# SS Geosub and AC Environmental Pump Controller

Installation and Operation Manual


Rev.5 6/05/08 Part # 11200813

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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

## 300 Watt Controller Function and Theory

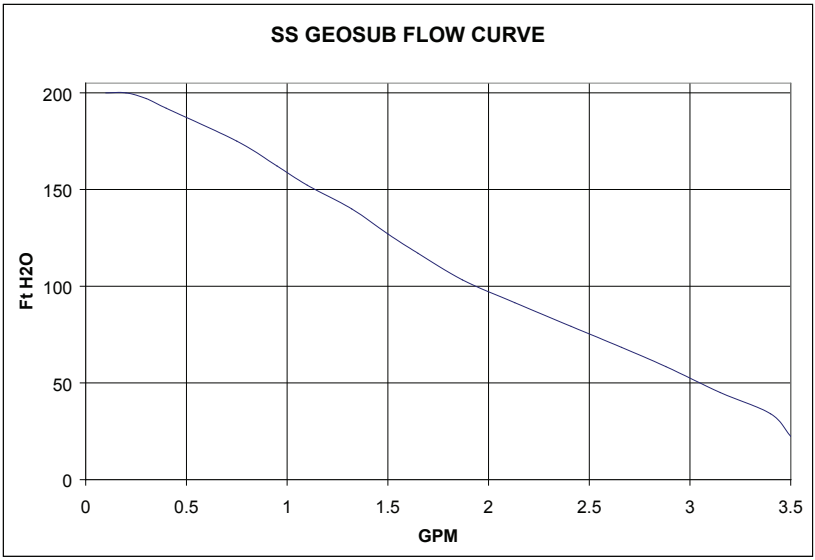
This AC Controller is designed specifically for use with Geotech's SS GEOSUB Pump. It provides a safe conditioned variable DC output power from an AC power source. Built in sensing gives the operator accurate and precise control over the pump during sampling events. Efficient operation allows for extended field operation using portable AC generator equipment such as a gasoline powered generator. An average 1000 Watt gasoline powered generator with 1 gallon of gasoline will operate the 300 Watt AC Controller and Geotech's sampling pump at full power for up to 18 hours continuously. Generally much longer runtimes can be expected as the controller is used to reduce water flow for sampling.

An easy to use programmable user interface with bright display offers precise control over water flow during ground water sampling events. Site specific settings and conditions can easily be stored and recalled for more efficient repeat sampling events. Rugged construction and fully connectorized installation make setup and portability a breeze. The controller also includes a user activated dry run protection feature.

## Pump Function and Theory

The Geotech SS Geosub environmental pump is a fully submersible pump designed specifically for use in ground water sampling. All wetted parts are made from high quality inert materials so sample integrity is not affected during sampling. The SS Geosub flow rate can be adjusted to change from well purge flow rates to low flow sampling rates. See included graphs for flow rates and operating depths.

## Pump chart



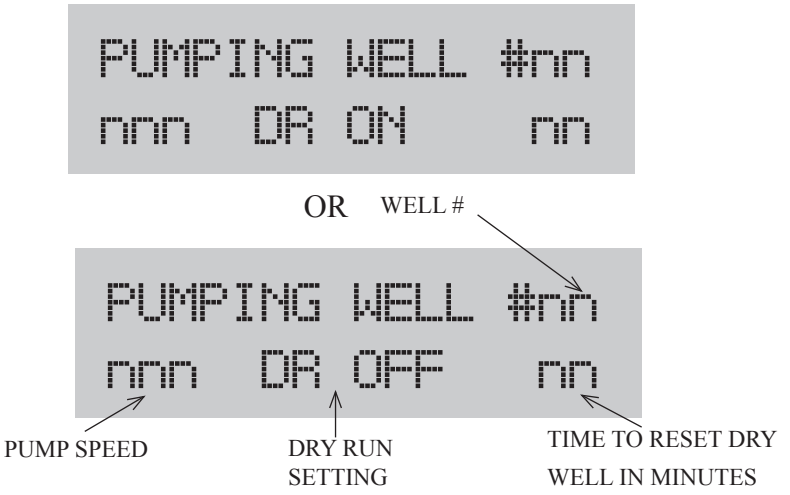
## Dry Run Feature Operation and Theory

The dry run pump protection feature operates by measuring the output current level and comparing it to a user enterable set point. Many factors can influence the pump current draw, including head pressure, length of tubing and length of cable. Under all conditions, one thing remains the same: While pumping water, the pump draws higher current from the controller than when it is out of water and running dry regardless of other variables.

Dry Run is intended for use in situations where flow rates are above .1 GPM. Results using DRY RUN with lower flow rate are un-reliable.

## Pump Speed Control Operation and Theory

Pump speed control is achieved by pressing the up or down button during run time. The number can be adjusted from 0 to 255 in increments of one unit. The adjustments can be made one at a time by pressing a button once or can be changed rapidly by holding a button down continuously. This number is representative of the power output. Most conditions do not allow for the full 0 to 255 point range of use. At the upper end of the scale, the controller automatically prevents the user from overpowering a pump. The controller indicates when max power has been reached and prevents the user from increasing the output further. In most cases, the usable range of control will be a 100 point window somewhere within the 0 to 255 point range. In general, the longer the cable being used the higher the speed set point and vice versa. Other application specific conditions such as head pressure and tubing size will affect the speed set point window of operation. When adjusting the speed at the lower end of the 0 to 255 point scale, the pump may shut down. This fault condition is most obvious when a system has: high flow, low pressure and long cable.



## Chapter 2: System Installation

**READ BEFORE PROCEEDING ANY FURTHER**

The AC controller operates on high voltages supplied by a portable generator or grid-supplied main power. Care must be taken at all times to avoid electrical shock. Do not submerge the controller in water.

**Caution:**
AC controller operation should be performed only by qualified persons. Reading this manual is essential for operating this equipment safely. If after reading this manual you are still unsure about the operation of this equipment contact Geotech for further information and training.

**Caution:**
AC controller stores energy for short periods even after power is removed. The AC controller has no field serviceable components and should never be opened by an unqualified person. For service or repair contact Geotech directly at **1- 800- 833-7958**

The AC controller has been specifically designed for use with Geotech's SS GEOSUB Pump ONLY! Care must be taken when operating any equipment that operates on main voltage. If the operator accessible fuse is blowing due to a fault, identify the fault before replacing fuse or contact Geotech for service or repair. (See CHAPTER 5: SYSTEM TROUBLE SHOOTING for common fault conditions and suggestions on how to correct the issue.)

Verify intended power source matches the model supply specifications of your AC controller. AC controllers are available in 120VAC and 230VAC 50/60HZ and models and must be powered accordingly. Damage will result if controllers are connected to incorrect input power supply.

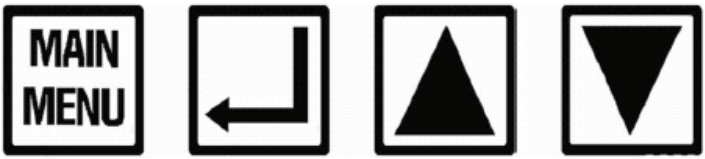
Turn main power switch to OFF position. Once input power source has been verified, connect input power cable to AC controller, and then connect cable to power source. (i.e. portable generator or main grid power.) Flip main power switch to the reset position. The display will light up and after a short startup sequence is executed, a message will display indicating the controller status.

Attach the pump to the controller using factory installed connectors on both the AC controller and pump cable. Use of any other connectors or method of attaching pump to controller will cause shock and or fire hazard.

If status display shows “main menu” proceed to chapter 3: SYSTEM OPERATION. If display is blank, shows a fault or error condition, proceed to CHAPTER 5: SYSTEM TROUBLESHOOTING.

## Chapter 3: System Operation

**Key Pad Description:**




The 

button will return you to the MAIN MENU from anywhere in the program.

The  button is used to confirm selections and advance to the next section of the program.

The  arrow is used to start the pump, raise the speed of the pump, and adjust settings in the program.

The  arrow is used to lower pump speed and adjust other settings of the program.

**Basic Operation**

- Verify main power switch is in OFF position.
- Plug power cord into controller.
- Plug power cord into AC supply outlet.
- Switch main power to ON position.
- Wait for initialization sequence to complete.
- From main menu
- Press ▲ to start the pump at default settings.

```
UP    START PUMP
DOWN   LOAD WELL
```

- Wait for pump start up to finish.

```
PUMPING WELL #nn
PUMP START UP
```

- Press ▲ or ▼ to adjust pump speed to achieve desired flow rate.

```
PUMPING WELL #nn
nnn  DR ON  nn
```

OR

```
PUMPING WELL #nn
nnn  DR OFF  nn
```

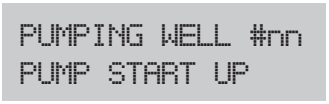
- Pump water at desired pump speed.
- Press MAIN MENU to stop pump and return to the MAIN MENU.

**Dry Run and Save Instructions**

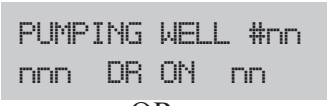
- Verify main power switch is in OFF position.
- Plug power cord into controller.
- Plug power cord into AC supply outlet.
- Switch main power to ON position.
- Wait for initialization sequence to complete.
- Choose from MAIN MENU.

- Press ▲ to start the pump at default settings.


- Wait for soft start sequence to complete.




- Press ▲ or ▼ to adjust pump speed to desired point.



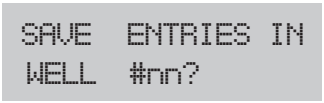

OR


- Press ↵ to toggle Dry Run (DR) on or off
- Hold down ↵ button for 3 seconds to enter Dry Run reset time change menu and well save menu.

- Press ▲ and ▼ buttons to change reset from dry run time from 0 to 60 minutes.


- Press ↵ to advance to well # write menu.

- Press ▲ and ▼ buttons to choose the well # you would like to save new parameters in. Up to 80 unique wells can be saved.




- Press ↵ to save new parameters that can be recalled under the selected well number at a later time.

- Confirm overwrite by pressing the ↵ button. Cancel overwrite by pressing the MAIN MENU button.
- Observe desired settings are displayed in the runtime display screen.

**Loading Saved Well**

- Verify main power switch is in OFF position.
- Plug power cord into controller.
- Plug power cord into AC supply outlet.
- Switch main power to ON position.
- Wait for initialization sequence to complete.
- Choose from MAIN MENU.

- Press ▼ to enter well load menu.

```
UP     START PUMP
DOWN   LOAD WELL
```

- Press ▲ or ▼ to select the well number and pre-set the parameters you would like to start pumping from.

```
CHOOSE WELL #nn
nnn  OR OFF  nn
```

- Press ↵ to load selected well parameters.

```
WELL #nn
LOADED
```

- Press ▲ to start pump at loaded well settings.

```
UP     START PUMP
DOWN   LOAD WELL
```

LOADING WELL #0 WILL LOAD DEFAULT START-UP CONFIGURATION.

**Preset well settings**

- Verify main power switch is in OFF position.
- Plug power cord into controller.
- Plug power cord into AC supply outlet.
- Switch main power to ON position.
- Wait for initialization sequence to complete.
- Choose from MAIN MENU

- Press ↵ to go to well setup menus.

```
UP    START PUMP
DOWN   LOAD WELL
```

- Press ▲ or ▼ to select the speed setting you would like to start pumping at.

```
SET SPEED
nnn
```

- Press ↵

- Press ▲ or ▼ to select how long the controller waits to start pumping again after dry run protection has been activated.

```
NEW RESET TIME
nn MIN(S)
```

- Press ↵

- Press ▲ or ▼ to select the well number to save these parameters in.

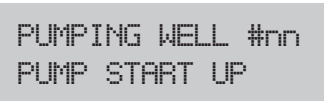
```
SAVE  ENTRIES IN
WELL  #nn?
```

- Press ↵ You will now be returned to the MAIN MENU screen. From here you can press the ▲ button to begin pumping at the settings just entered.

**Display Descriptions**

- MAIN MENU. Press ▲ button to start the pump. Press the ▼ button to load saved data based on well number.

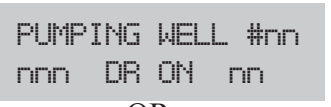

- This message is shown after pressing the up button from the MAIN MENU. You can press MAIN MENU to stop the pump and return to the MAIN MENU.




- This message is shown after pressing the ▼ button in the MAIN MENU. You can use the ▲ and ▼ buttons to scroll through the well numbers from 0 to 80. The bottom line shows the parameters specific to the well number shown. Press ↵ to load the chosen well parameters.


- This message is shown after pressing ↵ to choose to load well # nn information.


- This is the run time message shown during normal operation. Press ▲ or ▼ to adjust pump speed to desired set point. Press ↵ to change: Dry Run on or off. Hold ↵ for 3 seconds to change reset dry run time, and well # to save parameters. Press MAIN MENU to stop pumping and return to Main Menu. The lower left numbers are the pump speed point. The lower middle shows if Dry Run protection is on or off. The lower right number is the time the controller will wait before resetting from a dry run detection fault.




OR

- This message is shown if during soft start no pump is detected. There are various reasons for this to happen. Check to see if the connector is secure and that the cable is not broken. Press MAIN MENU

```
NO PUMP DETECTED
ATTACH PUMP
```

- This message is shown during runtime if the pump speed set point is raised to a point that overloads the output. The controller will automatically detect when max output has been reached and prevent the user from increasing the output further.

```
PUMPING WELL #nn
 !AT MAX POWER!
```

- This message is shown during setup for menus for adjusting the time the controller waits to reset after a dry run fault has has been detected.

```
ENTER DR RESET
nn MIN(S)
```

- This message displays when an entry has been changed but not saved to controllers memory for recall.

```
ENTRIES NOT!
SAVED!!!!!!
```

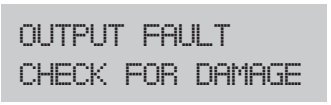
- This message is shown when the pump is no longer submerged in water during normal run time operation mm:ss indicates the time left in minutes: seconds before pumping is restarted. If the pump is still not submerged the controller will restart the counter and return to this message. Press ▲ to manually override the Dry Run counter and return to normal run time opera-

```
DRY RUN ALARM
PUMPING IN nn:nn
```

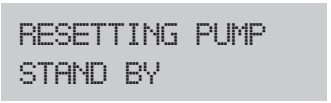
- This message is shown if the Dry Run counter has been manual overridden.

```
HANG ON WE'RE
RESETTING
```

- This message is shown when there is a short circuit fault on the controller output. Check the cable and pump carefully for any damage that may have occurred.




- This message is shown when the operator has chosen to exit any runtime menu and is returning to the Main Menu.



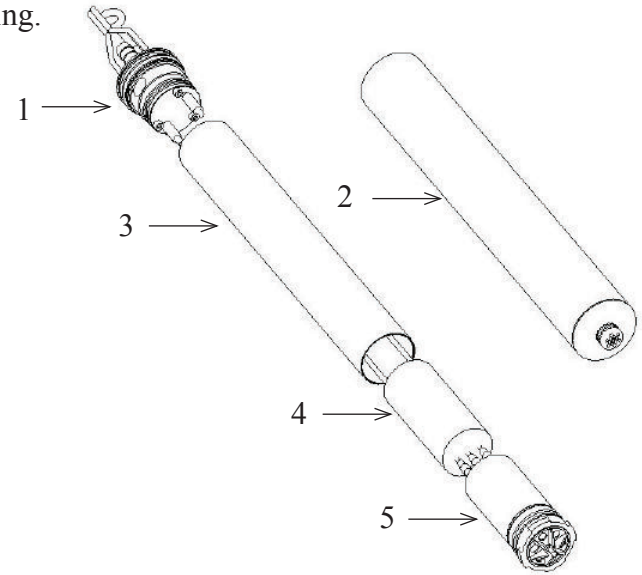

- This menu lets you choose which # to save new parameters in.


- This menu asks you to confirm your choice to overwrite information currently stored in well # nn

## Chapter 4: System Maintenance

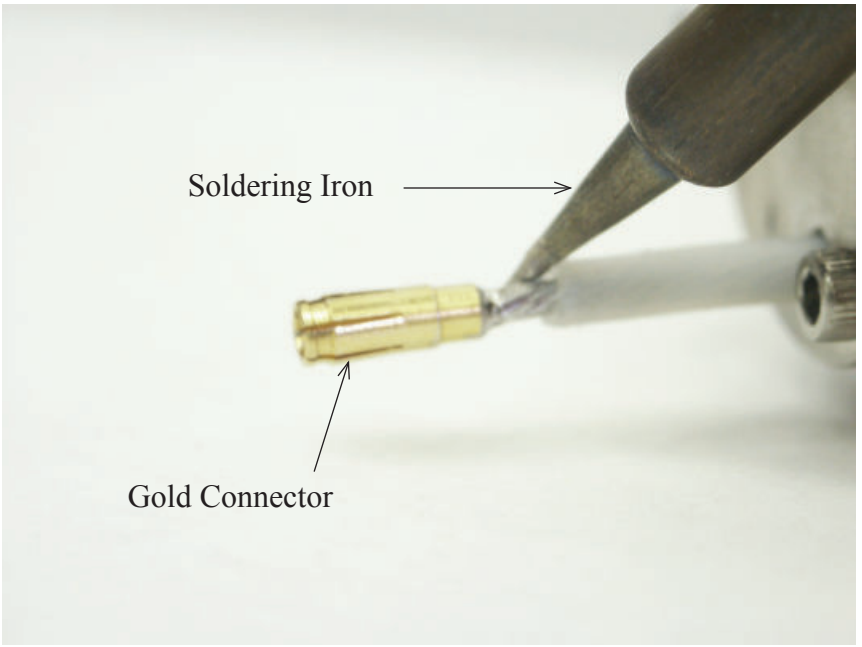
**Controller:**
Clean the controller as needed with mild soap and water on a cloth. Do not use abrasive cleaners or solvents. Do not spray with water or any other liquid or pressured solvents.

**Pump:**
Clean the pump between sampling events using Alconox detergent and water. Cleaning the pump between uses is important to keep the impeller from getting stuck in place, making it impossible to pump water. Fine grits and particulate matter can cause threads and tight fitting parts to become extremely difficult to disassemble if left to dry in the pump after use. The pump can be disassembled completely for decontamination and cleaning.

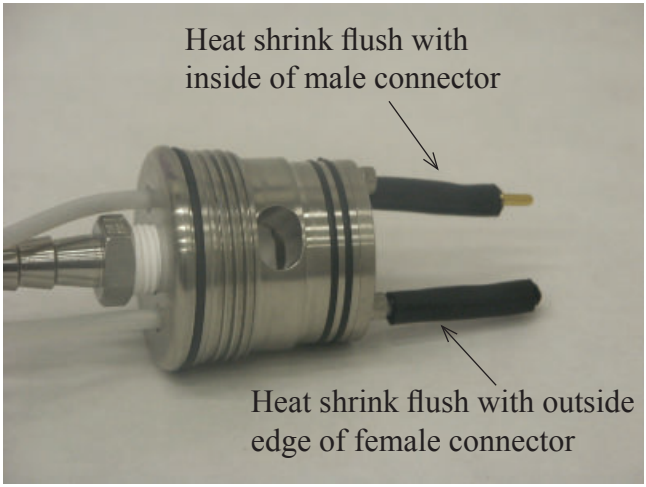



| PART | PART # |
|---|---|
| 1. TOP CAP ASSEMBLY | 21200076 |
| 2. OUTER HOUSING WELDMENT | 21200122 |
| 3. INNER HOUSING | 21200072 |
| 4. CONTROL MODULE | 51200083 |
| 5. MOTOR ASSEMBLY | 51200089 |
| 6. AC CONTROLLER 300 WATT | 81200031 |

From time to time it may become necessary to replace the gold male and female connectors on the down well cable end. This can be done by simply cutting the tip of the individual conductors off. Strip and tin the end of the cables, then solder new connectors on. Male connectors go onto the red striped conductor and female go on the unmarked conductor. When stripping the individual conductors start by stripping approximately 3/8” from the end with 12 AWG wire strippers. Then strip the very last 1/8” of exposed wire with 14 AWG wire strippers. This removes the outmost strands and allows the wire to fit into the solder cups on the connectors. Use the remaining 1/4” of exposed wire to transfer heat for soldering the connector without getting solder on the outside of the connector solder cup diameter.



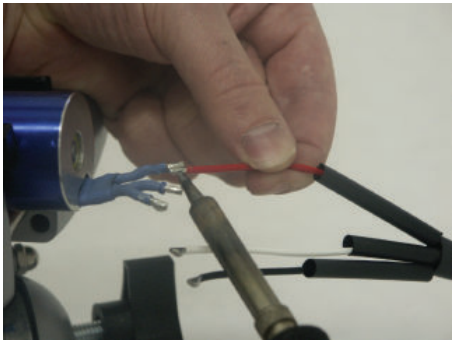
After connectors are attached, cover joints and connectors with heat shrink. Notice heat shrink is flush with outer edge of female connector and flush with inner edge of male connector.



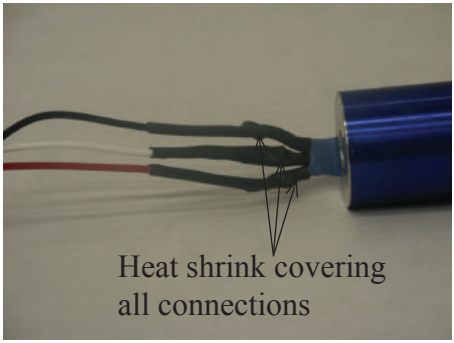

From time to time it may become necessary to replace your Geosub control module. This can be done by removing existing heat shrink between the control module and motor assembly. When removing heat shrink be careful to not damage the insulation on any wires. Disconnect the control module for the top cap and motor assembly.

## Replacing your control module

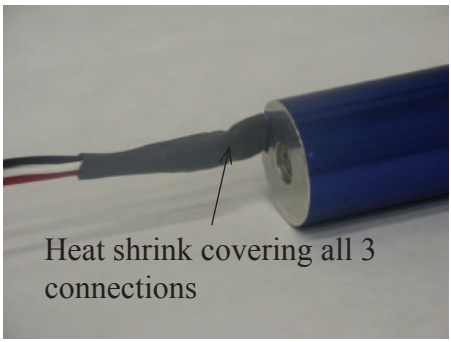
Connect the control module to the top cap using the male and female gold connectors making sure heat shrink covers all connections. Continue to solder the control module to the motor assembly. Heat shrink must be in position before the connections are made.Make sure that the connections are correct. If any two wires are swapped, the motor will run in the wrong direction. With the motor wires facing you they should be positioned on the bottom of the motor. The red wire is connected on the right. The white wire is in the center and the black wire is on the left.



After all connections are soldered, apply heat shrink to cover all connections.




After all connections are covered, apply a second layer of heat shrink to cover all 3 connections.




Replace motor assembly and control module into the inner housing. Reconnect the top cap to the control module using the gold connectors. Slide the inner assembly in to the outer housing then tighten the top cap to the outer housing. Your Geosub is now ready for operation.

## Chapter 5: System Troubleshooting

**DO NOT OPERATE THIS CONTROLLER IF IT HAS BEEN DAMAGED, BROKEN, SMASHED OR EXCESSIVELY WORN. BROKEN COMPONENTS POSE A SEVERE THREAT TO THE SAFETY OF THE OPERATOR AND HIS OR HER ENVIRONMENT. CONTACT GEOTECH FOR ANY SERVICE OR REPAIR NEEDS.**

Geotech's AC controller has been designed and manufactured to provide a long and trouble-free life during harsh field operation. In general, the display will indicate any fault conditions that can occur in the field.

**Problem:** The display is not showing anything:
**Solution:** Verify the input power is correct and at the correct voltage. If unsure of this have a qualified electrician verify main power source.

**Problem:** The ON/OFF circuit breaker is tripped:
**Solution:** This could be caused by attaching the controller to the incorrect input voltage. If unsure of this have a qualified electrician verify main power source. If input voltage is correct contact Geotech for service and repair.

**Problem:** The display states there is no pump attached.
**Solution:** Inspect the cable for damage and make sure the connections are secure inside the pump. If everything is connected and there is no cable damage, check the fuse.

**Problem:** The display states output fault check for damage.
**Solution:** Inspect the cable for damage. If no damage is found, disconnect the pump from the controller and press up to start the pump. If the display says output fault then the controller is internally damaged and must be returned to Geotech for repairs. If the controller display states there is no pump attached, then the problem is in the cable or pump assembly and the controller is working well. If there is no cable damage then the problem could be in the pump. Use an ohm meter to measure the input terminals to the pump. If the measurement is less than 100 ohms the potted control board inside the pump must be returned to Geotech for repair or replacement.

If the measurement is greater than 100 ohms then inspect the motor assembly for bad bearings or debris preventing the impeller form turning.

**Problem:** The fuse is blown:
**Solution:** There is only one operator serviceable component on the AC controller which is the fuse for the pump power output. If this is found to be blown, be sure to identify the cause of the fault before replacing the fuse. Start by visually inspecting the entire pump cable length for physical damage. See pump manual for pump operation and maintenance.

**Problem:** Pump impeller will not turn and controller indicates no pump is attached.
**Solution:** If mud, dirt or sand has dried onto the impeller, soak in water and try to remove debris. If the impeller is free of such debris then one of the bearings may be worn out and you must replace the motor/impeller assembly.

## Chapter 6: System Specifications

**Controller specifications**

| | |
|---|---|
| **Model:** | 300 Watt AC Controller |
| **Input power range:** | 130 Volts AC<br>50/60 HZ 310 Watts<br>2.6 amps nominal full load<br><br>230 Volts AC<br>50/60 HZ 300 Watts<br>1.3 amps nominal full load |

**One or the other input voltages - not both! Controllers must be configured for either 110 or 230 volts ac input at the factory**.

| | |
|---|---|
| **Output power:** | Variable 0 to 46 Volts DC<br>at < 300 Watts |
| **Output power @ max voltage:** | 10 amps (max) |
| **Operating Temp:** | -20 to 100 degrees<br>Fahrenheit<br>(Ambient Air temperature). |
| **Humidity:** | Up to 90% humidity. |
| **Weight:** | 16.45 lbs |
| **Size:** | 16”L x 13”W x7”H |
| **Input protection:** | 10 amps circuit breaker<br>on/off switch. |

**Pump specifications**

Electric
Full Load Rating.....2/3 HP
Maximum Amp Draw.....35 amps
Overload.....Incorporated into AC controller
**Pipe Connection**
Discharge Port .....1/4” Female NPT
(includes 3/8” Barb)

**Operating Conditions**
Minimum Ambient Fluid Temperature.....34°F (1°C)
Maximum Ambient Fluid Temperature .....80°F (28°C)
Dimensions & Weight (Pump & Motor)
Dimensions of pump.....12.2” L X 1.75” OD
Net Weight of pump w/o lead.....3.9 lbs

Weight of small Georeel and 100 feet of 12 AWG with safety cable...18.3 lbs
Weight of small Georeel and 150 feet of 12 AWG with safety cable...21.6 lbs
Weight of small Georeel and 200 feet of 12 AWG with safety cable...24.9 lbs

## Chapter 7: Replacement Parts List

| Part Description | Part Number |
|---|---|
| Power cord, 115 Volt | 12070014 |
| Power cord, 230 Volt | 11200850 |
| 300 Watt AC controller 115 Volt | 81200031 |
| 300 Watt AC controller 250 Volt | 81200032 |
| Fuse | 11200746 |
| Manual | 11200813 |
| Extension Cord | 51200085 |
| Gold connector set | 11200754 |
| Motor assembly | 51200089 |
| Outer housing weldment | 51200186 |
| Inner housing | 21200072 |
| Top cap | 21200076 |
| Compression plate | 21200121 |
| Compression plate screws | 12070039 |
| O-ring kit | 51200088 |
| Control module | 51200083 |
| Check Valve | 81200033 |
| Motor lead with intergraded safety cable | 21200103 |
| 100’ Georeel and SSGeosub | 81400101 |
| 150’ Georeel and SSGeosub | 81400102 |
| 200’ Georeel and SSGeosub | 81400103 |
| Inert Grease | 12103157 |

## 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 1-800-833-7958 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:

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

**Geotech Environmental Equipment, Inc**
2650 East 40th Avenue Denver, Colorado 80205
(303) 320-4764 ● **(800) 833-7958** ● FAX (303) 322-7242
email: sales@geotechenv.com website: www.geotechenv.com