

Please read and save this Repair Parts Manual. Read this manual and the General Operating Instructions carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. The Safety Instructions are contained in the General Operating Instructions. Failure to comply with the safety instructions accompanying this product could result in personal injury and/or property damage! Retain instructions for future reference.

Self-Priming Centrifugal Pumps

Medium Volume Dewatering Models

Refer to form 1808-634-00 for General Operating and Safety Instructions.

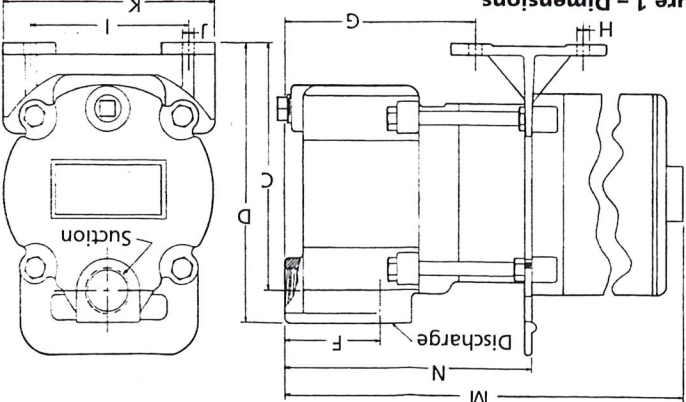
Service Manual

Model	Req'd HP
2851, 285E	0.58
2855, 285D	0.75
2852, 285F, 285M, 285P	0.80
2853, 2856, 285G, 285J	1.13
2855, 2857, 285H, 285K	1.40
285A, 285C	1.50

Description
 These self-priming (to 15 ft. lift (to 10 ft. lift on aluminum models)) centrifugal pumps are designed for general purpose liquid transfer. Pumps include a semi-open clog resistant impeller. Handle liquids from 40° to 180° F (4° to 82° C) with Buna N seals and 40° to 200° F (4° to 93° C) with Viton seals. Some units will handle liquid with up to 1.65 specific gravity (see "Performance"). For use with non-flammable, non-abrasive, liquids compatible with pump component materials.

PUMPS
 Motorized units are direct coupled to a 3450 RPM motor (see Specifications for additional motor data). Single phase pump motors have automatic reset thermal protection. All models are manual mode and require field wiring, no controls are supplied. Check motor wiring before putting unit into operation (see motor nameplate for specific wiring diagram).

UNITS SHIPPED WITHOUT MOTOR
 Some models are not equipped with motors. They are suitable for mounting to 3450 RPM, NEMA 56J face threaded shaft motors, with counterclockwise rotation (looking at motor shaft). To find motor's available horsepower multiply motor's rated horsepower by service factor. This number must be equal to or greater than that required by pump. To determine minimum horsepower requirements of pump see chart.



Model	Suc.*	Dis.*	C	D	F	G	H	I	J	K	MT	N
2851-95	1"	1"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	16.02	7.88
2852-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	16.02	7.88
285M-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	16.02	7.88
285E-95	1"	1"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	16.02	7.88
2853-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	16.52	7.88
285F-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	16.77	7.88
285P-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	17.94	7.88
2855-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	17.32	7.88
285G-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	17.02	7.88
2857-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	17.15	7.88
2851-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	18.32	7.88
285H-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	17.94	7.88
285K-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	19.19	7.88
2851-96	1"	1"	6.79	7.98	2.81	6.13	0.75	4.50	0.50	6.00	16.02	7.88
285E-96	1"	1"	6.79	7.98	2.81	6.13	0.75	4.50	0.50	6.00	17.44	7.88
285B-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	17.94	7.88
285D-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	17.32	7.88
285C-95	1 1/4"	1 1/4"	5.94	7.13	2.81	6.88	0.44	6.00	0.44	7.00	18.32	7.88

NOTE: All dimensions have a tolerance of ±1/8".
 (*) Standard NPT (female) pipe thread.
 (†) This dimension may vary due to motor manufacturer's specifications.

Self-Priming Centrifugal Pumps

Medium Volume Dewatering Models

Specifications

Model	HP	Phase	Enclosure	Volts	Hertz	NEMA Frame	RPM	PUMP Port Size (Inches)*	Casing	Adapt. Imp.	Sealst.	Ship Weight (Lbs.)	
2851-95	1/3	1	ODP	115/230	60	56J	3450	1 x 1	CI	CI	CI	Buna N	39
2852-95	1/2	1	ODP	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	42
285M-95	1/2	3	ODP	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	45
285E-95	1/2	1	TEFC	115/230	60	56J	3450	1 x 1	CI	CI	CI	Buna N	43
2853-95	3/4	1	ODP	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	43
2856-95	3/4	3	ODP	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	43
285F-95	3/4	1	TEFC	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	48
285P-95	3/4	3	TEFC	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	48
285P-95	3/4	3	TEFC	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	43
2855-95	1	1	ODP	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	46
2857-95	1	3	ODP	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	44
285G-95	1	3	TEFC	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	48
285J-95	1	3	TEFC	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	44
285H-95	1 1/2	1	TEFC	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	55
285K-95	1 1/2	3	TEFC	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	Buna N	48
2851-96	1/3	1	ODP	115/230	60	56J	3450	1 x 1	AL	AL	AL	Viton	25
285E-96	1/2	1	TEFC	115/230	60	56J	3450	1 x 1	AL	AL	AL	Viton	29
285B-95	3/4	1	TEFC	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	SS Viton	48
285D-95	3/4	3	TEFC	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	SS Viton	46
285A-95	1 1/2	1	TEFC	115/230	60	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	SS Viton	55
285C-95	1 1/2	3	TEFC	230/460	60/50	56J	3450	1 1/2 x 1 1/2	CI	CI	CI	SS Viton	48

(*) Standard NPT (female) pipe thread.
 (†) Shaft seal also contains carbon, ceramic, and stainless steel components.
 NOTE: Driver data is subject to change without notice, see label on driver for actual specifications.

Performance

Model	HP	(TEFC) Totally Enclosed Fan Cooled	(ODP) Open Drip Proof	(CI) Cast Iron	(AL) Aluminum	(SS) Stainless Steel	Max. Head**
2851-96†	1/3	1	1	1	1	1	33 ft.
2851-95, 285E-96†	1/3	3	3	3	3	3	33 ft.
2852, 285F, 285M, 285P	1/2	1	1	1	1	1	52
2852, 285F, 285M, 285P	1/2	3	3	3	3	3	59
2853, 2856, 285G, 285J	3/4	1	1	1	1	1	65
2853, 2856, 285G, 285J	3/4	3	3	3	3	3	65
2855, 2857, 285H, 285K	1	1	1	1	1	1	70
2855, 2857, 285H, 285K	1	3	3	3	3	3	70
285B, 285D	3/4	1	1	1	1	1	51
285B, 285D	3/4	3	3	3	3	3	51
285A, 285C	1 1/2	1	1	1	1	1	64
285A, 285C	1 1/2	3	3	3	3	3	64

(†) Handles liquids up to 1.65 specific gravity.
 (**) Shut-off; to convert to PSI, multiply by SG (specific gravity of liquid), then divide by 2.31.
 (ODP) Open Drip Proof; (TEFC) Totally Enclosed Fan Cooled

Assembly

MOTOR (FOR UNITS SHIPPED WITHOUT MOTOR ONLY)

- If any parts are missing or damaged, do not attempt to assemble or operate pump until replacement parts are obtained and properly installed.
- Verify that motor conforms to ALL standards specified in "Description", and is equipped with flinger washer (Ref. No. 2) not included with pump head.

WARNING

- Make certain that the power source is disconnected before attempting to service or disassemble any components; lock it in the open position and tag to prevent application of power.
- Place motor in vertical position with shaft end up. Set adapter (Ref. No. 3) on top of motor.
 - See "Shaft Seal Replacement" and follow steps to complete assembly.

MECHANICAL SEAL REPLACEMENT

- IMPORTANT: Always replace both the seal seat (Ref. No. 6) and the seal head (Ref. No. 8) to insure proper mating of mechanical seal components!
- NOTE: It is not necessary to remove piping from pump casing. The motor and impeller assembly is removed from back of casing.
- Unthread cap screws (Ref. No. 13) and remove pump casing (Ref. No. 11)

Models 2851, 2852, 2853, 2855, 2856, 2857, 285A, 285B, 285C, 285D, 285E, 285F, 285G, 285H, 285J, 285K, 285M and 285P

Model 285E

Maintenance (Continued)

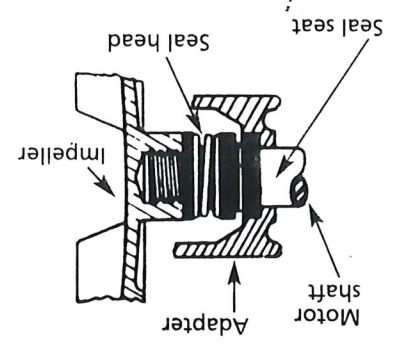


Figure 2 - Models 2851, 2852, 2853, 2855, 285E, 285F, 285G, 285H

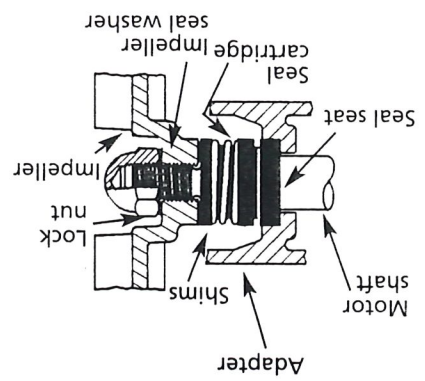


Figure 3 - Models 2856, 2857, 285A, 285M, 285P, 285B, 285C, 285D, 285J, 285K

from adapter (Ref. No. 5).

2. The motor used with this pump is a 56l frame. It has a threaded shaft; impeller is screwed directly onto shaft. To unscrew the impeller (Ref. No. 10), turn counterclockwise (CCW) facing impeller.

NOTE: A screwdriver slot or two flats for use with an open end 7/16" wrench, are provided at the rear of the motor shaft (remove bearing cap for access). To hold the motor shaft from turning, either insert a large screwdriver blade into the slot or use a 7/16" wrench across the flats.

Before removing impeller, remove impeller nut (Ref. No. 15) and impeller seal washer (Ref. No. 16) (where applicable).

3. Remove the adapter from the motor and

mounting face. The seal head (Ref. No. 8) and impeller shims (Ref. No. 9) will come loose at this time.

IMPORTANT: Retain impeller shims for use when reassembling unit.

4. Push seal seat (Ref. No. 6) from the adapter recess with a screwdriver.

5. Clean the adapter recess before inserting a new seal seat.

6. Carefully wipe the ceramic surface of the new seal seat with a clean cloth.

7. Wet the rubber portion of the seal seat with a light coating of soapy water.

8. Press the new seal seat squarely into the cavity in the adapter. If the seal seat does not press squarely into the cavity, it can be adjusted into place by pushing on it with a piece of cardboard between the pipe and seal seat to avoid scratching the seal seat. (This is a lapped surface and must be handled very carefully.)

9. After the seal seat is in place, insure that it is clean and has not been marred.

10. Using a clean cloth, wipe the shaft and make certain that it is perfectly clean.

NOTE: If removed, slide flinger washer (Ref. No. 2) onto the shaft until it is located approximately 1/8" from the face of the motor bearing hub.

11. Secure the adapter (Ref. No. 5) on the motor mounting face. Carefully guide motor shaft through the seal seat.

12. Apply a light coating of soapy water to the inside rubber portion of seal head (Ref. No. 8) and slide onto the shaft (with the sealing face first) so that the rubber portion is just up over the shaft shoulder.

13. Replace any impeller shims which may have been removed in disassembly. (See "Shim Adjustment".)

14. Screw the impeller (Ref. No. 10) back in place, tightening until it is against

the shaft shoulder.

NOTE: After impeller clearance has been set (see "Shim Adjustment"), place a new impeller seal washer onto exposed shaft. Screw impeller nut onto shaft and tighten (where applicable).

15. Remount the pump casing (Ref. No. 11) on the adapter (Ref. No. 5). (See "Shim Adjustment" if motor or impeller was replaced.)

IMPORTANT: Always inspect the O-ring gasket (Ref. No. 7) for cracks or cuts when unit is disassembled, replace if damaged.

SHIM ADJUSTMENT

When installing a replacement impeller (Ref. No. 10) or motor (Ref. No. 1), it may be necessary to adjust the number of shims (Ref. No. 9) to insure proper running clearance between the impeller and the casing. Proceed as follows:

NOTE: A proper running clearance is less than 0.010.

1. For impeller replacement, add one (1) shim in addition to the one (1) removed originally.

2. For motor replacement, add two (2) shims in addition to the shims removed during disassembly.

3. Reassemble the pump using **MECHANICAL SEAL REPLACEMENT** for reference.

IMPORTANT: Insure that the casing is snugly in place and check the shaft to make sure it is turning freely (use the screwdriver slot in the motor to turn the shaft). If it turns freely, check to insure that the casing cover and casing are fitted "metal to metal" where they meet on the outside. If they are not "metal to metal" tighten the fasteners (Ref. No. 13) and recheck the shaft for free turning. Tighten carefully turning over the shaft shoulder.

13. Replace any impeller shims which may have been removed in disassembly. (See "Shim Adjustment".)

14. Screw the impeller (Ref. No. 10) back in place, tightening until it is against

2851, 2852, 2853, 2855, 2856, 2857, 285A, 285B, 285C, 285D, 285E, 285F, 285G, 285H, 285J, 285K, 285M and 285P

Specifications Information and Repair Parts Manual

For Repair Parts, contact dealer where pump was purchased.

Please provide following information:

-Model number

-Serial number (if any)

-Part description and number as shown in parts list

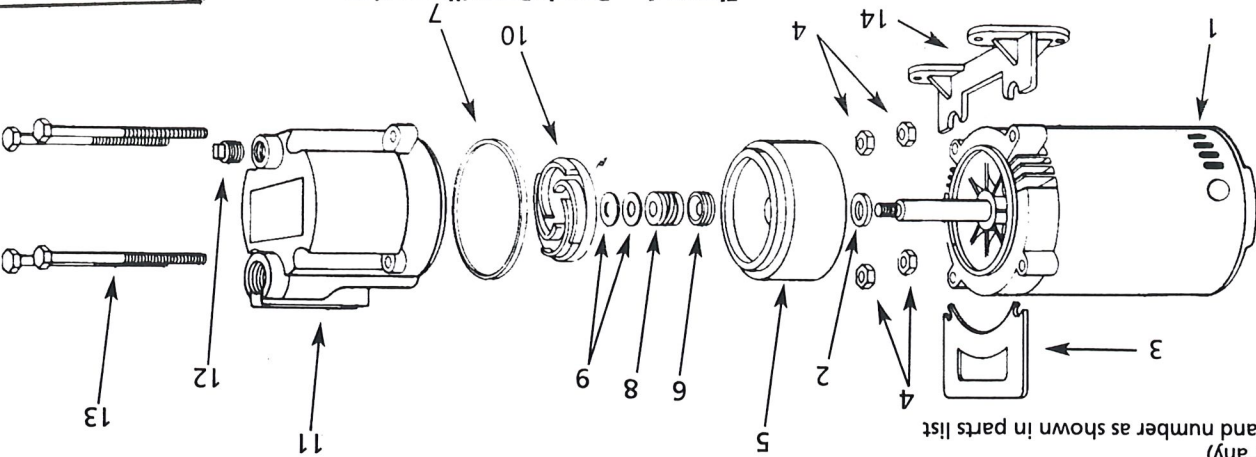


Figure 4 — Repair Parts Illustration

Repair Parts List

Ref. No.	Description	2852-95 & 285F-95	2853-95 & 285G-95	2854-95 & 285H-95	2855-95 & 285J-95	2856-95 & 285K-95	2857-95 & 285L-95	2858-95 & 285M-95	2859-95 & 285P-95	Qty.
Part Number for Models:										
1	Motor (ODP)	1626-09-00	1626-010-00	1626-011-00	1626-014-00	1626-015-00	1626-015-00	1626-008-00	1626-013-00	1
2	Slinger washer (TEFC)	1626-051-00	1626-069-00	1626-050-00	1626-077-00	1626-053-00	1626-053-00	1626-052-00	1626-052-00	1
3	Handle	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1
4	Fastener	*	*	*	*	*	*	*	*	4
5	Adapter	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1
6 & 8	Shaft seal assembly (Buna N)	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1
7	O-ring (Buna N) (Viton)	1531-000-00	1531-000-00	1531-000-00	1531-000-00	1531-000-00	1531-000-00	1531-000-00	1531-000-00	1
9	Shim package (Viton)	-	-	-	-	-	-	-	-	1
10	Impeller (1 of each) 0.010", 0.020", 0.030" (1 of each)	1657-000-90	1537-000-02	1657-000-90	1541-000-03	1657-000-90	1657-000-90	1657-000-90	1657-000-90	1
11	Casing	1558-000-02	1558-000-02	1558-000-03	1558-000-03	1558-000-03	1558-000-03	1558-000-01	1558-000-01	1
12	1/2" NPT Drain plug	*	*	*	*	*	*	*	*	1
13	Fastener	*	*	*	*	*	*	*	*	4
14	Foot	-	-	-	-	-	-	-	-	1
15	Impeller seal washer	-	-	-	-	-	-	-	-	1
16	Impeller nut	-	-	-	-	-	-	-	-	1

(*) Standard hardware item, available locally. (†) Includes handle and foot (unitized construction) (-) Not applicable (t) Not shown

1	Motor (ODP)	1626-051-00	1626-052-00	1626-050-00	1626-053-00	1626-053-00	1626-053-00	1626-052-00	1626-013-00	1
2	Slinger washer (TEFC)	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1534-000-00	1
3	Handle	-	-	-	-	-	-	-	-	1
4	Fastener	*	*	*	*	*	*	*	*	4
5	Adapter	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1560-000-01†	1
6 & 8	Shaft seal assembly (Buna N)	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1640-161-90	1
7	O-ring (Buna N) (Viton)	-	-	-	-	-	-	-	-	1
9	Shim package (Viton)	1532-000-00	1532-000-00	1532-000-00	1532-000-00	1532-000-00	1532-000-00	1532-000-00	1532-000-00	1
10	Impeller (1 of each) 0.010", 0.020", 0.030" (1 of each)	1657-000-90	1657-000-90	1657-000-90	1657-000-90	1657-000-90	1657-000-90	1657-000-90	1657-000-90	1
11	Casing	1558-000-02	1558-000-02	1558-000-03	1558-000-03	1558-000-03	1558-000-03	1558-000-01	1558-000-01	1
12	1/2" NPT Drain plug	*	*	*	*	*	*	*	*	1
13	Fastener	*	*	*	*	*	*	*	*	4
14	Foot	-	-	-	-	-	-	-	-	1
15	Impeller seal washer	1471-020-00	1471-020-00	1471-020-00	1471-020-00	1471-020-00	1471-020-00	1471-020-00	1471-020-00	1
16	Impeller nut	1784-000-00	1784-000-00	1784-000-00	1784-000-00	1784-000-00	1784-000-00	1784-000-00	1784-000-00	1

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Electric Motor-Driven Pumps

Refer to Specifications Information and Repair Parts Manual for product specific information

Safety Guidelines

This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols:

▲ DANGER

Danger indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

▲ WARNING

Warning indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

▲ CAUTION

Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury. NOTE: indicates important information that, if not followed, may cause damage to equipment. When unpacking the unit, inspect carefully for any damage that may have occurred during transit. Check for loose, missing or damaged parts. (See pump exploded view and Repair Parts List.) Do not attempt to assemble or operate pump if any parts are missing or damaged.

Determine that all parts are properly installed.

General Safety Information

1. Know the pump application, limitations, and potential hazards.

▲ WARNING

only be used with liquids compatible with pump component materials.



Do not use to pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in flammable and/or explosive atmospheres.

When pumping hazardous or dangerous materials, use only in room or area designated for that purpose. For your protection, always wear proper clothing, eye protection, etc. in case of any malfunction. For proper handling techniques and cautions, contact your chemical supplier, insurance company and local agencies (fire dept., etc.). Failure to comply with this warning could result in personal injury and/or property damage.

2. Make certain that the power source conforms to the requirements of your equipment.
3. Provide adequate protection and guarding around moving parts.
4. Disconnect power before servicing. If the power

disconnect is out of sight, lock in the open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock!

5. Release all pressure within the system before servicing any component.

6. Drain liquids from the system before servicing.

7. Secure the discharge line before starting the pump. An unsecured discharge line will whip, possibly causing personal injury and/or property damage.

8. Check hoses for weak or worn condition before each use. Make certain that all connections are secure.

9. Periodically inspect pump and system components. Perform routine maintenance as required (See Maintenance section).

10. Provide a means of pressure relief for pumps whose discharge line can be shut off or obstructed.

11. Personal Safety:

- a. Wear safety glasses at all times when working with pumps.
- b. Wear a face shield and proper apparel when pumping hazardous chemicals.
- c. Keep work area clean,

Electric Motor-Driven Pumps

General Safety Information (Cont.)

uncluttered, and properly lighted; replace all unused tools and equipment.

d. Keep visitors at a safe distance from the work area.

e. Make workshop child-proof - with padlocks, master switches, and by removing starter keys.

12. This unit is not water-

proof and is not intended to be used in showers, saunas, or other potentially wet locations. The motor is designed to be used in a clean dry location with access to an adequate supply of cooling air. Ambient temperature around the motor should not exceed 104°F (40°C). For outdoor installations, motor must be protected by a cover that does not block airflow to and around the motor. This unit is not weather-proof nor is it able to be submerged in water.

13. When wiring an electrically driven pump, follow all electrical and safety codes, as well as the most recent United States National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

▲WARNING
Risk of electric shock!

14. **THREE-PHASE MOTORS:**

These units are for permanent installation using a power supply with a ground. To reduce the risk of electric shock, electric motor must be adequately grounded to a metal raceway system, or by using a separate grounding wire connected to bare metal on the motor frame, or to the grounding screw located inside motor terminal box, or by other suitable means. Refer to the most recent National Electrical Code (NEC) Article 250 (Grounding) for additional information. ALL WIRING SHOULD BE DONE BY A QUALIFIED ELECTRICIAN.

On three-phase power, voltages on all three lines should be balanced within 1%. Unbalanced voltages cause motor overheating and poor performance.

▲WARNING

Risk of electric shock! Never connect the green (or green and yellow) wire to a live terminal!

15. **SINGLE PHASE MOTORS:** These units can be wired for either port-

ability, with flexible 3-wire cord, or permanent installation using a supply with a ground. To reduce

the risk of electric shock, the motor must be securely and adequately grounded! This can be accomplished by either 1) inserting plug (portable) directly into a properly installed and grounded 3-prong grounding type receptacle (as shown in Figure A for 110-120 volt, or Figure B for 220-240 volt); 2) permanently wiring the unit with a grounded, metal raceway system; 3) Using a separate ground wire connected to the bare metal of the motor frame; 4) Other suitable means. The green (or green and yellow) conductor in the cord is the grounding wire.

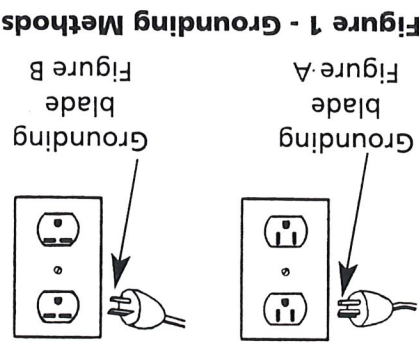


Figure 1 - Grounding Methods

Where a 2-prong wall receptacle is encountered, it must be replaced with a properly grounded 3-prong receptacle installed in accordance with the National Electrical Code, local codes and ordinances. To ensure a proper ground, the grounding means must be tested by a quali-

General Safety Information (Cont.)

16. Use only 3-wire extension cords that have 3-prong grounding type plugs and 3-pole receptacles that accept the equipment plug.
 17. All wiring should be performed by a qualified electrician.
 18. Protect electrical cord from sharp objects, hot surfaces, oil, and chemicals. Avoid kinking the cord. Replace or repair damaged or worn cords immediately.
 19. Keep fingers and foreign objects away from ventilation and other openings. Do not insert any objects into the motor.
 20. Use wire of adequate size to minimize voltage drop at the motor.
 21. Disconnect power before servicing a motor or its load. If the power disconnect is out of sight, lock it in the open position and tag it to prevent unexpected application of power.
 22. Do not touch an operating motor. Modern motors are designed to operate at high temperatures.
- Do not handle a pump or pump motor with wet hands or when standing**

WARNING

Do not handle a pump or pump motor with wet hands or when standing

on a wet or damp surface, or in water.

WARNING

All single phase

pump motors are equipped with an automatic resetting thermal protector and may restart unexpectedly.

Protector tripping is an indication of motor overloading as a result of operating the pump at low heads (low discharge restriction), excessive high or low voltage, inadequate wiring, incorrect motor connections, or a defective motor or pump.

Installation

The pumps should not

WARNING

be used in flammable or explosive atmospheres. In order to safely use this product, familiarize yourself with this pump and also with the liquid (chemical, etc.) that is going to be pumped through the unit. This pump is not suitable for many liquids.

For installations where property damage might result from an inoperative or leaking pump due to power outages, discharge line blockage, or any other reason, a backup system(s) should be used.

Failure to follow any warning can result in personal injury and/or property damage.

LOCATION

— Open, Drip-proof Motor - Clean dry locations with access to an adequate supply of cooling air.

- Totally Enclosed Motor - Harsher environments where damp and dirty conditions may exist. Totally enclosed motors are not water proof.
- Use only UL listed Hazardous Location motors for service in Hazardous Locations as defined in Article 500 of the NEC.
- Temperature around the motor should not exceed 104°F (40°C). Minimum temperature is -20°F (29°C).
- If the motor nameplate indicates "Air-Over, Cont. A.O.," etc., the motor must be mounted in the air stream of an air moving device.
- 1. Locate pump as close to the fluid source as possible, thus making the suction line short and direct as possible.

CAUTION

The unit should be placed where the motor and electrical components are protected from the weather and extremes of heat, cold and humidity.

2. Attach piping suction line to suction inlet and piping discharge line to discharge outlet. Avoid using looped section of pipe or fittings which might permit air to insure airtight pipe connections.

IMPORTANT: If plastic or fabric hose is used for the

Installation (Cont.)

- suction piping, it should be of a reinforced type so as not to collapse under suction. The suction piping should be one size larger than the discharge piping.
3. Support the piping independently of the pump to avoid universal or excessive stresses on the pump casing, which would cause impeller misalignment and possible pump failure.
4. Install both a union and a gate valve (not furnished) on the discharge side of the pump for service convenience.

▲ CAUTION

Do not use a globe or

- other restricting type of valve at the discharge. Globe valves seriously restrict the capacity of the pump; however, restricting the discharge of a centrifugal pump will not overload the drive motor.
5. **SELF-PRIMING PUMPS:** It is recommended that a foot-valve be used on the suction line to assure quick priming and that a suitable suction strainer be attached to the suction line so that large pieces of foreign material are not drawn into the pump.

6. **WIRING:** For proper electrical connections, refer to the diagram located on the nameplate or inside the terminal of the motor. Make sure the connections are correct for the voltage

being supplied to the motor. Connections should be made with flexible conduit to minimize vibration transmission.

Whenever possible, the pump should be powered from a separate branch circuit of adequate capacity to keep voltage drop to a minimum during starting and running. For longer runs, increase wire size in accordance with the Wire Selection Guide.

- Select the voltage to be used, either
- a. Single phase - 115V or 230V
 - b. Three-phase - 230V or 460V

Check motor wiring to verify which voltage the motor is currently wired for. If the wiring must be changed to conform to a specific voltage requirement, then the motor should be wired according to recommendations of wiring diagrams located on motor nameplate or wiring compartment cover. Make sure unit is properly grounded. A motor to be used with single-phase power cannot be used with three-phase power and vice versa. If unsure about the above information or the wiring diagram, consult an electrician familiar with motor wiring.

▲ WARNING

A wrong connection

can burn out the pump motor, cause an electrical short, or produce an electrical shock. Failure to follow the above warning can result in property damage and/or personal injury. Always wire the motor with a three-wire system, ensuring that a ground wire runs to a good electrical ground such as a grounded water system or conduit. Also, ensure that a good electrical ground is provided at the supply end of the line.

7. Do not operate pump dry. Mechanical seal damage will result.
8. Install any auxiliary components (e.g. pressure switch, time).

Operation

SELF-PRIMING PUMPS

It is necessary to prime the pump before initial start up. Prime the pump by filling the casing with liquid through the top fill plug, the discharge port, or by installing a pipe tee at the discharge of the pump. (When installing a tee, use the horizontal leg of the tee as the pump discharge and place a pipe plug in the vertical leg. This procedure will help facilitate priming later.)

NON-PRIMING PUMPS

1. The casing and suction dip-

Operation (Cont.)

ing must be filled with liquid before the unit can begin pumping. In order to completely fill casing with liquid, entrapped air in casing must be vented. This is accomplished by momentarily loosening or removing the top drain plug located on the casing.

▲ CAUTION

Do not run pump dry as permanent damage to the mechanical seal will result.

2. Activate the unit.

IMPORTANT: Proper Rotation - Power supply

should be applied momentarily to the pump at first and the direction of rotation checked. When viewing the front of the pump, the motor shaft (impeller) should be rotating counterclockwise. If it is not, disconnect power and re-check wiring to motor. (See "Installation" section.)

To change rotation on three-phase models, interchange any two incoming line (power) leads. Other models, consult driver information that came with driver.

NOTE: Never shut off discharge or restrict suction

flow while the pump is operating. It may take up to 5 minutes for a **SELF-PRIMING** pump to prime if long horizontal/vertical lines are used. If pump has not picked up prime in 2 minutes, re-priming and casing after let-

ting unit cool down for 5 minutes. Re-check all suction connections making sure pipe compound has sealed all connections. Initial priming may take 2 to 3 tries to prime successfully.

▲ CAUTION

The proper impeller (motor) rotation is CCW facing the front of the pump. Wrong rotation will give low performance, low head, and could damage unit and/or injure personnel.

3. On initial start-up (after 15 minutes running time), check power consumption to be sure motor is not overloaded.

4. If motor is overloaded, install a valve on discharge to increase back pressure. Close the valve until pump motor is below full name-plate, or within Service Factor (SF) amps.

Maintenance

▲ WARNING

Make certain that the unit is disconnected from the power source before attempting to service or remove any components!

NOTE: Always flush pump thoroughly after use or if unit is not going to be used for any prolonged length of time to prevent crystallization and/or damage to seal and pump.

ROUTINE

1. Pump should be drained when subjected to freezing temperatures.

1. Properly selected and installed electric motors are capable of operating for years with minimal maintenance. Periodically clean dirt accumulations from open-type motors, especially in and around vent openings, preferably by vacuuming (avoids imbedding dirt in windings).
2. Clean the suction line strainer at regular intervals.
3. Properly selected and installed electric motors are capable of operating for years with minimal maintenance. Periodically clean dirt accumulations from open-type motors, especially in and around vent openings, preferably by vacuuming (avoids imbedding dirt in windings).

4. Periodically check to see if electrical connections are tight.

5. Pump should be checked daily, weekly, monthly, etc. for proper operation. If anything has changed since unit was new, unit should be removed and repaired or replaced.*Only qualified electricians or service personnel should attempt to repair this unit. Improper repair and/or assembly can cause an electrical shock hazard.

Electric Motor-Driven Pumps

Troubleshooting Chart

Symptom **Possible Cause(s)** **Corrective Action**

Motor will not start or run

1. Improperly wired circuit breaker

2. Blown fuse or open circuit breaker

3. Loose or broken wiring

4. Stone or foreign object lodged in impeller

5. Motor shorted out

6. Thermal overload has opened circuit

7. Voltage too low at motor terminals due to line drop

Motor runs slowly; will not get up to speed

1. Motor wired improperly

2. Capacitor burned out (single-phase units only)

3. Voltage too low at motor terminals

4. Check and recheck wiring diagram on motor. Make internal wiring changes in wiring compartment

5. Replace capacitor

6. Increase wire size. Check for poor connections. Check for voltage unbalance (3-phase)

Motor overheats while running under load

1. Dirt blocking ventilation openings

2. Unbalanced supply voltage

3. Faulty connection

4. High or low voltage

5. Check for faulty connections. Voltage on all three lines should be balanced within 1%. Excessive single phase loads

6. Clean, tighten, or replace

7. Check voltage at motor, should not be more than 10% above or below rated

Pump will not prime

1. No priming water in casing

2. Mechanical seal is leaking

3. Leak in suction line

4. Discharge line is closed and priming air has nowhere to go

5. Suction line (or valve) is closed

6. Fill pump casing

7. Replace (See Maintenance)

8. Use thread sealant on piping, tighten, repair or replace

9. Open

10. Open

Troubleshooting Chart (Continued)

Symptom	Possible Cause(s)	Corrective Action
Pump will not prime (cont.)	6. Pipe union was used on suction side instead of discharge	6. Remove union from suction side. Replace with single section of pipe
	7. Pump is worn	7. Replace worn parts
Little or no discharge	1. Casing not filled with water	1. Fill pump casing with liquid
	2. Total head too high	2. Shorten suction lift and/or discharge head
	3. Suction head too high	3. Lower suction head, install foot valve and prime
	4. Impeller plugged	4. Disassemble pump and clean impeller
	5. Rotation incorrect	5. Correct (See wiring diagram on motor)
	6. Hole or air leak in suction line	6. Repair or replace suction line
	7. Foot valve was too small	7. Match foot valve to piping or install one size larger foot valve
	8. Impeller damaged	8. Replace
	9. Foot valve or suction line not submerged deep enough in water	9. Submerge lower in water
	10. Suction piping too small	10. Increase to pump inlet size or one size larger
	11. Discharge piping too small	11. Match to discharge outlet size on pump
	12. Motor wired incorrectly	12. Check wiring diagram
	13. Casing gasket leaking	13. Replace
	14. Suction or discharge line valve closed	14. Open
	15. Single-phase, new installation. Motor wired for 230V, etc. but supply is 115V, etc.	15. Check voltage of incoming power supply. Rewire as necessary
	16. Mechanical seal is leaking	16. Replace (See Maintenance)
Loss of suction	1. Air leak in suction line	1. Use thread sealant on piping, tighten, repair or replace
	2. Suction lift too high	2. Lower suction lift, install foot valve and prime
	3. Clogged foot valve or strainer	3. Clean

Electric Motor-Driven Pumps

Troubleshooting Chart (Continued)

Symptom	Possible Cause(s)	Corrective Action
Pump vibrates and/or makes excessive noise	<ol style="list-style-type: none"> 1. Mounting plate or foundation not rigid enough 	<ol style="list-style-type: none"> 1. Reinforce
Pump leaks at shaft	<ol style="list-style-type: none"> 1. Damaged or worn mechanical seal 	<ol style="list-style-type: none"> 1. Replace (See Maintenance)
Pinholes in casting, drips around seal area	<ol style="list-style-type: none"> 1. Foreign material in pump 2. Impeller damaged 3. Worn motor bearings 4. Suction lift too high 5. Cavitation present 	<ol style="list-style-type: none"> 2. Disassemble pump and clean 3. Replace 4. Replace 5. Decrease suction lift 6. Check suction line for proper size and be sure valve is open. Remove excessive loops in suction line. Install gate valve on discharge side of pump and reduce flow as necessary to match suction conditions available
Pump leaks at shaft	<ol style="list-style-type: none"> 1. Corrosion due to character of liquid pumped 2. Abrasive material in liquid causing an accumulation around the rotating assembly which results in faces opening up and allowing grit between them 3. Liquid not compatible with seal 4. Temperature too high 	<ol style="list-style-type: none"> 2. Discontinue pumping liquid and consult factory 3. Pump not designed for abrasives. Discontinue use 4. Consult factory. Operational seal may be available 5. Lower liquid temperature below temperature rating of pump, See specifications
Pinholes in casting, drips around seal area	<ol style="list-style-type: none"> 1. Cavitation caused by insufficient inlet pressure or suction head (NPSH) 	<ol style="list-style-type: none"> 1. Increase inlet pressure by adding a higher liquid level of fluid to source, increasing inlet pressure, or remove piping restrictions (valves, loops, etc.) in suction line