

Geotech Total Fluids System

Installation and Operation Manual



Table of Contents

Section 1: System Description	3
Section 2: System Installation	9
Section 3: System Operation	12
Section 4: System Maintenance	13
Section 5: System Troubleshooting	14
Section 6: System Specifications:	16
Section 7: System Schematics	17
Section 8: Replacement Parts List	18
Warranty and Repair	20

DOCUMENTATION CONVENTIONS

This 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.

Section 1: System Description

Function and Theory

The Geotech Total Fluids System (TFS) is a compact total fluids pumping system, designed for shallow sump applications with less than 25 feet (7.6 m) of suction lift. The TFS is self-regulating and requires no electricity for the controls. The system consists of a pneumatic dual diaphragm pump, automatic level control with manual override, an air filter, and a regulator. An optional overflow sensor is available if discharging into a recovery tank.

The level control system employs a control valve and a down-hole sensing tube. As the fluid level rises in the well, the pressure created in the sensing tube activates the control valve. This turns the pump on until the fluid level in the sump has fallen to the low level set point of the sensing tube. A manual override enables continuous operation if desired.

The pump draws a vacuum, pulling fluid from up to 15 feet (4.6 m) dry or 25 feet (7.6 m) if primed. A speed control valve mounted on the pump controls the pumping rate, yielding a maximum of 4 gpm (15 lpm) for the standard pump.

The TFS' overflow sensor is installed in the recovery tank's 2" NPT bung opening. As the tank fills, pressure created in the sensor tube signals a control valve, which shuts off the air supply to the pump. After the tank is emptied, the overflow sensor will automatically reset, allowing the system to resume normal operation.

System Components

The TFS utilizes an air driven dual diaphragm pump. The pump fittings are pre-attached, and the pump can be configured in several different ways to ease installation. For more information on the pump consult the Manufacturer's Service and Operating Manual. Figure 1-1 is an example of the TFS pump. An inlet screen (or filter) is provided with the system and is attached to the intake hose to prevent debris from entering the pump.

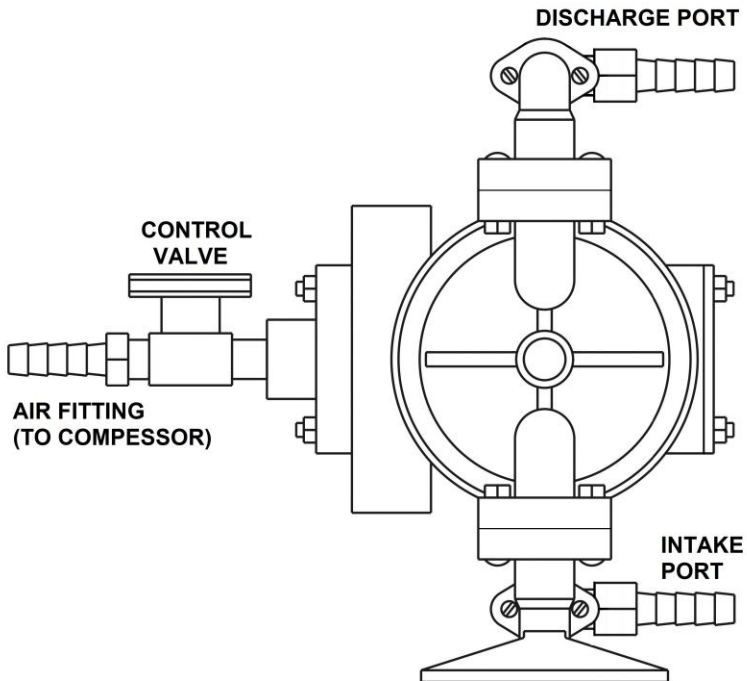


Figure 1-1 – Total Fluids System Pump

Air and Level Controls

The TFS is supplied with an air filter/regulator and a level control valve. These devices are preassembled and work best when mounted near the pump.

The air filter is designed to remove particles and liquids in the air stream, and has a drain on the bottom of the bowl to empty the filter when it becomes full. The regulator is pre-set to 45 psi (3 bar), which should be suitable for most applications. Higher pressures are only required if the discharge head is greater than 100 feet (30.5 m). The air requirements for the system will vary with the operating speed of the pump. As the pumping rate increases, the airflow requirement increases. At maximum speed, the pump requires 6 cfm (.17 cmm) of air. In freezing conditions, adding an air dryer to the system may be necessary to avoid stalling the pump.

Level Control Sensor Tube

The Level Control Sensor tube (Figure 1-2) consists of a sensing tube, a level control valve and 50 feet (15 m) of sensor air line. The level control valve can either be mounted at the well or directly to the air filter/regulator.

The sensor tube turns on the pump with the presence of fluid and will shut off the pump with the absence of fluid. When the product in the well rises approximately 11" (28 cm) up the side of the sensing tube, the level control valve turns on the air supply to the pump. When the product level is lowered to approximately 5" (12 cm) on the tube, the level control valve turns the pump off.



The level control valve also has a bypass valve which allows the pump to run continuously, independent of the level control valve and sensor tube.

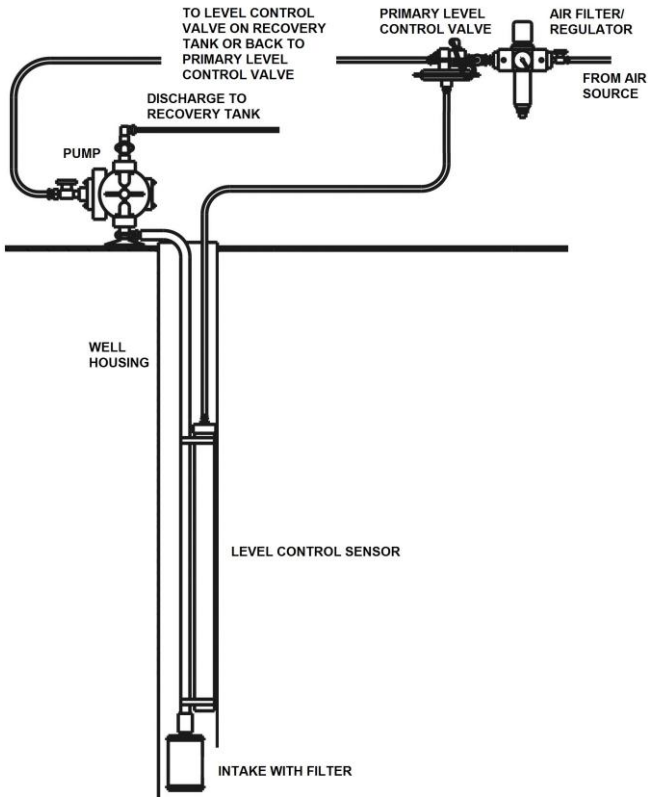


Figure 1-2 Level Control Sensor Tube Configuration

Product Recovery Tank (not provided with the Total Fluid System)

A product recovery tank with a 2" NPT bung opening for the optional Tankfull Shut-off Sensor tube, a product inlet opening, and a vent are required for proper operation – typically a 55 gallon (208 liter) drum or other suitable container. Check government regulations regarding fuel storage before selecting a recovery tank.

Tankfull Shut-off Sensor (optional)

The Tankfull Shut-off Sensor assembly (Figure 1-3) consists of a sensing tube, a level control valve and 50 feet (15 m) of sensor air line. The level control valve is attached in-line to the air filter/regulator and pump and must be mounted within 50' (15 m) of the discharge tank.

When the product rises approximately 11" (28 cm) up the sensing tube side, the level control valve shuts off the air supply to the pump. Once the tank is drained, the system will automatically reset and continue operation. The level control valve may be mounted at the recovery tank or directly to the air filter/regulator, provided that it is within 50 feet (15 m) of the recovery tank.

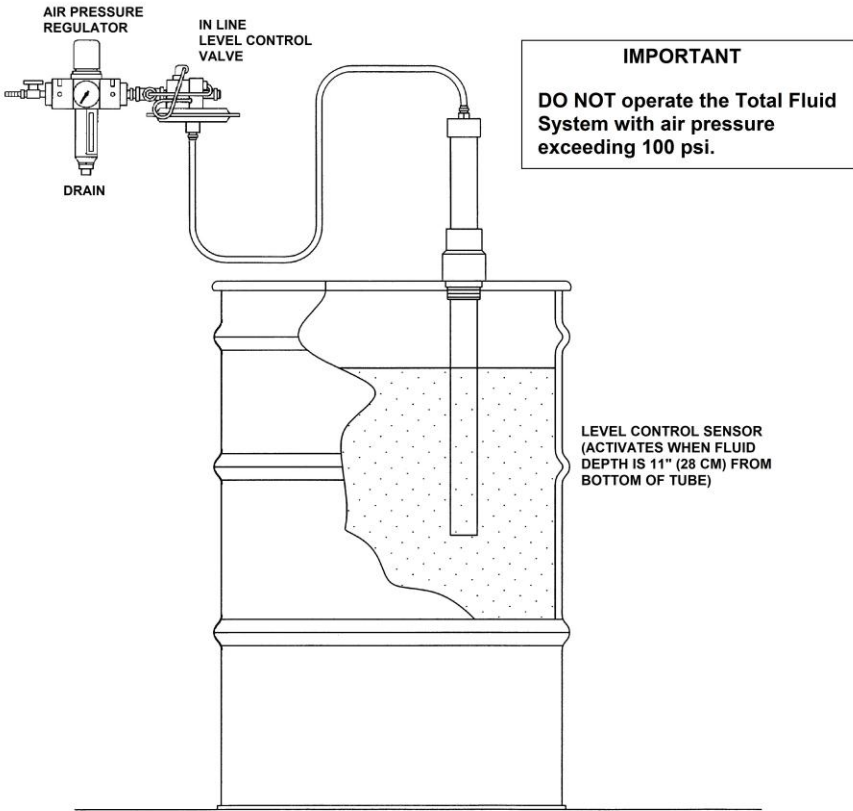


Figure 1-3 – Tankfull Shut-off Sensor Assembly (recovery tank not supplied)

The standard Tankfull Shut-off Sensor assembly, as shown in Figure 1-4, is also available in stainless steel (with the level control valve plumbed to the sensor tube) or in stainless steel with a manual reset box attached. A listing of the available sensor assemblies can be found in Section 8. Contact Geotech to discuss which application is best for your product recovery needs.



Figure 1-4 – Optional Tankfull Shut-off Sensor Assemblies

Air Line and Discharge Hoses

The TFS comes with 100 feet (30.5 m) of 3/8" (9.5 mm) ID hose which may be used for both the air and discharge lines.

Typically, conduit or 2" (5 cm) PVC pipe, buried below grade, should be used to protect the air and discharge lines from damage. Failure to safeguard the air and discharge lines may lead to uncontrolled pump discharge and/or compressor failure. The discharge port of the pump accepts standard 1/4" NPT and 1/2" FPT pipe threads. The dimensions of the air lines to the listed devices are:

Air source / Discharge Line	3/8" ID x 100ft (30.5 m)
Level Control Valve to Sensor Tube	1/4" OD x 50ft. (15.2 m)

Section 2: System Installation

Planning Guidelines

To successfully plan the installation of the Total Fluids System, use the following guidelines to determine a suitable location for the pump, (optional) air compressor, and recovery tank (with optional Tankfull Shut-off Sensor).

1. The standard TFS does not include an air source. When installing an air compressor (6 cfm (170 lfm) at 45 psi (3 bar) minimum), do not locate the compressor in areas where there may be explosive vapors. Compliance with Section 5 of the U.S. National Electric Code Handbook and any local codes is essential for an electrically safe installation. The compressor requires a cool, well ventilated environment to operate efficiently, and may require an air dryer in freezing or humid environments.
2. The product recovery tank should be located within 50' (15 m) of the level control valve when the optional Tankfull Shut-off Sensor is used. The air filter and regulator are attached to the level control valve, but they may be separated. It is not necessary for the level control valve to be mounted near the pump for the system to operate normally.
3. Run all air and discharge hoses through pipe or conduit to protect them from damage. All air and discharge hoses must be installed correctly for the system to operate properly. The cut ends of the hoses must be straight, and the connections leak free.

Pump Installation

The TFS pump must be securely mounted at the well head for best performance. For larger sumps, the pump may also be mounted on a stand or attached to the side of the casing and then placed in the well. The pump has a variety of product inlet and discharge piping options. The pump is pre-configured but may be plumbed differently using the labeled ports around the outside of the pump.

Support any hard plumbing used to prevent undue stress on the pump housing. Place the pump, pump controls, discharge tank, and air compressor where desired, then cut the appropriate lengths of hose for air supply, product intake and product discharge.

Attach the intake (vacuum) hose from the well to the pump. Connect the product discharge hose from the pump to the product recovery tank. Attach all hoses using the hose clamps provided. Ensure that all lines are kept level and that there are no kinks or sags in the lines. When possible, enclose the lines within a secondary pipe or conduit to protect them from damage.

Air Line Preparation

The TFS is provided with 3/8" ID tubing for the air line. After the system components are properly placed, install the air line between the compressor and the end of the air filter (or the Tankfull Shut-off Sensor level control valve if installed).

Attach the 1/4" OD black air line to the level control valve and to the level sensing tube for the well. Tighten the fittings to achieve a 100% seal on the tubing; (to achieve a 100% seal, push the tubing firmly into the fitting, hand tighten, then one turn past hand tight with a wrench).

Level Control Sensor Preparation

Once the air lines are connected, attach the Level Control Sensor tube for the well to the intake hose with filter (as shown in Figure 1-2). Referring to Figure 2-1, place the sensor tube into the well so that the desired upper fluid limit will be approximately 11" up from the bottom of the sensing tube.

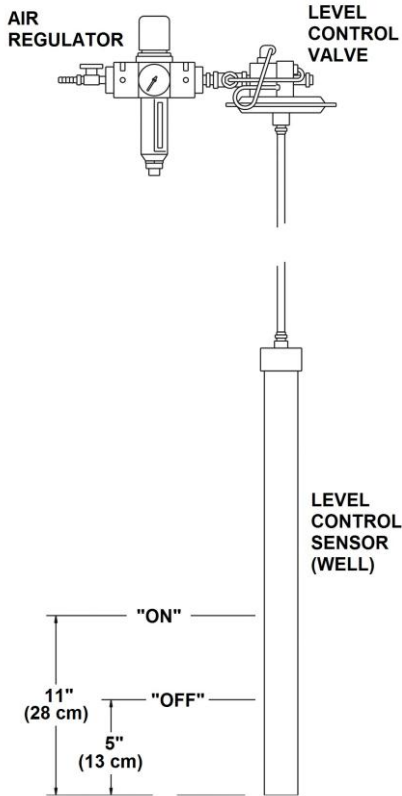


Figure 2-1 – Level Control Sensor (Well)

Tankfull Shut-off Sensor Installation (optional)

The optional Tankfull Shut-off Sensor is installed in line between the air filter/regulator and the pump. See System Schematic, Figure 7-1.

Install the Tankfull Shut-off Sensor tube in a 2" NPT bung opening on your recovery tank. Adjust the position of the tube so that 12" (30 cm) to 13" (33 cm) of the tube is within the tank. When the fluid level reaches approximately 11" (28 cm) on the sensor tube side the level control valve will activate to shut off the pump.

Connect the 1/4" (6.4 mm) OD black air line to the bottom fitting on the level control valve and to the Tankfull Shut-off Sensor tube. Tighten the fittings to achieve a 100% seal on the tubing: to achieve a 100% seal, push the tubing firmly into the fitting, hand tighten, then one turn past hand tight with a wrench.

Section 3: System Operation



Do not operate the Total Fluid System with air pressures exceeding 100 psi (6 bar).

The TFS will immediately operate when the air supply is turned on. Before the system is turned on, make sure the air pressure is set to 45 psi (3 bar) (or with the pressure regulator knob turned down). Once the system is operating, the air pressure may be adjusted between 30 (2 bar) – 100 (6 bar) psi. To adjust the pressure, rotate the knob at the top of the air pressure regulator while the system is operating (see Figure 2-1).



Higher air pressures will not yield a higher recovery rate, and should only be used to overcome high discharge head pressures.

Level Control Sensor Operation (Well)

Once the level control sensor for the well has been installed it can be tested by immersing the sensor tube in a pail of water (at least 12" (30.5 cm) deep) while the system is operating. Within a few seconds, the sensor will turn on the air supply and start the pump. When the sensing tube is removed from the pail, the pump will automatically shut off. If the system does not function as described, re-check the orientation of the tubing attachments, check the fittings at both the control valve and sensing tube, and check for kinks in the tubing.

Optional Tankfull Shut-off Sensor Operation

After installing a Tankfull Shut-off Sensor inline to the TFS system, test the Tankfull Shut-off Sensor by immersing the sensor tube in a pail of water (at least 12" (30.5 cm) deep) when the system is operating. Within one cycle, the sensor will shut off the air supply and stop the pump. When you remove the Tankfull Shut-off sensing tube from the pail, the pump will resume operation. If the system does not function as described, re-check the orientation of the tubing attachments, check the fittings at both the control valve and sensing tube, and check for kinks in the tubing.

Adjust the Pumping Rate

The fastest pumping rate possible on the system varies according to pumping depth, distance from the pump to the product recovery tank, and the product layer thickness. The speed control valve is located at the air inlet on the pump (see Figure 1-1) and may be rotated counter-clockwise to increase the rate, and clockwise to decrease the rate.



The pump must never be increased to the point where the air compressor is running at more than a 50% duty cycle. The pump should be adjusted so that it runs at its slowest steady speed. Higher pump speeds will not yield a higher pumping rate, and will cause premature compressor wear.

Section 4: System Maintenance

The TFS has been designed to require very little maintenance. With proper installation, and by following the enclosed periodic maintenance procedures, operation of the system will remain efficient and trouble free. For pump and air compressor maintenance, refer to their respective manuals.



In cold climates where the temperatures may fall below freezing, the air supply to the TFS should be run through an air dryer to prevent the pump from stalling.

Weekly Maintenance

- The system is equipped with an air filter on the air regulator. If there is fluid in the filter bowl, turn the knob on the bottom of the filter clockwise to open the drain. When the filter has drained completely, retighten the knob.
- Recheck the pressure setting to the system. Verify that the air regulator is set at the correct operating range.



Always ensure all hose and tubing fittings at the pump and between the level control valves are tight prior to deploying the unit into the well.

Monthly Maintenance

- Inspect all tubing for cracks, kinks and damage. Replace any old and brittle tubing.
- Verify that the intake screen is not blocked with debris.
- Clear away any debris collected in the well vault (or above ground casement).
- Measure the well and record product layer thickness and depth to water from top of well casing.
- Check the Tankfull Shut-off Sensor tube for proper operation. Clean if necessary.

Section 5: System Troubleshooting

Problem: Pump will not cycle.

Solutions:

Fluid is not high enough to activate the level sensor in the well.

- Check fluid level and the position of the sensor tube (see System Installation). Adjust if necessary.

Recovery tank is full.

- Turn the air supply “OFF”. Empty the recovery tank, and turn the air supply “ON”. The system will automatically resume operation.
- Inspect Tankfull Shut-off Sensor.

Level control not functioning.

- Open bypass valve at the top of the level control valve. If the pump cycles, then first check all of the fittings and connections between the level control valve and the well sensor tube for possible air leaks. If no leaks are found and pump is still not cycling there may be a problem with the control valve. Contact Geotech at 1-800-833-7958.

Air supply operating pressure is too low.

- Verify that the air supply is providing air and that the speed control on the pump is open enough to operate the pump.

There is a pump malfunction.

- Contact Geotech at 1-800-833-7958.

Problem: Pump cycles, but produces no flow.

Solutions:

Intake has exceeded maximum depth.

- Bring intake up to a depth level pump can handle.
- Use alternate pumping system for deeper wells. Contact Geotech at 1-800-833-7958.

Problem: Pump cycles, but flow rate is unsatisfactory.

Solutions:

- Check system for kinks in air and discharge hoses.
- Check for cuts or air leaks to hose and hose connections.
- Check viscosity of fluid being pumped.

Problem: Pump cycle seems to produce excessive vibration.

Solutions:

Debris clogging pump check valve.

- Consult Manufacturers Service & Operating Manual to service and clean the pump check valves.

If these troubleshooting guidelines have not resolved the problem, then contact Geotech at 1-800-833-7958.

Section 6: System Specifications

Application:	2" (5 cm) or larger recovery wells
Maximum Depth to Fluid:	25 feet (7.6 m)
Maximum Pressure:	100 PSIG (6.9 bar)
Discharge Line:	.375" ID x .5" OD * (Polyethylene or fuel grade Synthetic Rubber) * (if over 100' (30 m), increase pressure to pump)
Air Lines:	.170" ID x .25" OD x 50ft. (15 m)

Section 7: System Schematic

Dual Diaphragm Pump:

See the Manufacturer's Service and Operating Manual, included with pump, for complete details on the TFS pump.

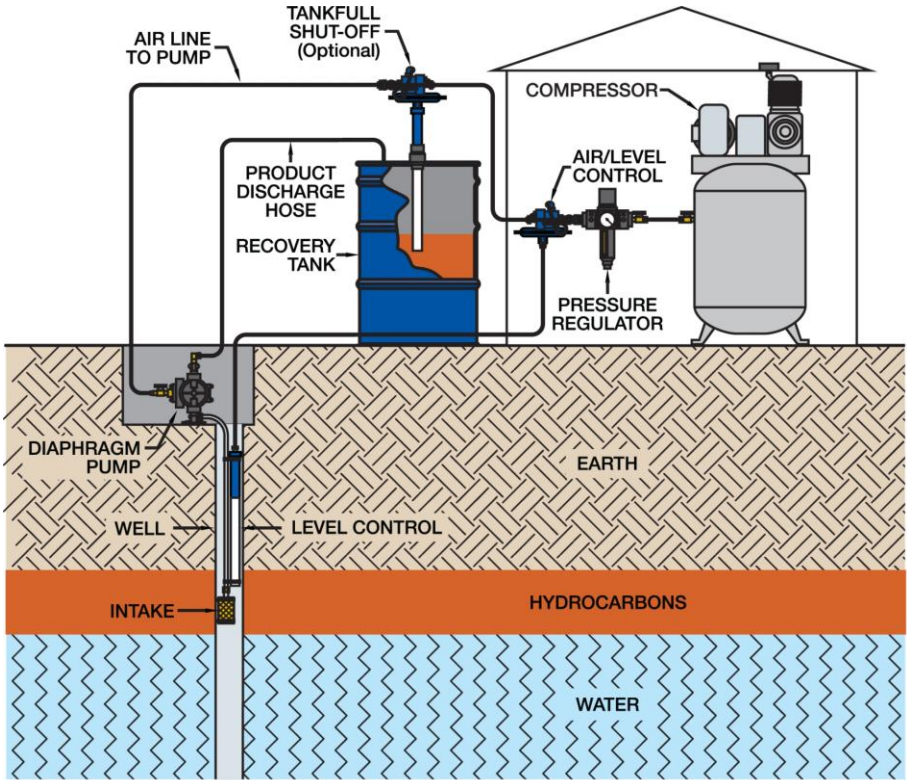


Figure 7-1 – Standard Total Fluid System Configuration

Section 8: Replacement Parts List

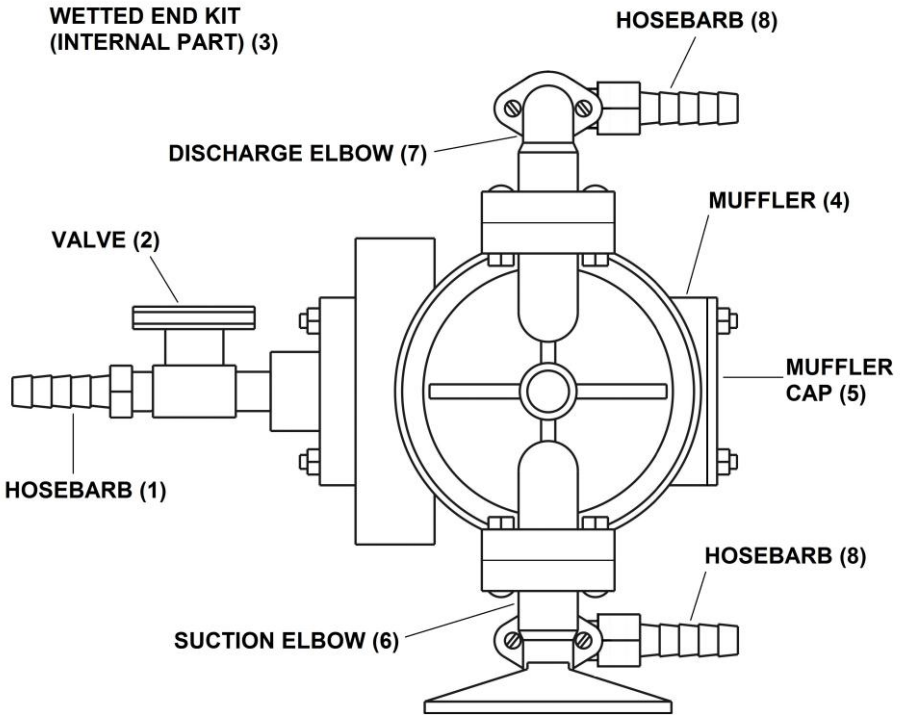


Figure 8-1 – Standard Pump Assembly

Dual Diaphragm Pump Assembly (56600019)

Item #	Parts Description	Parts List
1	HOSEBARB,BRS,3/8"X1/4MPT	16650323
2	VALVE,1/4MPTX1/4FPT	16600060
3	KIT,WETTED END,PTFE,SANDPIPER PB1/4	16600252
4	MUFFLER,SANDPIPER,PB1/4	16600238
5	CAP,MUFFLER,SANDPIPER,PB1/4	16600239
6	ELBOW,SUCTION,SANDPIPER,PB1/4	16600251
7	ELBOW,DISCHRG, SANDPIPER,PB1/4	16600240
8	HOSEBARB,BRS,1/2FPTX3/8"	16600234

Total Fluid System Accessories

Parts Description	Parts List
MANUAL,INSTRUCTION,TFS	16600168
TFS,TOTAL FLUIDS SYSTEM	86600011
SCREEN,INLET,TFS 1 7/8" X 4", 1/4 MPT	16600085
VALVE,LEVEL CONTROL	16600045
VALVE,RESET,PNEUMATIC	16600171
VALVE,LVL CNTRL,W/ MAN RESET	16600172
ASSY,PUMP,DIAPHRAM,SRS/TFS	56600019
ASSY,FILTER/REGULATOR,SRS W/ SHUTOFF	56600018
TUBING,RBR,3/8x5/8,100FT RL PRODUCT DISHCARGE	16600072
TUBING,NYL,1/4ODx0.040W,BLK	16600039
CLAMP,SS,STEPLESS EAR,7MM	16600005
CLAMP,SS6,WORM,7/32-5/8"	16600063

Tankfull Shut-off Sensors and Accessories

ASSY,TUBE,TANKFULL SENSOR,PVC W/ 50FT TUBING	56600061
TUBE,PVC,SENSOR,TANKFULL	26600077
ASSY,TUBE,TANKFULL SENSOR,SS CRS (SPOILER)	56600016
TUBE,SS,SENSOR,TANKFULL	16600074
NIPPLE,PVC80,2"NPTx6"L SENSOR TUBES	16600075
COUPLING,PVC,2"x1.5" PVC FLEXIBLE	16600078

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 abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. 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 our 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.

Model Number: _____

Serial Number: _____

Date of Purchase: _____

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 the equipment for a fee, which will be applied to the repair order invoice.

Geotech Environmental Equipment, Inc.

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