

Redi-Flo 2® and Geotech Variable Frequency Drive Systems

Installation and Operation Manual



Table of Contents

DOCUMENTATION CONVENTIONS	3
Section 1: System Description	6
Function and Theory	6
<i>Variable Frequency Drive</i>	6
<i>Dedicator®</i>	6
<i>Redi-Flo 2®/MP1 Pump</i>	6
System Components.....	6
<i>Variable Frequency Drive</i>	6
<i>Dedicator® Systems</i>	7
<i>Redi-Flo 2® Well Seal</i>	7
<i>Redi-Flo 2®/MP 1 Pump</i>	7
Other Accessories.....	9
Section 2: System Installation	10
Dedicator® Installation.....	11
Installing the Well Seal.....	13
Redi-Flo 2® Installation.....	15
Section 3: System Operation	16
Quick Start Guide.....	16
Dedicator® Operation	17
Operating Conditions	18
Preparing to Take a Sample	18
Important Do's and Don'ts.....	19
Section 4: System Maintenance	20
General maintenance.....	20
Dedicator® Maintenance	20
Motor Winding Test.....	25
Insulation Resistance Test	25
Checking the Impellers for Wear	26
Checking the Extension Cable.....	26
Section 5: System Troubleshooting	28
Section 6: System Specifications	29
VFD Specifications.....	29
Submersible pump Grundfos MP 1/Redi-Flo 2® Specifications	30
2" and 4" Dedicator® Specifications	30
Happy Hose!® Cable Specifications	30
All Happy Hose!® Cable Specifications	31
Section 7: Parts and Accessories	32
The Warranty	38

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.



In order to ensure your Environmental Pump Variable Frequency Drive has a long service life and operates properly, adhere to the following cautions and read this manual before use.



This equipment contains voltages that may be as great as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

- **Disconnect from power source when not in use.**
- **Power input source must be within +/- 10% of ratings.**
- **Avoid spraying fluid directly at equipment.**
- **Never submerge equipment.**
- **Avoid pulling on wires to unplug equipment wiring.**
- **To prevent equipment damage, avoid dropping it.**



Do not operate this equipment if it has visible signs of significant physical damage other than normal wear and tear.



Notice for consumers in Europe:

This symbol indicates that this product is to be collected separately.

The following applies only to users in European countries:

- This product is designated for separate collection at an appropriate collection point. Do not dispose of as household waste.

- For more information, contact the seller or the local authorities in charge of waste management.

Section 1: System Description

Function and Theory

Variable Frequency Drive

The Geotech Variable Frequency Drive (VFD) is designed to operate and protect the Redi-Flo 2® (RF2) pump. Using the control interface, the operator can precisely control the RF2 pump discharge flow rate from 8GPM (30 LPM) to 100 milliliters per minute, to depths down to 280' (85 m). In addition to providing precise control over the RF2 pump, the Geotech VFD protects the pump from adverse motor conditions such as over-and-under voltage, over-current, and ground fault. The Geotech VFD uses either 120V or 230V Single-Phase AC input power source for operation.

Dedicator®

The Dedicator® is a turnkey, dedicated sampling system designed for easy installation and operation. Each system is configured to meet site specifications, completely assembled, and tested prior to shipment. Dedicator® Systems include a low profile well seal, Happy Hosesel® (integrated motor lead, safety cable and discharge tubing), a Grundfos Redi-Flo 2® MP1 2" electric submersible pump and all clamps and fittings. The well seal incorporates an access port for water level indicators when the sample tube is removed; low-clearance adapters are available to fit our standard 2" and 4" (5.08 and 10.2 cm) well seals in virtually any well pipe size.

Redi-Flo 2®/MP1 Pump

The Grundfos Redi-Flo 2® electrical submersible pump provides smooth, uninterrupted water flow during ground water sampling to depths down to 280' (85 m). Both high flow rates needed for purging and low flow sampling are achieved with the same pump.

System Components

Variable Frequency Drive

The Geotech VFD System includes:

- Variable Frequency Drive in NEMA 4 carry case with water-tight cable seals mounting bracket.
- The carry case is designed for outdoor duty and is resistant to damage as a result of incidental exposure to rain.
- Power cable with standard NEMA 5-15P plug (115V supply model) or open-wire pigtail cable (230V supply model).
-

Geotech VFD features:

- UL Approvals: The Geotech VFD is UL Listed to U.S. and Canadian electrical safety standards.

- Torque Boost: The Geotech VFD is equipped with a torque boost (voltage boost) feature to aid in start-up under severe conditions.
- Optimized Volts/Frequency (V/Hz) Pattern: The Geotech VFD V/Hz pattern is specially optimized to allow the most efficient operation of the Redi-Flo 2® pump.

A complete system includes:

- Redi-Flo 2® (MP1) pump and motor lead.
- A discharge hose to connect to the pump.
- Safety cable and hardware for lowering and lifting the pump.

An electrical plug to connect the VFD power cord to your portable generator may be needed if the supplied plug is not compatible with your generator or in the case of a 230V supply model.

An extension pump cable may be needed depending on your pump cable configuration.

Dedicator® Systems

The Dedicator® includes:

- Grundfos Redi-Flo 2® MP1 2" electric submersible pump
- Happy Hose!® integrated motor lead, safety cable and discharge tubing
- Configured systems to meet site specifications
- Well identification tag
- In-the-well sample tube storage
- Fits 2" (5.08 cm) or larger wells
- UL rated weather-resistant electrical connection with cap
- Water level access port
- Well seal provides a liquid tight barrier (see details below)
- Ideal for purge and sample or low-sampling methods

Redi-Flo 2® Well Seal

- NEMA – 6P rated weather resistant electrical connection with cap for connecting the extension cable to the VFD.
- Discharge port for connection to the sampling tube assembly, and a stainless steel discharge fitting for 0.5" ID tubing.
- Storage/access port for storing sampling tube assembly, using a water level indicator, or other down hole device with an OD less than 0.5".

Redi-Flo 2®/MP 1 Pump

RF2 features include:

- Chemically inert materials
- Maximum sample integrity and easy decontamination
- 1.8 inch (4.6 cm) diameter

- Easy access into 2" (5 cm) or larger wells
- Flow rates range from 8 GPM (30 LPM) to as little as 100ml/min
- Controlled with the simple push of a button
- Low velocities and agitation
- Ideal for sampling and purging
- Eliminates the need for control valves
- Continuous flow
- Dedicated or Portable configurations available

Designed for long-term reliability in dedicated monitoring wells, the Redi-Flo 2® provides optimal sample quality. Whether doing traditional purge and sample or low-flow sampling, when operated with the Geotech VFD (Variable Frequency Drive) flow control is easy.

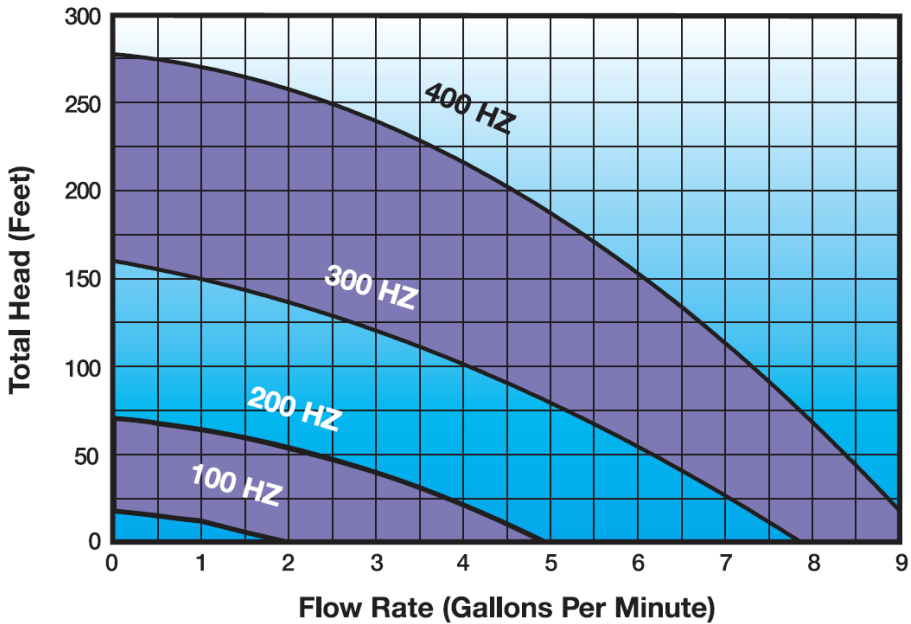


Figure 1-1: Flow Rate

Purging and sampling with the same pump is extremely efficient. The unique design and superior materials allow for easy operation, decontamination and maintenance, and disassembly and reassembly.

RF2 Accessories

Professional accessories make your job easier, your equipment last longer, and protect your investment.

Geotech offers a shroud specifically designed for use with the Grundfos Redi-Flo 2® in wells 4" (10cm) in diameter or larger. The Redi-Flo 2® electrical submersible pump is designed to stay cool by the action of water passing rapidly over the body of the stainless steel and PTFE pump. In 2" (5 cm) diameter wells, this is achieved automatically. In larger diameter wells, the pump may overheat causing permanent damage to the inner workings. The Geotech pump shroud can help to avoid damage to the Redi-Flo 2® pump.

If your site plan requires all the water passing through your pump be disposed of and not allowed to return to the well, ask your sales representative about our custom stainless steel check valve.

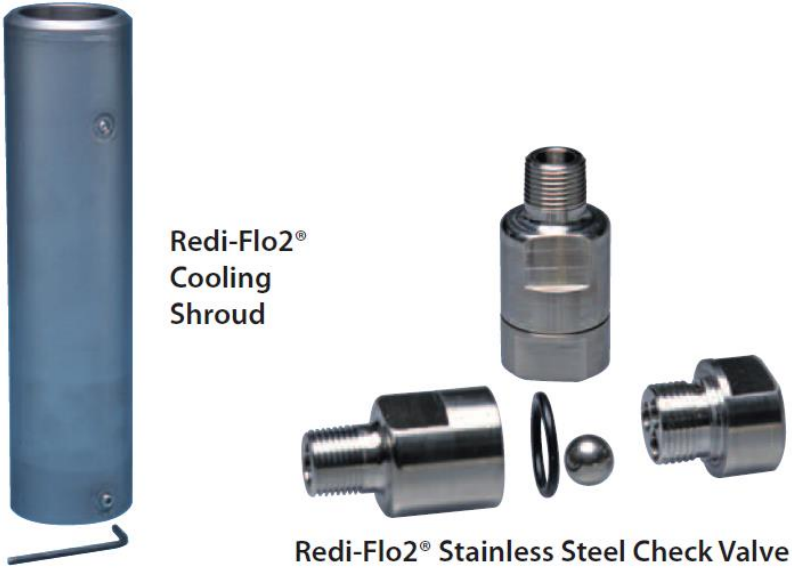


Figure 1-2: RF2 Accessory Options

Other Accessories

For portable systems, Geotech offers a variety of portable reels and well caps. Contact Geotech at 1-800-833-7958 for more information.

Section 2: System Installation



The pumping system is not approved as explosion-proof. Local authorities and regulations should be consulted if there is any doubt about its suitability for a certain application.

Reverse Rotation Test

Connect the motor lead to the Geotech VFD and test the rotation of the pump. Submerge the pump in water, start it at its slowest speed and make sure the pump shaft is turning counterclockwise (when viewed from the top).

Attaching the Pump to the Pipe

Use a wrench when connecting piping to the pump. After the first section of pipe has been attached to the pump, connect the safety cable to the pump.



Do not clamp to the pump.

When raising the pump, do not pick up pump from the pump end only. Picking up from the pump end only places bending stress on the pump. Geotech recommends attaching a safety cable to the pump (using special brackets and cables, sold separately, see *Section 7: Parts and Accessories*) anytime plastic pipe or flexible tubing is used.

A check valve may also be added to Redi-Flo 2® pumps to prevent fluid from flowing back into the pump after it is turned off (backflow prevention).

Always check to ensure joints are fastened securely. The use of a torque arrestor is not required when using the Geotech VFD.

Lowering the Pump into the Well

Ensure the electrical motor leads are not cut or damaged in any way when the pump is being lowered into the well.



Do not use the motor leads to support the weight of the pump.

To protect against surface water entering the well and contaminating the well, Geotech recommends using a locally approved well seal.

Secure the motor lead to the discharge pipe at frequent intervals to prevent sagging, looping and possible motor lead damage. PTFE wire ties are recommended for environmental applications.



Plastic pipe and tubing tend to stretch under load. This stretching must be taken into account when securing the motor lead to the riser pipe or tubing. Leave 3"-4" of slack between clipped points. This tendency to stretch will also affect the calculation of the pump setting depth. When plastic pipe or tubing is used, it is recommended that a safety cable be attached to the pump to raise and lower it.

Redi-Flo 2® pumps can be fitted with a safety cable bracket (See *Section 7: Parts and Accessories*)

Dedicator® Installation

The Dedicator® Dedicated Sampling System was designed to be installed by lowering the pump and Happy Hose® into the well then tightening the bolts on the well seal to accomplish a water-tight seal.



A 3/16" long-arm hex key is provided for installation.

1. Check the water level and total depth of the well to verify the correct installation elevation.
 - Happy Hose!® lengths ("A") are referenced from the bottom of the pump to the bottom of the well seal plate (see Figure 2-1 dimension "A").
 - The well seal plate sits flush against the top of the well casing.

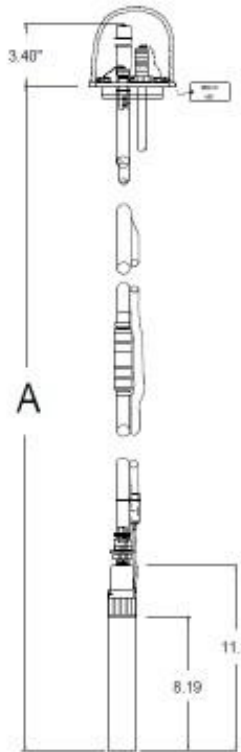


Figure 2-1: Reference Points for Dedicator® Installation

2. Position the Dedicator® assembly over the well opening and lower the pump and Happy Hose® slowly into the well.
 - Be sure not to scrape the Happy Hose® on the edge of the well casing.
3. Once the system is lowered, position the well seal onto the well casing until seated.
4. Tighten all the bolts on the well seal.
5. To store the sample tube, feed the sample tube down into the well through the access port.
 - The sample tube was designed to be stored in the well when not in use.
 - The sample tube is included loose in the shipping box.
6. Thread and tighten the sample tube end fitting into the port.



DO NOT OVER-TORQUE THE FITTING — it is only necessary to tighten the fitting until the O-ring is seated on the seal.

7. Thread and tighten the access port plug into the top of the sample tube fitting (see Figure 2-2).



The Dedicator® will operate only when used with the Geotech VFD Converter.

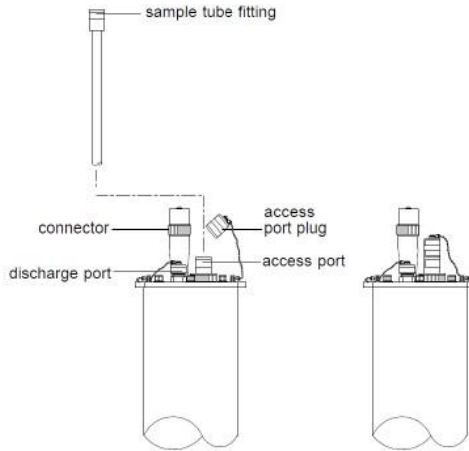


Figure 2-2: Reference Points for Dedicator® Installation

Installing the Well Seal

- 1) Determine the depth at which you'll install the MP1.
- 2) Connect the discharge hose to the MP1.
 - Refer to the Redi-Flo 2® Installation and Operating instructions (see *Section 3: System Operation*).
 - Do not connect the motor lead to the VFD.
- 3) Connect the discharge hose to the well seal.
 - The Redi Flo 2® pump Well Seal can only be connected to a hose with a 1/2" internal diameter.
 - To do so:
 - a. Make an even cut through the hose at the desired length.
 - b. Slide the clamp over the end of the hose.
 - c. Push the end of the hose over the hose nipple.
 - d. Secure the hose with the clamp.

- 4) Connect the Motor Lead to the Well Seal.
 - Motor leads are shipped with one end connected to the MP1 pump and the other to a well seal when system lengths are provided.
 - Connecting to Well Seal in the field by using the directions below:
 - a. Use pliers to unscrew the retaining ring.
 - b. Use a small screwdriver (3 mm blade or smaller) to remove the screw holding the terminal block on the side of the housing and then loosen each wire from the electrical terminal block.
 - c. With the motor lead free from the connector cut across the leads diagonally to make it easier to push it through the well seal gasket.
 - d. Make sure to leave enough slack in the motor lead (2-3" of tubing length).
 - As the pump assembly is lowered into the well, the hose is sure to stretch.
 - Unless slack is put into the motor lead the entire weight of the pump will be borne by the lead, causing possible wire breakage or a bad connection.
 - e. Push the lead through the well seal gasket.
 - f. Strip 1/4" from the end of each wire and insert each back into its proper terminal slot at the back of the terminal block (yellow/green is ground; wire next to it is #3, then #2, then #1).
 - g. Tighten the screw down over each terminal to secure the wire.
 - h. Test each connection by pulling on it gently.
 - i. Insert the block into the well seal's electrical housing, lining up the screw hole in the housing with the one in the terminal block.
 - j. Secure them together with the screw you removed earlier (this also grounds the pump).
 - k. You may wish to connect the discharge hose and lead together (i.e. with a wire tie) just below the well seal to keep them together.

- 5) Install the sampling tube assembly
 - Install sampling tube assembly (provided separately) by removing the plug in the access port and inserting the sampling tube assembly through the port.
 - Seal the top of the sampling tube assembly with the plug.

- 6) Lower the pump into the well
 - Position the pump over the well opening and lower it slowly into the well.
 - Do not to scrape the motor lead or discharge tube on the edge of the well casing.

- 7) Secure the seal to the well casing –
 - a. Insert the well seal into the end of the well casing until seated.
 - b. Tighten the Allen screws on top of the seal forces the seal's rubber gasket to expand against the inside edges of the casing, thereby sealing it.
 - c. Cover the electrical connection with the hood provided.

Redi-Flo 2® Installation

To ensure the Redi-Flo 2® Variable Performance Pumping system operates properly, follow these guidelines:

- The Redi-Flo 2® pump must be installed vertically with the discharge end pointed upwards.
- The electrical voltage supply to the Geotech VFD must always be within + or - 10% of the specified power supply.
- For best performance when operating on a generator, 115V generators should be set at 120V without load and 230V generators should be set at 240V without load.
- Use a separate meter to set voltage; do not rely on built-in meters found on generators.
- The pump and motor must always be completely submerged in fluid to ensure lubrication and cooling of the motor.
- The temperature of the fluid being pumped should be according to the technical specifications shown in the motor specifications.
- The installation depth of the pump should always be at least 3' (.9 m) below the maximum drawdown level of the well.
- Redi-Flo 2® pump is not recommended for well development or pumping fluid containing abrasives.
- Redi-Flo 2® pump is not recommended for continuous operation applications.
- The warranty of the Redi-Flo 2® pumps will be void if other than the Geotech VFD is used or if corrosive fluids are pumped.
- The service life of dedicated Redi-Flo 2® pumps may be compromised if the ambient water quality exceeds one or more of the following values:

pH<5 DO>2 ppm H₂S>1 ppm CL->500 ppm TDS>1000 ppm



Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that grounds are connected. Electrical shock can cause serious or fatal injury.

A qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations should perform all electrical work.

Section 3: System Operation



When pumping water containing hazardous material, personal safety equipment must be used.

Quick Start Guide

1. Fully submerge RF2 in the water to be pumped.
2. Connect the motor lead to the VFD.
3. If using a generator, start the generator and allow sufficient time for it to warm up.
4. Ensure VFD knobs are in the following positions:

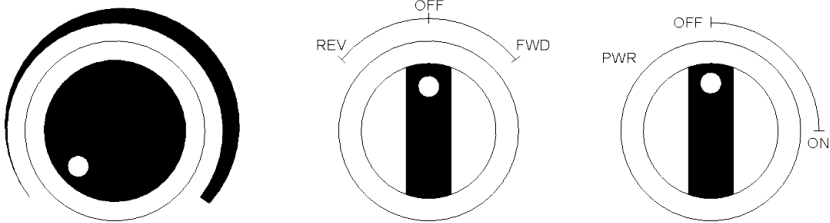



Figure 3-1: VFD Knobs
(From left to right)

The top, middle, bottom knobs on VFD interface, all shown in the “OFF” position

5. Plug VFD into generator or utility power supply; ensure incoming power is compatible with unit's configured power.



Incorrect wiring on the 115V or 230V terminal will damage the drive, double check that power source voltage matches VFD voltage.

6. Turn the bottom “PWR” knob to the “ON” position.
 - Do NOT press down on the lockout button while turning.
 - Knob may be resistant to turning on new VFDs.
 - “STOP” will be shown on the display.
7. Turn the middle knob to the “FWD” position.
 - “Hz 0.0” will be shown on the display.
8. To begin pumping, use the top knob to increase or decrease speed.
9. Use the  (Navigate) button to toggle speed in Hz and current in Amps.
10. When powering down, return all knobs to positions shown in step #4.
11. Unplug the VFD from the generator BEFORE removing the motor lead from the VFD or turning off the generator.

To ensure the Redi-Flo 2® and Geotech Variable Performance system operates properly, follow the guidelines listed in *Section 2: System Installation*.

Adherence to Environmental Regulations

When handling and operating the Redi-Flo 2® Pump system, all environmental regulations concerning the handling of hazardous materials must be observed. When the pump is taken out of operation, great care should be taken to ensure that the pump contains no hazardous materials that might cause injury to human health or to the environment.

Purging a Well

If the pump is used to purge a well, start the pump at minimum speed and gradually increase to desired speed. Redi-Flo 2® products are not recommended for well development.

Generator Usage

Minimum generator size

For generators with voltage regulation	2000 watts at 115/230VAC, single phase
For generators without voltage regulation	5000 watts at 115/230VAC, single phase
Recommended for optimal performance	3000 watts at 115/230VAC, single phase with voltage regulation

Dedicator® Operation

Step 1

1. Remove top plug from access port.
2. Remove the sample tube from the access port, and then remove the discharge port cap.
3. Attach the sample tube fitting to the discharge port fitting and tighten.
 - Do not re-install access port top plug.
4. Port must be open during operation to vent the well.
 - It is okay for the top plug to rest in the access port, but DO NOT tighten it.

Step 2

1. Remove connector hood.
2. Attach the extension cable to the well seal connector.
3. Attach the other end of the extension cable to the VFD.

Step 3

Operate the pump and VFD per the pump and VFD specifications found in *Section 6: Technical Specifications*.

To start the pump see the “Quick Start Guide” at the beginning of this section.

The pump may become clogged if pumping suspended solids. Refer to the *Section 4: System Maintenance* to dismantle the pump end.

Step 4

1. When sampling is complete, turn off the VFD by moving the **Start/Stop** switch to the “Stop” position.
2. TURN THE POWER OFF AT THE GENERATOR before disconnecting the Dedicator® VFD cable from both the well seal and the VFD.
3. Disconnect the sample tube from the discharge port fitting and store the sample tube.

Step 5

1. Replace and tighten the discharge port cap and the access port top plug.
2. Replace the hood on the well seal connector.

Operating Conditions

- The electrical voltage to the VFD must always be + or - 10% of the specified power supply voltage.
 - For the 230V VFD: between 207 and 253 volts, single phase AC;
 - For the 115V VFD: between 104 and 126 volts
- The motor and pump must be completely submerged in fluid to ensure lubrication of the shaft seal and cooling of the motor.
- The pump is capable of producing a total head equivalent to 280' (85 m) of water.
 - Total head includes the distance from the ground level to the pumping level of the water in the well and all friction losses.
- If the pump is used in a well larger than 4" in diameter, a shroud should be used around it to ensure proper motor cooling — call Geotech for more details.
- The temperature of the water being pumped should be between 34°F and 86°F (1°C and 30°C).
 - If the temperature drops below freezing and your pump is frozen so the motor shaft cannot rotate.
 - Pull the pump out, lower it into water, and start it at the slowest speed possible.
 - Continue to operate the pump at this speed for about 10 minutes, at which time it should thaw and operate properly.

Preparing to Take a Sample

- 1) Loosen/remove the access port plug – this port **MUST NOT** be left open while the sample is being collected.
- 2) Attach the sampling tube assembly by remove the tube assembly from the access port and attaching it, finger tight, to the discharge port fitting.
- 3) Make the electrical connection by removing the hood from the electrical connection and attach it to the extension cable from the well seal to the VFD.

Important Do's and Don'ts

A Checklist to prevent the most common problems:

- Do** lower the pumping system slowly down the well
- Do** tighten all allen bolts before operating the system
- Do** remove sample fitting from storage port and install on purge port before operating

- Don't** leave the plug on the access port during operation
- Don't** over-tighten the sampling tube assembly when installing in an access hole for storage. It is only necessary to tighten it until the O-ring is seated on the seal.
- Don't** allow water to build up inside the well seal connector. If water build-up does occur, dry COMPLETELY before operation.

Section 4: System Maintenance

Per use maintenance:

1. Inspect extension cord for cuts, broken housings or connector pins.
2. Ensure VFD is securely mounted and inspect for cracks, dirt or other damage.

General maintenance

Clean VFD enclosure and case 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.

Dedicator® Maintenance

The Dedicator® requires minimal maintenance due to the specially designed features. To properly care for the Dedicator®:

1. Replace all caps, plugs, and hoods on the well seal when wear is apparent to prevent contamination and corrosion of electrical connections.
2. Store the extension cable in a dry place with the VFD.
3. Make sure the well seal connector is completely dry before operating.

There is no recommended preventative maintenance for pump components. Reduced pump performance may be indicative of wear, especially if pumping suspended solids. See Redi-Flo 2® Maintenance later in this section. Disassemble the pump end impeller assembly and examine for wear according to the following:

- Impellers --- should show no visible wear
- Guide vane --- should show no visible wear
- Wear ring --- minimum thickness should never be less than 1.0mm

Replace any worn components using either a pump-end replacement kit or a PTFE pump-end replacement kit. See *Section 7: Parts and Accessories*.

Redi-Flo 2® Maintenance

Decontamination

If the pump is moved from well to well, it should be thoroughly decontaminated prior to being installed in the next well. In addition to cleaning the individual components inside and outside, the water in the pump motor should be replaced using a syringe (11200032). This can be accomplished through the following steps:

1. Shut the pump off by placing the Redi-Flo 2® VFD in the stop position.
2. Disconnect Redi-Flo 2® VFD from power supply or generator.
3. Disconnect the motor lead from the Redi-Flo 2® VFD.

4. Remove the discharge tubing and the pump end.
5. Turn the pump and motor upside down.
6. Use a flat blade screwdriver to remove the filling screw on the bottom of the motor.
7. Remove the three Allen head set screws at the bottom of the motor with a 2.5 mm Allen wrench.
8. Push gently on the motor shaft to move bearing housing out of the stator housing
9. Continue to remove bearing housing and motor shaft from stator housing.
10. Clean motor shaft with a brush.
11. Empty the water from the motor.
12. Clean inside of stator housing with a brush.
13. Replace motor shaft into stator housing.



Figure 4-1:
Disassembly

14. Refill motor using contaminant-free deionized water using a syringe (11200032).
15. Replace bearing housing and tighten Allen screws.
16. Continue to add water until the level is even with the bottom edge of the screw hole.
17. Replace and tighten the filling screw.
18. Turn the pump over several times, then remove the filling screw again to let any trapped air escape (if air is left inside the motor, the life of the motor will be shortened). Add more water, as necessary. Fluid should overflow when the fill cap is screwed back on the motor cavity.
19. Replace and tighten the filling screw.
20. Replace pump end and piping

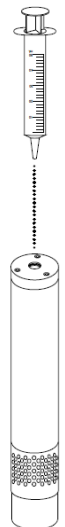


Figure 4-2: Motor
Lubrication

Replacing the Motor Lead

To replace the motor lead, refer to the diagram and follow these steps:

Removing the Old Motor Lead

1. Make sure the Redi-Flo 2® VFD is turned OFF, and the motor lead is not connected to the Redi-Flo 2® VFD.
2. Loosen and remove the Set Screw from the Inlet Screen
3. Slide the Inlet Screen off the pump. If you plan to use this motor lead again, be careful not to scrape insulation from it as the Inlet Screen is removed.
4. Loosen and remove the Pump Housing. Remove the impeller assembly (impellers, guide vanes, etc.).
5. Use a 6mm wrench to loosen and remove the Motor Lead Screw for the ground lead (green/yellow wire).
6. Pull up on the ground lead to remove it. Using a small screwdriver and precision electronics pliers, pry up and remove the PTFE Washer and Brass Washers from inside the enlarged Ground Motor Screw. Remove the 8mm Ground Motor Screw.
7. Use an Allen wrench (2.5 mm) to remove the two Motor Screws holding the Suction Interconnector in place. Remove the Suction Interconnector but be very careful to note which of its slots is lined up with which motor lead -- this will be very helpful during reassembly. You may wish to scratch a mark on both the Suction Interconnector and the motor to aid in matching them up later.
8. Refer to the illustration on the next page.
9. Use a 6mm wrench to loosen and remove the remaining Motor Lead Screws
10. Pull up on each of the leads to remove them. Make a note which lead comes out of each hole-- this is necessary when installing the new motor lead. Using a small screwdriver and precision electronics pliers, unscrew and remove the PTFE Washer and the Grommet

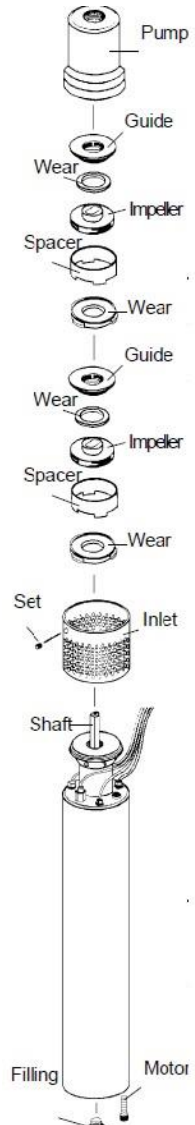


Figure 4-3: RF2 Components

Installing the New Motor Lead

1. Ensure the motor lead holes are clean and free of moisture.
2. String the Inlet Screen onto the motor lead.
3. String the motor lead components (shown at right) onto the end of each motor lead wire (except the striped green ground wire). Using a wire crimp tool, properly crimp each pin onto the lead wires.
4. For each wire, place the Crimped Pin down into the motor lead hole. Press the Grommet and PTFE Washer down around the lead. Be sure to reconnect the lead wires in their previous pattern described below.

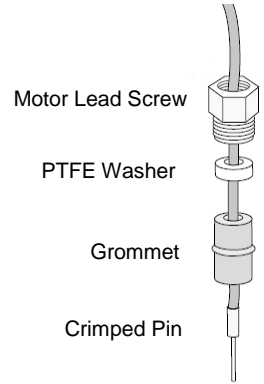


Figure 4-4: Power Conducting Motor Lead

- For motor lead, use the following wiring pattern: 1, 2, 3, clockwise from ground terminal (striped green)

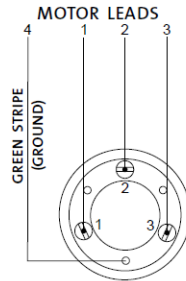


Figure 4-5: Motor Lead Connections

5. While pushing the lead down into the motor lead hole, use a 6mm wrench to tighten the Motor Lead Screw into place. Repeat for the other two lead wires.
6. Replace the Suction Interconnector. Replace the Ground Motor Screw. Since the ground wire will be attached to this screw, you will want to put it into the hole that will cause the least amount of twisting to the wire.
7. Replace and tighten the two Motor Screws with an Allen wrench.

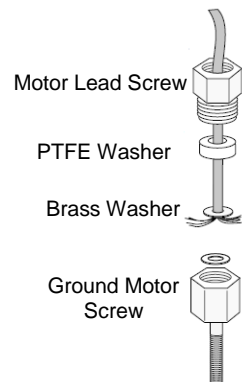


Figure 4-6: Ground Motor Lead

8. String the motor ground lead through the hex lead screw, PTFE washer and brass washers. Strip about 1/4 inch of insulation from the lead and fray the copper strands outward as shown.
9. Press the washers down into the ground screw and tighten the motor lead screw in place.
10. Return the impeller assembly to the top of the Suction Interconnector. Refer to Figure 4-3 for the proper sequence.
11. Screw the Pump Housing back onto the Suction Interconnector.
12. Position the motor lead in the recessed area of the Pump Housing.
13. Carefully push the Inlet Screen over the Pump Housing and the Suction Interconnector.
14. Line up the screw hole in the inlet screen with the screw hole in the pump housing.
15. Fit and tighten the set screw.
16. Connect the motor lead to the Redi-Flo 2® VFD and test the rotation of the pump.
17. Submerge the pump in water, start it at its slowest speed and make sure the pump shaft is turning counterclockwise (when viewed from the top). If the rotation is incorrect, switching any two power leads (with POWER OFF) will correct the problem.
18. Reconnect the tubing or pipe.



Figure 4-7: Shaft Orientation

Motor Inspection

If the pump is operating at a decreased capacity and the impeller assembly components (impellers, guide, vanes, etc.) do not appear to be the cause, the motor should be checked. A checklist of things to examine includes:

- Check the fluid level inside the motor. Replace and refill as necessary. See the section on “Decontamination” earlier in this section.
- Inspect the outside of the motor for cracks, dents, etc.
- Remove the Inlet Screen, Pump Housing, and the impeller assembly (see Figure 4-3).
 - Try to spin the motor shaft by hand.
 - It should spin freely.
 - If it does not, the motor must be replaced.

Motor Winding Test

This test checks for a short or open circuit in the pump and/or the motor leads. Place the pump in water. Using an Ohmmeter, measure resistance between any two power leads (see test below). The measurement should be 3 to 7 ohms depending on system length. The readings should be the same between any set of power leads. If the readings are zero, there is a short circuit in the pump or there is a set of nicked power lead wires. If the readings are greater, there is a cut motor lead.

Details of this test are as follows:

- A. Turn off the power and unplug the *DEDICATOR*® from the VFD.
- B. Using an Ohmmeter, set the scale to R X 1. Zero-adjust the meter and measure the resistance between any two power conducting leads (prongs on the motor lead plug). Compare the obtained reading to the value in the following table:

Lead Length	Ohm Value	Lead Length	
0 Feet	3.0 - 3.5	150 ft.	4.8 - 5.3
50 ft.	3.6 - 4.1	175 ft.	5.1 - 5.6
75 ft.	3.9 - 4.4	200 ft.	5.4 - 5.9
100 ft.	4.2 - 4.7	250 ft.	6.0 - 6.5
125 ft.	4.5 - 5.0	300 ft.	6.6 - 7.1

- C. If the Ohm value is too low, the motor may be shorted. If too high, the motor windings or the leads may be open.

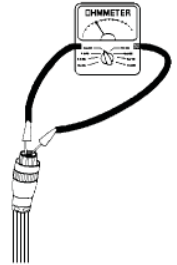


Figure 4-8:
Ohmmeter
Example

Insulation Resistance Test

This test checks for a short to ground in the pump and/or the motor leads. Place the pump in water. Using an Ohmmeter, measure the resistance between the ground lead and each power lead (see Figure 4-9). The resistance to each power lead should be greater than 2 meg ohms. If the resistance is less than 2 meg ohms, the pump is defective or there is a nicked/cut motor lead.

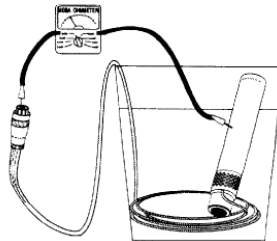


Figure 4-9: Using an Ohmmeter

Checking the Impellers for Wear

If pump performance decreases, the impellers may need to be replaced or cleaned. The Redi-Flo 2® can be dismantled and reassembled quickly and easily (see Figure 4-3).

Dismantling

Periodically, it will be necessary to check the pump for impeller wear.

1. Disconnect all power to the pump.
2. Remove the discharge hose.
3. Remove the Intake Screen Screw.
4. Carefully pull the screen up. Take care not to nick any motor leads.
5. Unscrew the pump housing.
6. The impeller components can now be inspected.

There is no recommended preventative maintenance for pump components. Reduced pump performance may be indicative of wear, especially if pumping suspended solids. Disassemble the pump end impeller assembly (see Figure 3-1) and examine for wear according to the following:

- Impellers --- should show no visible wear
- Guide vane --- should show no visible wear
- Wear ring --- minimum thickness should never be less than 1.0mm

Replace any worn components using either a pump-end replacement kit or a PTFE pump-end replacement kit (see *Section 7: Parts and Accessories*).

Checking the Extension Cable

To test the extension cable, use an Ohmmeter and check for continuity between connectors for each wire. To do this, select any one wire in the connector at one end of the cable and connect it to the Ohmmeter. Connect the other end of the Ohmmeter to the same wire at the other end of the cable. Do this for all four wires. The Ohmmeter will show if there is a short in any of the wires (see Figure 4-10).

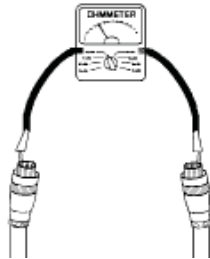


Figure 4-10: Checking the Extension Cable

Re-assembly (refer to Figure 4-3)

1. Make sure the system is not connected to the VFD.
2. Return the impeller assembly to the shaft in the proper order.
3. Screw the Pump Housing back onto the top of the pump.
 - If all the impellers and chambers were re-placed correctly, the Pump Housing should screw on easily.
4. Hand tighten.
5. Slip the Inlet Screen back over the Pump Housing.
6. Screw the Set Screw back into the Inlet Screen.

Section 5: System Troubleshooting

Fault Code Messages

Fault Code	Description	Corrective Action
STOP	Drive is READY and in a stopped condition. The motor is not energized. No enable signal is present to start the drive	
F0001	Instantaneous Over current on the drive output. Excess load or shock load on the motor.	Fault occurs immediately on drive enable or run command: Check the output wiring connections to the motor and the motor for short circuits phase to phase and phase to earth. Fault occurs during motor starting: Check the motor is free to rotate and there are no mechanical blockages. If the motor has a brake fitted, check the brake is releasing correctly. Check for the correct star-delta motor wiring. Fault occurs when motor operating at constant speed: Investigate overload or malfunction.
F0002	Over voltage on DC bus	Check the supply voltage is within the allowed tolerance for the drive.
F0003	Heatsink over temperature	The drive is too hot. Check the ambient temperature around the drive is within the drive specification. Ensure sufficient cooling air is free to circulate around the drive. Increase the panel ventilation if required. Ensure sufficient cooling air can enter the drive, and that the bottom entry and top exit vents are not blocked or obstructed.
F0004	Hardware Over Current	Check the wiring to motor and the motor for phase to phase and phase to earth short circuits. Disconnect the motor and motor cable and retest. If the drive trips with no motor connected, it must be replaced and the system fully checked and retested before a replacement unit is installed.
F0006	Under voltage on DC bus	The incoming supply voltage is too low. This trip occurs routinely when power is removed from the drive. If it occurs during running, check the incoming power supply voltage and all components in the power feed line to the drive.
F0009	Motor thermal overload protection trip. The drive has tripped after delivering >100% of value in 9906 for a period of time to prevent damage to the motor.	Check for correct Star or Delta wiring configuration. Check to see when the decimal points are flashing (which indicates the output current > parameter 9906 value) and decrease motor load. Check the total motor cable length is within the drive specification. Check the load mechanically to ensure it is free, and that no jams, blockages or other mechanical faults exist
F0018	Faulty thermistor on heatsink.	Refer to your local Geotech representative
F0021	Internal drive Fault	Refer to your local Geotech representative
FAULTY	Internal drive Fault	Refer to your local Geotech representative
SPI N-F	Spin start failed	Spin start function failed to detect the motor speed.
U-T	Under temperature	Trip occurs when ambient temperature is less than -10°C. The temperature must be raised over -10°C in order to start the drive.

Section 6: System Specifications

VFD Specifications

Electrical

Input (115V model)	115V(+/-10%)/1PH/48-62Hz/23A
Input (230V model)	230V(+/-10%)/1PH/48-62Hz/23A
Output	1.1kW/400Hz/220V/3PH/5.5A
Acceleration Time (preset)	0 to 400Hz, 5 seconds
Deceleration Time (preset)	0 to 400Hz, 5 seconds
Recommended Input Protection (115V)	Fuse, 600V, 35A, Fast Acting, UL Class CC or J
Recommended Input Protection (230V)	Fuse, 600V, 25A, Fast Acting, UL Class CC or J
Power Cord	18AWG, 300V, 6ft
Minimum/Maximum Frequency	1Hz/400Hz

Dimensions and Weight

Dimensions (L x W x D)

Protective Case	19.2" x 15.2" x 9.0" (49 x 39 x 23cm)
VFD Only	10.12" x 7.40" x 7.34" (26 x 19 x 19cm)

Weight

VFD, Cords and Case	19.2lbs (8.7kg)
VFD Only	9.26lbs (4.2kg)

Operations Conditions

Ambient Temperature	-10 - 40degC (14 - 104degF)
---------------------	-----------------------------

Storage Conditions

Ambient Temperature	-40 - 60degC (-40 - 140degF)
Maximum Humidity	95%, non-condensing

Protective Case Construction

Case	Lightweight, Strong HPX® Resin
------	--------------------------------

Options

Models:	120V Input 230V Input
---------	--------------------------

Submersible pump Grundfos MP 1/Redi-Flo 2® Specifications

Electric

Full Load Rating	.5 HP/220V/3PH/400 Hz/5.5A
Maximum Current	5.5 amps
Motor Protection	Thermal Overload Thermik Geratebau, Series Sy6 (176°F/80°C)
Current Overload	Incorporated into Redi-Flo VFD (9.0A for 10 seconds)

Piping Connection

Discharge Port	1/2" Female NPT
----------------	-----------------

Operating Conditions

Minimum Ambient Fluid Temp.	34°F (1°C)
Maximum Ambient Fluid Temp.	80°F (28°C)

Motor Fluid

Motor Lubricating Fluid	Deionized (DI) Water
-------------------------	----------------------

Dimensions & Weight (Pump & Motor)

Dimensions	11.3" L X 1.81" D (28.7 cm L X 4.6 cm D)
Weight	5.5 lbs (2.5 kg), excluding motor lead

Lead Lengths

Standard Lengths in Feet	30, 50, 75, 100, 125, 150, 175, 200, 250, 250, 300 (9,15, 23, 30, 38, 46, 53, 61, 76, 91 meters)
--------------------------	---

Custom Lengths	Available in 1' (0.3m) increments from 30' – 300' (9 m – 91 m)
----------------	---

Optional Cooling Shroud

Dimensions	9.9" L X 2.375" OD (25 cm L X 6 cm OD)
------------	--

2" and 4" Deducator® Specifications

2" OD Deducator® outside diameter:	3.90" (9.9cm)
4" OD Deducator® outside diameter:	5.96" (15.1cm)
2" ID Deducator® outside diameter:	2.38" (6cm)
4" ID Deducator® outside diameter:	4.50" (11.4cm)
Minimum height clearance required:	3.41" (8.7cm)

Happy Hose!® Cable Specifications

PVC Happy Hose!®

Happy Hose!® I.D.:	1/2" (1.3cm)
Happy Hose!® O.D.:	3/4" (1.9cm)
Hose Materials:	PVC clear, nylon reinforced

Cable Materials: Yellow, PVC jacketed
Cable O.D. 0.46" (1.16cm)

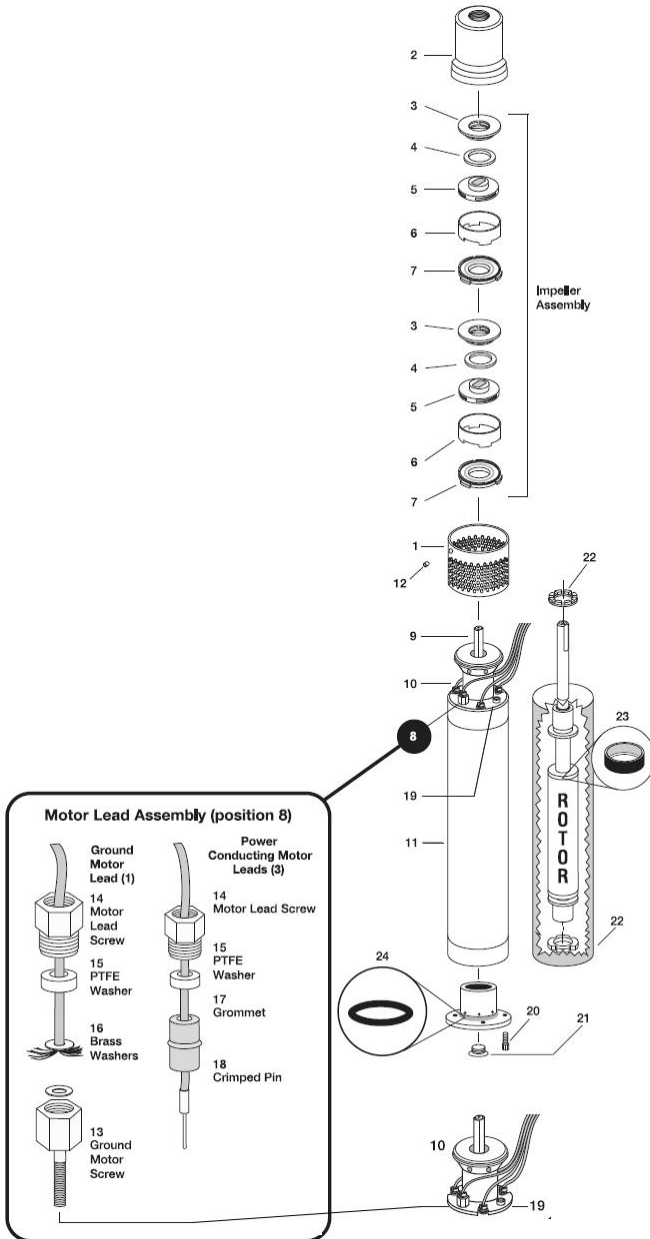
PTFE-lined Polyethylene Happy Hose!®

Happy Hose!® I.D.: 1/2" (1.3cm)
Happy Hose!® O.D.: 5/8" (1.6cm)
Hose Materials: Polyethylene, PTFE-lined
Cable Materials: Yellow, Polyethylene jacketed
Cable O.D.: 0.46" (1.16cm)

All Happy Hose!® Cable Specifications

Cable Construction: includes: 4 each 16 EWG PVC jacketed, color-coated conductors, and 1 each of 0.094" (0.24cm) max dia., 7 x 7 stainless steel wire rope - PVC or PE jacketed to 0.125" (.32cm) dia.
Breaking Strength: 480 lbs. (218kg)
Weight: 0.22 lbs per foot (0.33 kg per meter)

Section 7: Parts and Accessories



Parts Number	Part Description
--------------	------------------

Redi-Flo 2® 2 Pump – Includes Pump, Lead, Male Elbow Harting Connector

11200001	PUMP,RF2,NO LEAD
11200417	PUMP,REDI-FLO 2,25 FT LEAD
11200130	PUMP,REDI-FLO 2,30 FT LEAD
11200002	PUMP,REDI-FLO 2,50 FT LEAD
11200003	PUMP,REDI-FLO 2,75 FT LEAD
11200004	PUMP,REDI-FLO 2,100 FT LEAD
11200005	PUMP,REDI-FLO 2,125 FT LEAD
11200006	PUMP,REDI-FLO 2,150 FT LEAD
11200007	PUMP,REDI-FLO2,175 FT LEAD
11200008	PUMP,REDI-FLO2,200 FT LEAD
11200009	PUMP,REDI-FLO2,250FT LEAD
11200010	PUMP,REDI-FLO2,300 FT LEAD

Service Kits and Spare Parts

Diagram #	Part #	Description
3 - 7	11200012	KIT,PUMP END SERVICE,RF2
4, 7	11200013	KIT,SERVICE,PTFE,PUMPEND,RF2
1	11200028	SCREEN,INLET,RF2
2	11200029	HOUSING,PUMP END, 1/2 NPT, RF2
12	11200016	KIT,SET SCREWS,RF2
10	11200030	SUCTION INTERCONNECTOR,RF2
22	11201055	KIT,MOTOR THRUST WASHER,RF2
13 - 18	11200014	KIT,TERMINATION,MOTOR LEAD,RF2
15, 17, 18	11200017	KIT,MOTOR LEAD SCREW,RF2
18	11200981	KIT,RF2,PIN,WASHER,GROMMET
15	11200018	KIT,PTFE MOTOR WASHER,RF2
16	11200019	KIT,BRASS MOTOR WASHER,RF2
17	11200020	KIT,MOTOR GROMMET,VITON,RF2
18	11200073	PIN,MOTOR,CRIMP,EACH,RF2
19	11200022	KIT,MOTOR SCREW (LONG),RF2
20	11200023	KIT,MOTOR SCREW (SHORT),RF2
21	11200024	KIT,MOTOR SCREW & O-RING,RF2
23	11200026	KIT,LIP SEAL,RF2,EACH
24	11200027	KIT,O-RING,BEARING HOUSING,RF2
9*	NA	SHAFT, ROTOR
11*	NA	STATOR HOUSING
Not Shown	22050255	GUIDE,TAPE,DELTRIN
Not Shown	52050284	PUMP,HOLDER,GEOSUB / RF2
Not Shown	81200001	VALVE,CHECK,SS6,2",GF
Not Shown	17500026	BALL,PTFE,5/8"
Not Shown	11200360	SCREW,SS4,1/4-20x1/4",NYLOK

**Parts are not available for replacement.*

Happy Cable

81410008	HAPPY CABLE,PE,PER FOOT,16AWG
81410009	HAPPY CABLE,PVC,PER FOOT,16AWG
81410004	HAPPY HOSE,PE,1/2X5/8
81410067	HAPPY HOSE,PVC,1/2X3/4
81410006	HAPPY HOSE,TLPE,1/2X5/8"

Variable Frequency Drive

81200053	VFD,RF2,120V,GEOTECH WITH CASE
51200191	VFD,RF2,120V,GEOTECH NO CASE
81200055	VFD,RF2,230V,GEOTECH WITH CASE
51200193	VFD,RF2,230V,GEOTECH NO CASE

Accessories

(Maximum Motor Lead Length is 300')

87200001	CORD,EXT,MHRTG(S)XMHRTG(ELBOW) 15FT STANDARD
81201003	ASSY,BRACKET,SAFETY CABLE WITH LOOP, RF2
21400010	CABLE GUARD,UNIVERSAL FOR 2" OR 4" WELLS
81200001	VALVE,CHECK,SS6,2",GF
81200005	SHROUD,COOLING,SS,2"GF,W/SCREW AND ALLEN WRENCH FOR 4+" WELLS
11200142	CABLE,MOTORLEAD,TEFZEL,GEOTECH FLAT, 16-4, W/1/16" SAFETY CBL
17500065	CABLE,16-4,TEFZEL,FLAT CABLE
11201356	KNOB,CONTROL SWITCH,VFD GEOTECH

Service Tools

11200032	SYRINGE,MOTOR FILLING,RF2
11200033	TOOL,MOTOR PIN CRIMPING,RF 2

REVISION HISTORY		
PROJECT #	DESCRIPTION	DATE
1748	Combined VFD, RF2, Dedicator®, RF2 well seal into the VFD user manual – StellaR	8/1/2019
1867	Added PN 11201356 – StellaR	11/6/2019
1957	Changed syringe in-text to indicate optional service item, updated parts list. – StellaR	4/6/2020
1957	Updated grounding warning – StellaR	4/13/2020

NOTES

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 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.

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