

**INSTALLATION, OPERATION,
AND MAINTENANCE MANUAL**
WITH PARTS LIST



HANDY-SUBTM
SUBMERSIBLE PUMP

MODEL
SE1 1/2B3-E.33 12V

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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Register your new
Gorman-Rupp pump online at
www.grpumps.com

Valid serial number and e-mail address required.

RECORD YOUR PUMP MODEL AND SERIAL NUMBER

Please record your pump model and serial number in the spaces provided below. Your Gorman-Rupp distributor needs this information when you require parts or service.

Pump Model: _____

Serial Number: _____

TABLE OF CONTENTS

INTRODUCTION	PAGE I – 1
SAFETY - SECTION A	PAGE A – 1
INSTALLATION – SECTION B	PAGE B – 1
PREINSTALLATION INSPECTION	PAGE B – 1
Lubrication	PAGE B – 1
PUMP INSTALLATION	PAGE B – 1
Pump Dimensions	PAGE B – 1
Lifting	PAGE B – 2
Positioning the Pump	PAGE B – 2
Typical Pump Installations	PAGE B – 2
PIPING	PAGE B – 3
PUMP POWER CABLE CONNECTIONS	PAGE B – 3
OPERATION – SECTION C	PAGE C – 1
PUMP OPERATION	PAGE C – 1
Switching	PAGE C – 1
Running Time	PAGE C – 1
Overload Protection	PAGE C – 1
Operational Checks	PAGE C – 1
STOPPING	PAGE C – 2
Storage and Cold Weather Preservation	PAGE C – 2
TROUBLESHOOTING – SECTION D	PAGE D – 1
ELECTRICAL TESTING	PAGE D – 2
Test Equipment	PAGE D – 2
Power Cable Continuity Check	PAGE D – 2
Circuit Breaker Check	PAGE D – 2
On-Off Switch Check	PAGE D – 2
PUMP MAINTENANCE AND REPAIR - SECTION E	PAGE E – 1
PERFORMANCE CURVE	PAGE E – 1
PARTS LIST:	
Pump Model	PAGE E – 3
PUMP AND SEAL DISASSEMBLY AND REASSEMBLY	PAGE E – 4
PUMP END DISASSEMBLY	PAGE E – 4
Strainer Removal	PAGE E – 4
Impeller Removal	PAGE E – 5
Seal Removal	PAGE E – 5
PUMP END REASSEMBLY	PAGE E – 5
Cleaning And Inspection Of Pump Parts	PAGE E – 5
Seal Installation	PAGE E – 6
Impeller Installation	PAGE E – 7
Strainer Installation	PAGE E – 7
MOTOR DISASSEMBLY	PAGE E – 7

TABLE OF CONTENTS
(continued)

Cable Assembly and Motor Cover Removal	PAGE E – 7
Motor Circuit Breaker Removal	PAGE E – 8
Motor Brush Removal	PAGE E – 8
MOTOR REASSEMBLY	PAGE E – 8
Motor Brush Installation	PAGE E – 8
Motor Circuit Breaker Installation	PAGE E – 8
Cable Assembly and Motor Cover Installation	PAGE E – 8

INTRODUCTION

Thank You for purchasing a Gorman-Rupp pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump.

This pump is an SE Series, Handy-Sub[®] submersible model, designed to handle dirty water that does not contain large entrained solids. Do not attempt to pump volatile, flammable or corrosive liquids that may damage the pump. The basic material of construction is aluminum, with a cast iron impeller.

The pump may be operated fully or partially submerged, but should not be operated dry for extended periods. The integral 1/3 H.P. electric motor may be driven by any standard 12-volt DC vehicle battery. The pump is not explosion-proof, and should not be operated in a hazardous atmosphere.

This manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

If there are any questions regarding the pump or its application which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor, or the Gorman-Rupp Company:

The Gorman-Rupp Company
P.O. Box 1217

Mansfield, Ohio 44901—1217
Phone: (419) 755—1011

or:

Gorman-Rupp of Canada Limited
70 Burwell Road

St. Thomas, Ontario N5P 3R7
Phone: (519) 631—2870

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:



Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.



Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.



Hazards or unsafe practices which COULD result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

SAFETY - SECTION A

This information applies to the SE Series Handy-Sub™ submersible electric motor driven pump.



Do not operate this pump where explosive vapors or flammable material exist. Death or serious injury will result. Check the National Electric Code (N.E.C.) and local codes before using.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Switch off the pump and disconnect the power cables from the vehicle battery to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.



This pump is designed to handle dirty water that does not contain large entrained solids. It is not designed to pump volatile, flammable or corrosive materials. Do not attempt to pump any liquids which may damage the pump or endanger personnel as a result of pump failure.



Do not allow the pump and vehicle to come into contact when connecting the power cable to the battery. If the pump should develop an internal short to the

casing, electrical shock could occur, causing severe injury or death to personnel.



Always make sure the switch on the power cables is in the OFF position before connecting the leads to the vehicle battery. Failure to do so could cause arcing, resulting in explosion or fire.



Never attempt to alter the length or repair any power cable with a splice. The pump motor and cable must be completely waterproof. Damage to the pump or personal injury may result from alterations.



After the pump has been installed, make certain that the pump and all piping or hose connections are secure before operation.



Do not attempt to lift the pump by the power cables, carry handle or piping. Attach proper lifting equipment to the lifting eye fitted to the pump.



Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components of this pump.

INSTALLATION – SECTION B

Review all SAFETY information in Section A.



Do not operate this pump where explosive vapors or flammable material exist. Death or serious injury will result. Check the National Electric Code (N.E.C.) and local codes before using.

This section only summarizes recommended installation practices for the pump. If there are questions concerning your specific application, contact your local distributor or the Gorman-Rupp Company.

PREINSTALLATION INSPECTION

The pump was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

- a. Inspect the pump assembly for cracks, dents, damaged threads, and other obvious damage.
- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.

- c. The standard pump is furnished with two 30-foot (3 m) long power cables. Inspect the cables for cuts or damage.
- d. Screw the lifting eye (shipped loose) into the tapped hole in the top of the motor cover until fully seated, and secure it with the jam nut.
- e. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties as indicated.

If anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the pump into service until appropriate action has been taken.

Lubrication

The shaft seal in this pump is lubricated by the medium being pumped. The bearings in this pump are permanently lubricated for life. No additional lubrication is required.

PUMP INSTALLATION

Pump Dimensions

The pump is provided with a suction strainer to prevent large solids from clogging the impeller. See Figure 1 for the approximate physical dimensions of the pump.

OUTLINE DRAWING

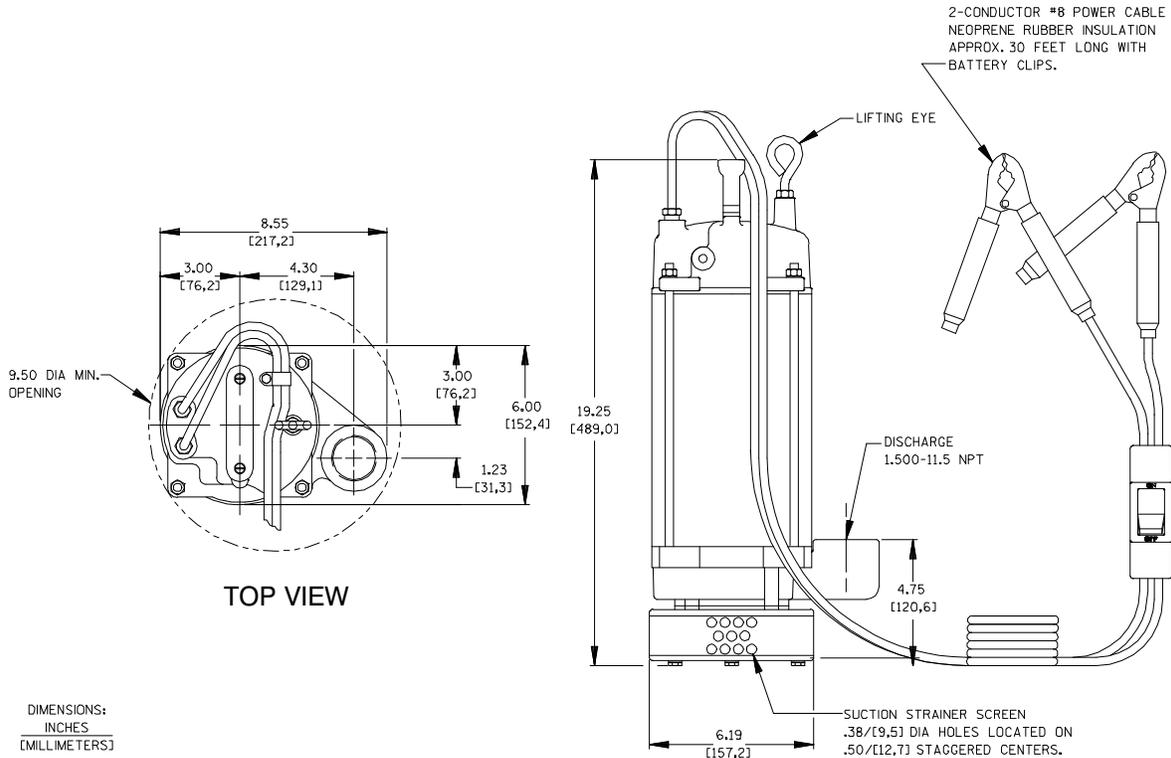


Figure 1. Pump Model SE1 1/2B3-E.33 12V

Lifting

Pump unit weights will vary depending on the mounting and drive provided. Check the shipping tag on the unit packaging for the actual weight, and use lifting equipment with appropriate capacity. Drain the pump and remove all customer-installed equipment such as suction and discharge hoses or piping before attempting to lift existing, installed units.

Attach a rope or chain to the lifting handle in the top of the motor cover. **Do not** lift the unit by the power cables or the discharge piping. **Do not** attach lifting equipment to the carry handle. Customer installed equipment such as rigid discharge piping **must** be removed before attempting to lift.



Do not attempt to lift the pump by the power cables, carry handle or piping. Attach proper lifting equipment to the lifting eye fitted to the pump.

Positioning the Pump

This pump is designed to operate fully or partially submerged; however, it **should not** be operated dry for extended periods of time.



Extended dry operation will destroy the seal assembly.

Secure and support the pump by the lifting eye fitted on the pump. If the application involves a lot of debris, protect the pump from excessive wear and clogging by suspending it in a perforated barrel or culvert pipe. If the bottom is heavily sludge-covered, rest the pump on support blocks or suspend it from a raft or similar device near the surface of the liquid. See Figure 2 for typical pump installations.

The pump is provided with a suction strainer to prevent large solids from clogging the impeller. Any spherical solids which pass through the strainer will pass through the pump.

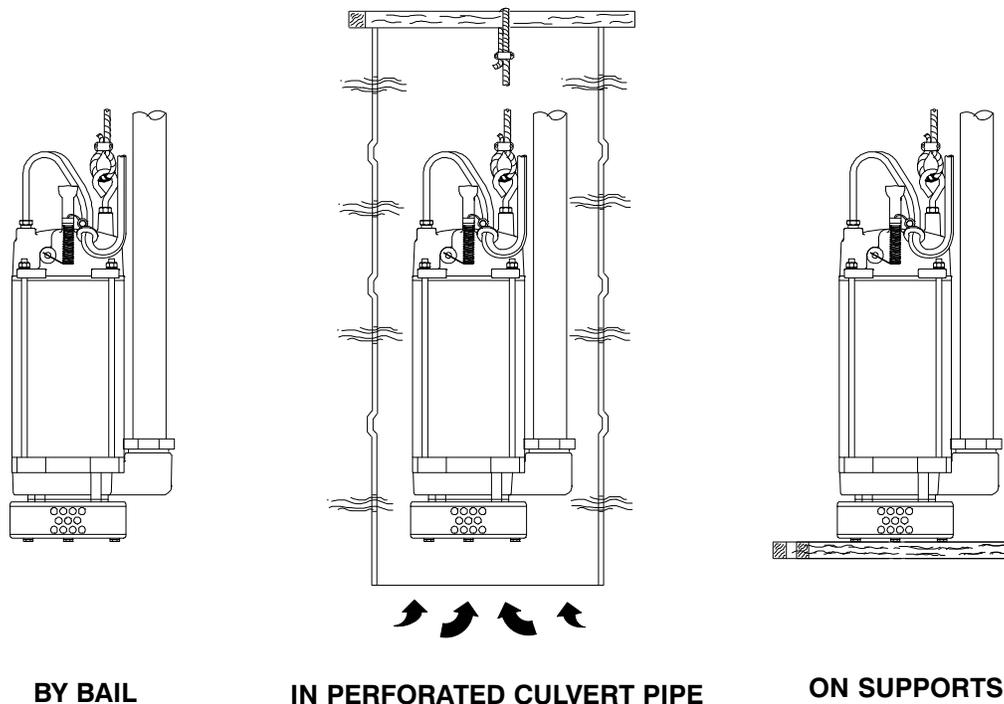


Figure 2. Typical Pump Installations

PIPING

The pump volute is equipped with a standard 1-1/2-inch NPT tapped discharge connection. Either hose or rigid pipe may be used for the discharge connection.

For maximum pumping capacity, use non-collapsible hose or rigid piping, and keep the discharge as short and straight as possible. If rigid piping is used, minimize the use of elbows and fittings which increase friction losses and reduce pump performance.

A check valve or throttling valve may be installed in the discharge line to control siphoning or back flow when the pump is shut off.

PUMP POWER CABLE CONNECTIONS

The pump is provided with two 30-foot (3 m) power cables. Splicing of the power cables is **not** recommended by the Gorman-Rupp Company due to safety and warranty considerations.



Never attempt to alter the length or repair any power cable with a splice. The pump motor and cable must be completely waterproof. Damage to the pump or personal injury may result from alterations.

When connecting the pump power cables to the vehicle, first check the vehicle owner's manual to determine if the vehicle has a *negative* or a *positive* grounding system.



Always make sure the switch on the power cables is in the OFF position before connecting the leads to the vehicle battery. Failure to do so could cause arcing, resulting in explosion or fire.

Refer to Figure 3 for pump power cable connections, and proceed as follows:

- 1) Connect the red cable clamp from the pump to the *positive* (+) terminal on *negative* grounding systems, or to the *negative* (-) terminal on *positive* grounding systems.



Do not allow the pump and vehicle to come into contact when connecting the power cable to the battery. If the pump should develop an internal short to the casing, electrical shock could occur, causing severe injury or death to personnel.

- 2) Connect the black cable clamp from the pump to ground, preferably to a solid, metallic, stationary point on the engine. The con-

nection should be made as far away from the battery as possible.

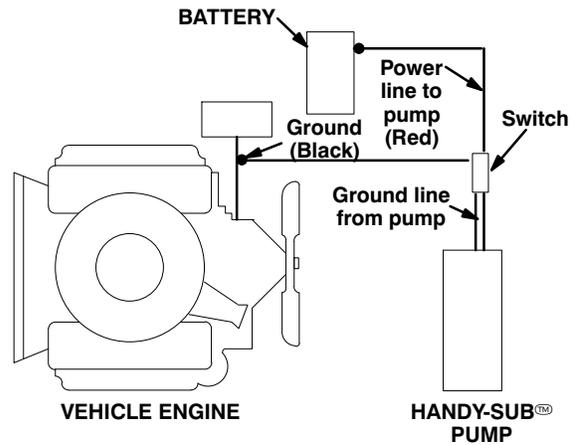


Figure 3. Pump Power Cable Connections (Negative Ground System)

OPERATION – SECTION C

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.

PUMP OPERATION



Do not operate this pump where explosive vapors or flammable material exist. Death or serious injury will result. Check the National Electric Code (N.E.C.) and local codes before using.



This pump is designed to handle dirty water that does not contain large entrained solids. It is not designed to pump volatile, flammable or corrosive materials. Do not attempt to pump any liquids which may damage the pump or endanger personnel as a result of pump failure.

Install the pump and piping as described in **INSTALLATION**, Section B.

Switching

The ON-OFF switch for the pump is located on the power cable. With the switch in the OFF position, a safety interlock circuit eliminates arcing when the cable is connected to the battery. Arcing may occur if the switch was left ON because the pump was stopped after its last operation by disconnecting the battery clips without using the switch. Always make sure the switch is in the OFF position before connecting to the vehicle battery.

Running Time

The pump draws about 30 Amps, and can be operated for about 45 minutes on a fully-charged 55 AMP-hour battery, and still permit starting of the vehicle under normal conditions. Caution should be used when the running time exceeds 30 or 40 minutes without the engine running to recharge the battery, particularly in cold weather when the battery efficiency is lowered. Battery size (AMP-hour rating) and the use of other accessories such as the lights and radio, must be taken into consideration for practical running periods without the vehicle engine running.



Do not operate an internal combustion engine in an explosive atmosphere. When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless, and odorless.

Overload Protection

Overload protection is provided by means of a 40 Amp automatic reset circuit breaker located inside the motor cover on top of the pump.

Operational Checks

Check the pump for proper operation when it is first started and periodically thereafter to identify minor problems.

Check the pump for unusual noises or excessive vibration while it is operating. If noise or vibration is excessive, stop the pump and refer to the troubleshooting chart for possible causes.

Check the pump strainer screen for clogging caused by stones, sticks, or other debris. Clean the strainer screen when required. In some cases, stopping the pump momentarily may back flush

the strainer screen, purging most of the debris from it. If this fails to clean the screen, remove the pump from the sump and remove the debris manually (see **MAINTENANCE AND REPAIR** in Section E).

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve (see **MAINTENANCE AND REPAIR**, Section E).

STOPPING

After stopping the pump, be sure to perform all required maintenance and preservation procedures.

Storage and Cold Weather Preservation

After stopping the pump, disconnect the power cables from the vehicle battery, and use the rope or chain attached to the lifting eye on the motor cover to remove the pump from the sump. **Do not** lift the unit by the power cables or the discharge piping. **Do not** attach lifting equipment to the carry handle. Customer installed equipment such as rigid discharge piping **must** be removed before attempting to lift.



Do not attempt to lift the pump by the power cables, carry handle or piping. Attach proper lifting equipment to the lifting eye fitted to the pump.

Clean the strainer screen before storage. If the application involves a lot of mud or sludge, remove the strainer and clean the impeller before storage.

NOTE

The most common cause of failure to run is hardened mud or sludge in the impeller.

In freezing temperatures, the pump will not freeze as long as it is submerged in liquid. If the pump casing is not submerged, or if the liquid begins to freeze, remove the pump from the sump and allow it to dry thoroughly. Run the pump for two or three minutes to dry the inner walls.

If the pump freezes, move it into a warm area until completely thawed, or submerge it into the liquid. If the liquid is near freezing, the pump must be submerged for an extended period of time. Start the pump and check for shaft rotation. If still frozen, allow additional thawing time before attempting to restart.



Do not attempt to thaw the pump by using a torch or other source of flame. This could damage gaskets, electrical components, or motor windings.

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
<p>MOTOR WILL NOT RUN</p>	<p>Hardened mud or sludge in impeller.</p> <p>Poor connection at battery or vehicle ground.</p> <p>Impeller binding.</p> <p>Damaged power cable(s).</p> <p>Open circuit in motor windings or power cable.</p> <p>Loose connection in motor cover.</p> <p>Bad switch or circuit breaker.</p> <p>Worn motor brushes or out of position to make contact with armature.</p>	<p>Remove strainer, check and clean.</p> <p>Check and correct connections.</p> <p>Check freedom of rotation. Add shims or gaskets as required.</p> <p>Inspect and replace as required.</p> <p>Check continuity.</p> <p>Remove cover, check connections and correct as required.</p> <p>Check electrical components as described in this section and replace as required.</p> <p>Disassemble pump, check and replace brushes as required.</p>
<p>MOTOR RUNS, BUT PUMP FAILS TO DELIVER RATED DISCHARGE</p>	<p>Strainer clogged.</p> <p>Impeller binding.</p> <p>Discharge line clogged or restricted; hose kinked.</p> <p>Liquid being pumped too thick.</p> <p>Vehicle battery not fully charged.</p> <p>Worn impeller vanes; excessive impeller clearance.</p> <p>Pumping entrained air.</p> <p>Damaged or unbalanced impeller.</p>	<p>Check and clean as required.</p> <p>Check freedom of rotation. Add shims or gaskets as required.</p> <p>Check discharge lines; straighten hose.</p> <p>Dilute liquid by heating if possible.</p> <p>Start vehicle and allow to run until battery is fully charged.</p> <p>Check impeller and clearance. See PUMP END REASSEMBLY.</p> <p>Check liquid level in sump; check position of pump.</p> <p>Replace impeller.</p>

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP RUNS WITH EXCESSIVE NOISE OR VIBRATION	Pumping entrained air.	Check liquid level in sump; check position of pump.
	Damaged impeller.	Inspect and replace impeller.
	Motor shaft or bearings defective.	Disassemble pump and check motor and bearings.

ELECTRICAL TESTING

If you suspect that pump malfunctions are caused by defects in the power cables or electrical components, perform the following checks to help isolate the defective part.



Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components of this pump.



Always disconnect the battery clamps from the vehicle battery when testing electrical components.

Test Equipment

A volt/amp/ohmmeter of adequate range and quality will be required to conduct the following electrical tests.

Equipment	Use
Ammeter	To check AC Voltage and current (amperage)
Ohmmeter	To measure resistance (ohms) to ground

Power Cable Continuity Check

Disconnect the power cables inside the motor cover. Use the ohmmeter to check continuity of the cables, and replace defective cables as required.



Never attempt to alter the length or repair any power cable with a splice. The pump motor and cable must be completely waterproof. Damage to the pump or personal injury may result from alterations.

Circuit Breaker Check

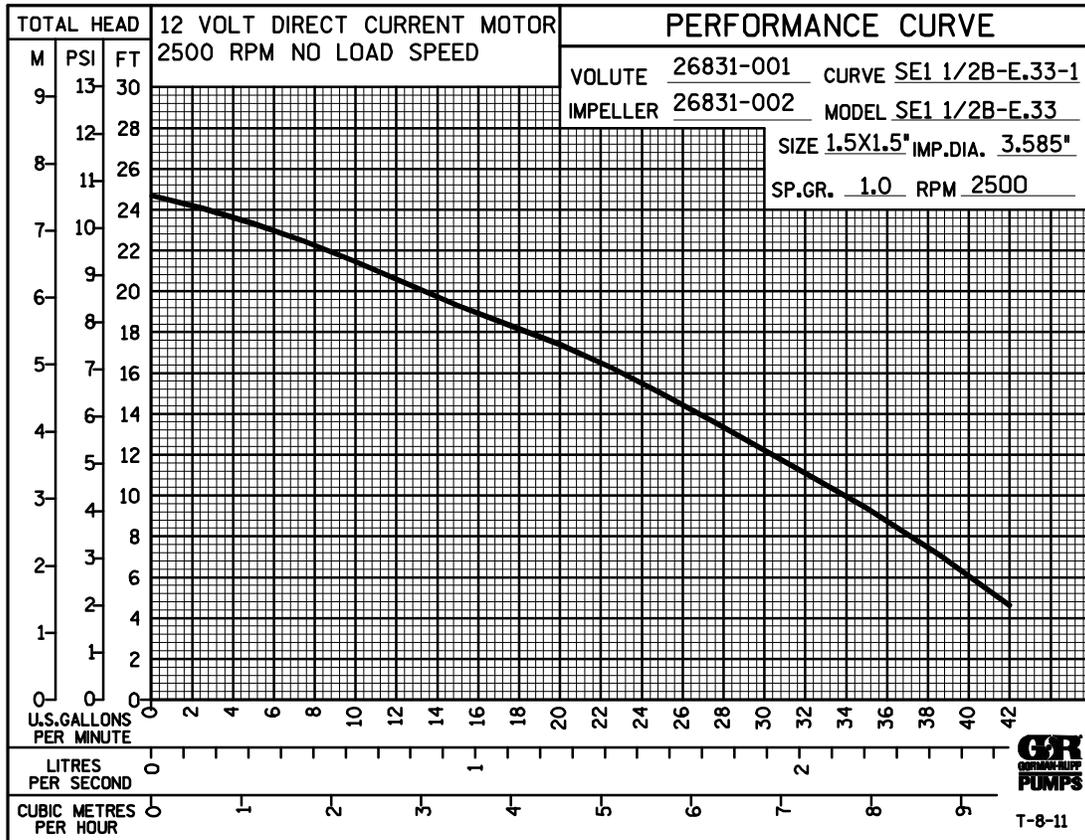
The circuit breaker used in this pump is normally closed. Disconnect the wires from the breaker, and check continuity across the terminals. If the circuit is open, replace the breaker.

On-Off Switch Check

Disconnect red battery cable lead from circuit breaker terminal. Check continuity between battery clamp and ring terminal on the end of the cable. Moving ON-OFF switch from ON to OFF should break continuity. If the switch is bad, the continuity will remain open when the switch is in the ON position.

PUMP MAINTENANCE AND REPAIR - SECTION E

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



* STANDARD PERFORMANCE FOR PUMP MODEL SE1 1/2B3-E.33 12V

* Based on 70° F (21° C) clear water at sea level.
 Since pump installations are seldom identical, your

performance may be difference due to such factors as viscosity, specific gravity and temperature.

SECTION DRAWING

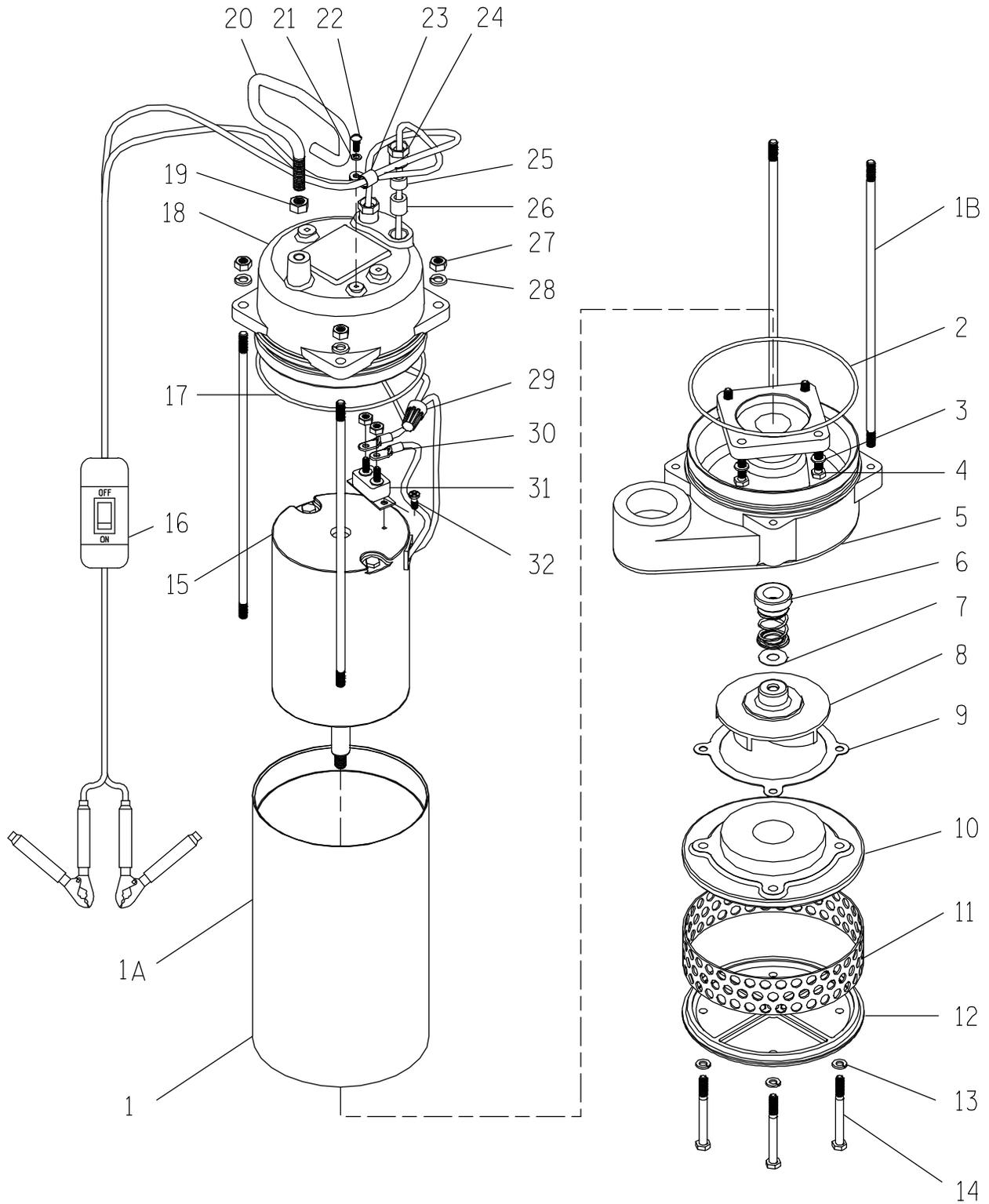


Figure 1. Pump Model SE1 1/2B3-E.33 12V

PARTS LIST
Pump Model SE1 1/2B3-E.33 12V
 (From S/N 1483930 Up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	CASING TUBE KIT	26831-071	----	1	21	LOCK WASHER	J#10	15991	1
1A	-CASING TUBE	NOT AVAILABLE		1	22	RD HD MACH SCREW	X#04-02	15991	1
1B	-STUD	NOT AVAILABLE		4	23	CABLE CLAMP	26831-007	----	1
2	O-RING	25152-254	----	1	24	GLAND NUT	26831-022	----	2
3	LOCK WASHER	J04	15991	4	25	GLAND SPACER	26831-023	----	2
4	HEX HD CAPSCREW	B0403-1/2	15991	4	26	SEALING RING	26831-024	----	2
5	PUMP CASING	26831-072	----	1	27	HEX NUT	D05	15991	4
6	SEAL ASSY	26831-003	----	1	28	LOCK WASHER	J05	15991	4
7	IMP ADJ SHIM	26831-061	----	7	29	TWIST TYPE CONNECTOR	26831-078	----	1
8	IMPELLER	26831-002	----	1	30	RING TERMINAL	26831-077	----	1
9	CASING GASKET	26831-062	----	5	31	CIRCUIT BREAKER	26831-042	----	1
10	SUCTION COVER	26831-076	----	1	32	SELF-TAPPING SCREW	26831-035	----	2
11	STRAINER	26831-064	----	1					
12	STRAINER PLATE	26831-065	----	1		NOT SHOWN:			
13	LOCK WASHER	J04	14991	4		MOTOR BRUSH	26831-079	----	2
14	HEX HD CAPSCREW	B0411	17000	4		CAUTION DECAL (LARGE)	26831-068	----	1
15	MOTOR	26831-075	----	1		NAMEPLATE	38812-073	----	1
16	POWER CABLE ASSY	26831-073	----	1		G-R DECAL	GR-03	----	1
17	O-RING	25152-254	----	1		CAUTION DECAL	26831-081	----	2
18	MOTOR COVER	26831-074	----	1					
19	HEX NUT	D06	15991	1		OPTIONAL:			
20	HANDLE	26831-052	----	1		CARRYING CASE/HOSE KIT	48782-001	----	1

* INDICATES PARTS RECOMMENDED FOR STOCK

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all **SAFETY** information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

The following maintenance and repair instructions are keyed to the Pump Model sectional view (Figure 1) and the accompanying parts lists.

Before attempting to service the pump, switch off the pump and disconnect the power cables from the vehicle battery to ensure that the pump will remain inoperative.



Before attempting to open or service the pump:

1. **Familiarize yourself with this manual.**
2. **Switch off the pump and disconnect the power cables from the vehicle battery to ensure that the pump will remain inoperative.**
3. **Allow the pump to cool if overheated.**

Use a rope or chain attached to the handle in the motor cover to remove the pump from the sump, and move it to a location where the discharge line can be removed. It is not necessary to disconnect a flexible discharge hose before removing the pump. If rigid discharge piping is used, disconnect the piping before attempting to move the pump.



Do not attempt to lift the pump by the power cables, carry handle or piping. Attach proper lifting equipment to the lifting eye fitted to the pump.

Select a suitable location, preferably indoors, to perform the degree of maintenance required. If the

motor housing is to be opened, the work must be done in a clean, well-equipped shop. All maintenance functions must be done by qualified personnel.



Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components of this pump.

Check the chart in **TROUBLESHOOTING**, Section D, to determine the nature of the pump problem. If the problem is mechanical in nature, such as worn pump parts, seal replacement, etc., refer to **PUMP END DISASSEMBLY** for instructions.

If the problem is electrical, complete disassembly may not be required. Refer to **Electrical Testing** in **TROUBLESHOOTING**, Section D, and have a qualified electrician check the cables and electrical components inside the motor cover. If the problem is determined to be in electrical components, complete disassembly of the pump may not be required. See the appropriate section in **MOTOR DISASSEMBLY**.

Carefully inspect any O-rings or gaskets before removal and cleaning to determine if a proper seal and compression existed prior to disassembly. If sealing was faulty or questionable, the cause must be determined and corrected before reassembly. All gaskets and most O-rings **must** be replaced if disturbed. Repair gaskets and O-rings are listed on the parts list.

PUMP END DISASSEMBLY

Strainer Removal

To remove the strainer screen (11), lay the pump on its side and disengage the hardware (13 and 14). Remove the strainer plate (12), strainer screen, suction cover (10) and casing gaskets (9). If the impeller is clogged, the debris can usually be removed without further disassembly.

Impeller Removal

Wedge a piece of wood between the vanes of the impeller (8) and the inside of the pump casing (5).

Insert a large flat-bladed screwdriver into the slot in the end of the shaft. Turn the shaft in a **clockwise** direction to break the impeller loose. After the impeller breaks loose, remove the screwdriver and wood block and unscrew the impeller from the shaft. Use caution when unscrewing the impeller; tension on the seal spring will be released.

Remove the impeller shims (7). For ease of reassembly, tie and tag the shims or measure and record their thickness.

Seal Removal

(Figures 1 and 2)

Remove the spring centering washer and spring. Lubricate the seal area of the rotor shaft with light oil. To easily remove the seal, disengage the hardware (3 and 4) securing the pump casing to the motor (15). Use a soft-faced mallet to tap the pump casing loose from the casing tube (1A).

Slide the pump casing and seal off the shaft. Press the stationary portion of the seal out of the pump casing from the back side.

Inspect the lower casing tube O-ring (2). If replacement is required, remove it from the pump casing.

If no further disassembly is required, proceed with **PUMP END REASSEMBLY**.

NOTE

*Do not disassemble the motor unless it is necessary and a clean, well-equipped shop is available. If the motor housing components are to be serviced, see **MOTOR DISASSEMBLY** in this section. Do not reassemble the end components at this time.*

PUMP END REASSEMBLY

NOTE

Reuse of old O-rings, gaskets, or shaft seal parts may result in premature leakage or reduced pump performance. It is strongly recommended that new gaskets and a new shaft seal assembly be used

during reassembly (see the parts lists for numbers).

Cleaning And Inspection Of Pump Parts

Carefully inspect any O-rings or gaskets before removal and cleaning to determine if a proper seal and compression existed prior to disassembly. If sealing was faulty or questionable, the cause must be determined and corrected before reassembly. Replace any parts as required.

Thoroughly clean all reuseable parts with a soft cloth soaked in cleaning solvent. Remove all O-rings and gaskets, and clean the sealing surfaces of dirt or gasket material. Be careful not to scratch gasket surfaces.



Most cleaning solvents are toxic and flammable. Use them only in a well-ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Inspect the rotor shaft for damaged threads, scoring, or nicks. Remove nicks and burrs with a fine file or emery cloth to restore original contours. If the shaft is bent or severely damaged, the motor must be replaced as an assembly (see **MOTOR DISASSEMBLY**).

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. The shaft seal assembly should not be reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If any components are worn, replace the complete seal; **never mix old and new seal parts.**

Handle a new seal with extreme care to prevent damage. Be careful not to contaminate the precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean, lint-free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Install the shaft seal as illustrated in Figure 2.

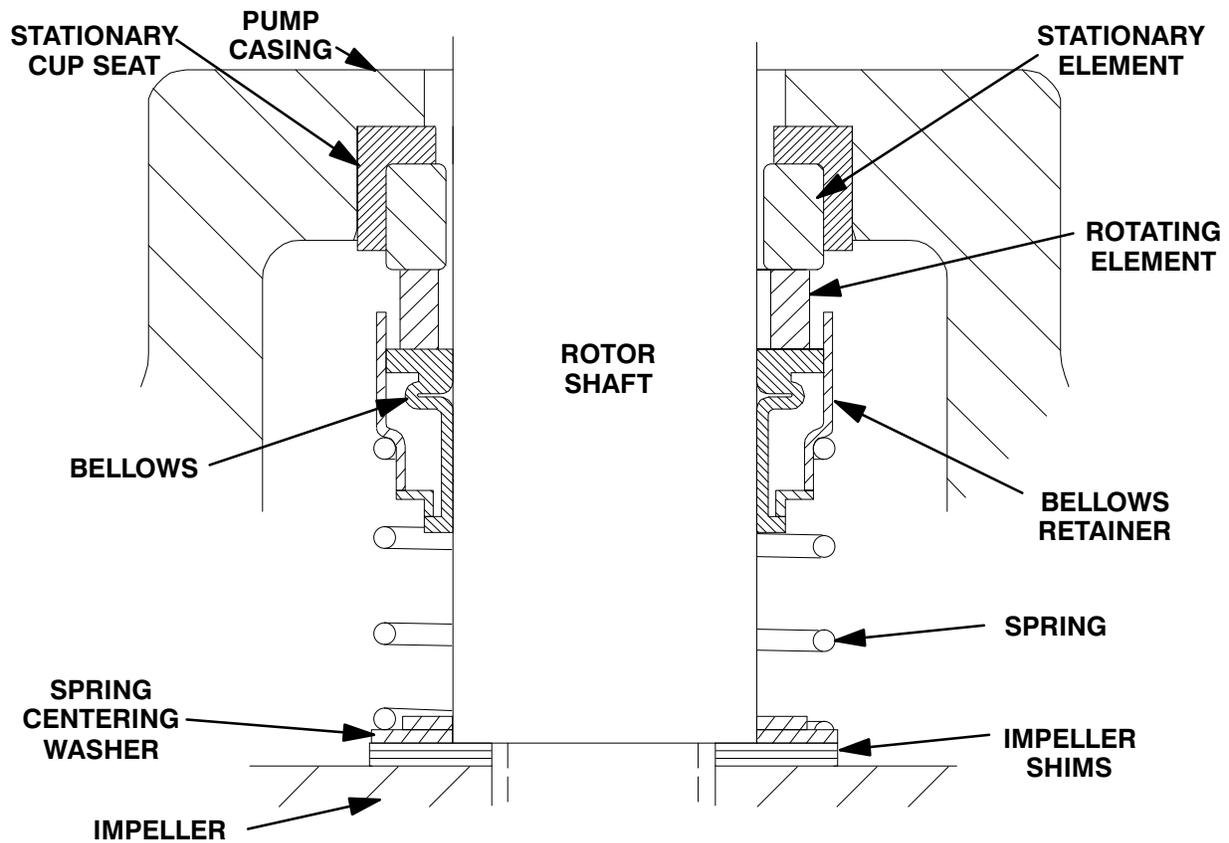


Figure 2. Seal Assembly

Seal Installation

(Figures 1 and 2)

If a **new** seal assembly is to be installed, do not unwrap it until time of installation. Cleanliness of seal components is critical, especially the seal faces.

Clean the rotor shaft and seal cavity area of the pump casing (5). Be sure the area is dry and free of lint and dirt. Check the seal bore for burrs or nicks that might prevent a good seal. Apply a **light** coating of oil to the bore.

NOTE

When pressing seal components onto the shaft, use hand pressure only. A push tube cut from a length of plastic pipe will aid in installing seal components. The I.D. of the push tube should be approximately the same as the I.D. of the seal spring.

Subassemble the stationary element in the stationary cup seat. Position this subassembly in the casing bore with the sealing face up, and cover the seal face with a clean, lint-free cloth. Use your

thumbs to press the assembly into the bore. Apply equal pressure on opposite sides until the seat contacts the bore shoulder. Remove the tissue and inspect the seal face to ensure that it is clean and dry. If cleaning is necessary, use a clean lint-free cloth to wipe **lightly** in a concentric pattern.

Lubricate and install a new casing tube O-ring (2) on the pump casing. Carefully slide the pump casing over the shaft and use a soft-faced mallet to tap the casing into the casing tube (1A) until fully seated. Secure the pump casing to the motor with the hardware (3 and 4).

Be certain the seal face of the rotating element is free of grit or surface damage. Apply a **light** coating of oil to the seal seating surface on the shaft and the I.D. of the bellows. Inspect the seal face to ensure that it is clean and dry. If cleaning is necessary, use a clean lint-free cloth to wipe in a concentric pattern.

Slide the seal rotating portion onto the lubricated shaft as shown in Figure 2. Apply firm, steady pressure on the seal retainer until it slides down the shaft.

Slide the seal spring over the shaft and bellows retainer, and install the spring centering washer. See Figure 2 for the proper order of seal assembly.

Impeller Installation

Inspect the impeller (8) for cracks, broken vanes, or wear from erosion, and replace it if damaged. Clean the threads on the rotor shaft.

Install the same thickness of impeller adjusting shims (7) as previously removed. Position the impeller against the shims and seal spring. Carefully compress the spring with the impeller until the impeller can be started on the shaft threads. Screw the impeller onto the shaft until it is fully seated.

Wedge a piece of wood between the vanes of the impeller and the inside of the pump casing.

Insert a large flat-bladed screwdriver into the slot in the end of the shaft. Turn the shaft in a **counter-clockwise** direction to secure the impeller.

Remove the block of wood, and turn the impeller to check for free rotation. If the impeller scrapes or binds against the pump casing, remove the impeller and install additional shims as required. Reinstall the impeller and re-check the clearance.

Check front impeller clearance after installing the suction cover (10).

Strainer Installation

Inspect the strainer screen (1) and suction cover (10) for cracks, distortion or erosion, and replace any defective parts.

Install the same thickness of casing gaskets (9) and position the suction cover against the gaskets. Insert a flat-bladed screwdriver in the slot in the end of the shaft, and turn the shaft to check for scraping or binding. If scraping or binding occurs, install additional gaskets.

Install the suction cover, strainer screen and strainer plate (12) and secure the parts with the hardware (13 and 14).

MOTOR DISASSEMBLY

Disassembly of the motor is rarely required except to replace electrical components or the motor brushes. Do not disassemble the motor unless it is necessary and a clean, well-equipped shop is available.

NOTE

It is recommended that a pump with a defective motor be returned to Gorman-Rupp, or to one of the Gorman-Rupp authorized Submersible Repair Centers.



Obtain the services of a qualified electrician to troubleshoot, test and/or service the electrical components of this pump.

Carefully inspect any O-rings or gaskets before removal and cleaning to determine if a proper seal and compression existed prior to disassembly. If sealing was faulty or questionable, the cause must be determined and corrected before reassembly. Replace any parts as required.

Cable Assembly and Motor Cover Removal

Total removal of the motor assembly (15) is not always required. Disassemble and replace **only** the parts proven defective by inspection or testing. See **Electrical Testing** in **TROUBLESHOOTING**.

The electrical components may be serviced without disassembling the motor housing or pump end.

Secure the pump in an upright position. To remove the motor cover, disengage the hardware (27 and 28). Use a screwdriver to carefully pry the motor cover out of the casing tube.

Carefully raise the motor cover until the electrical components are accessible. To remove the motor cover, unscrew the nut securing the red (positive) power cable lead to the shorter terminal on the circuit breaker (31).

Unscrew the twist-type connector (29) securing the black (negative) power cable lead to the red motor lead. Separate the motor cover from the casing tube.

Remove the O-ring (17) from the groove in the motor cover.

To remove the power cable assembly (16), remove the hardware (21 and 22) securing the cable clamp (23) to the motor cover. Unscrew the gland nuts (24) from the motor cover and pull the cables, spacers (25) and sealing rings (26) from the motor cover. Slide the cable clamp, sealing rings, spacers and gland nuts off the power cables.

See **Motor Cover Installation** if no further disassembly is required.

Motor Circuit Breaker Removal

If electrical testing indicates a defective circuit breaker (31), disconnect the red motor cable lead and the red power cable lead from the circuit breaker. Remove the self-tapping screws (32) securing the circuit breaker to the motor.

Motor Brush Removal

With the motor cover removed, the brushes (not shown) can be easily removed. Remove the two capscrews (not shown) in the top of the motor assembly and pry the motor casing open.

Disengage the two small screws securing the brush leads to the motor and remove the brushes.

There are no provisions for replacing motor parts. Individual motor parts are not sold separately. If the motor is damaged, the complete motor assembly must be replaced. See the parts list on page E-3 for replacement parts.

MOTOR REASSEMBLY

Motor Brush Installation

Position the new brushes (not shown) in the brush holders and secure the brush leads to the motor assembly with the two previously removed screws.

Reposition the previously separated motor casing parts. Use caution not to pinch the motor leads and to make sure the split grommet is properly positioned in the slot in the motor casing. Secure the motor casing parts with the previously removed capscrews.

Motor Circuit Breaker Installation

Secure the replacement circuit breaker (31) to the top of the motor assembly with the self-tapping screws (32). If a new motor assembly is being installed, crimp the ring terminal (30) to the black motor cable lead.

Secure the ring terminal on the black motor cable lead to the longer terminal on the circuit breaker with the previously removed nut.

Cable Assembly and Motor Cover Installation

If the cable assembly (16) was removed for replacement, slide the gland nuts (24), spacers (25) and sealing rings (26) up the ends of the cable leads approximately 12 inches (305 mm). Feed the cable leads down through the holes in the motor cover (18).

Lightly lubricate the upper casing tube O-ring (17) and install it in the groove in the motor cover.

Refer to the wiring diagram in Figure 3, and use the wire nut (29) to secure the black motor lead to the black cable lead. Secure the ring terminal on the red motor cable lead to the shorter terminal on the circuit breaker with the previously removed nut.

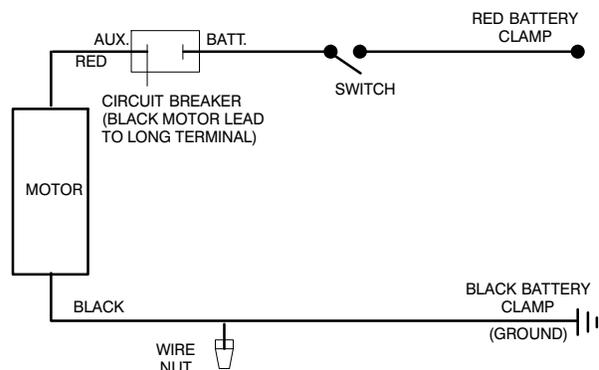


Figure 3. Wiring Diagram

With the pump end components installed and the casing tube (1A) in place, carefully pull the excess cable leads up through the holes in the motor cover.

Position the motor cover in the casing tube with the studs (1B) through the holes in the motor cover. Install the hardware (27 and 28) and tighten the nuts (27) in an alternating pattern until the motor cover is fully seated in the casing tube. Use caution not to cut or pinch the casing tube O-ring.

Slide the sealing rings (26) down the cable leads and into the bores in the motor cover. Slide the spacers (25) down the leads onto the sealing rings.

Screw the gland nuts (24) into the motor cover to seal the cables.

Secure the cable leads to the motor cover with the cable clamp (23) and hardware (21 and 22).

If removed, reinstall the lifting handle (20) and secure it with the jam nut (19).

Proceed with **PUMP END REASSEMBLY**.

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