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# DOCUMENTATION CONVENTIONS

This manual uses the following conventions to present information:



**WARNING**

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message.



**CAUTION**

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.



**NOTE**

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

# Chapter 1: System Description

## Function and Theory

Geotech's pneumatic Bladder Pumps operate with a unique action, ideal for both, gentle low-flow sampling and high flow rate purging. Timed on/off cycles of compressed air alternately squeeze the flexible bladder to displace water out of the pump to the surface and exhaust allowing the pump to refill. Fluid enters the pump through the fluid inlet check valve at the bottom of the pump body, via hydrostatic pressure (automatically by submergence). The bladder then fills with fluid. Compressed air enters the space between the bladder and the interior of the pump wall housing. The intake check valve closes and the discharge check valve opens. The compressed air squeezes the bladder, pushing the fluid to the surface. The discharge check valve prevents back flow from the discharge tubing. Driven by the GEOCONTROLLER 2, this cycle automatically repeats.

**Compressed air does not contact the sample! The bladder prevents contact between the pump drive air and the sample.**

# System Components

The GEOTECH Bladder Pump consists of three parts. The Bladder Cartridge Assembly, the Pump Housing, and the Intake Screen.

## **Bladder Cartridge Assembly**

Geotech's bladder cartridge assembly is factory assembled and tested, and is designed to be field replaceable (see figure 1).

The cartridge assembly components consist of an upper and lower head constructed of virgin grade PTFE, (for bladder pump models GEO1.66PVC36 and GEO1.66PVC18 the upper and lower heads are constructed of NSF-grade PVC, extruded with no markings or lubricants). The internal flow tubes are constructed of electro polished 316 stainless steel, or NSF-grade PVC. The bladder material is constructed of inert virgin grade polymer resins, (proprietary resin grade PTFE – G303).

The bladder tube is assembled using a 316 stainless steel clamp, providing a true zero leak seal.

## **Housing**

The bladder pump housing is constructed of electro polished 316 Stainless Steel. The housing components consist of threaded top and bottom caps, and the housing tube. For bladder pump models GEO1.66PVC36 and GEO1.66PVC18 the housing is constructed of NSF-grade PVC. Viton O-rings provide the high pressure seals between the end caps and the housing tube.

## **Intake screen**

The intake filter screen is constructed of 316 Stainless Steel and is easily removable for field maintenance. For models Geo 1.66 PVC36 and Geo 1.66 PVC18, the intake screen is constructed of NSF-Grade PVC. The intake filter screen is intended to protect and extend the life of the bladder material (see warranty).

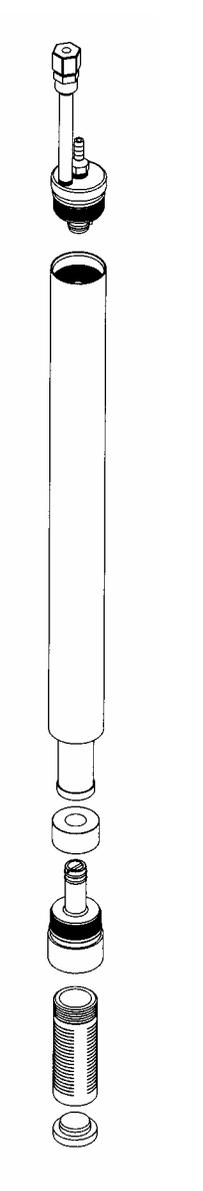
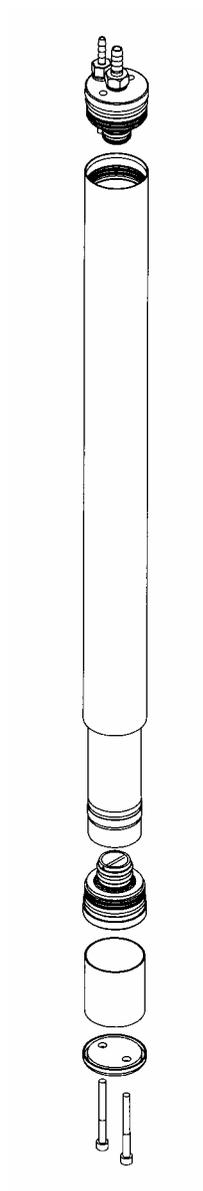


Figure 1 – SS Bladder Pump Assembly

Figure 2 – PVC Bladder Pump Assembly

## Chapter 2: System Installation

### **Bladder Pump**

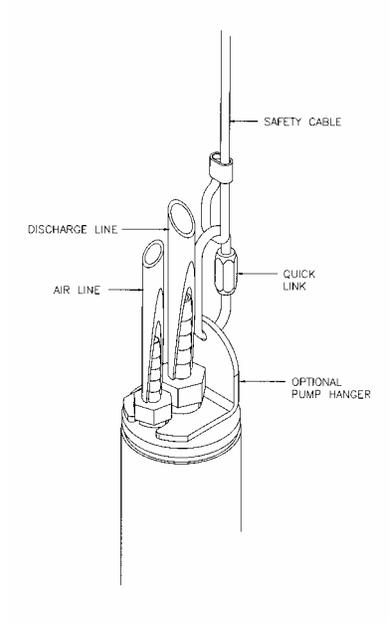
Geotech's Bladder Pumps are engineered for easy installation and use. Dedicated Bladder Pumps are shipped from GEOTECH with the tubing attached. Well identifications (supplied by customer) are located on tags connected to the tubing, and on the tubing bags.

Upon reaching the well head, connect the air line tubing to air line connection at the top of the Bladder Pump (see figure 3). The air line is smaller than the sample line. Next attach the sample line to the sample line connection at the top of pump (see figure 3).

The optional Bladder Pump Hanger is attached to the Quick Link on the safety cable and to the Pump Hanger. Carefully lower the Bladder Pump into the well using the reverse coil method to avoid kinking, until the well cap seats.

### **Reverse Coil Method** (see figure 4)

When lowering the pump into the well it is important to reverse the natural bend of the coiled tubing so that the tubing will straighten out as it is lowered. As the pump and tubing are lowered down into the well, the direction of the bend should be reversed from the direction in which it is coiled up. If the tubing is allowed to uncoil naturally and the natural bend not interrupted, the tubing will continue its coil into the well. Using the reverse coil method will avoid hang-ups or difficulty in lowering the pump into the well, especially when the well is not completely vertical, or has come out of alignment for any reason.



**Figure 3**

**Figure 4 – Reverse Coil Method**

## Chapter 3: System Operation

### **Bladder Pump Operation**

Fluid enters the pump through the fluid inlet check valve at the bottom of the pump body, and the bladder fills with fluid. Compressed air enters the space between the bladder and the interior of the pump wall housing, the inlet check valve closes and the discharge check valve opens. The compressed air squeezes the bladder pushing the fluid to the surface. The discharge check valve prevents backflow from the discharge tubing.

### **Selecting an Air Source**

The following explanation is based on the Model GEO1.66SS36 with a .170 ID air supply tubing. To determine the required capacity of the air source used, calculate the air consumption as follows. With 100 ft. of air line tubing in or out of the well, the air consumption is 125 cubic inches per cycle, with 6 cycles per minute (average).

*Example:* For 100 ft. of tubing you will need 125 cu. in. x 6 per min. which equals 750 cu. in. / min. or 45,000 cu. in. / hr. For each additional 100 ft. add 59 cu. in. If you plan to use an air compressor we advise that you use one with a reserve tank to insure proper air supply to the pump. If you plan to use a Nitrogen Tank, see figure 9 for Nitrogen Tank Volume vs. Bladder Pump consumption.

### **Determining PSI**

Determine the air pressure needed to operate the Bladder Pump based on the length of the air supply line to the pump (well depth). Use the simplified formula of (1/2 PSI per foot) + 10 PSI for friction.

*Example:* For a pump 100 ft. away from the air source, uses 100 ft. divided by 2 then add 10. This equals 60 PSI ( $100' / 2 + 10 = 60$  PSI).

The additional 10 PSI is to account for the pump itself and friction loss along the air line tubing. When the length of the air line to the Bladder Pump is 50 ft. or less, the additional 10 PSI need not be added.

To determine minimum operating pressures for the specific Bladder Pump model you are using, consult pumps specifications. Typically the minimum operating pressure will be 5 PSI above static head.

*Example:* Bladder Pump depth is 50 ft.  $50 / 2 = 25 + 5 = 30$  PSI.

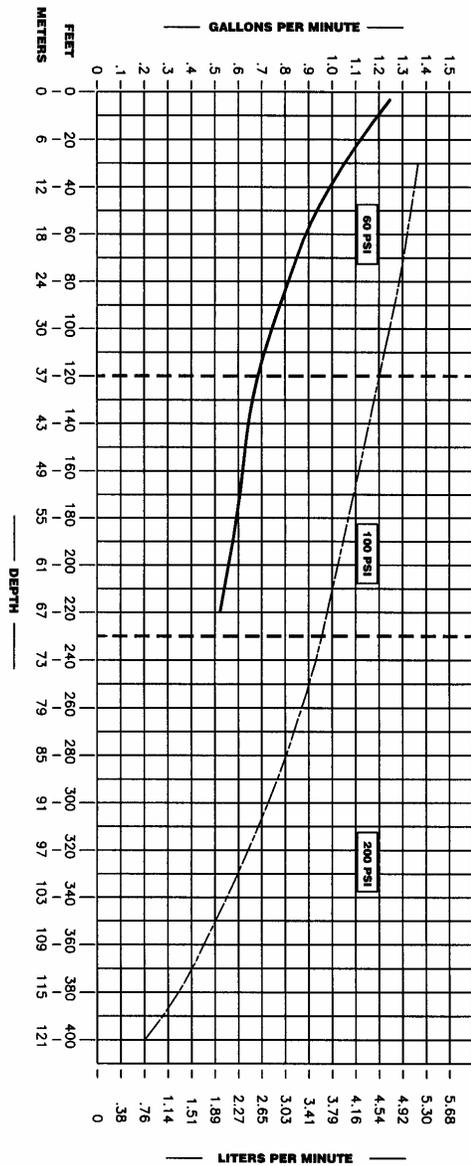
**The formulas stated above are not absolute, and are meant to provide baseline information.**

**Flowrates**

Flow rates are based on Geotech's models GEO1.66ss36 Stainless Steel Bladder Pump, and GEO1.66PVC36 PVC Bladder Pumps PERFORMANCE CURVE (see figures 5, 6, 7, & 8).

For determining the number of cycles it will take to receive sample fluid at the well head, see figure 9 CYCLES vs. DEPTH.

If using a nitrogen tank as an air source, see figure 10 NITROGEN TANK VOLUME vs. BLADDER PUMP CONSUMPTION.



NOBLE G801 PASSAGE  
 TUBE CONNECTIONS  
 1.7" ID AIR INLET TUBE AND .25" ID PRODUCT  
 DISCHARGE TUBE

**PERFORMANCE CURVE**

SUBMERGENCE

30 FT. 9.15 M

2 FT. 60.0 CM

\* FLOW RATES WILL VARY WITH ON-SITE CONDITIONS

Figure 5 – Performance Curve

MODEL: CE01 685326  
 TEST CONDUCTED AT INLET PRESSURES STATED WITH  
 .25" ID AIR INLET TUBE AND .25" ID PRODUCT  
 DISCHARGE TUBE

**SUBMERGENCE**  
 - - - - - 30 FT. 9.15 M  
 \_\_\_\_\_ 2 FT. 60.0 CM

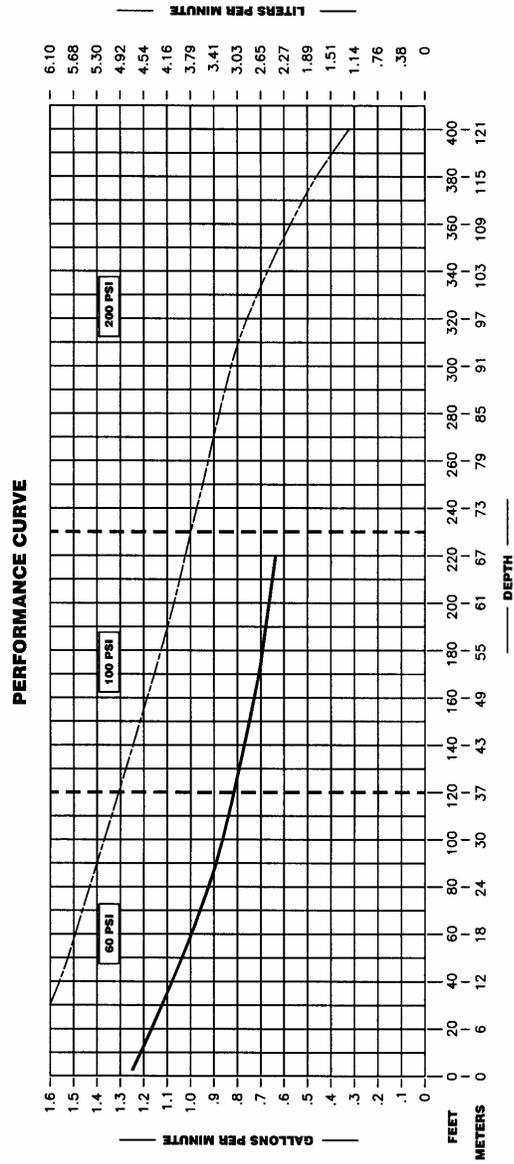


Figure 6 – Performance Curve  
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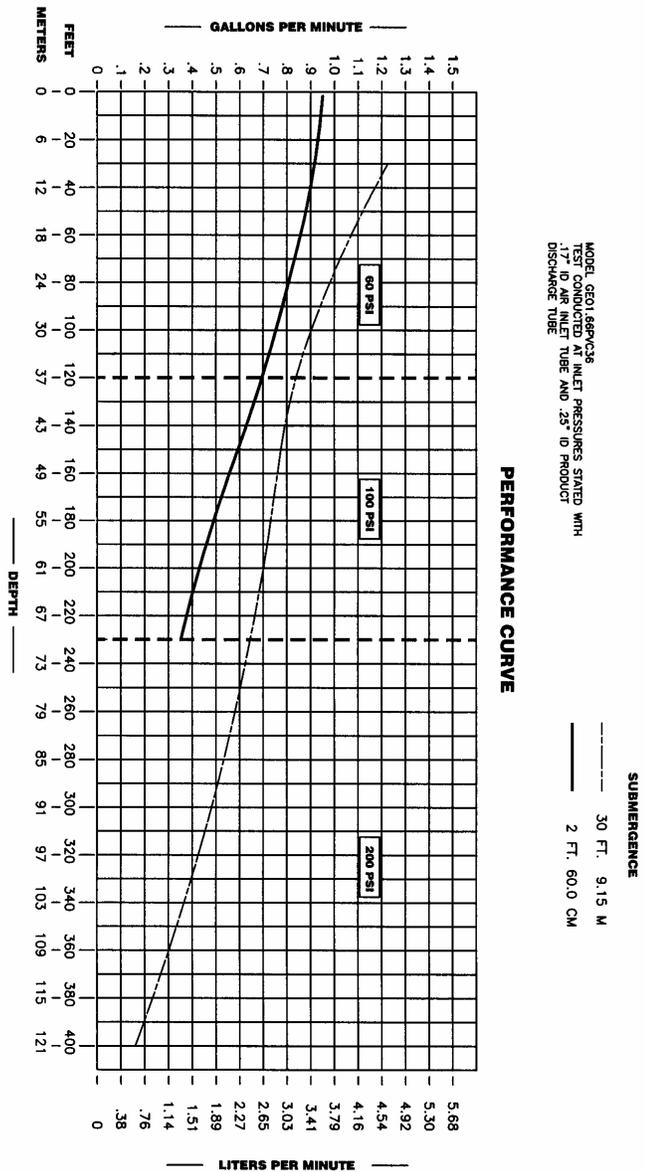
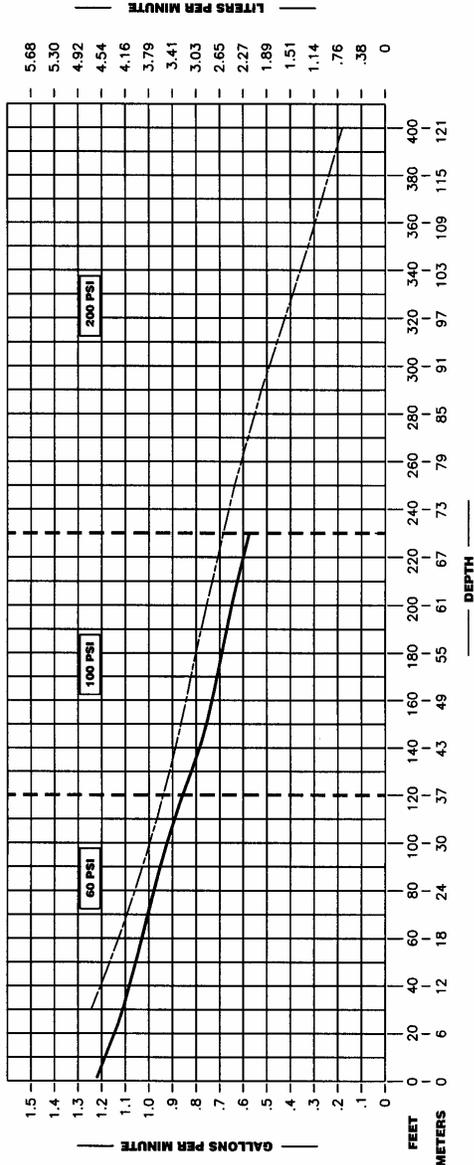


Figure 7 – Performance Curve

MODEL GE01.66PAC36  
 TEST CONDUCTED AT INLET PRESSURES STATED WITH  
 .25" ID AIR INLET TUBE AND .25" ID PRODUCT  
 DISCHARGE TUBE

**SUBMERGENCE**  
 - - - - - 30 FT. 9.15 M  
 \_\_\_\_\_ 2 FT. 60.0 CM

**PERFORMANCE CURVE**



\* FLOW RATES WILL VARY WITH ON-SITE CONDITIONS

Figure 8 – Performance Curve

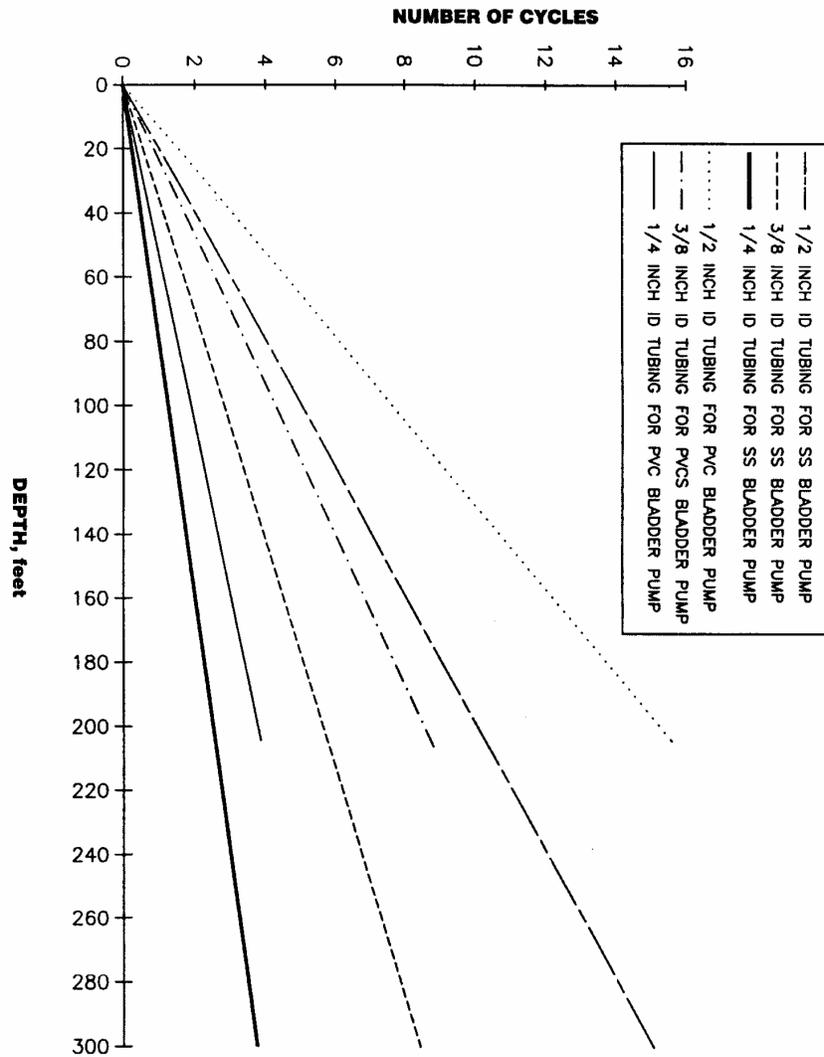


Figure 9 – Cycles vs. Depth

# NITROGEN TANK VOLUME VS BLADDER PUMP CONSUMPTION

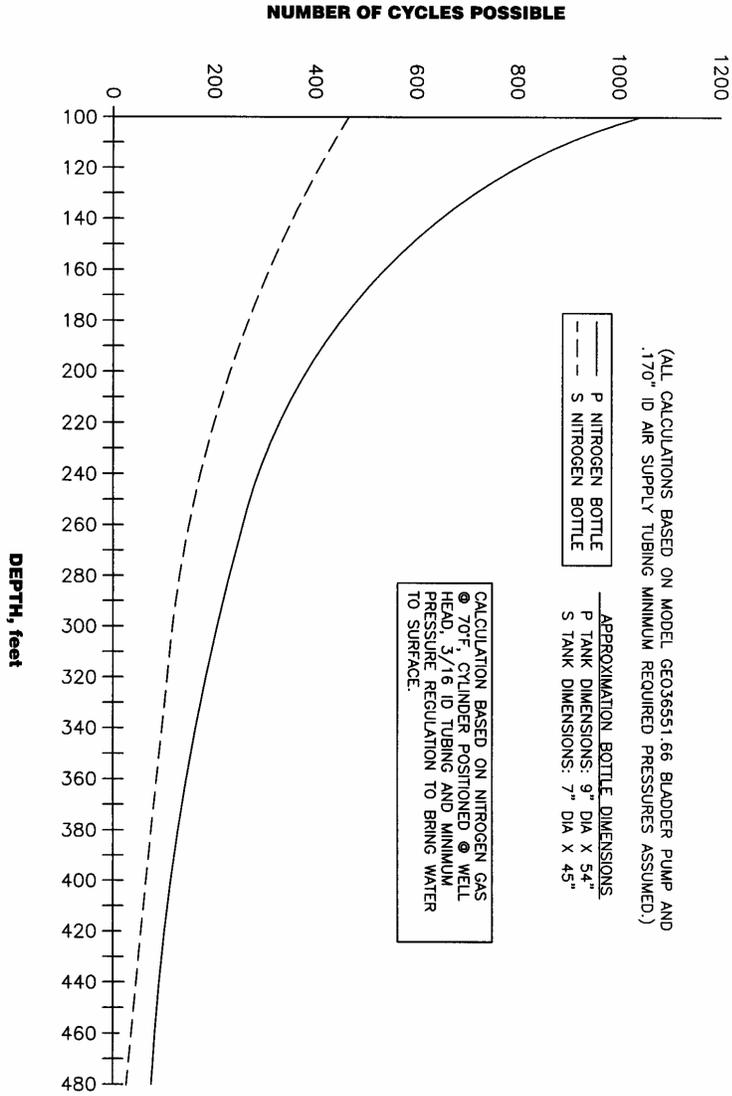


Figure 10 – Nitrogen Tank vs. Bladder Pump Consumption

## Chapter 4: System Maintenance

### **Bladder Pump**

As with any pump, scheduled or periodic maintenance should be performed, according to your sampling program and specific site conditions. Generally, the more turbid or sandy your water, the more often you should maintain and clean your pumps. (See System components, Bladder Cartridge Assembly). Disassemble Bladder Pump per instructions, decontaminate or replace as needed, then reassemble. Inspect all check balls for wear and replace as necessary. Inspect all O-rings for splits or cracks and replace as necessary.

### **Bladder Cartridge**

When installing a new bladder cartridge, or performing maintenance on an existing cartridge use the following instructions:

- Pull pump from the well, it is not necessary to remove the air and sample lines from the pump.
- (Models w/screens) Using an Allen head tool, remove the shoulder bolts from the intake screen cap (see figure 1).
- Using the Spanner tool, while holding pump body, with your hand or with a strap wrench, use a spanner tool to turn lower head in a counter clockwise direction and remove. Pump head will be very snug due to the high pressure O-ring seal. Once the seal is broken, the lower head will turn very easily (see figure 12).
- The internal bladder cartridge can now be removed for maintenance or replacement. Gently tap the tube housing on a firm wood like surface until the cartridge drops from the upper head seal. Reach into the tube with one or two fingers and pull the cartridge free.
- Before replacing lower pump head, always check o-rings for rips or cracks and replace as necessary.
- For models without intake screens, use the Spanner tool provided for lower head removal (see figure 12).

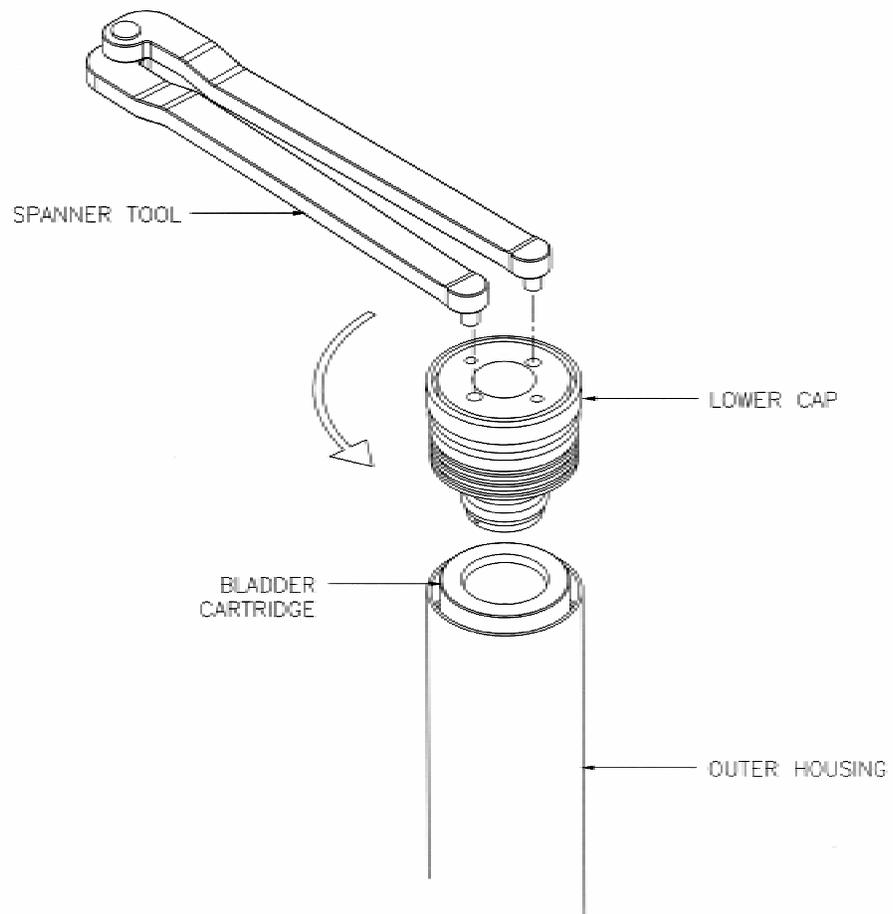


Figure 11  
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## Chapter 5: System Troubleshooting

### Bladder Pump: Troubleshooting

Problem:

Solutions:

*Air is cycling thru controller, but will not pump...*

- 1) Charge and exhaust times are not set correctly.  
Check and adjust charge and exhaust cycle times (i.e. if charge time is too long or if exhaust and charge time is too short).
- 2) Possible compromise in air line tubing.  
Check air line pump for leaks. If needed, repair using compression union or replace tubing.
- 3) Check pump intake screen for blockage and clean as needed.

*Controller is cycling but the pump stops producing water...*

- 1) Check drawdown level of water in the well.  
Ensure the pump is fully submerged and off of the bottom of the well.
- 2) Check psi at the regulator and adjust as necessary (see page 8).
- 3) Check for kinks in the discharge line.
- 4) Check pump intake screen for obstructions.
- 5) Charge time is too long or exhaust time is too short; causes pressure build up in pump, causing the pump not to fill.
- 6) Check power source, assure a strong reliable power supply. If using an old or weak battery, the control valves may not operate properly.

## System Troubleshooting cont...

*Getting air bubbles in sample line...*

- 1) Over charging pump.  
Reduce charge cycle time so that charge cycle ends as fluid discharge trails off.  
Inspect pump for compromised bladder or o-rings.
- 2) Pump is being over pressurized (PVC pump).  
Reduce psi to what is necessary to overcome pumping head (see page 8 for determining psi).
- 3) Check discharge line for holes or kinks.  
Repair using compression union or replace tubing.

*Discharge line drains back into pump...*

- 1) Remove Hosebarb on pump discharge outlet.  
Check the check ball seat for debris. Clean and re-install.

## Chapter 6: System Specifications

	GEO1.66SS36	GEO1.66SS18	GEO1.66PVC36
Pump Housing	SS, 316	SS, 316	PVC
Pump Ends	Virgin PTFE	Virgin PTFE	PVC
Bladder Matl.	Virgin PTFE Proprietary resin Grade (G303)	Virgin PTFE Proprietary resin grade (G303)	Virgin PTFE (Proprietary resin grade G303)
O.D.:	1.66"/4.2cm	1.66"/4.2cm	1.66"/4.2cm
Length: w/o screen	36"/91.4cm	18"/45.7cm	36"/91.4cm
Length: w/screen	38"/96.5cm	20"/51cm	—
Weight	5lb/1.9Kg.	2.5lb/0.93Kg	3.6lb/1.3Kg
Volume/Cycle	21.1oz./625ml	10.5oz./313ml	13.8oz.408ml
Max. Flowrate*	1.25gpm/4.7lpm	.65gpm/2.4lpm	.97gpm/3.7lpm
Min. Well I.D.	2"/50mm	2"/50mm	2"/50mm
Operating Press.	10-450psi/.7-31 bar	10-450psi/.7-31bar	10-110psi/.7-7.5 bar
Min. Operating Range	5psi/.34bar above static head	5psi/.34bar above static head	5psi/.34bar above static head
Maximum Depth **	1000'/305m	1000'/305m	250'/76.2M

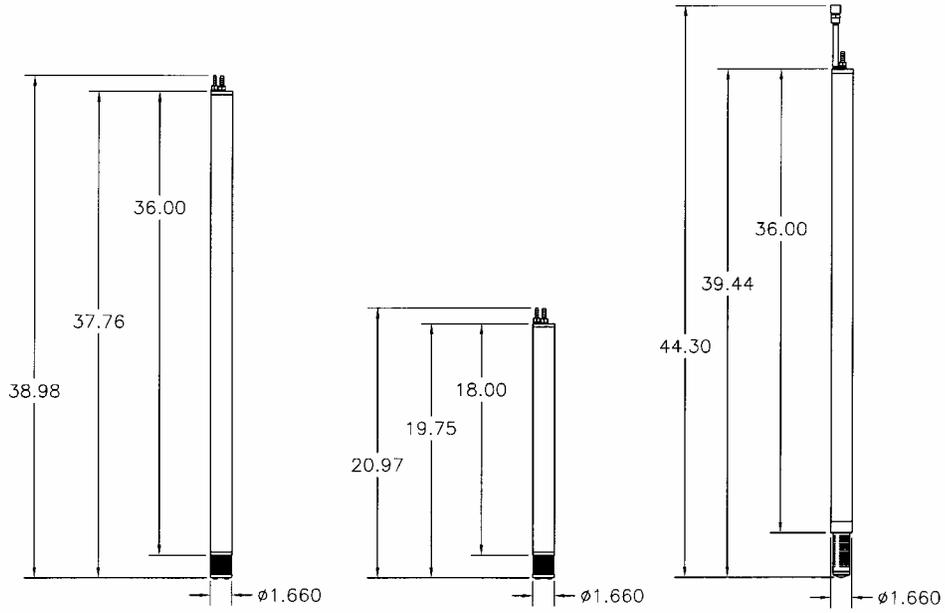
\* Flow rate determined @ 2ft/60cm submergence

\*\* With the use of a drop tube, maximum depth is increased

## System Specifications

	GEO1.66PVC18	GEO850.SS24	GEO675.SS18
<b>Pump Housing</b>	PVC	SS, 316	SS, 316
<b>Pump Ends</b>	PVC	Virgin PTFE	Electropolished SS 316
<b>Bladder Matl.</b>	Virgin PTFE (Proprietary resin grade G303)	Virgin PTFE (Proprietary resin grade G303)	Virgin PTFE (Proprietary resin grade G303)
<b>O.D.:</b>	1.66"/4.2cm	.850"/2.2cm	.675"/1.7cm
<b>Length: w/o screen</b>	18"/45.7cm	24"/61cm	N/A
<b>Length: w/screen</b>	22"/55.9cm	25"/63.5cm	18"
<b>Weight</b>	1.8lb/.67Kg	1.6/.60Kg	.83lb/.38Kg
<b>Volume/Cycle</b>	6.9oz./204ml	2.1oz./59.6ml	1.35oz./38.4ml
<b>Max. Flowrate*</b>	.53gpm/2.0lpm	.10gpm/.36lpm	.05gpm/.19lpm
<b>Min. Well I.D.</b>	2"/25mm	1.00"/25mm	.75"/19mm
<b>Operating Press.</b>	10-110psi/.7-7.5bar	10-110psi/.7-7.5bar	10-110psi/.7-7.5bar
<b>Min. Operating Range</b>	5psi/.34bar above static head	5psi/.34bar above static head	5psi/.34bar above static head
<b>Maximum Depth **</b>	250'/76.2m	250'/76.2m	250'/76.2m

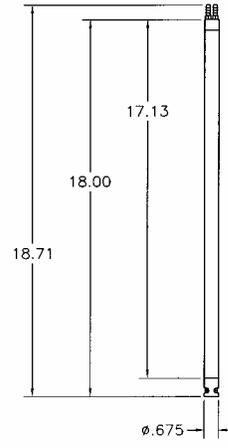
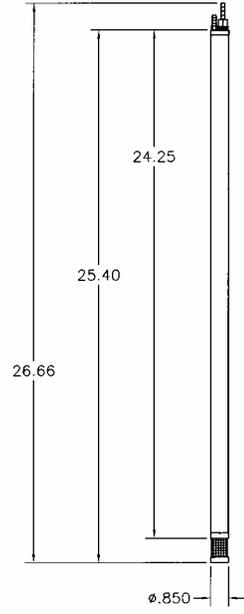
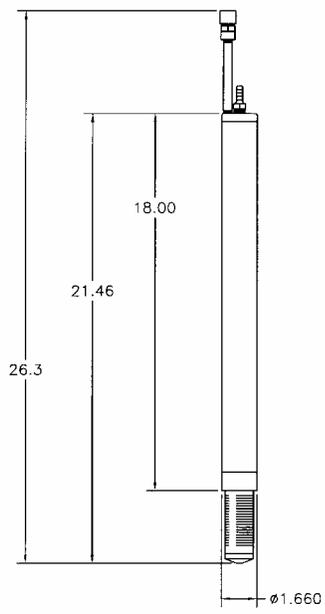
# Chapter 7: System Schematic



**GEO1.66SS36**

**GEO1.66SS18**

**GEO1.66PVC36**



**GEO1.66PVC18**

**GEO850.SS24**

**GEO675.SS18**

## Chapter 8: Replacement Parts List

### Model GEO1.66SS36

QTY/ASSY	DESCRIPTION	PART #
1	Bladder Cartridge	51150100
1	Cap, Upper	11150104
1	Cap, Lower	11150107
1	Screen, Intake	11150109
2	Bolts, Shoulder	17200241
1	Hose barb, Sample out	11150106
1	Hose barb, Air in	17200241
1	Check ball, Upper	17500081
1	Check ball, Lower	17500082
1	O-Ring Viton cap/upper lower	17500104
2	O-Ring Viton cap/upper head interface	17500103
2	O-Ring Viton cap/lower head interface	17500106

### MODEL GEO1.66SS18

QTY/ASSY	DESCRIPTION	PART #
1	Bladder Cartridge	51150106
1	Cap, Upper	11150104
1	Cap, Lower	11150107
1	Screen, Intake	11150109
2	Bolts, Shoulder	17200241
1	Hose barb, Sample out	11150106
1	Hose barb, Air in	21150019
1	Check ball Upper	17500081
1	Check ball Lower	17500082
1	O-Ring Viton cap/upper lower	17500104
2	O-Ring Viton cap/upper head interface	17500103
2	O-Ring Viton cap/lower head interface	17500106

**Model GEO1.66PVC36**

<b>QTY/ASSY</b>	<b>DESCRIPTION</b>	<b>PART #</b>
1	Bladder Cartridge	51150107
1	Cap, Upper	11150128
1	Cap, Lower	11150129
1	Screen, Intake	11150109
2	Cap Screen Intake	11150131
1	Hose barb, Sample out	11150134
1	Hose barb, Air in	17200248
1	Check ball, PVC Upper/lower	17500115
1	O-Ring, Viton cap/upper/lower	17500120
1	O-Ring Viton cap/head interface	17500119

**MODEL GEO1.66PVC18**

<b>QTY/ASSY</b>	<b>DESCRIPTION</b>	<b>PART #</b>
1	Bladder Cartridge	51150108
1	Cap, Upper	11150128
1	Cap, Lower	11150129
1	Screen, Intake	11150130
2	Cap, screen intake	11150131
1	Hose barb, Sample out	11150134
1	Hose barb, Air in	17200248
1	Check, PVC Upper/lower	17500115
1	O-Ring Viton cap/upper lower	17500120
2	O-Ring Viton cap/head interface	17500119

**Model GEO850.SS24**

<b>QTY/ASSY</b>	<b>DESCRIPTION</b>	<b>PART #</b>
1	Bladder Cartridge	51150103
1	Cap, Upper	11150111
1	Cap, Lower	11150112
1	Screen, Intake	11150119
2	Screw 4-40 x 1	17200246
1	Hose barb, Sample out	11150118
1	Hose barb, Air in	17200245
1	Check ball	17500079
1	O-Ring, Viton cap/upper/lower	17500112
2	O-Ring Viton cap/upper head interface	17500119
2	O-Ring Viton cap/lower head interface	17500111

**MODEL GEO.675SS18**

<b>QTY/ASSY</b>	<b>DESCRIPTION</b>	<b>PART #</b>
1	Bladder Cartridge	51150116
1	Cap, Upper	21150030
1	Cap, Lower	21150031
2	Hose barb, air sample	17200245
1	Check ball, upper	ppm130001
1	Check ball, lower	17500079
1	Disc Teflon	21150033
1	Snapping	11150182
1	O-Ring, Bladder Cap, Upper	11150183
1	O-Ring, Bladder Cap, Lower	17500183
2	O-Ring, cap housing	11150184

## Notes

## The Warranty

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abuse, misuse, or inability to use this product. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

## Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION, PLEASE CALL OUR  
SERVICE DEPARTMENT AT 1-800-833-7958 OR 1-800-275-5325.

Model Number: \_\_\_\_\_  
Serial Number: \_\_\_\_\_  
Date: \_\_\_\_\_

## Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used.

Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate equipment for a fee, which will be applied to the repair order invoice.

**Geotech Environmental Equipment, Inc**  
8035 East 40<sup>th</sup> Avenue Denver, Colorado 80207  
(303) 320-4764 • **(800) 833-7958** • FAX (303) 322-7242  
email: [sales@geotechenv.com](mailto:sales@geotechenv.com) website: [www.geotechenv.com](http://www.geotechenv.com)