# Redmond 200R Series Pump

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# 1.0 -- INTRODUCTION

## *Preface*

This manual provides operating and maintenance instructions, parts lists, and drawings for the Redmond Environmental Model 200R grinder pump. The Information contained in this manual will aid the end user in the operation and maintenance required to keep the equipment in good operating condition.

Information, illustrations and specifications contained in this manual are based on the latest product information available at the time of manual generation. Redmond Environmental reserves the right to alter and substitute specifications at any time.

This equipment is intended for use only as described in this document. Redmond Environmental cannot be responsible for the improper functioning of non-described use of the equipment. Liability for any personal injury or property damage occasioned by the use of this manual in effect maintenance, operation, or repair of the equipment is in no way assumed by Redmond Environmental. Anyone using a procedure not recommended by the manufacturer should first completely satisfy himself or herself that personal safety and equipment integrity will not be jeopardized in the method selected.
No patent liability is assumed with respect to the use of information contained herein. While every precaution has been taken in the preparation of this manual, Redmond Environmental assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

## *1.0.1 Safety Warnings*

This equipment must NOT be used for purposes other than those for which it has been supplied. Failure to use the pump for the purposes as described in this manual nullifies any warranty claim or injury claim that could arise as a result.
Be sure that anyone using or working with this equipment read this manual before attempting to operate or perform maintenance or service to the machine. Failure to follow these instructions could possibly result in serious personal injury and/or cause damage to the system or components of the equipment. Recognize safety symbols, words, and labels. Warning and important safety instructions appearing in this manual are not meant to cover all possible conditions and situations that may occur. Common sense, caution, and care must be exercised when installing, maintaining or operating this equipment.


**CAUTION** – Hazards or unsafe practices, which COULD result in minor personal injury


**WARNING** – Hazards or unsafe practices, which COULD result in personal injury and/or equipment damage.

### *1.0.2 Pump Overview and operation*

The grinder pump is a semi positive displacement, progressing cavity pump designed to grind and pump fluid. The Redmond 200R Series is a complete unit, including grinder pump, check valve, tank and all necessary controls packaged into a single unit, ready to connect. All solids are ground into fine particles to pass easily through the pump, check valve and small diameter pipe lines. Even objects that should not be in sewage (plastic, rubber, fiber, wood, etc.) are ground easily. The 1 1/4" inch discharge connection can be adapted to any piping materials which meets local code requirements. A tough, corrosion resistant tank of high-density polyethylene, sized on the basis of computer studies of water usage patterns, provides optimum holding capacity. An internal check valve assembly in the Grinder Pump is custom designed for non-clog, trouble-free operation. The Grinder Pump is automatically activated and, because it runs infrequently and for very short periods, its annual electric energy consumption is typically that of a 40-watt light bulb. Units are available for indoor and outdoor installations. Outdoor units accommodate a wide range of depths.

### *1.0.3 Environmental Considerations*

The presence of petroleum-based products such as paint thinner, photo developing chemicals (metallic silver, acetic acid or citric acid, ammonium thiosulfates), transmission fluid, brake fluid, gas or oil are harmful to the pump stator made of EPDM material. This will absorb petroleum products and must be eliminated from the waste stream. Contact Redmond Environmental for information regarding an oil-resistant stator.

# 2.0 -- Troubleshooting: 200R/AMGP

## *2.0.1 Alarm ON – Pump Running but not Pumping*

| Possible Causes | Troubleshooting Steps |
|---|---|
| Blocked discharge line, worn stator or leak in pump discharge assembly | Check the amperage. If the amperage is high (8 amps or higher), turn off the pump and check the discharge line for blockage. Confirm that the pump has not been damaged by disconnecting the discharge piping and recycling the fluid in the tank. Turn the pump power on and check the amperage. If the amperage remains high, replace the pump and return the failed pump for repair. If amperage returns to normal, clear the blockage in the discharge line and re-check the amperage.<br><br>If the amperage is low (3.0 amps or less), the pump must be pulled and the stator (and possibly the rotor) replaced or the leaking discharge line repaired. The cause of the failure must be determined and corrected, or it will fail prematurely again. See Chapter 4 on how to identify and correct. |

## *2.0.2 Alarm ON – Pump not Operating*

| Possible Causes | Troubleshooting Steps |
|---|---|
| Incorrect Voltage | Check the voltage at a location nearest to the pump (junction box or electrical quick disconnect EQD plug). The correct voltage is listed on the pump nameplate. |
| Plugged Breather | Check the breather. Ensure it is not plugged or crimped closed. If the breather is plugged, replace the Gore-Tex patch. 3.0.10 describes the process for replacing. |
| Wet or corroded controls | Inspect the electrical controls. Replace any wet or corroded controls. See 3.0.10. |
| Low Fluid Level | Check the tank for sufficient fluid to operate the pump. Insufficient fluid may indicate a problem with the alarm wiring, the alarm sensing line or the alarm switch. 3.0.10 describes for checking alarm wiring. |
| Inoperative Control | Test the controls as described in 3.0.11 |

## *2.0.3 Alarm Activates Frequently*

| Possible Causes | Troubleshooting Steps |
|---|---|
| Sensing Line Leak | Pull the pump out of the tank. Inspect the sensing bells for tightness, cracks and debris; use sensing bell test to check for leaks. If removing or replacing the sensing bell, it must be cleaned and sealed with 3/4-inch Teflon tape. |
| Tube connector/EPDM Tubing Leak | Remove the Top Housing and PVC Tube (3.0.4). Check the tube connector for leaks, clean and seal with Teflon tape. Ensure EPDM Tubing does not have a tear or rip in it. Replace as needed. |
| Faulty Alarm Switch | See 3.0.5 |
| Plugged Vent or Breather | Check the vent and the breather. A plugged or partially plugged vent or breather will cause the alarm to activate frequently. |
| Line Blockage or Worn Stator | Check the amperage. If the amperage is high, look for a line blockage. If the amperage is low, inspect the stator for excessive wear. |
| High Flow | The incoming flow is greater than the pump can handle. Infiltration, a hot tub, sump pump or any other device that could cause excessive water flow. |
| Underground Wire Damage | Check the underground wire for shorts, breaks or cuts. Check for shorts between each pair of leads. |

## *2.0.4 Noisy Pump*

| Possible Causes | Troubleshooting Steps |
|---|---|
| Normal Operation | The pump may be grinding up material. Wait a few minutes. If it doesn't quite down, remove the core and clean the basin. |
| Low Voltage | Check the voltage level make sure it matches what is recommended on the control box. |
| Damaged Stator | Check the stator for holes and tears. |
| Worn Motor Bearing | Remove the stator and hand rotate the shaft. If the shaft turns roughly and makes an audible noise the bearing will have to be replaced. |
| Blocked Discharge | Check the amperage. If it is high (8 amps or higher), turn off the pump and check the discharge line for blockage. Confirm that the pump has not been damaged by disconnecting the discharge piping and recycling the fluid in the tank. Turn the pump on check for amperage. If it remains high, it could possibly be motor related. |

## 3.0 -- ELECTRICAL CONTROLS

The electrical controls consist of two parts. The main pump controls reside in the electrical enclosure and the pump core electrical components which are housed in the pump core itself.

**WARNING** – Hazards or unsafe practices, which COULD result in personal injury and/or equipment damage.

**CAUTION**

The grinder pump has two sources of electrical power: 240V (or 120V) power for the pump and 120V for the alarm signal. Before servicing, always use a voltmeter to check voltage and verify power is OFF.

### *3.0.1 Electrical Enclosure*

The pump control enclosure houses the components needed to provide power to the pump control devices and interface signals for alarm indications. This should be mounted in a convenient location which allows easy access and pump monitoring and control. Specific details are covered in chapter 4 of this manual.

**Figure 1 - Electrical Enclosure**

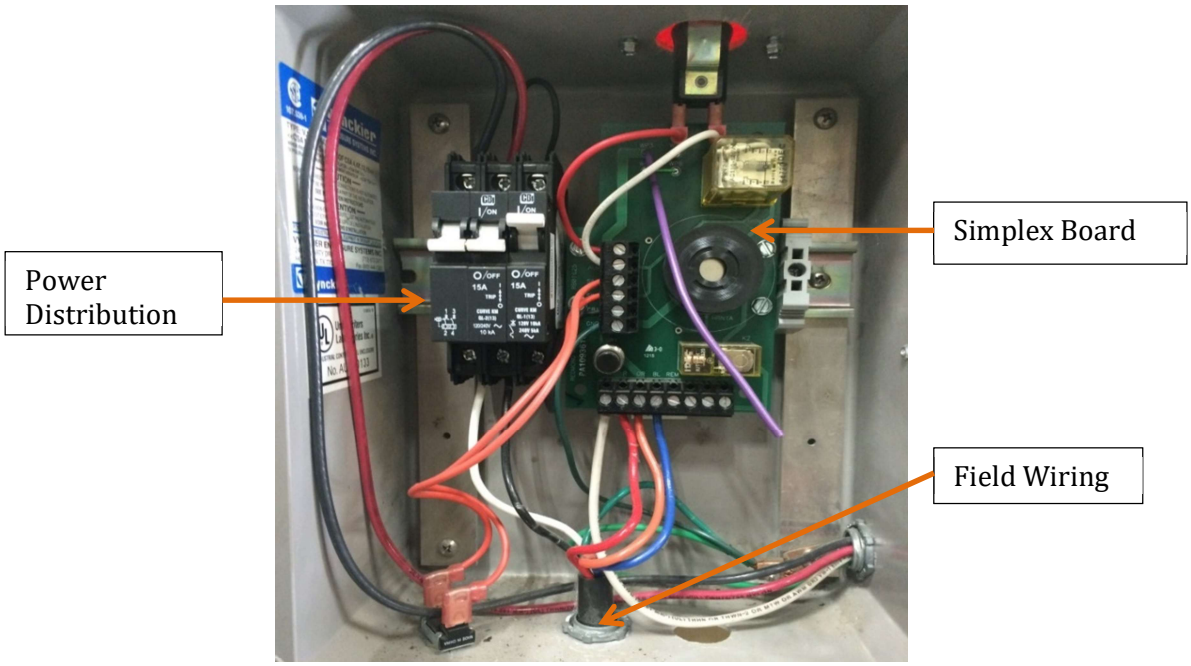



**Figure 2 - Electrical Enclosure Internal Components**

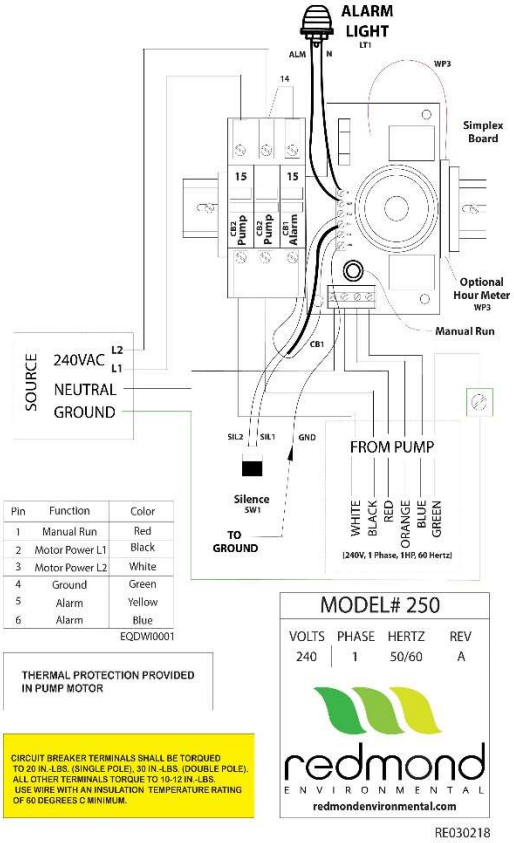



**Figure 3 - Electrical Enclosure Schematic**

## *3.0.2 Pump Core Electrical Components*

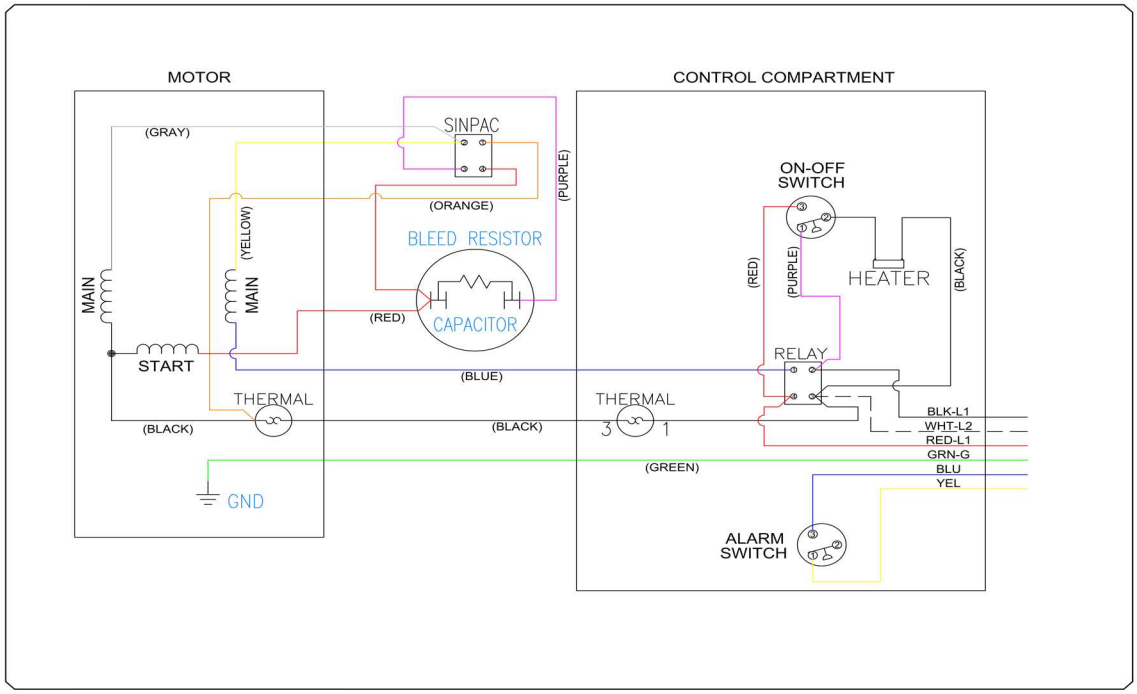



**Figure 4 - Pump Core Electrical Schematic**

The bleed resistor, capacitor and Sinpac switch are mounted directly on the motor housing.

**Figure 5 - Motor Control Components**

*Pump Core Controls Continued*

The two pressure switches and solid-state relay are located on the underside of the top housing.

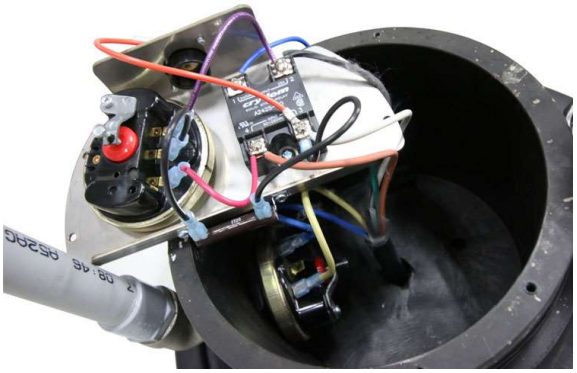


**Figure 6 – On/Off Pressure Switch Assembly, Solid State Relay and Thermal Protector**

**Figure 7 - Pressure Switch Assembly Mounted to Top Housing**

## 3.0.3 Accessing and Sealing the 200R Control Compartment

Controls in the top housing include an on/off and alarm pressure switch, solid state relay, thermal protector and heating resistor. Mounted on top of the motor (#5013) is the capacitor and the Sinpac Switch.

**Accessing**

1. Unscrew the 1 ½ inch compression nut at the top of the anti-siphon check valve assembly. Pull the upper discharge pipe out of the check valve. Assembly can be reused. See also 5.0.1

**Figure 8 – Discharge Assembly**

2. Remove the tie rods. Use a wrench (1/2 inch) to loosen #9001A band clamps attached to the PVC. Lightly tap around the top housing with a rubber mallet until loose.
3. Pull the EPDM tubing from the on/off switch and disconnect the molex.
4. Remove the (4) 8-32 x 3/8 Machine screws from the top housing exposing the controls.
5. Inspect all the controls (top housing and motor). If they have been wet or are corroded replace them. Wet or corroded controls may test properly but will fail prematurely.
6. Connect the wires as indicated (see Figure 4 above) and screw the top housing bracket mount into place.

**Sealing**

1. Replace existing O-Rings on the Top Housing (#6039) and set sideways on the PVC. Re-attach the EPM tubing to the on/off switch and connect the molex (ensuring colors line up).
2. Line up the top housing using the discharge tube as a guide and lubricate the O-rings (P-80 Emulsion is recommended). Push housing into place ensuring the O-rings seal tight.
3. Replace discharge O-Rings (#6049) and tighten back into place.
4. Torque nuts evenly (140-inch pounds) on the band clamps (1/2 " down on top clamp, 3/8" on bottom) and insert the tie rods into the top housing (do not overtighten).

5. Pressure test the control cavity. See 6.0.1 Leak Testing

## ***3.0.4 Pressure Switch Operation***

The pressure switches are mounted under the top housing, one mounted on the bracket and the other to the top housing casing. The on/off switch is mounted to the bracket, while the alarm switch is pushed into the 90-degree elbow on the housing itself (see figure 6 & 7). (note: a 1 ¼" piece of EPM tubing must be placed over the stem of the alarm switch using P-80 Emulsion Lubricant.)

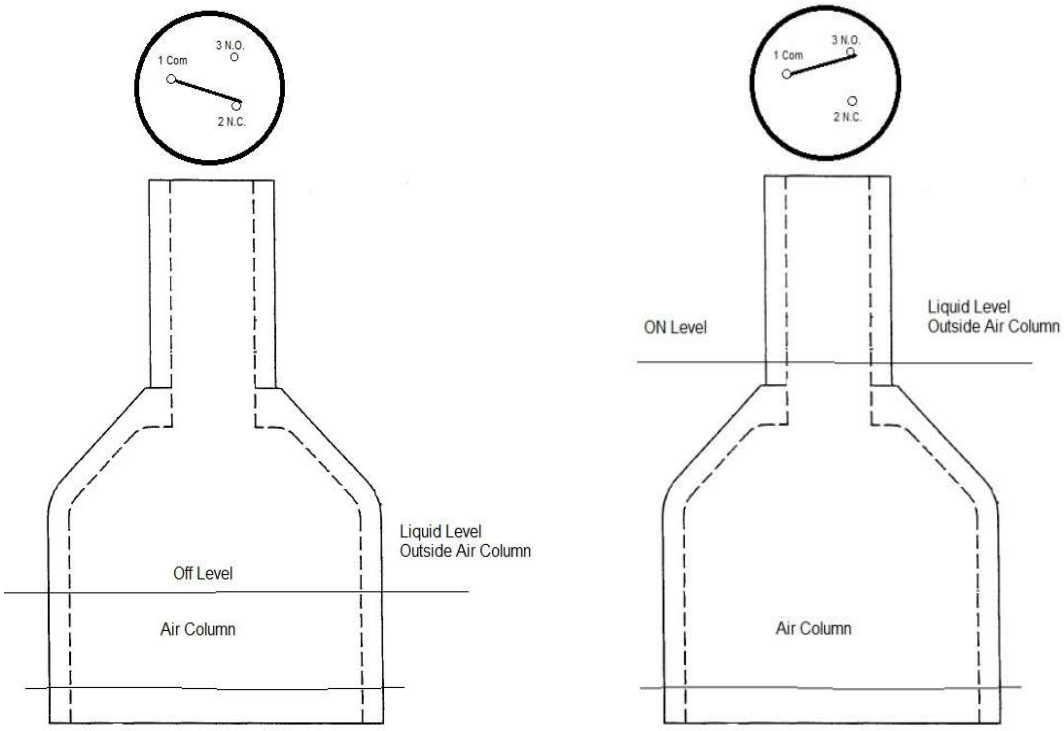
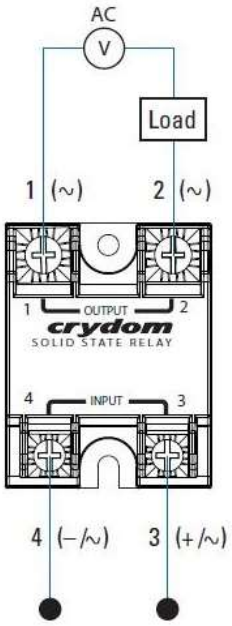



**Figure 9 - Pressure Switch On and Off Diagram**

As the water level increases outside of the air column, air pressure will build up in the column. The pressure pushes on the switch diaphragm in the pressure switch. When it reaches the trip point the switch will change states activating the contact switch. There are two sets of contacts on the switch, one for normally open and one for normally closed operation. To replace the pressure switches, remove the top housing to expose the switch mount bracket assembly. Don't remove or tighten the pressure switches by the switch body. This could damage the seal and stem of the switch housing.

## *3.0.5 Solid-State Relay*

The solid-state relay (#7092) is mounted inside of the top housing. When the on/off pressure switch energizes the coil the contact closes and operates the pump. Terminals 3 and 4 are the coil side of the relay and terminals 1 and 2 are the load (motor) side.




**Recommended Wire Sizes**

| Terminals | Wire Size (Solid / Stranded) | Wire Pull-Out Strength (lb)[N] |
|---|---|---|
| Input | 24 AWG (0.2 $mm^2$) / 0.2 [minimum] | 10 [44.5] |
| | 2 x 12 AWG (3.3 $mm^2$) / 3.3 [maximum] | 90 [400] |
| Output | 20 AWG (0.5 $mm^2$) / 0.518 [minimum] | 30 [133] |
| | 2 x 10 AWG (5.3 $mm^2$) / 5.3 | 110 [490] |
| | 2 x 8 AWG (8.4 $mm^2$) / 8.4 [maximum] | 90 [400] |

**Figure 10 - Power Relay**

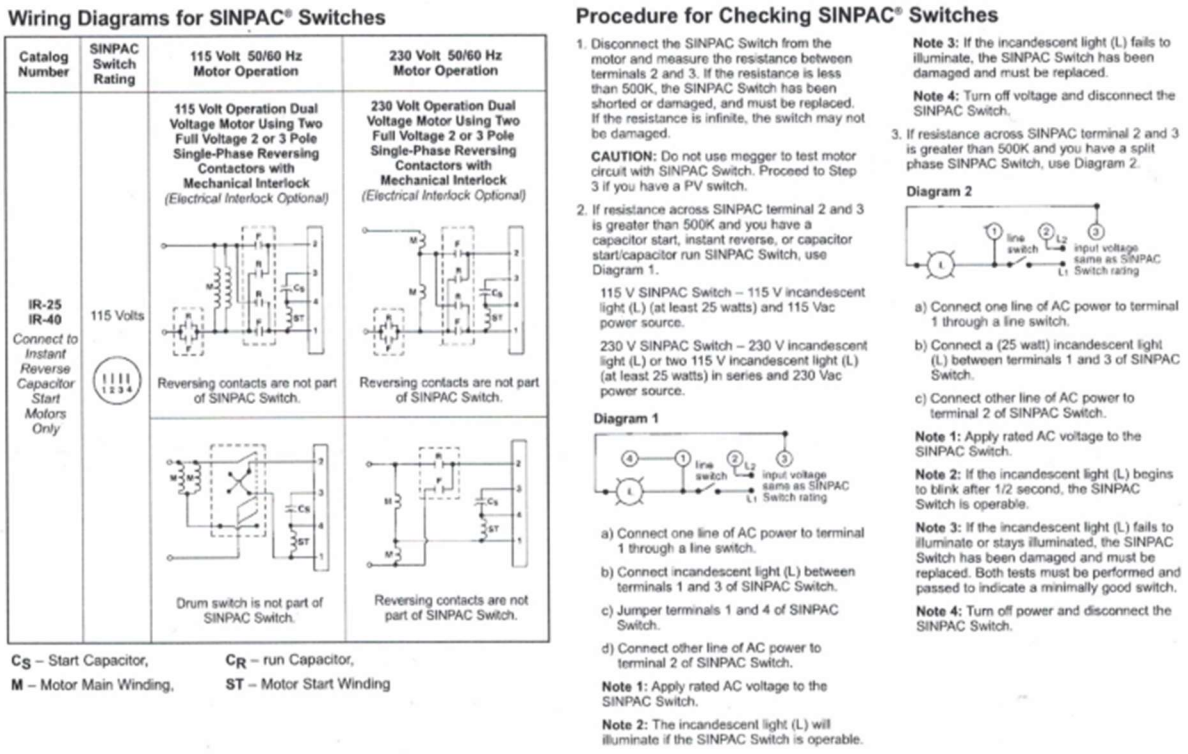
### *Testing Relay Operation*

With power off, connect a power source to terminals 3 and 4. Either voltage may be used. The relay coil is rated from 90 to 280 volts.
Connect a voltage meter (set to read resistance) on terminals 1 and 2 of the load side of the relay.
With power off to terminals 3 and 4, the contact should read an infinite resistance. (Typically, “OL” on a Fluke)
With power applied to terminals 3 and 4, the resistance reading should be 0 ohms. (No resistance).
If the contact on the load side does not operate as described, replace the relay.

## *3.0.6 Motor Start Switch*

The motor start switch (#5031-S) is mounted to bracket that is attached to the motor. By comparing the start winding RPM-sensitive voltage with the main AC input voltage (which serves as the reference voltage), the switch determines when the start circuit should be energized. The electronic switch interrupts the start circuit current after the motor has accelerated to the cut-out speed and reconnects the start circuit whenever the motor speed has fallen to cut speed (usually about 50% of synchronous motor speed).

### *To Test the Switch*



**Wiring Diagrams for SINPAC® Switches**

| Catalog Number | SINPAC Switch Rating | 115 Volt 50/60 Hz Motor Operation | 230 Volt 50/60 Hz Motor Operation |
|---|---|---|---|
| IR-25 IR-40 *Connect to Instant Reverse Capacitor Start Motors Only* | 115 Volts | 115 Volt Operation Dual Voltage Motor Using Two Full Voltage 2 or 3 Pole Single-Phase Reversing Contactors with Mechanical Interlock *(Electrical Interlock Optional)* | 230 Volt Operation Dual Voltage Motor Using Two Full Voltage 2 or 3 Pole Single-Phase Reversing Contactors with Mechanical Interlock *(Electrical Interlock Optional)* |
| | | Reversing contacts are not part of SINPAC Switch. | Reversing contacts are not part of SINPAC Switch. |
| | | Drum switch is not part of SINPAC Switch. | Reversing contacts are not part of SINPAC Switch. |

$C_S$ – Start Capacitor, $C_R$ – run Capacitor,
**M** – Motor Main Winding, **ST** – Motor Start Winding

**Procedure for Checking SINPAC® Switches**

1. Disconnect the SINPAC Switch from the motor and measure the resistance between terminals 2 and 3. If the resistance is less than 500K, the SINPAC Switch has been shorted or damaged, and must be replaced. If the resistance is infinite, the switch may not be damaged.

   **CAUTION:** Do not use megger to test motor circuit with SINPAC Switch. Proceed to Step 3 if you have a PV switch.

2. If resistance across SINPAC terminal 2 and 3 is greater than 500K and you have a capacitor start, instant reverse, or capacitor start/capacitor run SINPAC Switch, use Diagram 1.

   115 V SINPAC Switch – 115 V incandescent light (L) (at least 25 watts) and 115 Vac power source.

   230 V SINPAC Switch – 230 V incandescent light (L) or two 115 V incandescent light (L) (at least 25 watts) in series and 230 Vac power source.

**Diagram 1**




   a) Connect one line of AC power to terminal 1 through a line switch.

   b) Connect incandescent light (L) between terminals 1 and 3 of SINPAC Switch.

   c) Jumper terminals 1 and 4 of SINPAC Switch.

   d) Connect other line of AC power to terminal 2 of SINPAC Switch.

   **Note 1:** Apply rated AC voltage to the SINPAC Switch.

   **Note 2:** The incandescent light (L) will illuminate if the SINPAC Switch is operable.

   **Note 3:** If the incandescent light (L) fails to illuminate, the SINPAC Switch has been damaged and must be replaced.

   **Note 4:** Turn off voltage and disconnect the SINPAC Switch.

3. If resistance across SINPAC terminal 2 and 3 is greater than 500K and you have a split phase SINPAC Switch, use Diagram 2.

**Diagram 2**




   a) Connect one line of AC power to terminal 1 through a line switch.

   b) Connect a (25 watt) incandescent light (L) between terminals 1 and 3 of SINPAC Switch.

   c) Connect other line of AC power to terminal 2 of SINPAC Switch.

   **Note 1:** Apply rated AC voltage to the SINPAC Switch.

   **Note 2:** If the incandescent light (L) begins to blink after 1/2 second, the SINPAC Switch is operable.

   **Note 3:** If the incandescent light (L) fails to illuminate or stays illuminated, the SINPAC Switch has been damaged and must be replaced. Both tests must be performed and passed to indicate a minimally good switch.

   **Note 4:** Turn off power and disconnect the SINPAC Switch.

**Figure 81 – Sinpac Switch**

### ***3.0.7 Motor Capacitor***

The Capacitor (#5029) is fastened to the bracket that is attached to the motor. It has four terminals with a bleeding resistor located in between the two sets that bleeds off any unused stored current. Two terminals are connected to the start switch and run it, the third one is the Red Motor wire. The capacitor gives the motor a voltage boost while starting.

To test the Capacitor:

1. Hold the insulated handle of a screwdriver and short the two terminals to bleed any remaining current.
2. Use a continuity tester to check between the two terminals. It should show a short and slowly bleed off. If it doesn't reverse the leads. If there is still no reading or the reading does not bleed off, replace the capacitor.

### ***3.0.8 Heating Resistor***

The heating resistor (##7093) is mounted to the side of the control bracket inside the top housing. A black wire from the (2) terminal on the on/off switch goes into one side of the resistor. Another black wire runs from the (3) terminal on the solid-state relay to the other side of the resistor. It only operates when the pump is not running. It is turned on and off by the on/off pressure switch. The heater maintains the control compartment temperature at about 80 F and keeps out the condensation.

To test the Heating Resistor:

1. Use an ohm meter to check between the two leads. It should read about 1500 ohm (on 240-volt units); if not, replace.

### ***3.0.9 Thermal Protector***

The thermal protector (#5032) (an auto-reset switch), keeps the motor from running to long above its rated amperage, is mounted to the side of the control bracket inside the top housing. Two wires are permanently attached to the protector, one directly the motor, the other to the (3) terminal on the solid-state relay.

A second thermal is wound into the windings of the motor which protects the motor from overheating. If the motor goes above its preset limits it will cut the power to the pump until it cools down. The motor terminal is not replaceable.

To test the Thermal Protector:

1. Check between the two wires with a continuity tester. The tester should read a short; if not, replace.

## *3.0.10 Supply, Breather Cable and Electrical Quick Disconnect (EQD)*

An installer runs the cable from the power source to an alarm panel (#MOD250). The cable used is a direct burial, six conductor tray cable that does not need conduit once buired below 24 inches. Redmond Enironmental provides provides cable (#7100) at any length per your reqest. The supply cable EQD receptacle attaches to the EQD plug on the breather cable, which attahces to the pump core. If the cable becomes damaged at any point, it must be repaired or replaced.

The Redmond 200R pumps come with a single cable (10 ft) that houses the alarm and pump power sources, breather and EQD plug for the control compartment.

The breather cable is made up of six conductors with a breather tube assembly built in. The cabel runs from the main controls enclosure to the pump core. When installed, the cable runs from the pump to the electrical enclosure. In the tank, the cable quick disconnect receptacle attaches to it. The supply cable receptacle attaches to the plug on the breather cable, which attaches to the pump core. The breather uses a Gore-Tex patch assembly that prevents water from passing throught the controls. It will breath air when not submerged and needs to be hung at the highest access point to prevent it from lying in water.

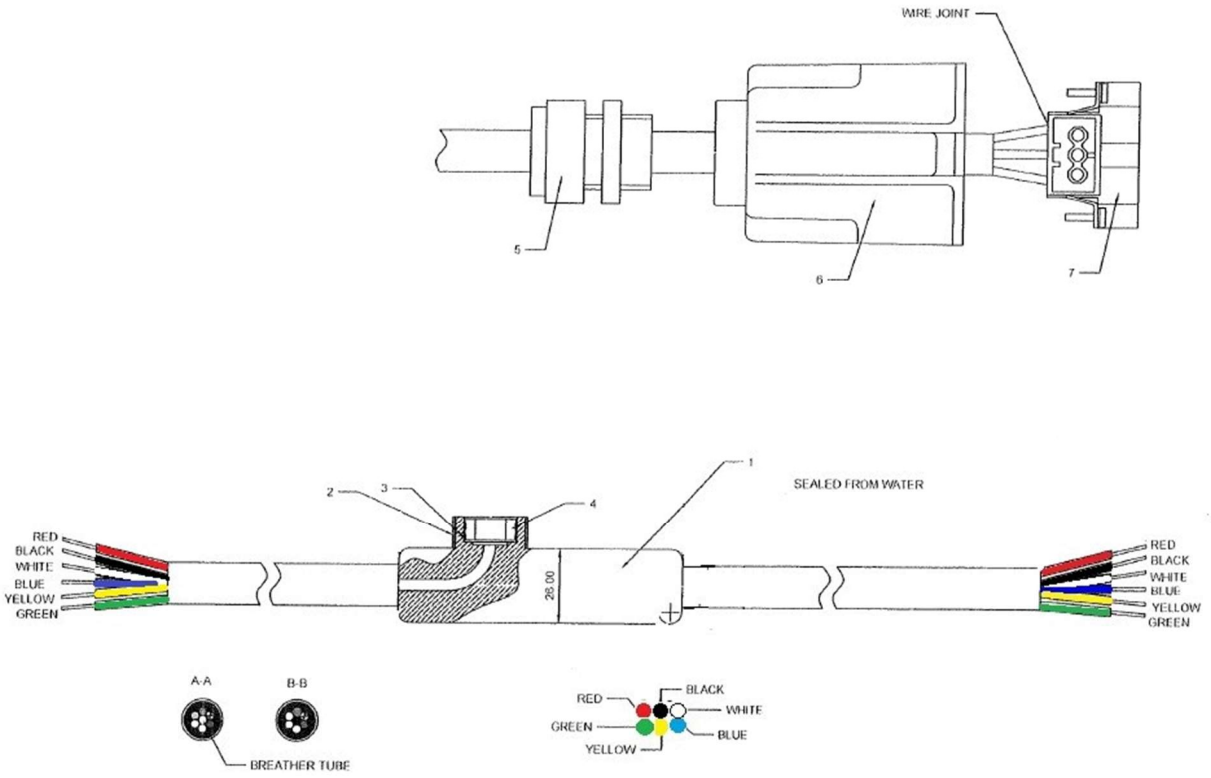



**Figure 12 - Breather Cable Assembly**

| Pin | Function | Color |
|---|---|---|
| 1 | Manual Run | Red |
| 2 | Motor Power L1 | Black |
| 3 | Motor Power L2 | White |
| 4 | Ground | Green |
| 5 | Alarm | Yellow |
| 6 | Alarm | Blue |

| No. | Part No. | Description | Quantity |
|---|---|---|---|
| 1 | 1060 | Cable, 145x3650 | 1 |
| 2 | 3127 | Hose Clamp | 1 |
| 3 | 1061-2 | Baffle | 1 |
| 4 | 1061 | Filter Sheath | 1 |
| 5 | 1060-1 | Fitting | 1 |
| 6 | 2059 | EQD Housing | 1 |
| 7 | 7095 | EQD Insert Male | 1 |

**Figure 13 – EQD Terminal Connections**

*Breather Cable Assembly Continued*

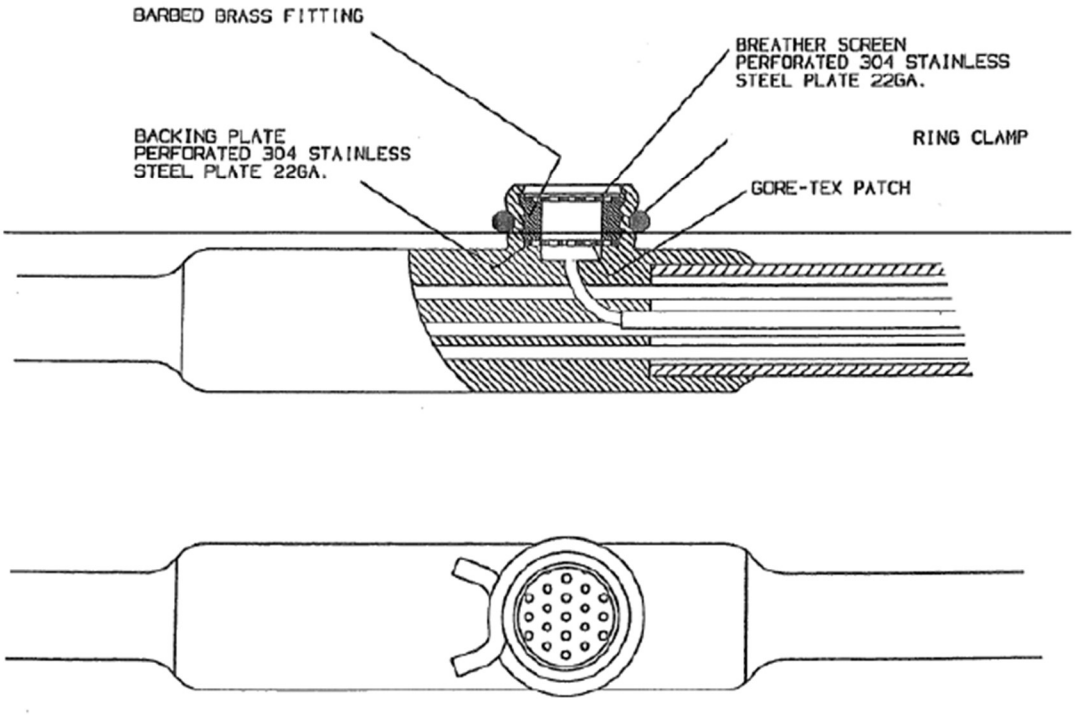



**Figure 14 - Breather Assembly**

Removing the Breather Cable:

1. Remove the top housing
2. Unplug the Molex leads connected to the motor and pull the EPDM tubing from the on/off switch.
3. Remove the (4) (8-32 x 3/8) machine screws from the control bracket attached to the top housing.
4. Remove the ground screw.
5. Unplug the yellow and blue leads that run to the alarm switch, Terminals 1 & 3.
6. Unscrew the leads to the solid-state relay.
7. Loosen the cable connector nut until the cable is able to move inside the connector. Remove the cable connector and the breather cable from the top housing.

Replacing the Gore-Tex Patch in the Breather Cable:

1. Remove the spring clamp.
2. Slip a small flathead screwdriver between the breather ring and the rubber jacket of the breather receiver.
3. Pry out the breather patch assembly carefully and clean out the area.
4. Remove old Gore-Tex patch.
5. Reinstall the stainless-steel screen, sharp side in.
6. Press the new patch onto the open end of the vent until it is firmly seated, place into rubber jacket housing.
7. Install the spring clamp around the rubber breather housing.

Inspecting the EQD Assembly (supply/pump side):

1. Make sure the power is off!
2. Loosen the screws on both sides of the EQD using a 5/16 nut driver and unplug the EQD.
3. Remove the EQD Gasket (this must be replaced) and inspect both halves for water or corrosion damage. If wet, remove the insert and check the cable for continuity. If the cable is bad, replace assembly. If the cable is good, only replace the insert.

Replacing the EQD Inserts:

1. Loosen the four screws at each corner of the insert and the cable connector. Push the cable through the housing.
2. Disconnect the six leads from the insert by loosening the set screws.
3. The stripped length for the outer cable jacket should be no more than 1 ¾ inches. The individual leads must be stripped to ¼ inch.
4. Slip the EQD Housing Hood and the attached cable connector over the cable.
5. Connect the individual wires to the insert as indicated in the above table (Figure 11) and tighten.
6. Push the housing over the insert, tighten the four screws and then the cable connector.
7. Plug the supply and pump housing together (with a new gasket and O-Ring) and snug the screws. Be careful to not overtighten.

# 4.0 -- PUMP CORE

## *4.0.1 Pump Core Overview*

The lower unit assembly with part numbers is shown below.

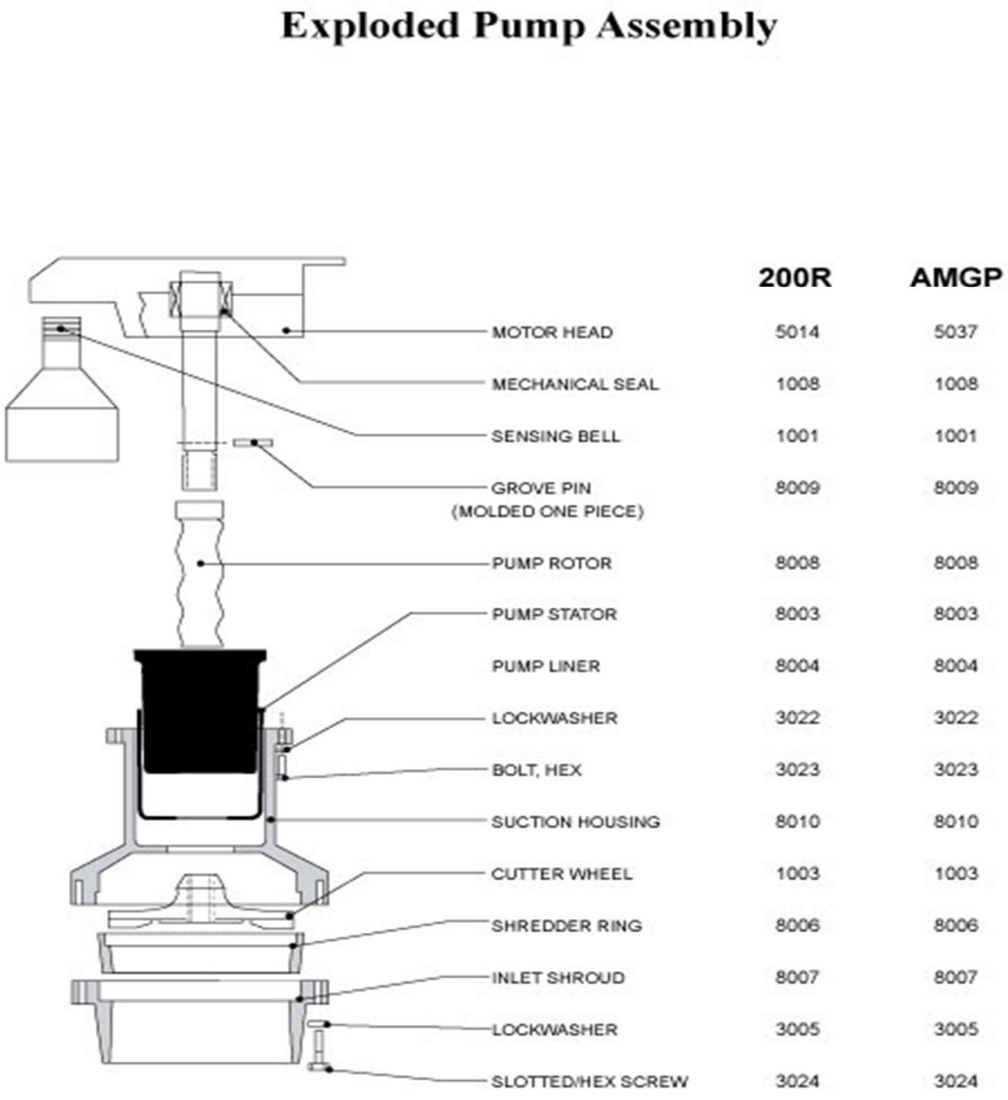



**Figure 15 – Exploded Lower Unit View**

### *4.0.2 Removing the Pump Assembly*

The following procedure is a guide for replacing the pump rotor and stator.

1. Turn off the power feeding the pump controls. Use any applicable lock out tag out procedures.

**Figure 16 - Incoming Power Breakers**

2. Close the discharge pipe valve
3. Disconnect and remove the discharge pipe.
4. Remove the mount bolts fastening the core to the tank.
5. Attached a means of lifting the core from the tank. Either by rope or small service come-along.

### *4.0.3 Removing the Pump Stator*

1. Lay the pump on a suitable work surface while supporting the pump assembly so it is secure.
2. Remove the inlet shroud screws (4ea).

**Figure 17 – Inlet Shroud Removal**

3. Remove the shredder ring. Using a vice grip pliers, grip the shredder ring and hit the head of the vice grip to loosen and remove the shredder ring. Inspect the shredder ring to insure it is not cracked, broken or worn. Replace if any damage or wear is evident.

**Figure 18 - Shredder Ring Removal**

4. The stainless-steel cutter wheel is removed by placing the rubber face of a mallet on the cutter bars and hitting the mallet with another hammer. Use repeated attempts until the cutter wheel spins free. (Right hand threads) If the cutter wheel is too tight to loosen, a penetrating oil can be sprayed on the threads and allowed to soak in. Replace the cutter wheel if it is worn or out of round. If more than 1/32“are rounded off the edge of the cutter bars, replace the cutter wheel.

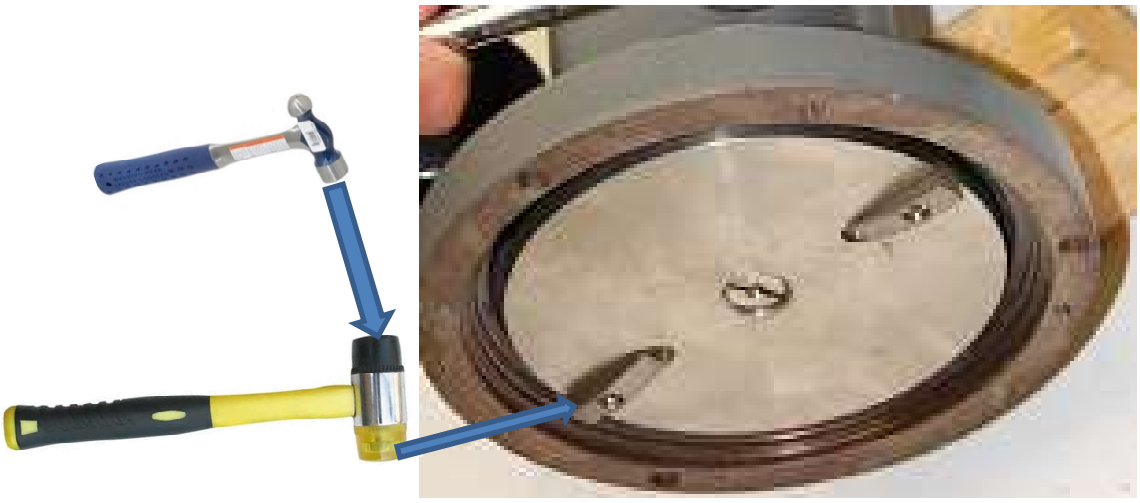


**Figure 19 - Cutter Wheel Loosening & Removal**

5. With the cutter wheel removed, loosen and remove the four bolts that secure the suction housing to the motor head and remove the suction housing.

**Figure 20 - Suction Housing Removal**

6. Remove (Slide) the liner and stator from the rotor. The liner will be inside the suction housing. The liner must be replaced when the stator is replaced. The liner protects the stator from wearing against the suction housing.

**Figure 21 - Stator and Liner Removal**

7. Inspect the stator for wear. Section 4.0.4 describes references the types of wear to look for. It is important to determine the cause of pump failure using the inspection guide provided. The expected life of a stator is approximately 8 years.

## ***4.0.4 Pump Rotor Inspection***

The pump rotor has a long-life expectancy, (10-15 yrs.) but due to age, use conditions etc. the rotor experiences wear. The following are typical causes of wear.

- High flow rates.
- Abrasives
- The pump running dry.

The rotor does not have to be removed from the motor shaft for inspection. When inspecting the rotor, scratches, lines, casting marks or pit marks are acceptable wear. Check the high rounded lobes that spiral the length of the rotor. If the lobes have been worn flat into a 1/4" or wider band, the rotor is considered worn and must be replaced.

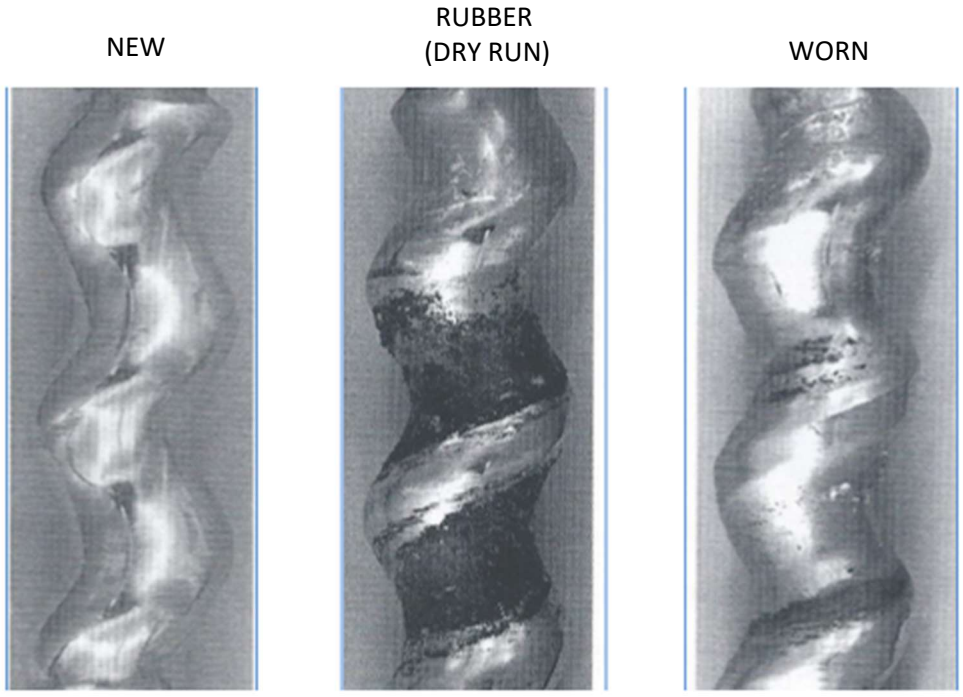



**Figure 22 - Rotor Wear Examples**

Rubber found on the rotor indicates that the pump has run dry. Rubber can be cleaned with paint thinner or petroleum cleaner. Inspect the rotor for excessive wear and replace if necessary. If unsure, reinstall the rotor with a new stator and perform a flow check. Flow should read about 14 gpm at 15 psi. Run the pump allowing the discharge to flow into a five gallon pail. Filling the pail at 15 psi should take about 23 seconds.

## ***4.0.5 Pump Stator Inspection***

There are different types of stator wear that can cause pump failure. They include:

- *A hole or tears in the stator*
  A hole or tear in the stator can be caused by blockage in the discharge line. If the pump runs for a long period of time against a blocked line, the excessive pressure in the pump cavity ruptures or tears the stator. The blockage must be cleared before the pump is put back into service. Check the discharge line for a plugged line, closed valve, frozen valve or bad check valve.

- *Worn lobes*
  Inspect the lobed areas in the center of the stator. On a good stator, the rubber lobes are rounded at the high points. If the lobes are flattened, the texture of the worn rubber can be rough or smooth.
  The stator lobes that are worn have the below indicated characteristics:
  - Wear looks rough with loose particles of rubber hanging from the lobes.
  - Rubber material is stuck in the lower portions between the lobes.
  - The rubber is soft or has hard spots on it.
  - Worn lobes will have surface cracks resembling weather checking.
  - The rotor may have rubber stuck to it.
  - The body of the top housing is bulged or swollen (200 Series only)

- *Lobes That Are Worn Smooth*
  Old age is the most common reason for smooth wear. The general life of a stator operating in a single-family home (300 gpd) is about 10 years. Higher incoming flows will shorten the life of the stator. If two homes are on the same station, the stator will last about five years. If the stator has worn prematurely then it's reasonable that abrasives caused the wear.

  Look into the void between the inner skirt and the outer bore of the stator. Check for an accumulation of more than 1/8" of any of these types of materials: goldfish stones, gravel, kitty litter, glass, etc. Determine and eliminate the source of the abrasives or the stator will fail prematurely. Check for infiltration from a broken line, as sump or even a roof drain. Additionally, ensure that the homeowner is not introducing the abrasive materials through a toilet or sink.

- *Lobes That Are Worn Rough*
  A pump that has been run dry is the main reason for lobes that have worn rough. To determine the cause of a dry running pump:
  - Check to see if the breather is plugged. On the 200 Series pumps, the breather is located at the top of the access way, attached to a 3/16" hose that drops down and connects to the valve stem.
  - Check the tank vent. Insure the vent is clear and properly installed.

- Check the sensing line to ensure it is clear. On a 200 Series unit, blow through the tube connecting the top housing to the on-off pressure switch to ensure it is free-flowing. Attach a second tube to the pressure switch and blow into it. If the switch clicks, then clicks again when you relieve the pressure, the switch is good. If not, replace the switch.
- Check for an obstruction at the inlet (shroud) of the pump. An obstruction will restrict the flow. Check for objects that may have been introduced to the inlet of the pump.
- Inspect and troubleshoot the electrical controls. Electrical controls are described in Chapter 2.0, electrical controls.
- Check the push to run circuit. Check the push to run circuit for all units with the feature. Look for shorts in the panel, underground wiring, junction box, EQD and control compartment. Two wires touching, corrosion or water can cause shorts.

### ***4.0.6 Swollen Pump Stator***

Presence of a petroleum-based product such as paint thinner, photo developing chemicals, gas, oil, brake fluid, transmission fluid, etc. will cause a swollen pump stator: introduction of these types of products into the system must be eliminated or the problem will reoccur. The pump stator is made of EPDM material, which absorbs petroleum the way a sponge absorbs water. If the pump stator appears to have any wear but will not pump liquid, compare it to a new stator. Slide the old stator over the pump rotor and remove it. Slide the new stator over the rotor and remove it. If the new stator fits tighter or if the old stator appears larger than the new one, the pump stator needs to be replaced.

NOTE: If organic solvents cannot be avoided, contact Redmond Environmental and ask for an oil resistant stator. This stator is not recommended under normal conditions because of the reduced life expectancy. (Two to three years.)

### ***4.0.7 Removing the Pump Rotor***

1. Support the end of the motor shaft on a wood block.
2. Use a hammer and a 1/8” punch to remove the tapered groove pin that retains the pump rotor.
3. Tapping lightly on the rotor will help to loosen it from the shaft.

**Figure 23 - Groove Pin Removal**

**Figure 24 - Rotor Loosening**

4. Slide the rotor off the shaft. If the rotor sticks, use a rubber mallet to tap the end of the rotor until it comes off. Be careful not to bend the armature shaft.

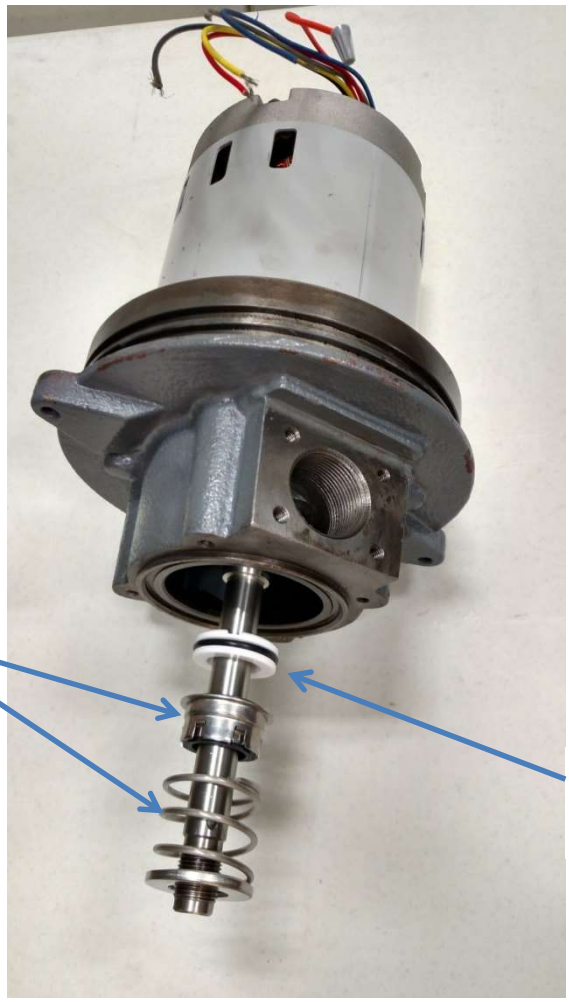
**Figure 25 – Rotor Removal**

**NOTE:** *Do not disturb the mechanical seal. String like fibers and other debris around the seal are normal. If the seal bellows is moved on the shaft, it will create a leak path and flood the motor cavity. The mechanical seal should only be replaced at a repair shop and only during a total overhaul of the pump motor*.

### *4.0.8 Shaft Seal Removal and Replacement*

The seal assembly (#1008) is normally held in place by the rotor (#8008). Once the rotor is removed, the spring and secondary seal can be removed. The seal may be removed with the use of an O-Ring removal tool. If the seal is not removable from the stator side, the motor head casting will have to be removed from the motor head (#5014) and armature removed using a press. The mechanical seal should only be replaced when doing a motor overhaul.

1. Remove the seal spring and secondary seal.



2. Remove the seal. (O-Ring tool shown above)

**Figure 26 - Seal Assembly Removal**

3. With the seal removed, inspect the lower bearing to insure it is in good operational condition. See the next section for bearing removal and replacement.
4. Clean the casting where the new seal seats with a degreaser and shop rag.
5. Coat the new seal O-Ring with P-80 Emulsion lubricant. With the slotted side of the seal facing the casting, insert the new seal over the motor shaft.

6. Hand push the new mechanical seal (#1008) into the motor head until it is seated into position.

Illustration of the seating tool used to seat the shaft seal. (#4020)

**Figure 27 - Seal Tool**

7. Lightly coat with P-80 Emulsion lubricant the secondary seal and install.
8. Install the spring and metal washer.

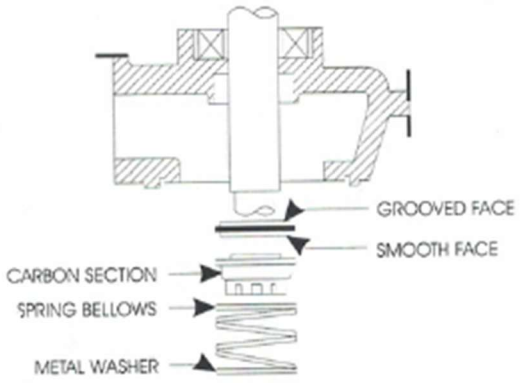



**Figure 28- Mechanical Seal**

9. Install the rotor insuring the slotted end aligns with the keeper pin hole in the shaft.
10. Install the groove pin with a channel lock pliers.
11. Rotate the motor shaft to help seat the seal.
12. Lubricate the inside of the new pump stator with silicone lubricant (#50098) and install it along with the lining.
13. Install the suction housing. Tighten the stainless-steel bolts (1/4-20x1) and lock washers (1/4) diagonally to maintain housing alignment with the motor shaft. Failure to align properly will cause the cutter wheel to hit the shredder ring.
14. Apply a small amount of Neverseez to the threads of the armature shaft and hand tighten the cutter wheel (#1003) onto the shaft. Lock the cutter wheel into place by tapping a rubber mallet clock-wise into the teeth.

15. Seat the shredder ring (#8006) into the suction housing. Set with rubber mallet and a block of wood. Start with one side maintaining pressure and drive the opposite side into place. Make sure the shredder ring is seated all the way around. Spin the cutter wheel and ensure is not interfering with the shredder ring (you will hear an audible noise).
16. Install the inlet shroud (#8007). Dab the four screws with Threadlocker and tighten diagonally.
17. Reinstall the core. Be sure to open all the valves on the discharge plumbing before turning on the power. Verify the voltage and amperage readings.

### ***4.0.9 Assembling the Pump/Grinder Mechanism***

1. If the rotor was removed, slide the rotor over the armature shaft, compressing the seal spring. The spring washer may need to be aligned with the shoulder of the armature shaft. Press the groove pin into place with a channel lock pliers. Do not use a hammer to seat the groove pin. Doing so may bend the armature shaft.
2. Install the new pump stator over the rotor. The rotor or internal bore of the stator should be lubricated with a small amount of silicone grease; most new stators are lubricated at the factory. Ensure the lip of the stator is uniformly seated in the motor head groove.
3. Remove the old pump liner from the suction housing and replace it with a new liner.
4. Install the suction housing. Tighten the bolts diagonally to maintain housing alignment with the motor shaft. Failure to align properly will cause the cutter wheel to hit the shredder ring.
5. Apply a small amount of never-seize to the threads of the armature shaft and hand tighten the cutter wheel onto the shaft. Don not overtighten the impeller; it will be difficult to remove the next time the unit is serviced.
6. Seat the shredder ring in the suction housing. Set with a rubber mallet or hammer and a block of wood. Start with one side, maintain pressure on it and drive the opposite side into place. Ensure the shredder ring is seated all the way around.

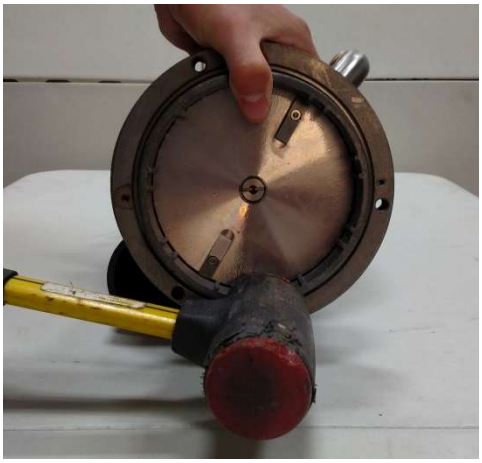
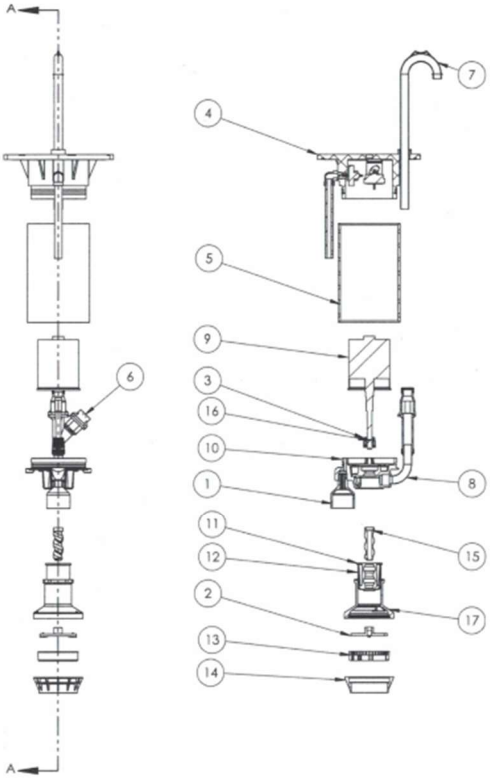


**Figure 29 - Shredder Ring Install**

7. Install the shroud. Apply small amount of threadlock on each of the four screws (#3129) and tighten them diagonally.
8. Rotate the cutter wheel to ensure if does not interfere with the shredder ring.
9. Reinstall the core. Be sure to open all the valves on the discharge plumbing before turning on the power. Verify that the voltage and amperage readings are correct.




| ITEM NO. | PART NUMBER | DESCRIPTION | QTY. |
|---|---|---|---|
| 1 | 1001 SENSING BELL | SENSING BELL | 1 |
| 2 | 1003 Cutter Wheel | Cutter Wheel | 1 |
| 3 | 1008 | MECHANICAL SEAL | 1 |
| 4 | 1033 E1 032016 | TOP HOUSING ASSY | 1 |
| 5 | 1033 PVC | PVC LINER | 1 |
| 6 | 1064 Anti Siphone Check Valve | ANTI SIPHONE CHECK VALVE | 1 |
| 7 | 2063 | U-TUBE | 1 |
| 8 | 2075 | DISCHARGE ELBOW SS | 1 |
| 9 | 5013 | MOTOR, DUAL 120/240V | 1 |
| 10 | 5014 CASTING | MOTOR HEAD | 1 |
| 11 | 8003 Pump Stator | PUMP STATOR | 1 |
| 12 | 8004 | LINER | 1 |
| 13 | 8006 SHREDDER RING | SHREDDER RING | 1 |
| 14 | 8007 | INLET SHROUD | 1 |
| 15 | 8008 | ROTOR | 1 |
| 16 | 8009 | GROOVE PIN | 1 |
| 17 | 8010 | SUCTION HOUSING | 1 |

**Figure 30 – Exploded Pump Assembly**

## 240 V Continuity Test

Assumes enough water is in the tank to turn on the alarm. Meter should be set on 2000K on 2 meg.

| Color 1 | Color 2 | Normal Reading | Operation | If Reading is Wrong, Check |
|---|---|---|---|---|
| Black 2 | Red 1 | 0.00 - short or closed circuit | on-off PSI switch is on | Low water level; EQD may be unplugged; broken wire or mis-wired; inoperative switch; sensing line leak or blockage; blocked vent. |
| Orange 5 | Blue 6 | 0.00 - short or closed circuit | Alarm PSI switch on | Low water level; EQD unplugged; broken wire or mis-wired; inoperative switch; sensing line leak or blockage; blocked vent. |
| Green 4 | Black 2, Red 1, White 3 | OL or 1 - open circuit | No shorts to ground | Underground wire cut; water in EQD or pump controls. Unplug EQD and reset to verify problem isn't underground or in EQD. |
| Green 4 | Blue 6, Orange 5 | 0.00 - short (closed circuit) or 219 ohms | | To read 219 ohms, set meter to 2k scale. The reading is coming from alarm light and relay coil. It is not a problem if neutral wire is connected to the alarm board. |
| Red 1 | Blue6, Orange 5, Green 4 | OL or 1 - open circuit | No short to push -to-run circuit | Underground wires cut; water in EQD or pump. Unplug EQD and restart. If a short is still found, the underground wire is suspect. If no short is found, EQD is dry and not corroded, core controls may be flooded. Test at core EQD. |
| Red 1 | White 3 | 20k ohms | Reading from bleeding resistor | Bleeding resistor mis-wired, shorted or broken wire. Defective or missing resistor must be replaced or install a bleeding resistor in alarm panel. |

## 240 V Continuity Test

| Assumes the pump has shut off on its own or is not installed in the station. Meter should be set on 2000K on 2 meg. | | | | |
|---|---|---|---|---|
| Color 1 | Color 2 | Normal Reading | Operation | If Reading is Wrong, Check |
| Black 2 | Red 1 | 35k OHMS. OL or 1. If not, resistor is installed. | On-off PSI switch is off | Enough water to turn switch to on; EQD may be unplugged; broken wire or mis-wired; inoperative switch; plugged sensing line; obstruction in vent. |
| Orange 5 | Blue 6 | OL or 1 - open circuit | Alarm PSI switch off | Enough water to turn switch to on; EQD may be unplugged; broken wire or mis-wired; inoperative switch; plugged sensing line; obstruction in vent. |
| Green 4 | Black 2, Red 1, White 3 | OL or 1 - open circuit | No shorts to ground | Underground wire cut; water in EQD or pump controls. Unplug EQD and reset to verify problem isn't underground or in EQD. |
| Green 4 | Blue 6 | 0.00 - short or closed circuit | | To read 219 ohms, set meter to 2k scale. The reading is coming from alarm light and relay coil. Neutral wire is connected to the alarm board isn't a problem. |
| Red 1 | Blue6, Orange 5, Green 4 | OL or 1 - open circuit | No short to push -to-run circuit | Underground wires cut; water in EQD or pump. Unplug EQD and retest. If a short is still found, the underground wire is suspect. If no short is found, EQD is dry and not corroded, core controls may be flooded. Test at core EQD. |
| Red 1 | White 3 | 20k ohms | Reading from bleeding resistor | Bleeding resistor mis-wired, shorted or broken wire. Defective or missing resistor must be replaced or install a bleeding resistor in the alarm panel. |

## 120 V Continuity Test

Assumes enough water is in the tank to turn on the alarm. Meter should be set on 2000k scale

| Color 1 | Color 2 | Normal Reading | Operation | If Reading is Wrong, Check |
|---|---|---|---|---|
| Red 1 | Black 2 | 0.00 - short or closed circuit | on-off PSI switch is on | Not enough water to turn switch on; EQD may be unplugged; broken wire or mis-wired; inoperative switch; plugged sensing line; obstruction in vent; damaged underground cable. |
| Orange 5 | Blue 6 | 0.00 - short or closed circuit | Alarm PSI switch on | Not enough water to turn switch on; EQD may be unplugged; broken wire or mis-wired; inoperative switch; plugged sensing line; obstruction in vent; damaged underground cable. |
| Green 4 | Black 2, Red 1 | OL or 1 - open circuit | No shorts to ground | Underground wire cut; water in EQD or pump. Unplug EQD and reset to verify problem isn't underground or in EQD. |
| Green 4 | White 3 | 0.00 - short or closed circuit | Neutral connection is good | Neutral not connected. Remove wire nut and check to wire coming from pump. If shorted, cable is suspect. |
| Green 4 | Orange 5 | 0.00 - short or closed circuit | No shorts to ground | Underground wire cut; water in EQD or pump controls. Unplug EQD and retest to verify problem isn't underground or in EQD. |
| Green 4 | Blue 6 | 0.00 - short or closed circuit | No shorts to ground | To read 219 ohms, set meter to 2k scale. The reading is coming from alarm light and relay coil. Neutral wire is connected to the alarm board isn't a problem. |
| Red 1 | White 3, Blue 5, orange 6, Green 4 | OL or 1 - open circuit | No Short to push-to-run circuit | Underground wire cut; water in EQD or pump. Unplug EQD and retest. If a short is still found, the underground wire is suspect. If no short is found, EQD is dry and not corroded, core controls may be flooded. Test core at EQD. |

## *5.0 -- Motor Repair and Rebuilding*

The following conditions require major repair:

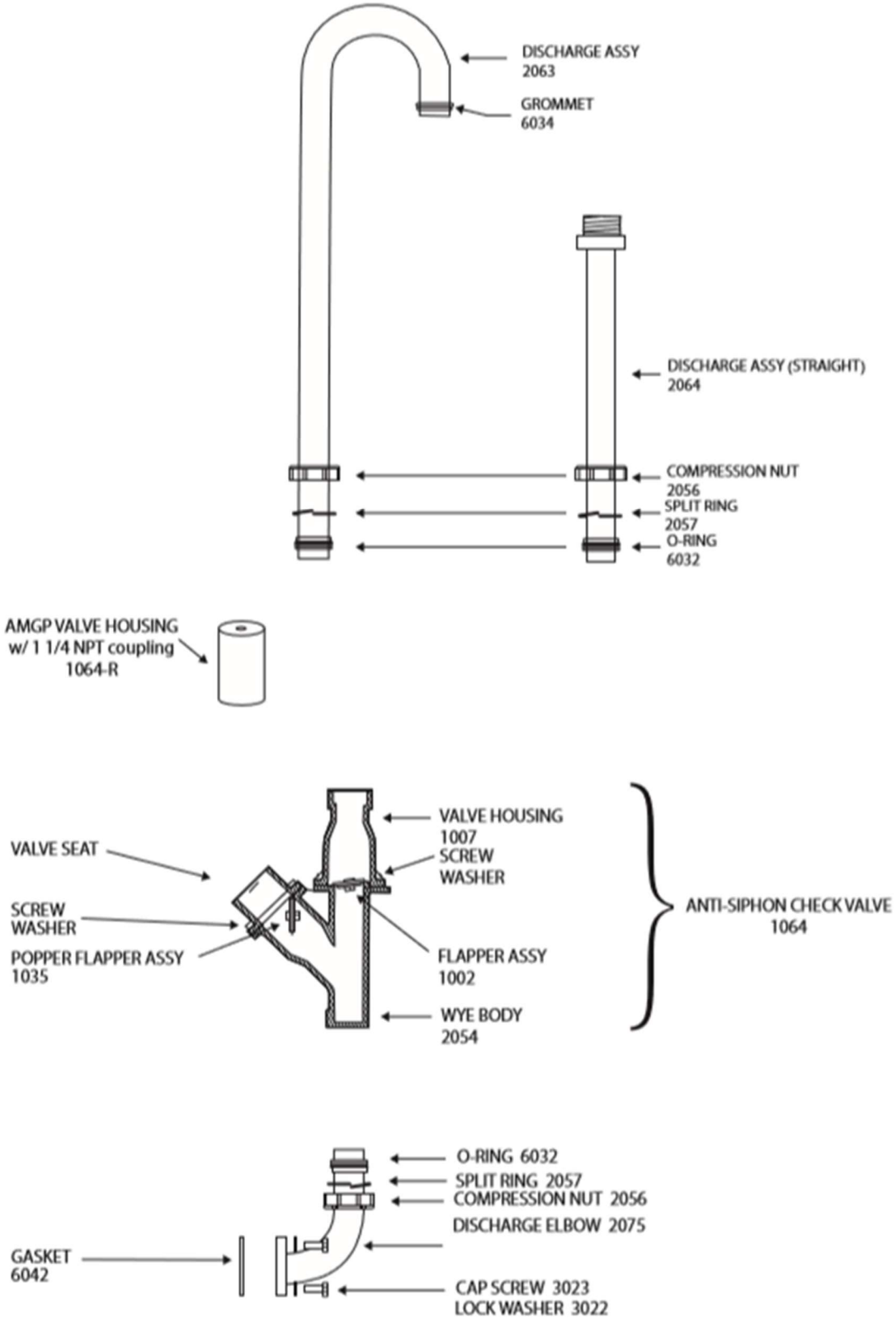
- Flooded motor
- Defective or shortened motor
- Worn seal or bearings

Clean core thoroughly before all major repairs. Any time a pump is rebuilt, all O-rings, seals, stator and liner and bearings should be replaced.

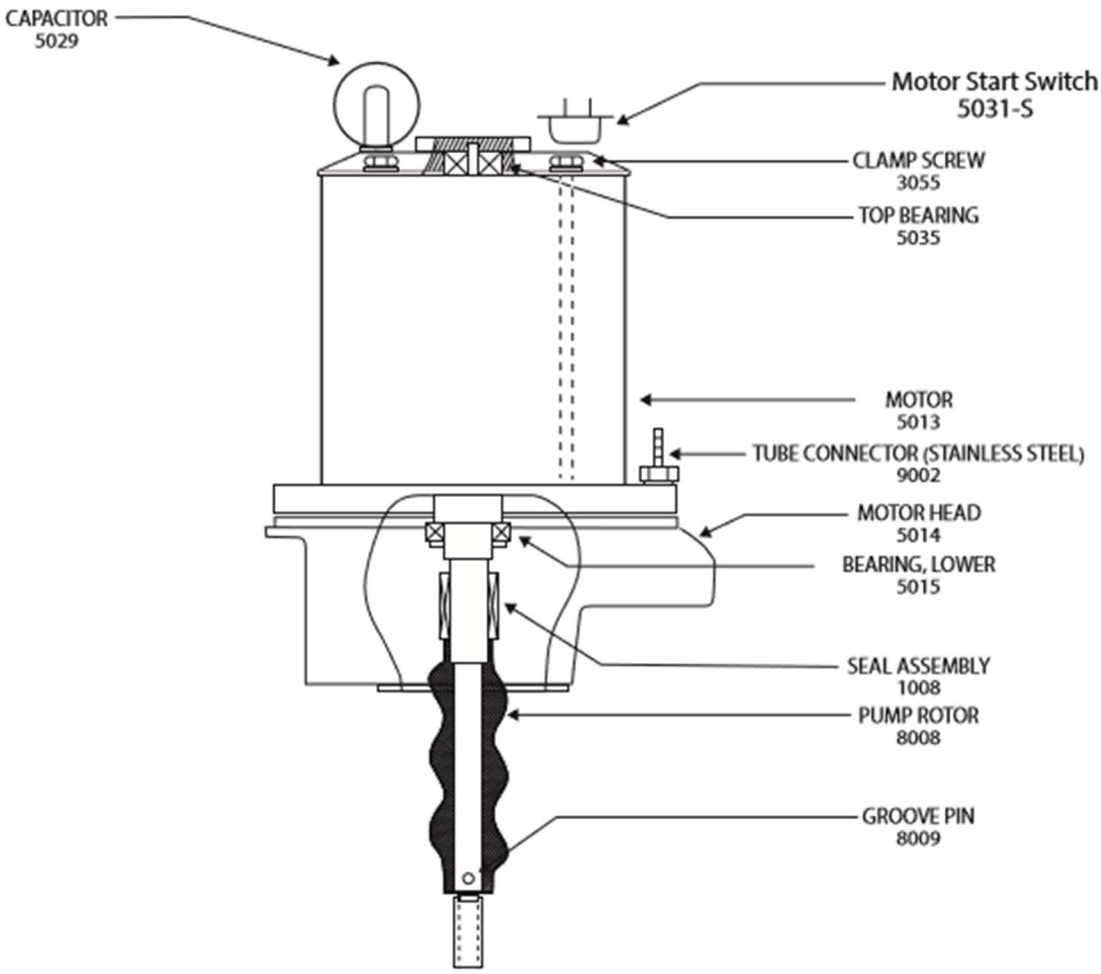
### ***5.0.1 Disassembling the Core and Motor***

1. Unscrew the 1 ½ inch compression nut at the top of the anti-siphon check valve assembly. To remove the nut from the pipe, insert a thin screwdriver between the compression nut and the discharge pipe, pushing out the split ring. Work the split ring over the welded-on ring on the discharge pipe. Start one side of the compression nut over the welded-on ring, then tap it, working it over the ring. Pull the upper discharge pipe out of the check valve. Assembly can be reused, apply in reverse order.
2. Remove the tie rods. Use a wrench (1/2 inch) to loosen #9001A band clamps attached to the PVC. Lightly tap around the top housing with a rubber mallet until loose.
3. Pull the EPDM tubing from the on/off switch and disconnect the molex.
4. Lightly tap around the PVC body tube until loose and remove. Disconnect the tubing the tube connector on the motor head above the sensing bell.
5. Remove the sensing bell.
6. Remove the inlet shroud, shredder ring, cutter wheel, stator, liner and rotor as described in Chapter 4.
7. Set the motor head on the suction housing and remove the capacitor and start switch.
8. Remove the four motor clamp screws.
9. Tap the motor field body with a rubber mallet. Lift the field body off the motor armature and the motor head.
10. Hold the motor head with two hands. Tap the pump end of the shaft sharply on the wood block to drive the motor armature out of the motor head.
11. Sandblast the inlet shroud, suction housing and motor head. Be sure to clean all dirt, dust and grease from the bearing bore, O-ring groove, seal bore, motor field body seat and tube connector. Failure to clean the components may cause assembly problems.
12. Clean the shaft bearing stops of the armature with a soft rag and solvent. Inspect the armature shaft for scars and pits where the ceramic and carbon seal make contact on the bearing surface. Pits or scars under spring bellows will not affect the unit. If the shaft is pitted, it must be replaced.

## Stainless Steel Disharge Assembly



## Motor, Bearing & Head Assembly, Redmond 200R Series



### *5.0.2 Motor Winding Test*

Perform the motor winding resistance check per chart below to verify the motor condition. If the motor has been flooded, it must be cleaned and dry before proceeding.

To test the motor field:

Use an ohm meter and the following table to test for shorts in the motor windings. The table below indicates normal resistance.

**Motor Field Winding Resistance**

| Meter Setting | Wire Combination | Good Motor Resistance | Bad Motor Resistance |
|---|---|---|---|
| 200 | Black/Red | 1.5 - 2.5 ohms | Infinity |
| 200 | Black/Gray | 1.5 - 2.5 ohms | Infinity |
| 200 | Yellow/Blue | 1.5 - 2.5 ohms | Infinity |
| 200 | Yellow/Black | Infinity | Any reading |
| 2000k | Ground/All motor lead with meter set on 2M or 2000K scale | Infinity | Any reading; possibly water in motor, dry windings and retest |

Motors use six colored wires:

**Motor Wire Functions**

| Test Colors | Function |
|---|---|
| Black | Run/start windings and internal thermal protector |
| Blue | Run windings |
| Gray | Run windings |
| Yellow | Run windings |
| Red | Start windings |
| Orange | Dual Application: For wiring for 240v - using to bypass motors internal thermal providing redundancy to the switch circuit, For 120v - jumper lead |

### *5.0.3 Assembling a Motor*

1. Apply a thin film of light machine oil to the armature shaft at the bearing seat. Keep the armature vertical and install into the motor head (sitting on the suction housing). Bearing should be a slight press fit. Do not hammer onto the shaft. If necessary, jiggle or press the armature until the bearing seats.
2. Install the field body over the armature. Keeping the wires out of the way.
3. Start the motor bolts through the end bell to ensure the proper alignment with the motor head.
4. Apply a thin layer of threadlock to motor bolts.
5. Tighten the motor bolts evenly to 30 inlb.
6. Reconnect the capacitor and start switch to their mounting.
7. Manually turn the shaft for free rotation. If resistance is noted, unscrew the motor bolts and twist the motor field right until each bolt is aligned with the next hole. Check for free rotation. Continue process until free rotation is verified.
8. Assemble the lower unit of the pump as described in Chapter 4.

### *5.0.4 Installing Top Housing*

1. The motor head (#5014) and mating surface of the PVC tube must be dirt and rust free. Install 2 new O-rings (#6010) on the motor head. Around the O-rings apply an even amount of P-80 Emulsion lubricant.
2. Inspect the air hole of the motor head, ensure there is no clogging. Push 19 ½ inch EPDM Tubing over the tube connector (#9002).
3. Press the PVC tube onto the motor head. Slide two band clamps (#9001A) over the tube.

On the discharge elbow (#2075):

4. If the elbow has been removed: four stainless steel screws (1/4-20x3/4) and lock washers (1/4) attach the elbow to the motor head. Replace the gasket (#6042).
5. Install the compression nut threaded side out. A rubber mallet can be used if the nut needs to be forced over the welded pipe.
6. Install the split ring (#2057). Start at one end of the split ring and work it over the ring welded to the pipe.
7. Lubricate the two discharge O-rings (#6032) and install them on the pipe, up against the welded-on O-ring.
8. Set the anti-siphon check valve (#1064) over the O-rings.
9. Using a channel-lock, softly tighten the compression nut onto the check valve to hold them together.

10. Connect the male to the female molex and the EPDM tubing to the on/off switch. Lubricate the two O-rings (#6010) on the top housing and around the PVC tubing. Press top housing into place.

11. Attach the discharge pipe before tightening any of the hardware.
    Using dish soap lubricate the top housing grommet (#6035) and pipe and slide into place.

    Slide the grommet (#6043) onto the stainless-steel top discharge pipe. The beveled end of the grommet should face the welded ring on the pipe.

    Feed the pipe through the top housing. Set the grommet into the top housing.

    Install the compression nut and split ring. (Follow steps 4 and 5 above)

12. Align the tierods (#9043) and discharge assembly. When the top housing is seated, the discharge should be 90 degrees to the top housing. Tighten the tie rods to 90 inlb. The tierods should have no vertical movement but should be able to be turned by hand.
13. Tighten the stainless-steel band clamps by hand to 140 inlb.

## *6.0 -- Final Test Procedures*

The following test procedures must be performed prior to reassembling the 200R. Failure to test the unit could result in a flooded core or a damaged unit.

If a leak is detected by these tests, they must be repaired before preforming other tests or installing a unit. After the leak test in complete, proceed with the remaining test procedures.

### ***6.0.1 Leak Testing***

1. Attach a blank EQD Cover (#1070) with gasket over the EQD and tighten. Pressurize the core of the pump through the breather cable to 3 psi. The pressure must hold for at least two hours with no loss. Any loss indicates a leak that must be found. Using a bottle of soapy water (spray) look for bubbles:
    - Around the body of the tube clamps
    - Elbow on the top housing
    - The cable connector on the top housing
2. Release the pressure after the test is complete.

**Figure 31 – Leak Test**

## *6.0.2 Sensing Line Test (on/off system)*

1. Clean the pump.
2. Clamp the test fixture around the sensing bell (see below). Tighten the wing nuts until the fixture seals against the bottom of the sensing bell.
3. Pressurize the sensing line through the fixture to 3 psi.
4. The pressure must hold for at least 2 hours with no loss. If the pressure drops spray the following areas with soapy water and check for bubbles indicating leaks:
5. Test Fixture (most common leak point)
6. Sensing bell threads
7. If the above steps fail to locate a leak, the body must be separated from the motor housing to gain access to more components of the sensing system. Remove the tierods and loosen the band clamps.
8. Disconnect the EPDM tubing from the tube connector (#9002). Pressurize the test fixture on the sensing bell to 5 psi, spray the following areas with soapy water and check for bubbles indicating leaks:
9. Around the tube connector base
10. Both ends of the EDPM tubing located between the tube connector on the motor head to the on/off switch in the top housing. (Reconnect the on/off switch to the tubing to hold air.)
11. If a leak cannot be found contact Redmond Environmental's service department.

### *6.0.3 Test Run*

1. Suspend the pump in a tank of water. Maintain a minimum clearance of 2 inches from the bottom of the tank.
2. Connect the discharge plumbing.
3. Connect the EQD from the pump to the EDQ on the supply box (MOD250).
4. Turn the alarm power circuit breaker (single) and the pump power circuit breaker (double) on.
5. Introduce water into the tank until the pump starts (approx. 18 inches). It should start at this point.
6. Switch the power breaker off.
7. Re-introduce water into the tank. At approximately 25 inches the alarm should sound. Silence and turn the power to pump back on.

Note: At 15 psi discharge pressure, the unit pumps approx. 14 gpm. At 40 psi, it pumps about 11 gpm. Flow can be checked with a 5 gallon pail and stop watch. 14 gpm equals 22 seconds; 11 gpm equals 28 seconds.

## *6.0.4 Amperage Draw Test*

Testing the amperage should coincide with the pumps test run.

1. Hook the amp clamp meter around the white power lead in the MOD 250 control panel.
2. With the power on, fill the tank until the pump is in operation.
3. Read the current directly. By knowing the current draw, you find a blown pump stator, restricted or blocked discharge line, bad bearing, high head operation, etc. See table below for troubleshooting information:

**Amperage Draw Readings**

| Current @240 V PWR | PSI | Head (FT) | GPM | Comments |
|---|---|---|---|---|
| 4.7 no load and less | 0 | 0 | 0 | worn pump stator |
| 5.6 | 10 | 24 | 14 | Normal |
| 5.8 | 20 | 46 | 13 | Normal |
| 6 | 30 | 70 | 12 | Normal |
| 6.2 | 40 | 92 | 11 | Normal |
| 6.5 | 50 | 115 | 10 | Normal |
| 6.8 | 60 | 138 | 9 | Normal |
| 8 and up | 90+ | 207+ | Variable | Plugged discharge line or bad bearings |
| 15.0 and up | 0 | 0 | 0 | Grinder jammed, or motor shorted/flooded |

The figures shown above are only averages and meant to be used only as an approximation. Motors, voltages and amp meters will vary.

A jammed grinder could trip the breaker and cause the overload protector to cycle. If this were to happen it causes the pump to cycle on and off and finally result in it going to alarm. A worn out or torn stator results in (a runs but does not pump condition) and will cause the pump to go into alarm. There is a possibility that the pump could show a slightly lower amp

reading. Readings with a clamp on meter showing below 4.7 amps will need to replace the stator and if needed, the rotor.

### ***6.0.5 Station and Panel Inspection***

Station:

- Check proper burial depth (1 to 4 inches below top of tank)
- Ground is graded away from the unit to prevent water from pooling
- Leak and damage free
- Breather cable is hung from the top of the station
- The power cord (tray cable) is not exposed outside the unit

Panel:

- Wired properly (confirm using diagram in panel)
- Damage and leak free
- No exposed wiring outside of the panel
- Test incoming voltage. If the voltage varies more than 10 percent of what is recommended, stop immediately. Correct the voltage problem

### ***6.0.6 Continuity Test***

Using an ohm meter, set the 2-meg ohm scale. Read all meter instructions carefully for safety information, operational procedures and scale setting.

The alarm panel is where the test points are taken. The colors listed below are the leads coming from the station and connect to the panel. The values listed are the average numbers you should read on your meter. Check the two points (Color 1 and Color 2) using the chart below, to see if it gives the proper reading listed.

The meter may give off a false reading while bleeding off an open circuit. Give the meter at least 5 seconds to obtain the correct reading.

Test using a volt meter to ensure power is off. The chart assumes the tank is full of water and the pump is completely wired.

If the test does not pass, unplug the EQD in the tank and repeat the test at the alarm panel, then at the pump EQD. The EQD pin numbers are listed with the corresponding wire colors (see figure 11). This will help narrow down where the problem could be located.

### ***6.0.7 Run Unit***

This test assumes that the station has enough water to operate the alarm and that all discharge lines and valves are open.

1. Test the voltage at the panel, it should be within 10% of the nameplate voltage.
2. Turn on the alarm breaker.
3. Silence the horn (located under the control box).
4. Turn on the pump breaker.
5. Take the amperage reading from either the black or white wire that runs to the pump. Amps should be between 4.5 and 8.2 at 240 volts (9 and 15 amps for 120-volt units). Higher amperage indicates higher pressure. High amps could indicate a plugged or closed line.
6. After the alarm turns off automatically, test the push-to-run button (black) located on the alarm board in the control panel.
7. Turn off the power to pump and the alarm.
8. Test with your resistance meter at the points listed in the graph. Set the meter to 2000k.
9. Test to ensure power is turned off.

The chart below assumes that the pump is run down and shut off on its own.

| Color 1 | Color 2 | Normal Reading | Operation | If Reading is Wrong, Check |
|---|---|---|---|---|
| Black 2 | Red 1 | 0.00 - short or closed circuit | on-off PSI switch is on | Low water level; EQD may be unplugged; broken wire or mis-wired; inoperative switch; sensing line leak or blockage; blocked vent |
| Orange 5 | Blue 6 | 0.00 - short or closed circuit | Alarm PSI switch on | Low water level; EQD unplugged; broken wire or mis-wired; inoperative switch; sensing line leak or blockage; blocked vent |
| Green 4 | Black 2, Red 1, White 3 | OL or 1 - open circuit | No shorts to ground | Underground wire cut; water in EQD or pump controls. Unplug EQD and retest to verify problem isn't underground or in EQD |
| Green 4 | Blue 6, Orange 5 | 0.00 - short (closed circuit) or 219 ohms | | To read 219 ohms, set meter to 2k scale. The reading is coming from alarm light and relay coil. It is not a problem if neutral wire is connected to the alarm board |
| Red 1 | Blue6, Orange 5, Green 4 | OL or 1 - open circuit | No short to push -to-run circuit | Underground wires cut; water in EQD or pump. Unplug EQD and restart. If a short is still found, the underground wire is suspect. If no short is found, EQD is dry and not corroded, core controls may be flooded. Test at core EQD. |
| Red 1 | White 3 | 20k ohms | Reading from bleeding resistor | Bleeding resistor mis-wired, shorted or broken wire. Defective or missing resistor must be replaced, or install a bleeding resistor in alarm panel |

**Grinder Pump, 1HP, 1725 RPM**