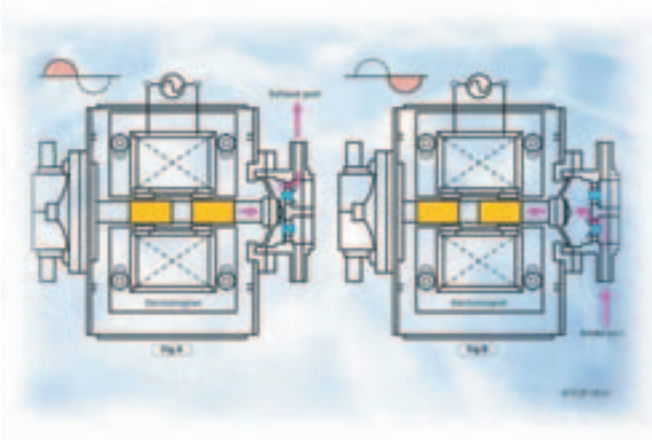
HIBLOW USA INC.

734-944-5032 fax 734-944-5163
www.hiblow-usa.com

Working Principle

When the alternating current is applied to the electromagnet, the actuating rod moves first in the direction of the arrow as shown in Fig A and then in the direction of the arrow as shown in Fig B, by the magnetic attraction and repellent forces exerted between the electromagnet and the permanent magnets attached to the rod.

The rod vibrates at the same frequency as that of the power supply and changes the volume of space enclosed between the casing and the diaphragm.



Features

- Quiet Operation
- Low Power Consumption, Vibration, Pulsation and Starting Current
- Oil-less Contamination Free Design
- Long Life
- Automatic Pressure Limitation
- U.L. Outdoor Rating Available on most HP Series
- Easy to Service
- Custom OEM Models
- Fast Reliable Shipments/Delivery
- Thermal Protection
- Over Pressurization Protection
- C.E. Compliant and U.L. Listed Models

Applications

- Aeration
- Air Purification
- Air Sampling
- Bubble Bath
- Gas Analyzer
- Liquid Agitation
- Medical & Scientific Equipment
- Pneumatic Beds
- Air Mattresses
- Wastewater Treatment
- Aerobic Treatment
- Air Cleaners
- Aquarium
- Ozoning Equipment
- Sequential Compression Devices
- Lift Station Equipment
- Air Massager

Product Performance Range

Flows up to 10.5 Cubic Feet per Minute
Pressures up to 7.5 p.s.i.g.

Terms/Conditions

Visit our website **www.hiblow-usa.com** for current data covering product Terms & Conditions of Sale and Warranty information.

ISO 14001
ISO 9001

1300 Tefft Court, Suite 8
Saline, Michigan 48176

HIBLOW USA INC.

734-944-5032 fax 734-944-5163
www.hiblow-usa.com

TROJANUVMAX™ Specification Sheet

TROJANUVMAX™ MODEL:	A	B	C	D	E	F
FLOW RATES*	<1-3 GPM	2-5 GPM	5-14 GPM	5-14 GPM	8-28 GPM	13-47 GPM
	<4-11 LPM	7-19 LPM	19-53 LPM	19-53 LPM	30-106 LPM	49-178 LPM
ELECTRICAL						
	120V/60Hz	90-140V	90-140V	90-265V	90-265V	90-265V
	230V/50Hz	190-265V	190-265V			
		50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz
	25 W	27 W	43 W	43 W	67 W	102 W
DIMENSIONS						
Chamber Assembly	15.5" x 2.5"	13.5" x 3.5"	19.5" x 3.5"	19.5" x 3.5"	29" x 3.5"	43.5" x 3.5"
	39 x 6.5cm	34 x 9cm	49.5 x 9cm	49.5 x 9cm	73.5 x 9cm	110 x 9cm
Lamp/Sleeve Length	12"	9.75"	16"	16"	25.5"	39.75"
	30cm	25cm	40.5cm	40.5cm	65cm	100.5cm
Control Module	2.8" x 3.3" x 2.3"	6" x 4" x 2.5"	6" x 4" x 2.5"	9.75" x 6" x 2.5"	9.75" x 6" x 2.5"	9.75" x 6" x 2.5"
	7 x 8 x 6cm	15 x 10 x 6cm	15 x 10 x 6cm	25 x 15 x 6cm	25 x 15 x 6cm	25 x 15 x 6cm
Max. Operating Pressure	125psi	125psi	125psi	125psi	125psi	125psi
Audible/Visual Lamp Failure Alarm	✓	✓	✓	✓	✓	✓
Alarm Reset	-	-	-	✓	✓	✓
Elapsed Time Meter	-	-	-	✓	✓	✓
Dry Contact**	-	-	-	✓	✓	✓
Lamp Replacement Reminder	-	-	-	✓	✓	✓
UV Intensity Monitor	-	-	-	D Plus	E Plus	F Plus
Water Chamber Material	304 SS	304 SS	304 SS	304 SS	316 SS	316 SS
Electropolished Exterior	-	-	-	✓	✓	✓
Inlet/Outlet	3/8" FNPT	3/4" NPT	3/4" NPT	3/4" NPT	1" NPT	1" NPT

**** See sizing charts for details. Flow rates shown are at 85% UVT.***

***** Remote options cord needed for solenoid valve or remote alarm connection***

Trojan Technologies Inc.

juin 8, 2001

TROJANUVMAX™

Owner's Manual

DO NOT REMOVE FROM UNIT
See back cover for vital records

ELECTRICAL SAFETY

GROUNDING

This product must be grounded. If it should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electrical shock. This system is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

DANGER – Improper connection of the equipment-grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if you are in doubt as to whether the outlet is properly grounded. Do not modify the plug provided with this system – if it will not fit the outlet, have a proper outlet installed by a qualified electrician. Do not use any type of adapter with this system.

GROUND FAULT CIRCUIT INTERRUPTER PROTECTION

To comply with the National Electrical Code (NFPA 70) and to provide additional protection from the risk of electric shock, this system should only be connected to a properly grounded, grounding-type power supply receptacle that is protected by a Ground Fault Circuit Interrupter (GFCI). Inspect operation of GFCI as per manufacturers suggested maintenance schedule.

EXTENSION CORDS

If an extension cord is necessary, use only 3-wire extension cords that have 3-prong grounding-type plugs and 3-pole cord connectors that accept the plug from this system. Use only extension cords that are intended for outdoor use. Use only extension cords having an electrical rating not less than the rating of the system. A cord rated for less amperes or watts than this system rating may overheat. Exercise caution when arranging the cord so that it will not be tripped over or pulled. Do not use damaged extension cords. Examine extension cord before using and replace if damaged. Do not abuse extension cord. Keep extension cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting this system from the extension cord. Never yank cord to pull plug from outlet. Always grasp the plug and pull to disconnect.

WARNING – To prevent risk of electrical shock, connect this system only to a properly grounded, grounding-type power supply receptacle that is protected by a Ground Fault Circuit Interrupter. Pull plug before servicing or replacing lamp. Keep all connections dry and off the ground. Do not touch plug with wet hands.

WARNING – Do not look directly at UV lamp when it is operating. The light emitted by the lamp will cause serious eye damage and burn unprotected skin.

WARNING – Read manual before installing or servicing this system. Only authorized personnel possessing a strong understanding of this system should attempt to replace lamp or service this system.

NOTE – Maximum pressure rating is 125 PSI (861.8 kPa)

WARNING –
To guard against injury, basic safety precautions should be observed, including the following:

1. READ AND FOLLOW ALL SAFETY INSTRUCTIONS.
2. DANGER – To avoid possible electric shock, special care should be taken since water is employed in the use of this system. Do not attempt repairs yourself. No user serviceable parts. Return the system to an authorized service facility for service or discard the system.
3. Do not operate the system if it has a damaged cord or plug, or if it is malfunctioning or if it has been dropped or damaged in any manner.
4. Always unplug the system from an outlet before servicing or cleaning. Never yank cord to pull plug from outlet. Always grasp the plug and pull to disconnect.
5. Do not use the system for other than intended use. The use of attachments or accessories not recommended or sold by Trojan Technologies may cause an unsafe condition and/or reduce disinfection performance.
6. CAUTION – To prevent risk of electrical shock, connect this system only to a properly grounded, grounding-type power supply receptacle that is protected by a Ground Fault Circuit Interrupter (GFCI). Inspect performance of GFCI as per manufacturer's suggested maintenance schedule.
7. Visually inspect this system prior to installation. If the quartz sleeve or lamp is broken, cracked or damaged in any way, do not use. Contact Trojan Technologies Client Services for replacement parts.
8. WARNING – To reduce the risk of electrocution, keep all connections dry and off the ground. Do not touch plug with wet hands.
9. The light emitted by the lamp will cause serious eye damage and burn unprotected skin. Never look directly at the lamp when it is operating. Do not plug unit into an electrical outlet without properly securing the lamp/sleeve into the reaction chamber. Disconnect lamp harness before removing lamp from reactor.
10. If the UV system malfunctions or fails, water must be boiled prior to consumption until the UV system is operational and the water lines have been shocked. System failure is indicated by the system's audible alarm and absent (Models B & C) or red (all other models) indicator light.
11. Always shut off water flow and release water pressure before cleaning or maintaining unit.
12. Intended for indoor use only. Power supply must not be exposed to weather elements. In seasonal applications, reactor must be drained to prevent freezing.
13. Installation of this system must be in accordance with local plumbing and electrical codes as well as any and all applicable regulations and laws.
14. SAVE THESE INSTRUCTIONS.

Thank you.

By purchasing this system, you have taken the first step to providing safe drinking water for you and your family.

Designed using the most advanced UV technology available today, your UV system will operate with minimal maintenance and provide you with years of worry-free water disinfection. All you have to do is follow the information in this manual, conduct the recommended maintenance, and replace the lamp once a year.

Contents

COMPONENTS

Each TrojanUVMax system comes with the following components.

One owner's manual

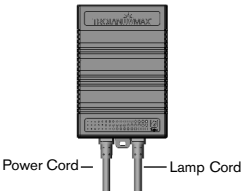
One warranty card

Reactor clamp(s)
One on Models A, B, C, D, two on larger models

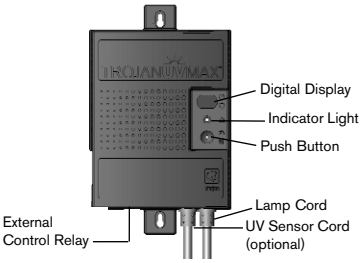
One power cord
Models D, E, F, Pro7 and Pro15 only

One power supply

Model A

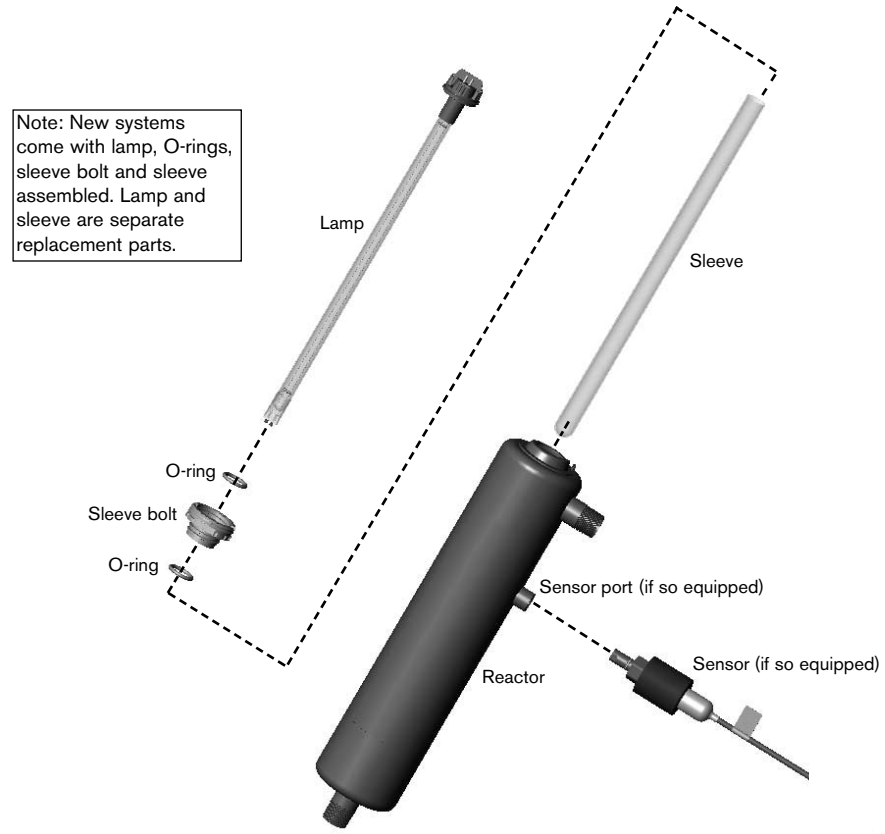


Models B and C



Models D, E, F, Pro7 & Pro15

One reactor; one lamp; one sleeve; one sleeve bolt; two O-rings; optional sensor.



PRODUCT SPECIFICATIONS

MODEL		A	B	C	D	E	F	Pro7	Pro15
Flow Rate GPM (LPM)	**16 dose***	**3 (11)**	**5 (19)**	**14 (53)**	**14 (53)**	**28 (106)**	**47 (178)**		
	30 dose*	**1 (3.8)**	**4 (15)**	**7 (26)**	**7 (26)**	**15 (56)**	**25 (94)**		
	40 dose**							**8.2 (31)**	**17.8 (67.4)**
Audible/Visual Lamp Failure Alarm		✓	✓	✓	✓	✓	✓	✓	✓
No-tools Maintenance		✓	✓	✓	✓	✓	✓	✓	✓
Safety Cap		✓	✓	✓	✓	✓	✓	✓	✓
Electronic Power Supply		✓	✓	✓	✓	✓	✓	✓	✓
Alarm Postpone		–	–	–	✓	✓	✓	✓	✓
Elapsed Time Meter		–	–	–	✓	✓	✓	✓	✓
Lamp-age Display & Alert		–	–	–	✓	✓	✓	✓	✓
Digital Diagnostic Display		–	–	–	✓	✓	✓	✓	✓
Electropolished Exterior		–	–	–	✓	✓	✓	✓	✓
External Control Relay		–	–	–	✓	✓	✓	✓	✓
UV Intensity Sensor		–	–	–	Optional	Optional	Optional	✓	✓
Solenoid (shut-off valve)***		–	–	–	Optional	Optional	Optional	Optional	Optional
Dynamic Flow Restrictor		–	–	–	Optional	Optional	Optional	✓	✓
Water Chamber Material		304 SST	304 SST	304 SST	304 SST	316 SST	316 SST	316 SST	316 SST
Inlet/Outlet		3/8" FNPT	3/4" NPT or BSP	3/4" NPT or BSP	3/4" NPT or BSP	1" NPT or BSP	1" NPT or BSP	1" NPT	1" NPT

* See sizing charts for details. Flow rates shown are at 85% UVT.
** NSF Standard 55 Class A certifies flow rates shown. The temperature of the flowing water being treated must be between 1°C and 35°C (33.8°F to 95°F).
*** Requires solenoid junction box.

PART NUMBERS

Model	Power Supply* 120V	230V	Lamp 254nm	185nm	O-Ring	Quartz Sleeve	Sleeve Bolt
A	650414	650415	602803	602826	002045	602730	602665
B	650411	650412	602804	602827	002045	602731	602665
C	650408	650409	602805	602828	002045	602732	602665

Model	Power Supply* 120V no sensor	120V w sensor	230V no sensor	230V w sensor	Lamp Cord**	Power Cord 120V	Power Cord 230V	Lamp 254nm	Lamp 185nm	O-Ring	Quartz Sleeve	Sleeve Bolt	UV Sensor
D	650405	650421	650406	650422	602799	602636	602637	602805	602828	002045	602732	602665	650505
E	650402	650418	650403	650419	602799	602636	602637	602806	602829	002045	602733	602665	650505
F	650398	650401	650399	650416	602799	602636	602637	602807	602830	002045	602734	602665	650505
Pro7	650510	N/A	650511	N/A	602799	602636	602637	602806	N/A	002045	602733	602665	650505
Pro15	650512	N/A	650513	N/A	602799	602636	602637	602807	N/A	002045	602734	602665	650505

* Includes power and lamp cords
** Without sensor: 602799-120; with sensor: 602799-120S

WATER QUALITY PARAMETERS

These are recommended levels, for use as a guideline for pre-treatment requirements.

Iron: < .3 PPM (.3 mg/L)
Hardness: < 120 PPM (7 Grains Per Gallon)
% UVT: > 75%

ADDITIONAL WATER TREATMENT EQUIPMENT

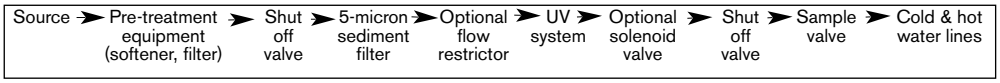
To meet the water quality parameters described above, you may need to pre-treat your water to ensure appropriate disinfection. Pre-treatment equipment must be installed BEFORE the UV reactor. Ask your water treatment dealer for further information about water quality and testing.

Pre-treatment systems can be comprised of one or more of the following elements:

- Carbon Filter
- Iron Removal System
- Water Softener
- Cyst reduction filter (ANSI/NSF Standard 53 listed)

Required: Pre-treatment MUST INCLUDE a sediment filter (5 micron nominal) installed upstream of (before) the UV system in order to ensure that particles capable of shielding pathogens are removed from the water prior to entering the UV system.

Recommended: Shut off valves should be installed before and after the UV unit, and a sample valve (outlet) should be installed after the unit to allow for pressure-release and water sampling.

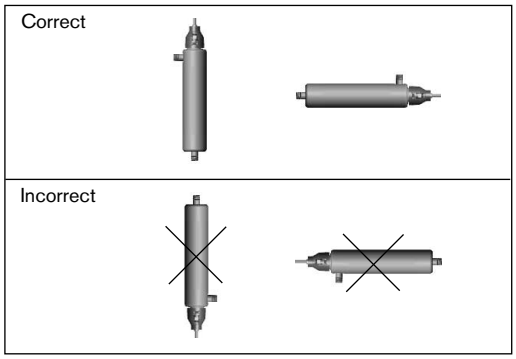


INSTALLATION

Follow the instructions below in order to avoid the risk of voiding your warranty.

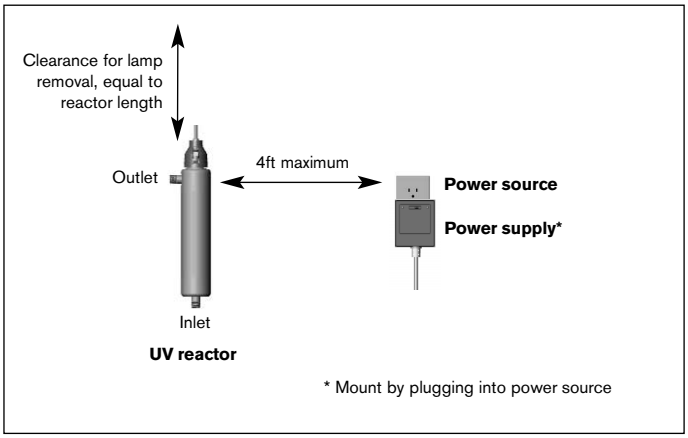
1. To protect your power supply, you must use a UL1449 certified transient voltage surge suppressor and a Ground Fault Circuit Interrupter (GFCI).
2. Determine location and orientation of reactor referring to diagrams on pages 10 and 11.
3. Attach reactor clamp(s) to the wall.
4. Insert reactor and tighten clamp(s).
5. Connect to plumbing.
6. Mount power supply to wall, referring to diagrams on pages 10 and 11. Power supply should be installed above all plumbing if possible
7. Insert power cord into male receptacle on left side of power supply (only on models D, E, F, Pro7 and Pro15).
8. Insert lamp/sleeve assembly (see Figure 9, page 16).
9. Attach the ground (green/yellow) and strain relief (red) wires from the lamp cord to the peg located on the reaction chamber, next to the lamp port (outlet end). Secure both wires with locknut provided.

REACTOR CHAMBER ORIENTATION

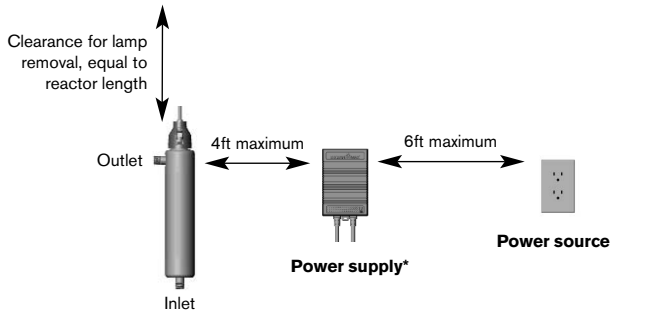


Note: Systems equipped with a sensor are not to be installed horizontally.

MODEL A

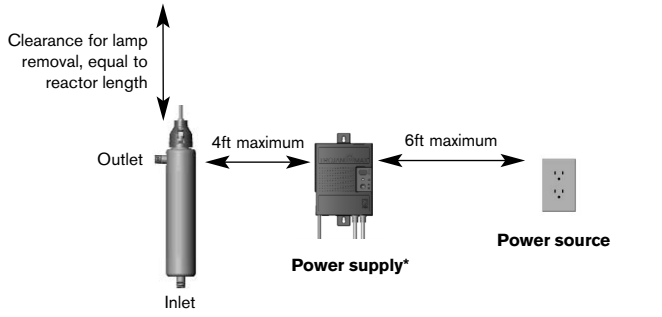


MODELS B & C



* Mount on wall through slot on back of power supply. Further secure using slot in bottom of power supply. **Caution: inspect for hidden electrical wiring or plumbing prior to drilling holes.**

MODELS D, E, F, Pro7 and Pro15



* Mount on wall through slots on top and bottom of power supply. **Caution: inspect for hidden electrical wiring or plumbing prior to drilling holes.**

10. Attach lamp cord to lamp (see Figures 10 and 11, page 17).
11. Plug system into the outlet. Note: When the UV system is first plugged in, the alarm may sound temporarily until the lamp is operational.
12. Clean the distribution lines: Once the UV system is installed, any contamination in the distribution lines between the UV system and your water outlets must be removed. Similarly, if the power goes out and your system is not equipped with an automatic shut-off feature, you must also disinfect the downstream distribution lines.
    - Make sure the UV system is on. Leave the system on during the entire cleaning process.
    - Remove a filter housing and fill the filter container with bleach (remove the filter for this process).
    - Replace the filter housing and allow water to flow to all faucets (hot and cold, inside and outside the house), your washing machine, toilets, and all other water outlets. Once you can smell bleach in the hot and the cold water, turn the water to that outlet off. When this has been done for all outlets, let the water sit in the water lines for two to four hours.
    - Completely flush all the lines a minimum of five minutes and then put the filter back in the filter housing.

OPERATION

Models A, B, and C

Power Supply

Model A is either 90-130V or 180-264V (50-60Hz). Models B & C are either 90-140V (60 Hz) or 190-265V (50Hz).

Indicator Light

When the lamp is operating properly, the indicator light on the power supply will be green. If the lamp is not operating properly, the indicator light will show red (Model A) or will not light (Model B or C) and an audible alarm will sound.

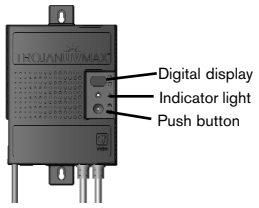
The audible and visual alarm indicators will persist until either the problem is corrected or the system is unplugged from the electrical outlet. Note: If the system is unplugged the water will not be disinfected and the distribution lines will have to be cleaned.

If you experience any kind of alarm (audible or visual), see the Troubleshooting Section of this manual.

Models D, E, F, Pro7, and Pro15

Power Supply

Auto ranging, constant current power supply. Accepts 90-265V at 50-60Hz.



Digital Display

Under normal operating conditions the Digital Display shows the number of months that the lamp has been operating. In the event of a failure of any kind, the display will indicate the nature of the problem. See the Troubleshooting Section for details.

Indicator Light

During normal operation the indicator light will be green.

Indicator light will turn amber:

- when lamp has operated for 11 months
- if UV sensor (if so equipped) detects a low UV output

Indicator light will turn red:

- when lamp has operated for 12 months
- if signal from UV sensor (if so equipped) is below set point
- if there is a failure of any kind, such as a lamp malfunction

An audible alarm will sound whenever the indicator light is red.

The audible and visual alarm indicators will persist until the problem is corrected or the system is unplugged from the electrical outlet. It is possible to disable the audible alarm; see 24-Hour Alarm Postpone Function. Note: If the system is unplugged the water will not be disinfected and the distribution lines will have to be cleaned.

If you experience any kind of alarm (audible or visual), see the Troubleshooting Section of this manual.

Elapsed Time Meter

The Elapsed Time Meter measures the number of months that the lamp has been operating. The lamp must be replaced after it has been operating for 12 months.

- After 11 months indicator light turns amber.
- After 12 months indicator light turns red and alarm sounds.

- After 14 months the alarm postpone function is disabled, indicating that the lamp must be replaced and that it is not providing proper disinfection.
- After lamp replacement, the time meter must be reset (see Elapsed Time Meter Re-Set Function).

Push Button

The push button has two functions.

24-Hour Alarm Postpone Function:
When the unit is in alarm, the indicator light is red and an alarm sounds. If you press the push button for less than two seconds, the indicator light will flash red and the audible alarm will stop. The unit is still in alarm, but the audio alarm stops for your convenience until you can contact a dealer.

This alarm will re-occur after 24 hours if its cause has not been corrected.

If the unit detects another problem during the 24-hour alarm postpone period, it will go into alarm again, the indicator light will turn solid red, and the alarm will sound.

After 14 months of lamp operation, the alarm postpone will not work until the lamp is replaced and the time meter is reset.

Elapsed Time Meter Re-Set Function:
After the lamp has been changed, the Elapsed Time Meter must be reset by following the procedure below:

a) Disconnect the power supply and leave it unplugged for 10 seconds.
b) Press and HOLD the push button.
c) Connect the power supply to the outlet while continuing to press the push button. The indicator light will flash green for about 3 seconds.
d) Continue to hold the push button until the indicator light flashes red, then release immediately.

External Control Relay

This feature provides switching for the operation of a solenoid (shut-off) valve and/or remote alarm. When the lamp is not operating properly or the UV sensor signals that the UV output is below set point, the contacts will open causing the solenoid to stop the water flow and/or a remote alarm to sound. The dry contact remains open if the lamp has been in operation for 12 months or more.

UV Sensor

The UV sensor measures the amount of UV light reaching it, allowing the system to monitor whether the intensity is above the minimum required for proper disinfection. The sensor is factory calibrated and is not field adjustable.

SERVICE AND MAINTENANCE

CAUTION:
UV-C rays are present when the unit is operating. Follow the instructions carefully to avoid injury to eyes and skin. Only qualified persons should install or replace UV lamps or sleeves.

There are two regular maintenance requirements common to all UV systems: cleaning and lamp replacement.

CLEANING

Minerals in the water will eventually coat the quartz sleeve (which protects the lamp), as well as the sensor (if system is so equipped). This coating must be cleaned off periodically because it reduces the amount of UV light reaching the water, thereby reducing disinfection performance.

Once a month, check the sleeve and clean it if you can see a mineral coating starting to form. If sleeve requires cleaning, refer to Lamp Replacement instructions but re-install the original lamp. If system is equipped with a sensor, be sure to clean the sensor each time the lamp is cleaned, as per Lamp Replacement instructions.

LAMP REPLACEMENT

The lamp's UV intensity decreases over time. You can safely use your lamp for 12 months, after which it must be replaced. For instance, if you use your system for 12 continuous months, you must replace your lamp at the end of this period. If you use the system only six months each year, you would need to change your lamp at the end of the second six-month period.

Follow the steps outlined below to replace your lamp.

Lamp Removal

1. Shut off water supply to (upstream of) the UV system.
2. Open a tap downstream of the UV unit to release pressure, then close this tap.
3. Unplug the power supply and let the lamp cool for 5 minutes.
4. Squeeze the sides of the safety cap in the area opposite the tabs (do not squeeze tabs), and remove the cap (Figure 1).
5. Pull the lamp plug off the lamp end (Figure 2). Do not pull on the cord when removing the plug. Note: During lamp replacement, the ground and strain relief wires of the lamp plug should remain connected to the peg on the reactor.
6. Holding the sleeve bolt, unscrew the lamp/sleeve assembly and carefully remove it from the reactor (Figure 3). Handle assembly by ends only. If required, a wrench can be placed on the two flat sides of the sleeve bolt. Do NOT apply the wrench to the lamp end, which sits within the sleeve bolt and protrudes 1/2".

7. To remove the lamp from its sleeve, use a glove or cloth to support and hold on to the sleeve. Holding the sleeve bolt tight, unscrew the lamp end, the top of which protrudes 1/2" above the sleeve bolt (Figure 4). Be careful not to drop the sleeve.

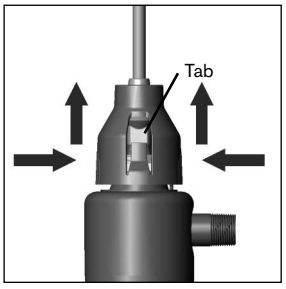


Figure 1

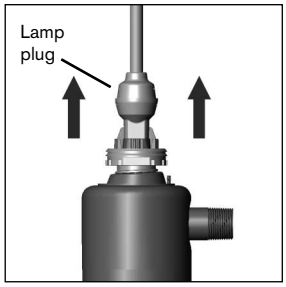


Figure 2

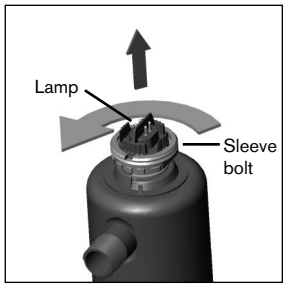


Figure 3

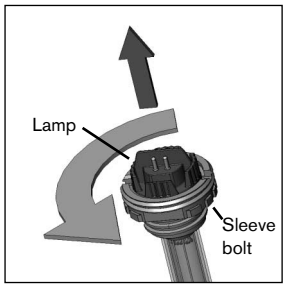


Figure 4

Cleaning

1. Remove first O-ring, sleeve bolt and second O-ring from lamp sleeve (Figure 5).
2. Clean lamp sleeve and sleeve bolt using a soft, lint-free cotton cloth (NOT paper towel or toilet paper) and a chemical scale-remover such as Lime-a-Way™ or CLR™ (follow manufacturer's directions). Remove all traces of cleaning solution by thoroughly rinsing.

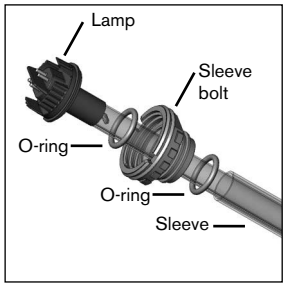


Figure 5

If unit is not equipped with a UV sensor, skip to "Lamp Installation".

3. Unscrew the sensor from the sensor port in the side of the reactor (Figure 6).
4. Inspect the two O-rings on the UV sensor for signs of damage or wear.
5. Ensure that the O-rings and any surfaces in contact with them are clean.
6. Clean the quartz-glass window of the UV sensor using a soft, lint-free cotton swab and a chemical scale-remover such as Lime-a-Way™ or CLR™ (follow manufacturer's

directions). Remove all traces of cleaning solution by thoroughly rinsing.

7. Insert the UV sensor completely into the sensor port, turning the sensor slowly while doing so. Water may be put on the sensor O-ring to facilitate this procedure.
8. Screw the brass nut on finger tight. **Caution: Over tightening may cause leakage.**

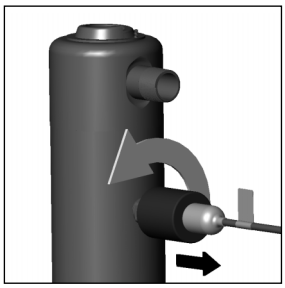


Figure 6

Lamp Installation

1. Each lamp and sleeve comes with two new O-rings. Place the new O-rings and the original sleeve bolt on the lamp sleeve as per Figure 7. **Caution: Do not lubricate any of the O-rings.**
2. Put the lamp completely into the sleeve. Maintain it in that position and screw the sleeve bolt into the lamp end until solidly hand-tight (Figure 8). **Caution: Over tightening will break the quartz lamp sleeve.**
3. Carefully place the lamp/ sleeve assembly into the reactor, making sure it is centered. Apply pressure to the assembly and screw it into the reactor until solidly hand-tight (Figure 9). **Caution: Over tightening will break the quartz lamp sleeve.**
4. Push the plug onto the end of the lamp while ensuring that the male tab on the lamp inserts into the female tab on the plug (Figure 10).
5. Push the safety cap on while ensuring that the grounding wires are under the cap and not in the way of the tabs (Figure 11).

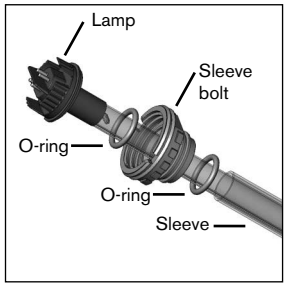


Figure 7

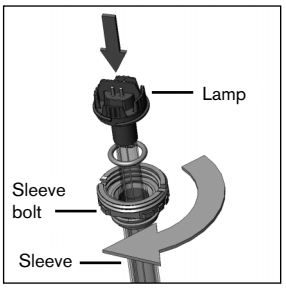


Figure 8

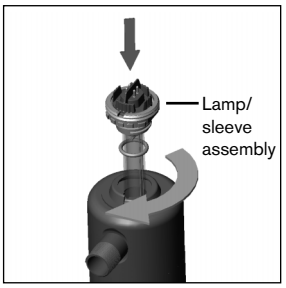


Figure 9

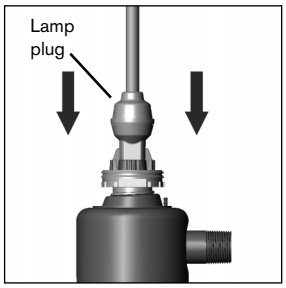


Figure 10

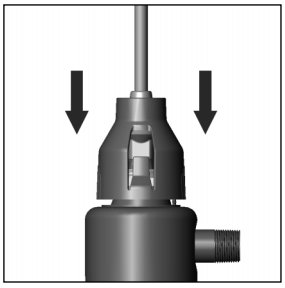


Figure 11

Restarting

For models A, B and C:

1. Connect the power supply to the outlet.

For all other models:

1. Press and hold the push button (Figure 12).
2. Connect the power supply to the outlet while continuing to press the push button. The indicator light will flash green for about 3 seconds.
3. Continue to hold the push button until the indicator light flashes red, then release immediately.
4. Open the water line and check for leaks.

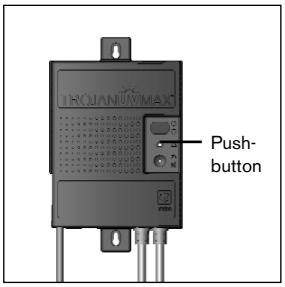


Figure 12

Disinfecting the Lines

It is recommended that the distribution lines be cleaned following any maintenance procedure in which the water in the lines may have been exposed to the air or to any undisinfected water.

1. Remove a filter housing, remove the filter, and fill the housing container with bleach. Replace the filter housing.
2. Allow water to flow to all faucets (hot and cold, inside and outside of the house), your washing machine, toilets, and all other outlets. Once you can smell bleach in the hot and the cold water, turn the water to that outlet off. When this has been done for all outlets, let the water sit in the water lines for two to four hours.
3. Completely flush all the lines a minimum of five minutes and then put the filter back in the filter housing.

WARRANTY

Our Commitment

To maximize the superior quality of Trojan UV disinfection, each product must be properly sized, installed, and maintained. If you experience difficulty with your Trojan product, our Technical Support Centre is available to help you.

During the applicable warranty period noted below, Trojan will provide warranty coverage, described below, for your product. After the product's warranty expires, repairs and replacement parts can be provided to you for a reasonable charge.

How to Get Help

To obtain help under this warranty, contact the Trojan Technical Support Center at 1-800-265-5774 or by email at residential@trojanuv.com. Please have available the model number, the date of purchase, the name of the dealer from whom you purchased your Trojan product ("the source dealer"), as well as a description of the problem you are experiencing. A Trojan technician will help you troubleshoot the problem and isolate the defective part.

For more information, please refer to the Troubleshooting section of your Owner's Manual. Owner's Manual information is also available at www.trojanuv.com

To establish proof of purchase to make a warranty claim, you will need to either retain your original invoice or complete and return a warranty card, which will register you as a product owner in Trojan's database.

Specific Warranty Coverage

Warranty coverage is specific to the following Trojan products:

- TrojanUVMax™
- Advantage Series
- UV 700 Series
- UV 600 Series

Ten-Year Limited Warranty for TrojanUVMax™ Reaction Chamber

Trojan warrants the reaction chamber on the TrojanUVMax™ product to be free from defects in material and workmanship for a period of ten (10) years from the date of purchase. During this time, Trojan will repair or replace, at its option, any defective TrojanUVMax™ reaction chamber.

Please return the defective part to a Trojan dealer, who will return it to Trojan. Trojan will either make the necessary repairs or, if Trojan determines that a replacement is required, will provide a replacement part. Trojan will then return the part to the dealer. This warranty does not include shipping and handling charges which will be collected from you by the dealer.

Parts repaired or replaced under this ten (10) year warranty will be covered under warranty to the end of the original ten (10) year warranty period.

This warranty is also subject to the conditions and limitations outlined under the heading "General Conditions and Limitations" below.

Five-Year Limited Warranty for Structural, Hardware and Electrical Components

Trojan warrants the structural, hardware, and electrical components to be free from defects in material and workmanship for a period of five (5) years from the date of purchase. During this time, Trojan will repair or replace, at its option, any defective parts covered by the warranty.

Please return the defective part to a Trojan dealer, who will return it to Trojan. Trojan will either make the necessary repairs or, if Trojan determines that a replacement is required, will provide a replacement part. Trojan will then return the part to the dealer. This warranty does not include shipping and handling charges which will be collected from you by the dealer.

Parts repaired or replaced under this five (5) year warranty will be covered under warranty to the end of the original five (5) year warranty period.

This warranty is also subject to the conditions and limitations outlined under the heading "General Conditions and Limitations" below.

One-Year Limited Warranty for Lamps, Sleeves and UV Sensors

Trojan warrants lamps, sleeves and UV sensors to be free from defects in material and workmanship for a period of one (1) year from the date of purchase. During this time, Trojan will repair or

replace, at its option, any defective parts covered by the warranty.

The warranty period for lamps and sleeves may be verified using date codes in addition to purchase receipts and Trojan's database of registered owners. Trojan will advise you whether the defective item needs to be returned to a Trojan dealer for failure analysis. Replacement lamps and sleeves provided under warranty will be sent to your Trojan dealer.

If the UV sensor experiences a problem which Trojan confirms is covered by warranty, please return the sensor to a Trojan dealer who will return it to Trojan. Trojan will either repair or replace the sensor and return the sensor to your dealer.

This warranty on lamps, sleeves and sensors does not include shipping and handling charges which will be collected from you by the dealer.

Parts replaced under this one (1) year warranty will be covered under warranty to the end of the original one (1) year warranty period.

This warranty is also subject to the conditions and limitations outlined under the heading "General Conditions and Limitations" below.

Warranty for Replacement Lamps and Parts

Trojan warrants replacement lamps, purchased for annual routine maintenance, and other parts purchased to repair product components that are no longer covered by the original warranty, to be free from defects in material and workmanship for a period of three (3) months from the date of purchase. During this time, Trojan will repair or replace, at its option, a defective replacement lamp or part free of charge except for shipping and handling charges.

The warranty period on replacement lamps and parts will be verified using date codes and/or purchase receipts. Trojan will advise you whether the defective item needs to be returned to a Trojan dealer for failure analysis. Replacement lamps and parts provided under warranty will be sent to your Trojan dealer.

General Conditions and Limitations

None of the above warranties cover damage caused by improper use or maintenance, accidents, acts of God or minor scratches or imperfections that do not materially impair the operation of the product. The warranties also do not cover products that are not installed as outlined in the applicable Owner's Manual.

The limited warranties described above are the only warranties applicable to the Trojan products listed in the "Specific Warranty Coverage" section. These limited warranties outline the exclusive remedy for all claims based on a failure of or defect in any of these products, whether the claim is based on contract, tort (including negligence), strict liability or otherwise. These warranties are in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to any of these products.

Trojan does not assume any liability for personal injury or property damage caused by the use or misuse of any of the above products. Trojan shall not in any event be liable for special, incidental, indirect or consequential damages. Trojan's liability shall, in all instances, be limited to repair or replacement of the defective product or part and this liability will terminate upon expiration of the applicable warranty period.

Troubleshooting

Models A, B, C

SITUATION	POSSIBLE CAUSE	POSSIBLE SOLUTION
Breaker repeatedly trips	Connection between lamp and lamp cord is wet	Clean and dry the cord and lamp, check unit for leaks
	Short circuit in the electrical assembly	Replace power supply
Leak at inlet or outlet	Threaded pipe fittings are leaking	Clean threads, reseal with Teflon tape, and re-tighten
Leak detected from area of reactor	Condensation of moist air on cold reactor (slow accumulation)	Control humidity, relocate unit, or insulate reactor
	O-ring on sleeve bolt damaged, deteriorated, or incorrectly installed	Inspect and replace if deteriorated
	Lamp/sleeve assembly not properly installed (too tight or not tight enough)	Tighten assembly solidly hand-tight
Audible alarm	Power failure, lamp failure	Unplug for 2 minutes then restart
		Replace lamp
		Replace power supply

Troubleshooting

Models D, E, F, Pro 7 and Pro 15

SITUATION	POSSIBLE CAUSE	POSSIBLE SOLUTION
Digital display does not read anything	Unit is unplugged	Plug unit into AC power outlet
	No power at AC power outlet	Replace fuse or reset breaker
	Power cord is damaged	Replace power cord
	Power surge caused damage to electrical assembly	Replace power supply and use a surge protector
Breaker repeatedly trips	Connection between lamp and lamp cord is wet	Clean and dry the cord and lamp, check unit for leaks
	Short circuit in the electrical assembly	Replace power supply
Leak at inlet or outlet	Threaded pipe fittings are leaking	Clean threads, reseal with Teflon tape, and re-tighten
Leak detected from area of reactor	Condensation of moist air on cold reactor (slow accumulation)	Control humidity, relocate unit, or insulate reactor
	O-ring on sleeve bolt damaged, deteriorated, or incorrectly installed	Inspect and replace if deteriorated
	Lamp/sleeve assembly not properly installed (too tight or not tight enough)	Tighten assembly solidly hand-tight
Digital Display indicates a number between **0 and 10**	Not an alarm condition	
Digital Display indicates **11**	Not an alarm condition; lamp is in its 12th month of operation and will require replacement shortly	Ensure that you have a replacement lamp on hand
Digital Display indicates **12, 13 or 14**	Lamp has reached the end of its life	Replace lamp and reset elapsed time meter
Digital Display indicates **L0**, **L1**, **L2**, or **L3**	Lamp is not operating	Inspect lamp cord and reconnect; ensure safety cap snaps into place
		Replace lamp and reset elapsed time meter
Digital Display reads **F0** or **F1**	Power supply failure	Restart; if this fails, replace power supply
Digital Display reads **C0**	Indicator light is malfunctioning	Restart; if this fails, replace power supply

Note: If push-button is pressed during an alarm condition, the audible alarm is postponed 24 hours. The alarm condition persists.

Troubleshooting

Systems with Sensors

SITUATION	POSSIBLE CAUSE	POSSIBLE SOLUTION
Digital Display reads **A3**	Not an alarm condition; system in high temperature mode	The system will do this every time the water is not flowing for more than 3-4 hours or is not in the correct temperature range. This warning will self-correct after water is allowed to flow through the system.
Digital Display reads **A0**	Quartz-glass sleeve has become coated	Follow cleaning procedures in manual
	UV sensor failing to detect the correct amount of UV energy	Ensure sensor is clean
		Ensure lamp/sleeve has been inserted properly; remove and re-insert
		Replace UV sensor if defective
	Lamp intensity is below safety level due to lamp age	Replace lamp
	Ultraviolet transmittance (UVT) of the water is below 75%.	Install prefiltration equipment to improve UVT of inlet water to recommended levels
Digital Display reads **EO**	Sensorboard failure	Replace sensor
Leak detected at sensor	UV sensor O-rings are damaged, deteriorated, or incorrectly installed	Inspect and replace O-rings if deteriorated

ISO 9001:1994

NSF information pertains to TrojanUVMax™ Pro7 and Pro15 models

This Class A system conforms to NSF Standard 55 for the disinfection of microbiologically contaminated water that meets all other public health standards. The system is not intended for treatment of water that has an obvious contamination source, such as raw sewage; nor is the system intended to convert wastewater to microbiologically safe drinking water. The system is intended to be installed on visually clear water (not coloured, cloudy, or turbid water). If this system is used for the treatment of surface waters a prefilter found to be in compliance for cyst reduction under ANSI/NSF Standard 53: Drinking Water Treatment Units - Health Effects shall be installed upstream of the system.

NSF Standard 55 defines waste water to include human and/or animal body waste, toilet paper, and any other material intended to be deposited in a receptacle designed to receive urine and/or feces (black waste); and other waste materials deposited in plumbing fixtures (gray waste).

System tested and certified by NSF International against ANSI/NSF Standard 55 for disinfection performance, Class A.

Installed by: _____

Date of installation: _____

Service numbers:

Installer - call _____

Trojan - call (519) 457-3400

Serial number: _____(see decal on back of power supply)

Model installed (check):

A	B	C D	E Pro7	F Pro15
☐	☐	☐ ☐	☐ ☐	☐ ☐

Corresponding lamp:	602803	602804	602805	602806	602807

Lamps **must** be replaced after 12 months of operation to ensure proper disinfection of your water.

Clean quartz sleeve and UV sensor (if equipped) frequently for optimum performance.

Lamp replacement dates:

1st: _____	6th: _____
2nd: _____	7th: _____
3rd: _____	8th: _____
4th: _____	9th: _____
5th: _____	10th: _____

TROJAN UV

WATER CONFIDENCE™

Head Office 3020 Gore Road, London, Ontario, Canada N5V 4T7
Tel: (519) 457-3400 Fax: (519) 457-3030

www.trojanuv.com

602669 Rev D

TROJANUVMAX™

Troubleshooting

All Models

SITUATION	POSSIBLE CAUSE	POSSIBLE SOLUTION
System is operating but water tests reveal bacterial contamination	Lamp sleeve has become coated	Ensure lamp sleeve is clean
	Lamp is too old	Ensure lamp is less than 12 months old
	Equipment is acting as a breeding ground for pathogens	Ensure UV is the last piece of treatment equipment
	Pathogens are residing in the distribution lines post-UV	Ensure all distribution lines have been disinfected with chlorine
		Ensure there are no dead-ends of pipe
	UVT is too low for UV to be effective	Submit water sample for UVT testing

TROJANUVMAX™

Troubleshooting

Models D, E, F, Pro 7 and Pro 15

SITUATION	POSSIBLE CAUSE	POSSIBLE SOLUTION
Digital display does not read anything	Unit is unplugged No power at AC power outlet Power cord is damaged Power surge caused damage to electrical assembly	Plug unit into AC power outlet Replace fuse or reset breaker Replace power cord Replace power supply and use a surge protector
Breaker repeatedly trips	Connection between lamp and lamp cord is wet Short circuit in the electrical assembly	Clean and dry the cord and lamp, check unit for leaks Replace power supply
Leak at inlet or outlet	Threaded pipe fittings are leaking	Clean threads, reseal with Teflon tape, and re-tighten
Leak detected from area of reactor	Condensation of moist air on cold reactor (slow accumulation) O-ring on sleeve bolt damaged, deteriorated, or incorrectly installed Lamp/sleeve assembly not properly installed (too tight or not tight enough)	Control humidity, relocate unit, or insulate reactor Inspect and replace if deteriorated Tighten assembly solidly hand-tight
Digital Display indicates a number between **0 and 10**	Not an alarm condition	
Digital Display indicates **11**	Not an alarm condition; lamp is in its 12th month of operation and will require replacement shortly	Ensure that you have a replacement lamp on hand
Digital Display indicates **12, 13 or 14**	Lamp has reached the end of its life	Replace lamp and reset elapsed time meter
Digital Display indicates **L0**, **L1**, **L2**, or **L3**	Lamp is not operating	Inspect lamp cord and reconnect; ensure safety cap snaps into place Replace lamp and reset elapsed time meter
Digital Display reads **F0** or **F1**	Power supply failure	Restart; if this fails, replace power supply
Digital Display reads **C0**	Indicator light is malfunctioning	Restart; if this fails, replace power supply

Note: If push-button is pressed during an alarm condition, the audible alarm is postponed 24 hours. The alarm condition persists.

TROJANUVMAX™

Troubleshooting

Models with Sensors

SITUATION	POSSIBLE CAUSE	POSSIBLE SOLUTION
Digital Display reads **A3**	Not an alarm condition; system in high temperature mode	The system will do this every time the water is not flowing for more than 3-4 hours or is not in the correct temperature range. This warning will self-correct after water is allowed to flow through the system.
Digital Display reads **A0**	Quartz-glass sleeve has become coated	Follow cleaning procedures in manual
	UV sensor failing to detect the correct amount of UV energy	Follow cleaning procedures in manual Ensure lamp/sleeve has been inserted properly; remove and re-insert
	Lamp intensity is below safety level due to lamp age	Replace lamp
	Corrosion on lamp pins	Replace lamp
	Ultraviolet transmittance (UVT) of the water is below 75%.	Verify UVT of water by performing a "dry test". Remove sensor as per manual, then drain the system to 1" below the sensor port. Reconnect sensor and plug the system in for 3 minutes. If the system alarms, call technical support group. If system does not alarm, turn water supply on - if alarm arises again, UVT is below 75% and pre-treatment may be required; call technical suppport group.
Digital Display reads **EO**	Sensorboard failure	Replace sensor
Leak detected at sensor	UV sensor O-rings are damaged, deteriorated, or incorrectly installed	Inspect and replace O-rings if deteriorated

BIONEST
Solutions Inspired by Nature™

New BIOLARM!

OPERATIONAL FUNCTIONALITIES :

The new BIOLARM™ connects directly into a single 120 V outlet while supplying the recirculation pump and sends out an audible and visual signal in case of malfunction of the following components:

- Recirculation pump
- Auxililary control box (BIO-UV)
- High level float (BIO-PUMP)
- Air pump pressure switch
- Relay contact

A green indicator light signals the BIOLARM™ is operational.

Two (2) red indicator lights signal the source of the alarm:

● AIR + AUX.	Low pressure in air supply line and auxiliary problem
○ ●))))	Low pressure in air supply line
●))))))	Auxiliary problem
● WATER + HL	Water recirculation pump stoppage and high water level
○ ●))))	Water recirculation pump stoppage
●))))))	High water level

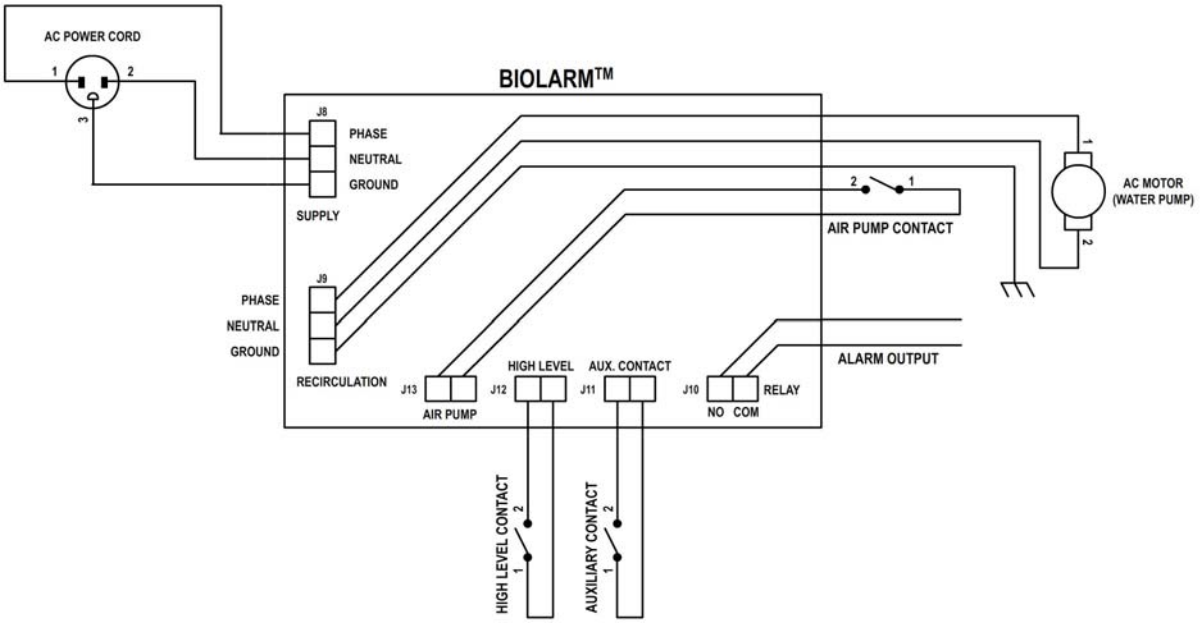
To stop the “AIR + AUX.” alarm, simply press the “Silence Air” button. The indicator light will remain on and the alarm will again go off 48 hours later.

To stop the “WATER + HL” alarm, simply press the “Silence Water” button. The indicator light will remain on until a technician turns it off.

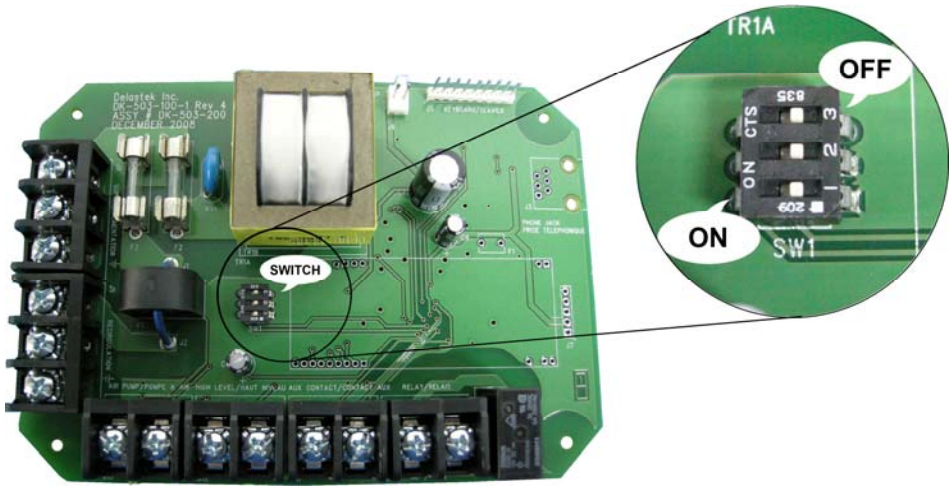
2009/07/06

BIONEST
Solutions Inspired by Nature™

BIOLARM™ ALARM ELECTRICAL CONNECTION DRAWING



ATTENTION: Risk of electrical shock
The BIOLARM™ must not be splashed on or immersed in water.



« SW1 » switch setting according to pump model			
Pump model	Switch 1	Switch 2	Switch 3
WPG-550 (0.6A) (SA-3 to SA-3240)	OFF	OFF	OFF
Liberty 247 (6A)	OFF	OFF	ON
JPG-20000 (3.5A)	ON	OFF	ON

TANK ALERT® XT Alarm System

Versatile, indoor or outdoor liquid level alarm system.

This alarm system monitors liquid levels in lift pump chambers, sump pump basins, holding tanks, sewage, agricultural, and other non-potable water applications.

The **Tank Alert® XT** indoor/outdoor alarm can serve as a high or low level alarm depending on the float switch model used.

The alarm horn sounds and the red beacon illuminates when a potentially threatening liquid level condition occurs. A "power on" light on the switch indicates power to the alarm panel.

FEATURES

- Enclosure meets Type 3R water-tight standard.
- Automatic alarm reset, horn silence switch, and alarm test switch.
- Alarm horn sounds at 85 decibels at 10 feet (3 meters).
- Alarm system (when installed on separate circuit) operates even if pump circuit fails.
- Complete package includes standard Sensor Float® control switch with 15 feet (4.57 meters) of cable (other lengths available) and mounting clamp.
- UL Listed for indoor or outdoor use.
- CSA Certified.
- Three-year limited warranty.

LR54245 LISTED 288X

Member of Hydraulic Institute

OPTIONS

When ordered with the alarm, the system is available with:

- alternate float switch models for high or low liquid level warning.
- auxiliary dry normally open contacts for easy attachment of remote devices.
- premounted terminal block so enclosure can also be used as a junction box for splicing pump, pump switch, and pump power. Meets NEC standard for junction boxes.
- 6 foot (1.8 meter) power cord and liquid-tight connectors.

SPECIFICATIONS

VOLTAGE: 120 VAC, 50/60 Hz, 8.5 watts max. (alarm condition)

ALARM ENCLOSURE: 6.5 x 4.5 x 3.0 inch (16.51 x 11.43 x 7.62 cm), indoor-outdoor, weatherproof, thermoplastic meets Type 3R water-tight standard

ALARM HORN: 85 decibels at 10 feet (3 meters), meets Type 3R water-tight standard as installed by factory

ALARM BEACON: meets Type 3R water-tight standard as installed by factory

TEST/SILENCE SWITCH: certified to IP66 and IP68 standards

AUXILIARY ALARM CONTACTS (OPTIONAL): 120 VAC, 5 amps max., 50/60 Hz

PRE-MOUNTED TERMINAL BLOCK (OPTIONAL): 20 amps, 120/230 VAC

POWER CORD (OPTIONAL): 6 foot (1.8 meter) cord with 120 VAC plug

FLOAT SWITCH: Sensor Float® control switch with mounting clamp
Cable: 15 feet (4.57 meters), flexible 18 gauge, 2 conductor (UL) SJOW, water-resistant (CPE)
Float: 3.38 inch diameter x 4.55 inch long (8.58 cm x 11.56 cm), high impact, corrosion resistant PVC housing for use in sewage and non-potable water up to 140°F (60°C)
Switch: hermetically sealed steel capsule features mercury-to-mercury contacts. Maximum line impedance for initiating device: 100 ohms

SJE Rhombus® CONTROLS

PO Box 1708, Detroit Lakes, MN 56502
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1-218-847-4617 Fax
email: sje@sjerhombus.com
www.sjerhombus.com

TANK ALERT® XT Installation Instructions

This alarm system monitors liquid levels in lift pump chambers, sump pump basins, holding tanks, sewage, agricultural, and other non-potable water applications.

The Tank Alert® XT indoor/outdoor alarm can serve as a high or low level alarm depending on the float switch model used. The alarm horn sounds and the red beacon illuminates when a potentially threatening liquid level condition occurs. A "power on" light on the switch indicates power to the alarm panel.

TANK ALERT® XT ALARM

- Voltage: 120 VAC, 50/60 Hz, 8.5 watts maximum (alarm condition) (circuit not supervised)
- Enclosure meets Type 3R water-tight standard.
- Automatic alarm reset, horn silence switch, and alarm test switch.
- Alarm horn sounds at 85 decibels at 10 feet (3 meters).
- Alarm system (when installed on separate circuit) operates even if pump circuit fails.
- Maximum line impedance for initiating device: 100 ohms.
- Complete package includes standard Sensor Float® control switch with 15 feet (4.57 meters) of cable (other lengths available) and mounting clamp.
- Three-year limited warranty.

OPTIONS

When ordered with the alarm, the system is available with:

- alternate float switch models for high or low liquid level warning.
- auxiliary alarm contacts for easy attachment of remote devices: (circuit not supervised) 120 VAC, 5 amps max., 50/60 Hz
- premounted terminal block so enclosure can also be used as a junction box for splicing pump, pump switch, and pump power. Meets NEC standard for junction boxes. 20 amps, 120/230 VAC.
- 6 foot (1.8 meter) power cord with 120 VAC plug and liquid-tight connectors.

PREVENTATIVE MAINTENANCE

- Periodically inspect the product. Check that the cable has not become worn or that the housing has not been damaged so as to impair the protection of the product. Replace the product immediately if any damage is found or suspected.
- Periodically check to see that the float is free to move and operate the switch.
- Use only SJE-Rhombus® replacement parts.

SJE-RHOMBUS® THREE-YEAR LIMITED WARRANTY

SJE-RHOMBUS® warrants to the original consumer that this product shall be free of manufacturing defects for three years after the date of consumer purchase. During that time period and subject to the conditions set forth below, **SJE-RHOMBUS®** will repair or replace, for the original consumer, any component which proves to be defective due to defective materials or workmanship of **SJE-RHOMBUS®**.

THIS EXPRESS WARRANTY DOES NOT APPLY TO THE MOTOR START KIT COMPONENT. SJE-RHOMBUS® MAKES NO WARRANTIES OF ANY TYPE WITH RESPECT TO THE MOTOR START KIT.

ELECTRICAL WIRING AND SERVICING OF THIS PRODUCT MUST BE PERFORMED BY A LICENSED ELECTRICIAN.

THIS WARRANTY DOES NOT APPLY: (A) to damage due to lightning or conditions beyond the control of **SJE-RHOMBUS®**; **(B)** to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with printed instructions provided; **(C)** to failures resulting from abuse, misuse, accident, or negligence; **(D)** to units which are not installed in accordance with applicable local codes, ordinances, or accepted trade practices, and **(E)** to units repaired and/or modified without prior authorization from **SJE-RHOMBUS®**.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

TO OBTAIN WARRANTY SERVICE: The consumer shall assume all responsibility and expense for removal, reinstallation, and freight. Any item to be repaired or replaced under this warranty must be returned to **SJE-RHOMBUS®**, or such place as designated by **SJE-RHOMBUS®**.

ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS ARE LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. SJE-RHOMBUS® SHALL NOT, IN ANY MANNER, BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES AS A RESULT OF A BREACH OF THIS WRITTEN WARRANTY OR ANY IMPLIED WARRANTY.

⚠WARNING **ELECTRICAL SHOCK HAZARD**

Disconnect power before installing or servicing this product. A qualified service person must install and service this product according to applicable electrical and plumbing codes.

⚠WARNING **EXPLOSION OR FIRE HAZARD**

Do not use this product with flammable liquids. Do not install in hazardous locations as defined by National Electrical Code, ANSI/NFPA 70.

Failure to follow these precautions could result in serious injury or death. Replace product immediately if switch cable becomes damaged or severed. Keep these instructions with warranty after installation. This product must be installed in accordance with National Electric Code, ANSI/NFPA 70 so as to prevent moisture from entering or accumulating within boxes, conduit bodies, fittings, float housing, or cable.

For detailed specifications on this product, or for the complete line of SJE-Rhombus® panel, alarm, and switch products, visit our web-site at www.sjerhombus.com.

INSTALLING THE FLOAT SWITCH

1. Place the cord into the clamp as shown in Figure A.
2. Locate the clamp at the desired activation level and secure the clamp to the discharge pipe as shown in see Figure A. **Note:** Do not install cord under hose clamp.
3. Tighten the hose clamp using a screwdriver. Over tightening may result in damage to the plastic clamp. Make sure the float cable is not allowed to touch the excess hose clamp band during operation.
4. Wire cable leads directly into control device as shown in Figure B.
5. Check installation. Allow system to cycle to insure proper operation. **Note:** All hose clamp components are made of 18-8 stainless steel material. See your SJE-Rhombus® supplier for replacements.

INSTALLING THE ALARM

1. Mount alarm box using existing holes in back of box. To ensure water-tight seal, use screws and sealing washers included with alarm. **Note:** Screws are to be located over wall stud or used with a wall anchor sized for a #8 x 1.25 self tapping screw.
2. Determine "conduit-in" locations on alarm as shown in Figure B. **Note:** When used with a pump application, connect alarm to a circuit separate from the pump circuit. This allows alarm to continue to operate if the pump circuit fails.
3. Drill holes for conduit entry, taking care not to damage bosses inside alarm box.
4. Attach conduit.

   If alarm includes premounted terminal block option, refer now to the Terminal Block Option Wiring Instructions.
5. Bring float switch cable through conduit and wire to terminal block positions 1 and 2 as shown in Figure B.
6. Wire power conductors to terminal block positions 3 and 4 and ground wire to ground termination post as shown in Figure B. **Note:** If terminal block option is used, attach ground wire as shown in Figure A of Terminal Block Option Wiring Instructions.
7. If remote device is used, connect wires as shown in Figure B using supplied wire nuts.
8. Attach alarm box cover using the four pre-installed screws.
9. Turn on power. Light on switch should come on.
10. Check installation by manually tipping the float. The horn and beacon should turn on.
11. Push silence switch to test silence feature.
12. Test unit once per week to insure proper operation.

Figure A

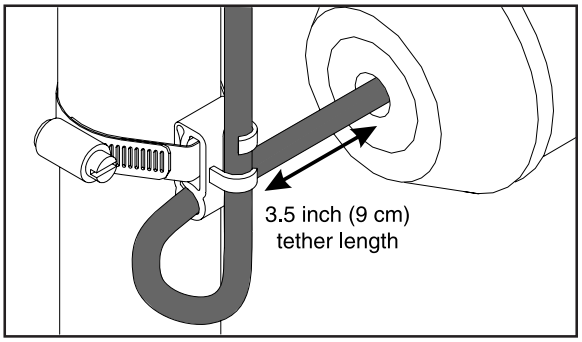
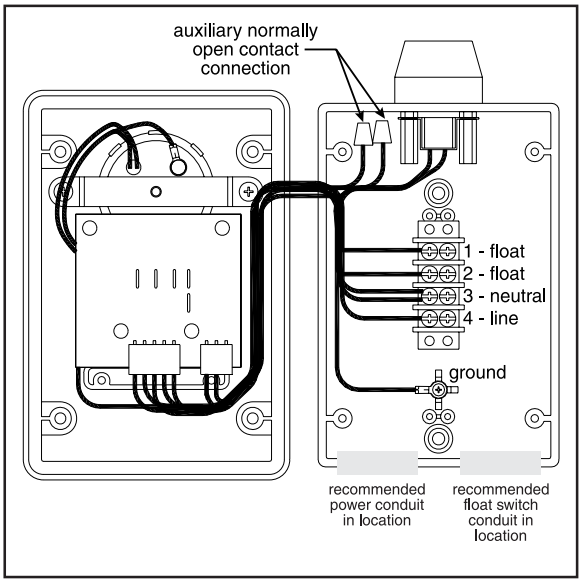


Figure B



SJE-Rhombus CONTROLS®

22650 County Highway 6 ■ P.O. Box 1708 ■ Detroit Lakes, Minnesota 56502 USA
1-888-DIAL-SJE (1-888-342-5753) ■ Phone: 218-847-1317 ■ Fax: 218-847-4617 ■ E-mail: sje@sjerhombus.com

Instl. Instr. PN 1016543C

Set Points

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1 AIR PUMP

Permanent aeration of the first compartment of the bioreactor is assured by linear diffusers (Basis: 1 diffuser per 1 m^3 of water). Therefore, 10 diffusers connected to 5 small diaphragm air pumps (model HP-80 from Hiblow or equivalent) is installed. Each air diffuser provides 35 L/min, for a total of 350 L/min.

2 RECIRCULATION PUMP

The effluent from the bioreactor is recirculated at a rate of 2,5 times the average daily flow. One recirculation pump will recirculate the effluent. At start-up, the average daily flow is estimate at 60% of design flow. The initial recirculation set point is; 6,2 L/min after. After the first year of operation, that set point might be adjusted.

Recirculation set point	6,2 L/min

3 DEVICES TO MAINTAIN TEMPERATURE

3.1 Pipe insert heaters

To maintain wastewater temperature above 12°C, two (2) pipe insert heaters (5 kW) are installed in the 1/3 section of the septic tank.

3.2 Temperature Probes

Three probes are installed in the KODIAK unit. Probes are connected to three different thermostats indicated below.

Mechanical room's probe:

A probe is installed in the mechanical room. It is connected to a thermostat (#1) that is also connected to an alarm in order to detect any breakage of the ceiling fan heater. A temperature below 10°C will activate the alarm. The thermostat's parameters are presented in the following table:

Thermostat #1 parameters.

Set point 1	**Set point 2**
°C	
S1 :10	S2 :---
Dif1.: 2	Dif2.: ---
H1	H2

Bioreactor' probes:

A first probe is installed in the non-aerated section of the bioreactor. It is connected to thermostat #2 that is also connected to the pipe insert heater control panel. A temperature below 12°C will activate a first pipe insert heater. If a temperature below 10°C is detected, a second pipe insert heater will be activated. In this case, both pipe insert heaters will work in the same time. The thermostat's parameters are presented in the following table:

Thermostat #2 parameters.

Set point 1	**Set point 2**
°C	
S1 :12	S2 :10
Dif1.: 2	Dif2.: 2
H1	H2

A second probe is also installed in the non-aerated section of the bioreactor. It is connected to thermostat #3, that is connected to an alarm. . A temperature below 10°C will activate the alarm. The thermostat's parameters are presented in the following table:

Thermostat #3 parameters.

Set point 1	**Set point 2**
°C	
S1 :9	S2 :---
Dif1.: 1	Dif2.: ---
H1	H2

3.3 Ceiling fan heater

To maintain a warm temperature in the mechanical room, a ceiling fan heater is installed. The thermostat has to be setted at 20°C.

Ceiling fan heater set point	20°C

4 ULTRAVIOLET UNIT

An ultraviolet disinfection unit is required to disinfect the effluent. One (1) UVmax model F unit disinfecting at a rate of 27 L/min is installed.

Ultraviolet unit set point	27L/min

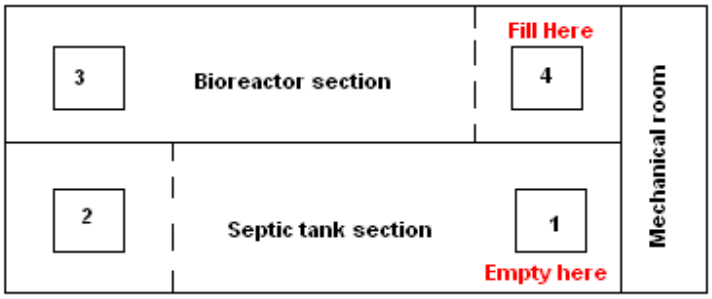
Maintenance

TABLE OF CONTENTS

1 START-UP PROCEDURE

1. Please verify that both the inlet and outlet pipes are properly connected to the KODIAK unit.
2. Completely fill the unit with clean water via the last compartment of the bioreactor, (section 1/3, lid #4)

Figure 1: KODIAK unit's configuration.

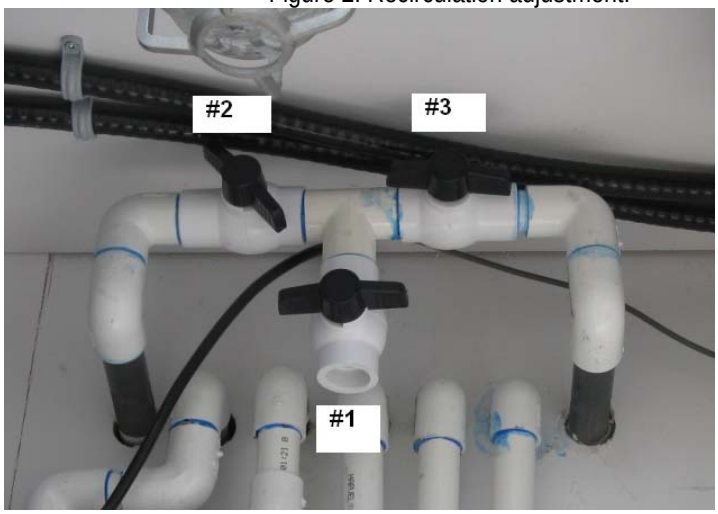


Kodiak 20 feet

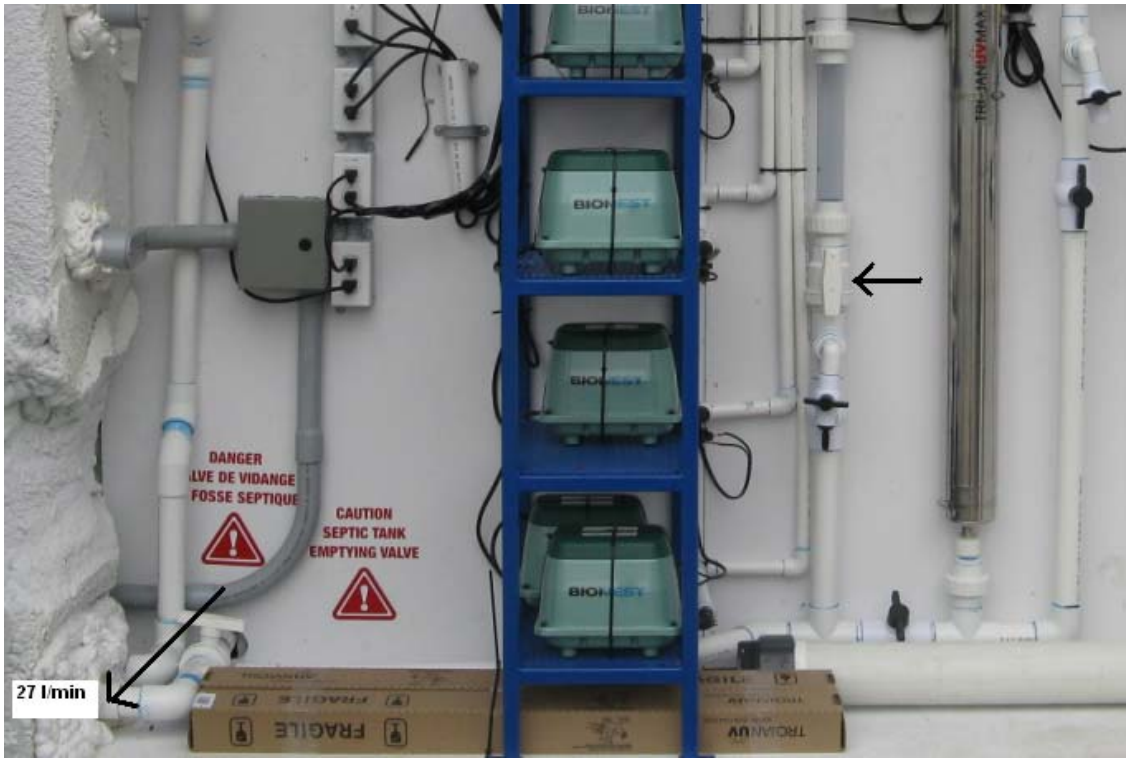
As the bioreactor is filled, water flows to the septic tank through one-way valves in order to balance the water level in each tank. If the filling is made by any other opening, water from the other tanks could not flow through one-way valves and therefore, too much pressure could cause breakage of partition walls.

3. Open water supply. (if needed)
4. Turn on the electrical supply. (The KODIAK unit should never be electrically powered if it is not fully filled with water)
5. Adjust the recirculation flow (see Figure 2)
    a. Place a bucket under valve #1.
    b. Open valves #1 and 3.
    c. Close valve #2.
    d. Adjust valve #3 in order to have a flow rate equivalent to 2,5 times the inlet flow rate.
    e. One adjusted, open valve #2 and close valve #1.

Figure 2: Recirculation adjustment.



6. Adjust the flow rate within the UV disinfection unit.
    a. Fill the KODIAK unit with clean water. (via the bioreactor compartment, section 1/3, lid #4).
    b. Adjust the valve identified below to obtain a flow rate of 27 L/min out of the KODIAK unit.



7. Verify the different alarms effectiveness.
8. Adjust the ceiling fan heater thermostat to 20°C.
9. Adjust the different setpoints (see SETPOINT document)

2 COMPONENT MAINTENANCE

Every year, an inspection of the following elements must be carried out by the owner. (If the KODIAK unit is used on a seasonal basis, the maintenance shall be done during the start-up and the shut down procedure of the system).

- ⇨ Effluent filter
- ⇨ Air pump
- ⇨ Recirculation pump
- ⇨ Alarm system
- ⇨ UV unit

2.1 Security instructions

- ✓ Do not allow wastewater or treated wastewater to come in contact with your mouth.
- ✓ Please wash your hands thoroughly with antibacterial soap after each inspection.
- ✓ Always turn off the power supply before carrying out the inspection or maintenance of electrical components.

CAUTION: The air pump may be hot. Please take the proper precautions.

2.2 Components inspection

2.2.1 AIR PUMP INSPECTION

A. Verification of the proper operation of the air pump.

1) Verify that the air pump functions properly and make sure that it does not emit any abnormal noise.

B. Cleaning the air pump filter

The filter of the air pump must be cleaned during the maintenance. However, depending on general conditions around the air pump (ex: dusty environment), it may be necessary to carry out additional cleaning during the year.

To clean the air pump filter:

1) Disconnect the power supply of the air pump. (The alarm should go on after a few minutes);
2) To remove the filter cover, put your fingers on one side of the cover and pull it up, then remove the filter. See figure 2 and 3. (Pump models may have a screw or a knob bolt to remove);

3) Vacuum any dust;

4) If heavily soiled, hand wash in soapy water, rinse with clear water and dry the filter before reinstalling;

5) Replace the filter, put the filter cover back and press downwards from above to fit it in. Remember to screw or bolt the knob if so. See figure 4 (Take care not to press the filter cover in its improper position as it may be damaged and make sure that the seal is adequately located);

Figure 3

Figure 4

Figure 5

6) Connect the power supply. (Reconnect the alarm if it was disconnected).

2.2.2 INSPECTION OF THE BIOLARM™

A. Verification of the proper operation of the BIOLARM™ control panel:

1) Disconnect the pressure switch from an air pump and stick the two clamps together.
2) Make sure that the alarm turns on (sound and light)
3) Reconnect the pressure switch
4) Repeat the same operation for each pump.

CAUTION:	If the alarm has not emitted any sound, it may be malfunctioning. Please refer to section 4.5 of this manual.

2.2.3 INSPECTION OF THE UV unit

To keep the effluent quality produced by this treatment, the UV lamp has to be expected and cleaned every 6 months. The lamp has to be replaced every year. An alarm is connected to the UV disinfection unit. This one is activated when the UV lamp is burned or when 375 days have elapsed since the change of the lamp. All the information related to the

maintenance of the unit is presented in the COMPONENTS documents. Note that if the KODIAK unit is used on a seasonal basis, the lamp has to be removed during the shut down procedure and put in a warm place.

2.2.4 INSPECTION OF THE BIOREACTOR SECTION

1) Remove both lids #3 and 4.
2) Verify that the water level in each compartment of the reactor is normal.
3) The first compartment of the reactor is aerated with fine bubble air diffusers. The appearance of fine bubbles on the surface is an indication that the fine bubble air diffusers are functioning normally.
4) In the event that no bubbles appear this may indicate a problem with the air pump and the BIOLARM™ should have been activated. Please refer to sections 3.4.2.

CAUTION:	Large bubbles of air at irregular frequency may indicate a problem with the fine bubble air diffusers. In that case, please contact us immediately.

5) Measure the dissolved oxygen (if possible) in the two compartment of the BIONEST™ reactor. The dissolved oxygen should be 4 mg/L or above in the first compartment (lid #3) and 1 mg/L or above in the 2nd compartment (lid #4).
    a. If the dissolved oxygen is lower than 4 mg/L, this indicates that there is not sufficient oxygen in the reactor. Please refer to section 3.4.1.
    b. If the dissolved oxygen is higher than 6 mg/L, this indicates too much oxygen is sent to the septic tank. Reduce the recirculation rate (see section 1.5)
6) Measure the pH (if possible) in the second compartment of the reactor and indicate it on the maintenance report.
7) Make sure that there is no strong smell coming from the second compartment of the reactor.

CAUTION:	A strong ammonia odour may indicate a problem with the treatment system. The malfunction of one of the components of the KODIAK unit or a lack of ventilation may be the cause of this problem. Please refer to section 3.2.2.

8) Verify the presence of sludge under the media in both compartments of the reactor. If you find any sludge, please proceed to its removal by pumping it back in the 1st compartment of septic tank.
9) Verify if the water recirculation pump functions properly.
10) Before replacing the lids, clean the surrounding area to make sure that the cover will close properly.
11) You can now replace the two lids of the reactor.

2.2.5 INSPECTION OF THE SEPTIC TANK

Sludge needs to be pumped out periodically from the septic tank using a vacuum truck normal pump-out procedure. Kodiak inc. recommends that the septic tank be pumped out when the sludge reaches 30 cm (12") deep. Please note that all applicable local regulations supersede these operational instructions.

Please note that the emptying of your septic tank must be carried out by a specialized firm. Do not hesitate to contact your local Health department, or adequate authorities, or us for a list of the specialized firms in your area.

A. Water level verification

1) Remove the lids of the septic tank (lids #1 and 2)
2) Verify that the water level in the septic tank is normal.
3) Verify that the pipe at the inlet and outlet are not blocked by any object.

B. Measurement of the sludge in the septic tank (if needed)

1) Using a sludge measurement apparatus, please measure the height of sludge in the septic tank. If the height of sludge is higher than 30 cm (12") in the first compartment, the septic tank needs to be pumped out.

CAUTION:	The contents of the septic tank can be harmful to your health. Avoid direct contact with the wastewater by using the appropriate equipment.

C. Inspection and cleaning of the effluent filter

1) If water level is high, move effluent filter up and down 2 or 3 times, without removing it to allow water to drop to normal level. Remove effluent filter only when water level is normal.
2) Remove the effluent filter which is located at the outlet of the second compartment of the septic tank (lid #2)
3) Make sure that it is not blocked. Note its condition in the maintenance report.
4) Use a water hose to clean the effluent filter by placing it over the first opening of the septic tank before rinsing it.
5) Replace the effluent filter into its receptacle.

D. Calculate the recirculation rate (see Section 1.5) and indicate it on the maintenance report.

2.2.6 VENTILATION

An adequate ventilation of the KODIAK unit is necessary to ensure the proper operation of the system. Make sure the vent is not blocked.

2.2.7 MAINTENANCE REPORT

The maintenance report must be filled out and sent to us.

2.2.8 SAMPLING PROCEDURE

Three different sampling valves are located in the mechanical room. These valves are indicated below:
Figure 7: Sampling valves configuration.

Valve #1: affluent
Valve #2: effluent of the bioreactor.
Valve #3: desinfected water.

2.2.9 PRELIMINARY EVALUATION OF THE COLLECTED SAMPLES

Although the sample must be analyzed in laboratory using specialized equipment, it is possible to make a qualitative evaluation of them immediately after having collected them.

The effluent samples and the disinfected water must normally be colourless, transparent and no strong smell of ammonia should be detected. The suspended solids are generally not detectable to the naked eye.

3 TROUBLESHOOTING SECTION

In the event where a malfunction or failure of the KODIAK unit treatment system component is detected, this section will provide you technical assistance. In such case, you must initially carry out a visual and olfactory inspection of all components of the system.

After having completed the inspection and identified the problem(s), you should use this section to carry out the repair of any non functioning component.

CAUTION:	It is strictly forbidden to remove the media from the KODIAK unit no matter what repair has to be carried out. If you judge that it is impossible to carry out the repair of the system without removing the media, please contact us. Please note that this instruction is very important to comply with.

If the content of this section does not help you to solve all problems encountered, please contact us as soon as possible.

3.1 Odours inside the building or wastewater backup

Generally, the appearance of a backup in the sanitary appliances means that:

- ✓ It's time to empty the septic tank or
- ✓ The effluent filter is blocked.

Please verify what has blocked the effluent filter (grease, paper, etc.), clean the effluent filter and check to see when the septic tank was emptied the last time. Please ensure that the tank was emptied in conformity with the local regulations in force and/or as indicated in this manual.

3.2 Odours outside the building

If odours are located outside the building, start by identifying from which part of the treatment train it comes from.

3.2.1 ODOURS COMING FROM THE SEPTIC TANK SECTION

Odours may originate from a properly functioning septic tank but is normally evacuated by the vent. However, in some cases, odours may evacuate by the covers of the septic tank. In those cases, locate and make sure the vent is not blocked. Also, to prevent the smell from exiting from the access covers of the septic tank, they may be sealed appropriately.

It is also appropriate to verify and clean the effluent filter since it may block the circulation of air into the system and may cause odours problems.

3.2.2 ODOURS COMING FROM THE REACTOR SECTION

Generally, an effluent which releases a strong ammonia smell is a sign of a possible failure of the air pump or that the effluent filter is blocked.

1) Verify that the air pump is functioning properly.
2) Measure the dissolved oxygen in the reactor (if possible). If the dissolved oxygen is lower than 4 mg/L in 1st compartment (lid #3) and lower than 1 mg/L in 2nd compartment (lid #4).
3) Inspect and clean the effluent filter.

The other possible cause of strong ammonia smell in the system is the absence of a sufficient biomass fixed to the media. This occurs when the system is subjected to a shock, i.e. under unusual conditions causing the death of the treatment bacteria. Please check the temperature and the pH of water. Relay this information to us in writing.

3.3 Abnormal water level

3.3.1 HIGH WATER LEVEL IN THE SEPTIC TANK SECTION

A high level of water in the septic tank section may indicate that the water cannot be properly evacuated. Please inspect and clean the effluent filter since it may be blocked and thus prevent the water from correctly exiting the septic tank.

1) The effluent filter must be removed only to its half to allow the water to exit the septic tank without bringing solids to the BIONEST™ reactor.
2) When the water reaches a normal level, the effluent may be completely removed.
3) Use a water hose to clean the effluent filter by placing it over the first opening of the septic tank (lid # 1) before rinsing it.
4) To avoid contamination of the surrounding area, remove the excess of water before replacing the effluent filter into the second compartment of the septic tank (lid #2).

3.3.2 LOW WATER LEVEL IN THE SEPTIC TANK SECTION

A low water level in the septic tank may be caused by a recent emptying of the septic tank. Please note that the septic tank must always be refilled with water after being emptied.

If the septic tank has not been recently emptied, this may be caused by a leaking septic tank. This may constitute a serious problem and we recommend that you immediately contact us to discuss what measures are to be taken.

3.3.3 LOW WATER LEVEL IN THE REACTOR

First, verify if the septic tank level is normal. If the water level of the septic tank is too low, this may be caused by a leakage from the septic tank. This may constitute a serious problem and we recommend that you immediately contact us to discuss what measures are to be taken.

3.4 Failure of specific components

3.4.1 DISSOLVED OXYGEN LEVEL

If the dissolved oxygen is lower than 4 mg/L in the first compartment of the bioreactor and lowers than 1 mg/L in the 2nd compartment of the bioreactor, this indicates that the amount of oxygen in the reactor is insufficient.

First, you must verify if there is fine air bubble in the first compartment of the BIONEST™ reactor. If not, verify if the air pump is functioning properly.

If the air pump does not function properly, please refer to section 3.4.2 Please note that if the air pump does not function properly, the alarm should go on. If the alarm did not go on, please refer to section 3.4.4.
If the air pump is functioning properly, verify that all connections are properly sealed. If so, verify if the air line is blocked by measuring the air flow at its entry to the reactor. To do so:

1) Unscrew the metal hose clamps that hold the air line to the pre-assembled adapter.
2) Remove the pre-assembled adapter from the air line. The air line may be heated with a heat gun to ease its removal.
3) Verify if there is condensation that may have occurred in the air line.
4) Measure the pressure with a pressure gage. It should be around 6-7 psi. If not, the air line is probably blocked. In that case, please contact us.

3.4.2 FAILURE OF THE AIR PUMP

CAUTION:	Before attempting any repair, unplug the electrical cord of the air pump.

A. Air pump does fails to work

1) If the air pump does not function, make sure it is properly connected to a power source.
2) Verify the safety screw. If the air pump over heated, the safety screw may have broken. To replace the safety screw, please refer to section 4.
3) If the air pump still does not function, the problem is related to the electrical supply.

B. Air pump works but makes loud irregular noise or does not evacuate enough air

1) Verify the air pump filter. If dirty, hand wash in soapy water, rinse with clear water and let dry before replacing it.

2) If the air pump functions but the alarm is on and/or the air pressure at the exit of the air pump is insufficient (lower than 4 psi), it is possible that the air pump is defective.
3) Verify the diaphragms, valves and electromagnet. If one of those is defective, replace the defective parts (see section 4 for replacement procedure). If after the replacement of the defective parts, the air pressure at the exit of the pump is still insufficient, proceed to complete replacement of the air pump (see section 4 for replacement procedure).

C. Air pump functions, but no air bubble appears in the first compartment of the BIONEST™ reactor.
1) Verify to insure that all connections are properly sealed.
2) Verify if the air pipe is blocked, damaged or pierced.
3) Push down on the media in the BIONEST™ reactor to see bubbles.
4) Open air line in the BIONEST™ reactor to see air pressure.

3.4.3 FAILURE OF THE FINE BUBBLE AIR DIFFUSERS

If inconsistent air bubbles are observed in the first compartment of the reactor, please notify us. We will determine the nature of the failure.

3.4.4 MALFUNCTION OF THE BIOLARM™

If the BIOLARM™ has not emitted any sound during the test or if it has not turned on while the air pump if defective, it is probably due to a bad electrical connection. Please contact us.

4 REPLACEMENT OF SYSTEM COMPONENTS

4.1 Air pump diaphragm and valve replacement

- Be sure to unplug the pump unit.
- For chamber block replacement, be sure to change both chamber blocks at the same time.
- The rod employs powerful permanent magnets. Therefore, be sure to remove your watch and precision machine before starting the work as it may fail due to their strong magnetic force.
- Do not put the actuating rod close to a magnetic card, a magnetic disk or any other magnetic media as their data may be lost.

4.1.1 HP-80

➔ IMPORTANT : For the HP-80 model, the diaphragm or the valves cannot be changed. The complete chamber block must be changed.

A. Remove all the bolts from the four corners.

B. If it is difficult to remove it due to the heavily stuck internal seal packing, pry it open by inserting the tip of a flat-head screwdriver into the clearance between the exhaust nozzle and the upper housing.

C. If the stick is too heavy, raise up the pump body and hit the exhaust nozzle lightly with a hammer (do not use a metal hammer).

D. Remove the sound absorber.
Pull out the L-tube from the casing nozzle. (See figure 8)
Remove the four screws hold the chamber block and the casing block on both side. (See figure 9)

Figure 8

Figure 9

E. Remove one of the U-lock nuts hold the diaphragm mounting block to the rod.
- Use the box driver to loosen (or tighten) the U-lock nut.

F. Remove one of the diaphragm mounting blocks from the actuating rod and pull out the other diaphragm mounting block with the rod and finally, separate the diaphragm mounting block and rod.

➔ IMPORTANT : When pull out the rod; take care not to allow the rod projection to accidentally hit the lever of the SP switch. If the pump stops automatically, the safety screw must be broken to prevent any further damage to the pump. Be sure all debris is removed from unit.

G. Install the new diaphragm mounting block on the actuating rod.
- Use new U-lock and washer only that come as replacement parts to prevent loosening and causing failure of the pump.

Figure 10

Figure 11

Figure 12

H. Insert the actuating rod in accordance with the gap of the frame.
Secure the diaphragm mounting block on the other side and tighten the U-lock nut with the box driver.
Make sure the gaps between the actuating rod and the electromagnet are even.

I. Connect L-tube to the casing block and secure the casing with the screws.

J. Repeat steps from "E" to "I" for the other chamber block.

K. Install the sound absorber.

L. Place the upper housing back on body.
- Be extremely careful not to pinch the Sound Absorber in the Upper Housing
  Secure it with the bolts.
  Then place the filter and filter cover on the upper housing.

4.2 Air pump safety screw replacement

4.2.1 HP-80, HP-100, HP-150 AND HP-200 MODELS

A. Dispose of broken screw. Be sure all debris is removed from unit as it can result in damage to permanent magnets and or even in a failure of the pump.

B. Draw the new and safety screw through a hole in the different direction of the terminal.
(Threading order: The L-shaped lever-the spring electrode)

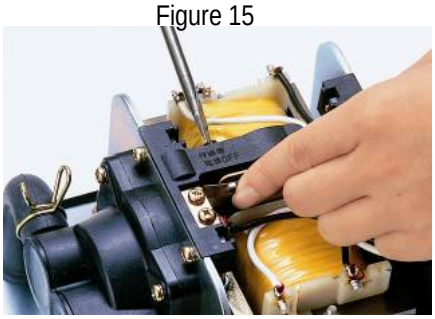
C. Fasten screw with nut.
The screw is designed so that the nut will turn freely when it is properly fastened, stop tightening when this happens.

D. Make sure the gaps between L-shaped lever and lug of the actuating rod are even.
- When checking the movement of the switch while the power is connected, touching the terminal will result in an electric shock.
- Unplug the pump immediately after the check.

Figure 13

Figure 14

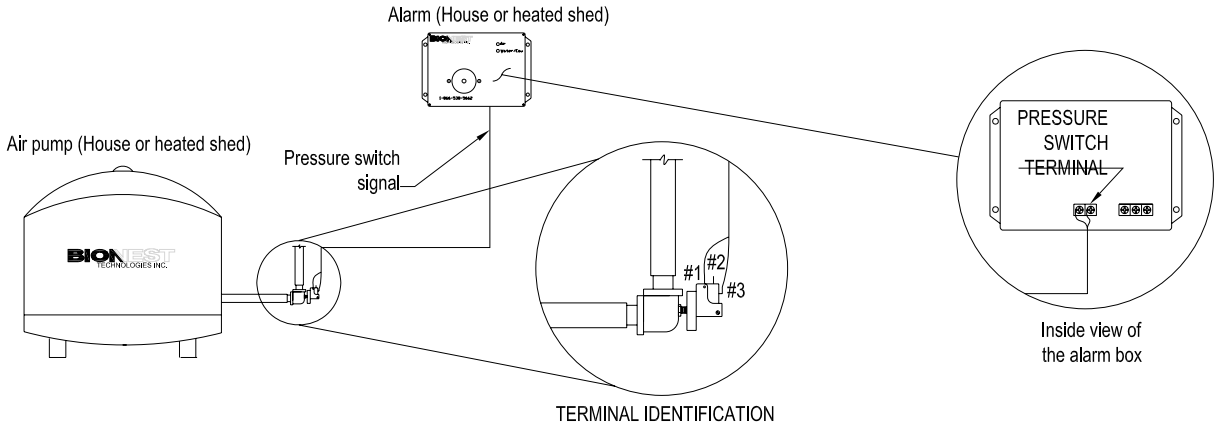
Figure 15



4.3 Complete air pump replacement

If the air pump needs to be replaced, please disconnect the electrical wire and the air line and replace it with a new one as followed. You may disconnect the alarm during the operation. Don't forget to reconnect it after the air pump has been replaced and to reconnect it to the BIOLARM™ control panel.

Figure 16: BIOLARM™ electrical connection.



4.4 Recirculation pump

The recirculation pump is located in the last compartment of the reactor. If it needs to be replaced, please contact us.

4.5 BIOLARM™ control panel

If the BIOLARM™ needs to be replaced, please contact us.

4.6 Air diffuser

In the event that the air diffuser needs to be replaced, please contact us. The media should never be removed from the reactor without prior written authorization from us.

5 PERIODIC EMPTYING PROCEDURE

1. Turn off electrical supply.
2. Clean the prefilter with a garden hose.
3. Clean the recirculation line.
    a. Open ball valves #1 and 2. (see Figure 2)
    b. With a garden hose, supply the recirculation line.
    c. Perform steps 4 a) and 4 b) but this time, with ball valves # 1 and 3.

4. Drain the KODIAK unit via the septic tank compartment (section 2/3; lid #1) (see Figure 1)

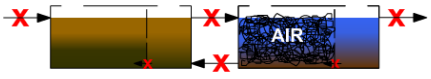
As water from the septic tank is pumped, water from other compartments flows through one-way valves to balance the water level in each tank. If the drain is made by any other opening, water from the other tanks could not flow through one-way valves and therefore too much pressure could cause breakage of partition walls.

5. Completely fill the KODIAK unit with clean water. (via the bioreactor compartment, section 1/3, lid #4). As the bioreactor is filled, water flows to the septic tank through one-way valves in order to balance the water level in each tank. If the filling is made by any other opening, water from the other tanks could not flow through one-way valves and therefore, too much pressure could cause breakage of partition walls.

6. Turn on the electrical supply. (The KODIAK unit should never be electrically powered if it is not fully filled with water)

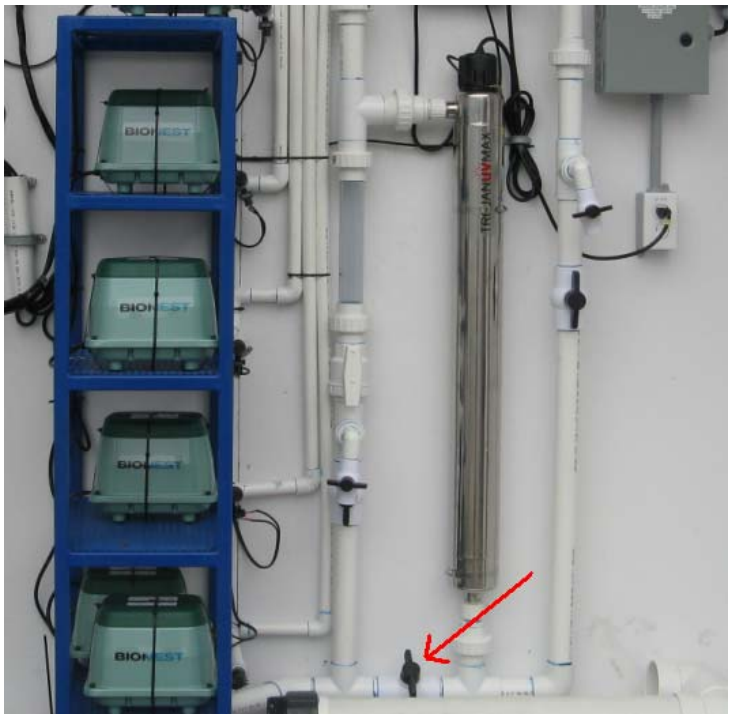
6 SHUTDOWN PROCEDURE

1. Shut off the wastewater supply.
    a. Pressure supply; take out the pump(s) from the pump station and put it in a dry place. Disconnect the feeding line from the KODIAK unit and put a cap on the unit's inlet.
    b. Gravity supply; disconnect the feeding line from the KODIAK unit and put a cap on the unit's inlet.

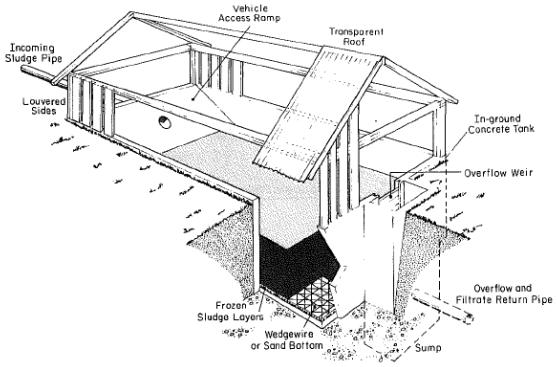


2. Disconnect the power supply of UV units.

3. Drain water from the UV unit by opening the valve indicated below. Drained water should be emptied in the septic tank compartment (lid #1). Remove the sleeve the TrojanUVmax disinfection unit and clean it using a soft, lint-free cotton cloth and a chemical scale-remover such as Lime-a-Way™ or CLR™. Then also remove the lamp and store the parts in a safe and warm environment.

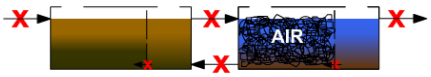


Since equipment, chemicals and spare parts are difficult to obtain where the Kodiak™ unit will be installed, the suggested method to condition the sludge is through freezing and thawing. The figure below demonstrates a typical freeze-thaw bed that would be use throughout the year.



The thickness of individual applied layer and the maximum thickness can be established based on the temperature and length of the freezing and the thawing periods. For design information, please refer to Martel (1989) for more details. For the current project, an uncovered underground lagoon will be used as a freezing bed. A sand layer will be added at the bottom with drainage pipes to allow a more complete removal of the water after thawing.

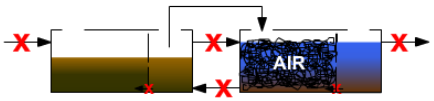
4. Leave the aeration in operation for a period equivalent to the hydraulic retention time (HRT), which is 1.5 days.



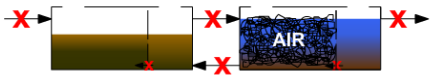
5. Using a sludge judge, determine the height of the accumulated secondary sludge and then transfer a little part of the supernatant of the bioreactor. (1 or 2 feet max)

6. Using a sludge judge as shown on the figure beside, identify the height of primary sludge accumulation in the septic tank.

   Then transfer the supernatant of the septic tank into the bioreactor using an adequate pump.

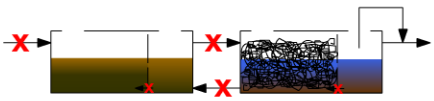


7. Leave the aeration in operation for a period equivalent to the hydraulic retention time (HRT), which is 1.5 days.

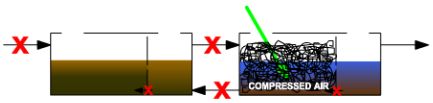


8. Turn off the main electrical breaker.

   Using a sludge judge, determine the height of the accumulated secondary sludge and then transfer the supernatant of the bioreactor.



9. Detach excess biomass on the Bionest™ media with compressed air.

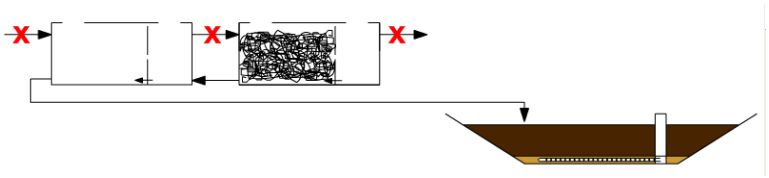


Clean the recirculation line.

a. Open ball valves #1 and 2. (see Figure 2)
b. With a garden hose, supply the recirculation line.
c. Perform steps 5 a) and 5 b) but this time, with ball valves # 1 and 3.

Clean the effluent filter with a garden hose.

10. Drain primary and secondary sludge through the drain valve located in the mechanical room of the Kodiak™ unit. The sludge will be transferred into a waterproof lagoon. The lagoon will operated as a freezing and thawing bed and will also serve as a contingency storage basin in the Kodiak™ unit has to be maintained for any reason.



Make sure that the tank is adequately drained by lifting the opposite end with a lift and the bioreactor side of the container. Sludge will flow from the last compartment of the bioreactor to the first compartment of the septic tank through the one-way valves at the bottom of the partition walls in the tank.

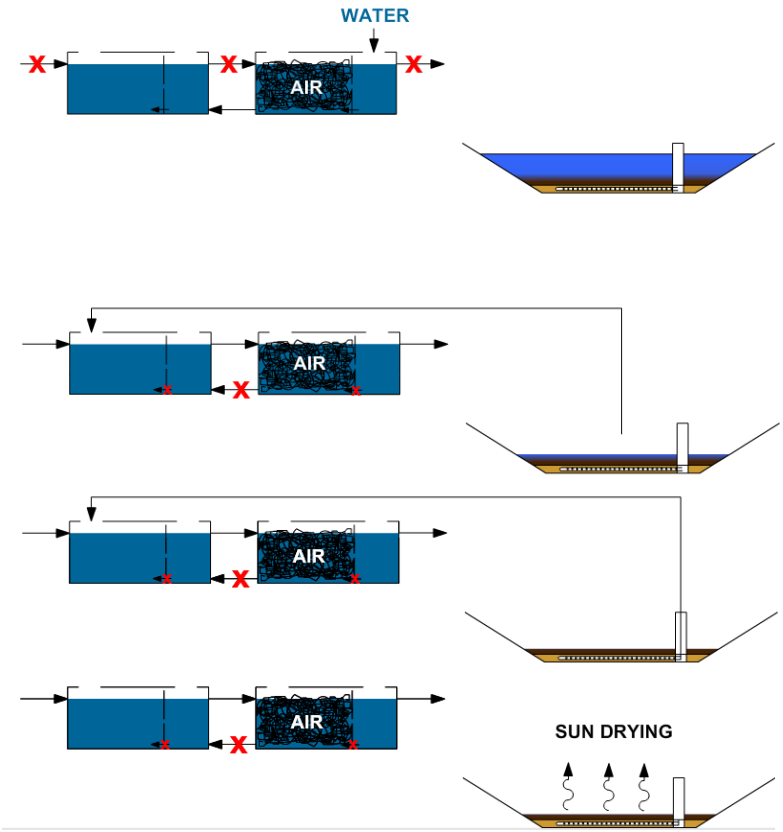
This completes the shut down procedure. The following steps describe the start-up of the Kodiak™ unit following the first year.

1. Add clean water in the last compartment of the bioreactor. Water will distribute throughout the entire tank through the one-way valve at the bottom of the partition walls.

2. Pump the supernatant of the freezing/thawing bed into the first compartment of the septic tank.

3. Transfer the rest of the water within the sludge by connecting to the drain located in the sand layer of the bed.

4. Please refer to chapter 1 for detailed instructions of the start-up of the Kodiak™ unit.



Bibliography

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Register

TABLE OF CONTENTS

1 MAINTENANCE

This register will allow you to maintain a follow-up on the operations and inspections made on your KODIAK unit. By completing it each time you are making the verifications and the operations asked, you will allow Bionest Kodiak be sure that the operations have been made in conformity with the recommendations.

Table 1: Maintenance activity register

Date	Description of the intervention	Signature

Date	Description of the intervention	Signature