



INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS FOR 12V FRAME L&H VERTICAL PUMPS

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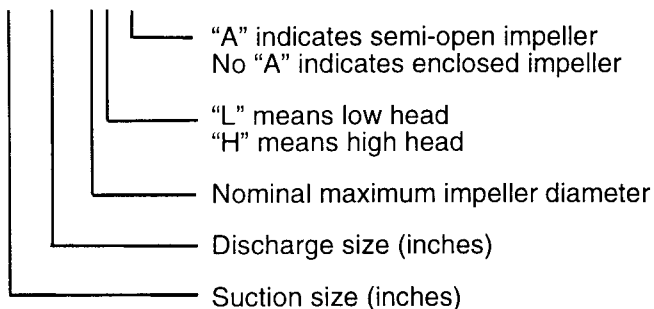
I. GENERAL DESCRIPTION AND SAFETY PRECAUTIONS.

A. GENERAL DESCRIPTION. The 12V Frame L&H Vertical Pump is flexible coupled to a constant speed motor. Chair mounts are provided for standard motors and barrel mounts for "C" face motors. The pump and motor are mounted on a structural steel baseplate. The pump end basically consists of a casing, shaft, impeller, backcover, suction cover, columns, baseplate, discharge piping, bearing frame, and bearings. The bearings frame supports the bearings above the solution tank, thereby preventing contamination of the bearings. Bearings are also protected from fluid and vapors by bearing cap and shaft seals.

Impellers on the 12V Frame L&H Vertical Pump are either enclosed or semi-open. Some pumps with enclosed impellers contain a renewable wear ring in the suction cover.

B. PUMP IDENTIFICATION. Use the following example for identifying information about your pump model number.

2 x 2 x 7LA



C. NAMEPLATE. A nameplate is attached to each pump. The data on the nameplate should be recorded and filed for easy reference. Nameplate data should be furnished to Carver Pump Company or its representative when ordering spare parts or requesting information. The serial number of the pump is also stamped on the circumference of the suction flange. Record pump serial number and model number below.

Pump Serial Number _____

Pump Model Number _____

D. SAFETY PRECAUTIONS. The manual contains descriptions and instructions which are the result of carefully conducted engineering and research efforts. The manual is designed to provide adequate instructions for the safe and efficient installation, operation, and maintenance of the pump. Failure or neglect to properly install, operate, or maintain the pump may result in personal injury, property damage, or unnecessary damage to the pump.

Variations exist in both the equipment used with these pumps and in particular installation of the pump and driver. Therefore, specific operating instructions are not

within the scope of this manual. This manual contains general rules for installation, operation, and maintenance of the pump.

Observe all caution or danger tags attached to the equipment or included in this manual.

CAUTION

IMPORTANT SAFETY NOTICE

Installation, use, and operation of pumping equipment is affected by various federal, state, and local laws and the regulations concerning OSHA. Compliance with such laws relating to the proper installation and safe operation of pumping equipment is the responsibility of the equipment owner and all necessary steps should be taken by the owner to assure compliance with such laws before operating the equipment.

II. INSPECTION AND STORAGE.

A. INSPECTION. Upon receipt of the shipment, unpack and inspect the pump, driver assemblies, and individual parts to insure none are missing or damaged. Carefully inspect all boxes and packing material for loose parts before discarding them. Immediately report any missing parts or damage incurred during shipment to the factory and to the transportation company and file your "damaged and/or lost in shipment" claim with carrier.

B. STORAGE OF PUMP. If the equipment is not to be immediately installed and operated, store it in a clean, dry well-ventilated place, free from vibrations, moisture, and rapid or wide variations in temperature. Rotate the shaft for several revolutions at least once every two weeks to coat the bearings with lubricant, retard oxidation and corrosion, and prevent possible false brinelling.

Consider a unit to be in storage when:

1. It has been delivered to the job site and is waiting to be installed.
2. It has been installed but operation is delayed pending completion of construction.
3. There are long (30 days or more) periods between operation cycles.
4. The plant (or department) is shut down for periods of longer than 30 days.

NOTE

Storage requirements vary depending on climatic environment, length of storage, and equipment. For storage periods of three months or longer, contact manufacturer for specific instructions. Improper storage could damage equipment and would result in non-warranty covered restoration or non-warranty covered product failures.

III. INSTALLATION.

The pump should be installed by skilled personnel in accordance with engineering standards. Faulty installation will result in operating troubles and premature wear of parts.

The pump and driver should be located in an area that will permit periodic inspection and maintenance. Head room and access should be provided. The pump should always be submerged enough to prevent vortexes from forming which might allow air to enter the suction.

When pump is supplied with coupling, motor, and base-plate, the complete set is assembled at Carver Pump Company. After ascertaining the unit has suffered no damage in transit, the pumping unit can be installed. Proceed as follows:

1. Make sure the foundation is level. Capscrew base to foundation. Check that pump rotates freely.
2. Connect suction and discharge piping. Extreme care should be taken when connecting new piping lines to be sure that no foreign matter such as dirt, chips, tools, etc., is in the piping, tank, or return piping as this debris will be drawn into the pump and cause excessive damage. Any debris caught in the pump passageways will throw the pumping unit out of balance.
3. Connect any necessary auxiliary piping and gauge lines.
4. Since the pumping unit is shipped with bearings packed, initial greasing will not be necessary unless pumping unit has been in storage for an extended period of time.
5. On chair mount pumps, check alignment of pump and motor as outlined in section IV in this manual. If misaligned, follow instructions in section IV on aligning the pumping unit.
6. Turn pump and motor shafts by hand to be sure they rotate freely.
7. Connect wiring to motor. Due to high voltage required to operate the pumping unit, personnel working with the equipment should be familiar with electrical safety practices and modern methods of resuscitation.
8. Connect electrical power supply to motor.
9. Open system valves.

IV. ALIGNMENT.

The pump and motor are connected by a flexible coupling.

On barrel mount pumps, the motor bracket aligns the pump and motor. No further alignment is necessary.

NOTE

The remaining paragraphs in section IV, apply to chair mount pumps only.

On chair mount pumps, the drive and pump shafts must be accurately aligned as any misalignment will cause damage to the coupling, motor and pump. When the shafts are in correct alignment, the coupling hubs will be on a common axis, concentric with each other, and at the correct distance apart.

To check the coupling gap and angular alignment, use a spacer bar equal in thickness to the gap specified by the coupling manufacturer. Insert bar to the same depth at 90 degree intervals and measure clearance between bar and coupling hub with a feeler gauge. The gap should be the same at all points. Angular misalignment must not exceed 1 degree.

To check axial alignment, place a straight edge on coupling hubs. The straight edge should be parallel to the pump and motor shaft at all points around the periphery. For a more accurate alignment, mount a dial indicator on the driving shaft and a dial indicator on the pump shaft. Slowly rotate both shafts. Record total indicator readings at 90 degree intervals. The four measurements must be within +0.005 inch tolerance.

On chair mount pumps, the distance between the centerline of the pump shaft to the back of the chair is 0.125 inch greater than the distance between the centerline of the motor shaft to the bottom of the motor foot. This permits shimming under the motor for proper alignment. If alignment is off, insert full shims under the feet of the motor and tighten fastening capscrews until correct alignment is achieved.

V. OPERATION.

A. PRESTART CAUTIONS.

1. Before starting or operating the pump, read this entire manual, especially the following instructions.
2. Before starting the pump, rotate shaft by hand to assure all moving parts are free.
3. Before starting the pump, install closed guards around all exposed rotating parts.
4. Observe all caution or danger tags attached to the equipment.
5. Never run pump dry. Dry running may result in pump seizure.
6. If excessive vibration or noise occurs during operation, shut the pump down and consult a Carver representative.
7. Use of a check valve in discharge piping is recommended if there is a high volume of reverse flow.

B. STARTING THE PUMP. The pumping unit will operate without operator intervention once system valves have been adjusted to specified pumping conditions. The casing of the pump will be submerged in the fluid being pumped, thus rendering it self-priming. Proceed with operation as follows:

1. Make sure no one is working on the pumping unit.
2. If the pumping unit has been idle for a period of time, make sure unit is firmly attached to its foundation.
3. Open valves to pressure gauges in system.

CAUTION

Check level of liquid in tank to be sure casing is under liquid level.

4. Jog starter switch on motor to check the direction of rotation. Direction of rotation is clockwise from fan end of motor.
5. Partially open discharge valve.
6. Start the pumping unit in accordance with the directions on the electrical power supply.
7. Slowly open discharge valve and adjust it to operating condition required.
8. Pumping unit is now in full operation.

C. STOPPING THE PUMP.

1. If pump is being stopped for overhaul, slowly close the discharge valve. Otherwise leave discharge valve set at condition.
2. Stop the pumping unit in accordance with the directions on the electrical power supply.
3. If the pump is being stopped for overhaul, close pressure gauge valves.
4. The pumping unit is now in the off position.

VI. MAINTENANCE.

Generally the pump does not require continuous supervision. Occasional visual checks are recommended. Data should be recorded for each pump to keep track of maintenance which has been performed and to note operational problems. A pump service record sheet is provided for this purpose at the back of this manual.

A. FIELD INSPECTION. Shutdown is not required. Perform field inspection at regular intervals and cover the following procedures:

1. Check and record the suction and discharge pressures to establish differential head. It should conform to the pump nameplate.
2. Check and record the power input and speed of driver.
3. Check and record pumping temperatures.
4. Check pump for quiet running.

B. STUFFING BOX. The stuffing box throat bushing requires no regular maintenance. The throat bushing should be inspected after pump disassembly for wear. For units without a shaft sleeve, the throat bushing requires replacement if the inside diameter is more than 1.672 inches. For units with a shaft sleeve, the throat bushing requires replacement if the inside diameter is more than 1.907 inches.

C. BEARING TEMPERATURE. Bearing temperature should be monitored periodically. Normal operating temperatures are 120 degrees F to 160 degrees F, depending on the ambient temperature. Bearings may appear to run hot when pump is first started. This is caused by the shaft seal, not the bearing. When the seal is seated, temperature should drop to normal.

Check bearing temperature by placing a pyrometer against the bearing frame while pump is running. A temperature rise above 180 degrees F indicates possible damage that requires checking. The most common cause of high bearing temperatures is overgreased bearings.

D. BEARING LUBRICATION. Lubrication frequency depends on operating conditions. Normal duty calls for relubrication every 1000 hours of operation. Bearings are lubricated at Carver Pump Company with Amoco Rykon Premium Grease No. 2EP, non-soap, polyurea thickened grease with a drop point of 450 degrees F. This grease was selected because of its suitability to extreme pressures and its high temperature stability. Never mix greases with differing properties.

Polyurea base greases are NOT compatible with lithium or soda soap base greases. Therefore, the type of grease added should not vary. However, if it is necessary to change greases type, the bearings, bearing frame, and bearing cap should be thoroughly cleaned and flushed with suitable solvent to remove all traces of old grease. Disassemble pump, remove shaft and bearings from bearing frame and follow this procedure:

NOTE

It is recommended that bearings removed from the shaft be replaced. If bearings that are in good condition must be reused, follow the procedures below.

1. Place bearings, bearing frame, and bearing cap in a wire or mesh basket and suspend the basket in a light mineral solvent. Allow it to soak, preferably overnight.
2. After soaking and cleaning, the bearings, bearing frame, and bearing cap should be rinsed in a clean, light mineral solvent and agitated vigorously to remove all loosened hard grease and dirt.
3. Dip bearings in clean, light oil and spin by hand to determine that all foreign matter has been removed.

4. After cleaning, repack bearings half full on both sides with a good quality ball bearing grease.

To relubricate bearings use the following procedure:

CAUTION

Overgreasing creates heat and is the cause of many problems requiring repair. **DO NOT OVERGREASE.**

1. Never relubricate pump bearings while unit is running. If necessary, shut down pump according to section V, paragraph C.
2. Remove plugs opposite grease fittings on both ends of bearing frame.

CAUTION

Do not lubricate bearings with a power grease gun.

3. Using a hand-operated grease gun on grease fittings, add approximately one ounce of fresh grease for each bearing. With most hand-operated grease guns, two or three pumps is enough. **DO NOT OVERGREASE.** When installing new bearings, pack new bearings only half full with grease.

Bearing temperature may rise above normal immediately after lubrication, but should stabilize within 4 to 8 hours.

VII. TROUBLESHOOTING.

The pump should provide reliable service and long life if the installation and starting procedures outlined in this manual are followed. If operating problems do occur, refer to table 1 to eliminate some of the most common causes of those problems.

VIII. SERVICE AND REPAIR.

A. PREPARATIONS FOR DISASSEMBLY OF PUMP. Read this entire section and study figure 1 for chair mount pumps or figure 2 for barrel mount pumps. For additional part options refer to figure 3.

1. Stop pump according to section V, paragraph C. Disconnect, lock out, and tag electrical power supply to motor. Disconnect wiring from motor.
2. Shut off and tag all valves controlling the flow of liquid to the tank and from the pump. If necessary, flush pump to remove corrosive or toxic pumpage.
3. Disconnect suction and discharge piping.

B. PUMP DISASSEMBLY. The 12V Frame L&H Vertical Pumps are of the same basic design, but parts do vary between model to model. Parts that may vary from

model to model are as follows: semi-open or enclosed impeller, wear ring (enclosed impeller pumps only), shaft sleeve, and chair or barrel mount.

During disassembly, mark parts so that they can be refit exactly as before during reassembly. When removing capscrews, use a socket assembly instead of open-ended wrenches. After extended operation, it may be difficult to separate some components. Rust solvent may be used and suitable extricating tools where possible. Do not use hard, metal-headed hammers.

Disassemble as follows:

CAUTION

To lift pumping unit, a hoist or suitable lifting device must be used.

1. Attach hoist to pumping unit. Remove pumping unit from its foundation to a work area. On chair mount pump, it is easier to work on pumping unit if chairback is against the floor and both L-braces extend away from the floor.
2. On barrel mount pumps remove capscrews and washers securing coupling guard (E1) to motor bracket (61). Remove coupling guard (E1).
3. Disconnect coupling (70).
4. On chair mount pumps, remove capscrews (66) and lockwashers (67) securing motor to chairback. Remove motor from pumping unit. On barrel mount pumps, remove nuts (64) and capscrews (63) securing motor bracket (61) to bearing frame (30). Remove motor bracket (61) and motor from pumping unit.
5. Remove capscrews (10) separating suction cover (3) from casing (2). Remove suction cover (3). Remove gasket(s) (5).
6. Remove impeller socket head capscrew (A3) and impeller washer (A1).
7. Pull impeller (1) from end of shaft (33). Remove shim(s) if applicable.
8. Remove capscrews (2D) separating casing (2) from backcover (2B). Remove casing (2). Remove O-ring (2C) from backcover (2B).
9. Remove capscrews (36) and washers (37) securing column (31) to backcover (2B). Remove backcover (2B).
10. Remove shaft sleeve (B7), if equipped.
11. If throat bushing (B3) needs to be replaced, remove capscrews (B4) securing locking ring (B1) to backcover (2B). Remove locking ring (B1) with throat bushing (B3). Remove setscrews (B5) securing throat bushing (B3) to locking ring (B1). Remove throat bushing (B3).
12. Loosen, but do not remove, setscrews (B6) in slinger (B2). Remove slinger (B2).
13. Remove capscrews (G9) securing bearing cap (G1) to bearing frame (30).

Table 1. Troubleshooting

SYMPTOM	PROBABLE CAUSE	REMEDY
Motor will not start.	<ol style="list-style-type: none"> 1. No input power. 2. Improper voltage. 3. Motor overload. 4. Mechanical obstruction that prevents rotor from turning. 	<ol style="list-style-type: none"> 1. Check connections to electrical power source. Check fuses or circuit breakers. Check terminals at source of power input. 2. Check voltage at motor terminals. 3. Refer to "Overload on motor". 4. Examine and clean pumping unit thoroughly. Check for bearing failure or bent shaft.
Motor overheats.	<ol style="list-style-type: none"> 1. Motor overload. 2. Improper voltage. 3. Obstruction in ventilation. 4. Insufficient cooling medium. 5. Overgreased motor bearings. 6. Improper motor grease. 	<ol style="list-style-type: none"> 1. Refer to "Overload on motor". 2. Check voltage at motor terminals. 3. Check ventilation opening of motor. Keep clear of obstructions at all times. 4. Check ambient temperature. Motor temperature should not exceed ambient temperature plus the rated temperature increase of the unit. 5. Remove lubricant from bearing chamber until the proper amount of grease is in chamber. 6. Remove grease and replace with grease recommended by motor manufacturer.
Failure to deliver liquid.	<ol style="list-style-type: none"> 1. Discharge valve closed. 2. Discharge head above shutoff. 3. Impeller or suction clogged. 4. Wrong rotation. 5. Liquid level in tank too low. 	<ol style="list-style-type: none"> 1. Check discharge valve. 2. Consult with nearest Carver Pump Company representative or factory. 3. Inspect and clean impeller and suction pipe. 4. Check power connection to motor. 5. Add liquid to system.
Reduced capacity and/or pressure.	<ol style="list-style-type: none"> 1. Discharge valve closed. 2. Damaged impeller. 3. Impeller or suction pipe partially clogged. 4. Suction pipe too close to bottom of tank. 5. Liquid level in tank too low. 6. Total head too high. 7. Wrong rotation. 	<ol style="list-style-type: none"> 1. Check discharge valve. 2. Replace impeller. 3. Inspect and clean impeller and suction pipe. 4. Reduce length of pipe. 5. Add liquid to system. 6. Consult with nearest Carver Pump Company representative or factory. 7. Check power connections to motor.

Table 1. Troubleshooting - (Contd)

SYMPTOM	PROBABLE CAUSE	REMEDY
Reduced capacity and/or pressure. - (Contd)	<ol style="list-style-type: none"> 8. Speed too low. 9. Semi-open impeller running clearance too large. 10. Enclosed impeller clearance between suction cover or wear ring, if equipped is too large. 	<ol style="list-style-type: none"> 8. Consult with nearest Carver Pump Company representative or factory. 9. Adjust semi-open impeller clearance according to section VIII, paragraph D, steps 12 and 13. 10. Check enclosed impeller clearance according to section VIII, paragraph C, step 7.
Pump surges.	<ol style="list-style-type: none"> 1. Liquid level in tank too low. 	<ol style="list-style-type: none"> 1. Add liquid to system.
Pump loses prime after starting.	<ol style="list-style-type: none"> 1. Suction lift over six feet. 2. Liquid level in tank too low. 	<ol style="list-style-type: none"> 1. Check with vacuum gauge. 2. Add liquid to system.
Overload on motor.	<ol style="list-style-type: none"> 1. Head lower than that for which pump is designed. 2. Mechanical defects of pump or motor such as bent shaft, binding or rubbing rotating element. 3. Liquid handled of higher specific gravity or lower viscosity than intended application. 	<ol style="list-style-type: none"> 1. Consult with nearest Carver Pump Company representative or factory. 2. Replace defective parts or replace pump or motor. 3. Consult with nearest Carver Pump Company representative or factory.
Insulation failure.	<ol style="list-style-type: none"> 1. Oil or water soaked windings. 2. Excessive vibration. 3. Wrong voltage. 	<ol style="list-style-type: none"> 1. Disassemble motor; clean and dry windings. 2. Refer to "Vibrates or is noisy". 3. Check voltage at motor terminals.
Vibrates or is noisy.	<ol style="list-style-type: none"> 1. Insufficient or insecure foundation. 2. Mechanical defects of pump or motor such as bent shaft, binding rotating element, or warped impeller. 3. Foreign matter in pump. 4. Strain due to piping or improper piping supports. 5. Misalignment. 6. Damaged bearings. 	<ol style="list-style-type: none"> 1. Enlarge foundation or relocate pumping unit so it can be firmly bolted to foundation. 2. Replace defective parts or replace pump or motor. 3. Disassemble pump; clean and replace damaged parts. 4. Check piping alignment and remove piping weight from pump with proper supports. 5. Align pump and motor as outlined in section IV of this manual. 6. Replace bearings.
Rapid wear of coupling spider.	<ol style="list-style-type: none"> 1. Misalignment on chair mount pumps. 2. Bent shaft. 	<ol style="list-style-type: none"> 1. Align pump and motor as outlined in section IV of this manual. 2. Replace shaft.

14. Pull out shaft (33) from outboard side of pumping unit.
15. Using a puller, remove coupling (70) hub from shaft (33). Remove coupling key (G11).
16. Remove bearing cap (G1) from shaft (33).
17. Remove bearing locknut (G4).
18. Using a puller, remove radial bearing (G3) and thrust bearing (G2).
19. Remove grease seals (G5) from column (31) and bearing frame (30). Remove grease seal (G6) from bearing cap (G1).

C. PARTS INSPECTION.

1. All parts should be thoroughly cleaned or replaced with new ones if necessary. All sealing faces should be perfectly clean. It is recommended that grease seals (G5) and (G6), gaskets (5), O-ring (2C), and locking devices with a nylock feature be replaced with new if disturbed from position.
2. Inspect bearings (G2 and G3) for damage. Damaged bearings must be replaced. If bearings are removed from shaft, it is recommended that bearings be replaced. If bearing replacement is not possible and bearings are in good condition, bearings should be cleaned according to section VI, paragraph D. Protect until ready for use.
3. Inspect for bent shaft (33) and replace shaft (33) if necessary. Shaft threads should be in good condition. Bearing seat must be in perfect condition.
4. If impeller (1) shows excessive wear and performance cannot be restored, it must be replaced.

5. The throat bushing should be inspected for wear. For units without a shaft sleeve, the throat bushing requires replacement if the inside diameter is more than 1.672 inches. For units with a shaft sleeve, the throat bushing requires replacement if the inside diameter is more than 1.907 inches.
6. Inspect and replace any defective grease fittings.
7. On an enclosed impeller pump, check the clearance as follows:
 - a. Measure outside diameter of front impeller (1) hub in three places.
 - b. Measure inside diameter of suction cover (3) or wear ring (4), if equipped in three places.
 - c. If difference between high reading of inside diameter of suction cover (3) or wear ring (4), if equipped and low reading of outside diameter of impeller (1) hub exceeds double the maximum clearances given in table 2, replace suction cover (3) or wear ring (4), if equipped. To replace wear ring (4) refer to section VIII, paragraph E.

D. PUMP REASSEMBLY. To reassemble the pump, use the following procedures:

NOTE

It is recommended that grease seals (G5) and (G6), gaskets (5), O-ring (2C), and locking devices with a nylock feature be replaced with new if disturbed from position.

Table 2. Enclosed Impeller Clearance

MODEL (Suction x Discharge x Maximum Impeller Diameter)	FACTORY STANDARD DIAMETRIC CLEARANCE	
	MINIMUM	MAXIMUM
1.25 X 1 X 5L	0.009	0.014
2 X 1.5 X 5L through 1.25 X 1 X 7L	0.012	0.016
1.5 X 1.25 X 7L	0.014	0.018
2 X 1.5 X 7L	0.012	0.016
2.5 X 2 X 7L	0.012	0.016
3 X 2.5 X 7L	0.014	0.018
4 X 3 X 7L	0.014	0.018
5 X 4 X 7L	0.015	0.020
1.5 X 1.25 X 10H	0.011	0.014
2 X 1.5 X 10H	0.012	0.016
2.5 X 2 X 10H	0.012	0.016
3 X 2.5 X 10H	0.012	0.017
4 X 3 X 10H	0.012	0.016
5 X 4 X 10H	0.016	0.021
6 X 5 X 10H	0.021	0.026

NOTE

It is recommended that bearings (G2 and G3) be replaced if removed from shaft.

1. Install new grease seals (G5) in column (31) and bearing frame (30). Install grease seal (G6) in bearing cap (G1).
2. Install radial bearing (G3) and thrust bearing (G2) on shaft (33). Bearings (G3 and G2) may be pressed onto shaft (33) or heated so they will slide onto shaft (33). Pack bearings half full with grease. Refer to section VI, paragraph D for proper grease type. Install and tighten bearing locknut (G4).
3. Install and secure bearing cap (G1) to bearing frame (30) with capscrews (G9).
4. Install coupling key (G11) in keyway of shaft (33). Install pump coupling (70) half.
5. Install shaft (33) through bearing frame (30).
6. Install slinger (B2) on shaft (33) and secure with setscrews (B6).
7. If throat bushing (B3) was removed, press new throat bushing (B3) into backcover (2B) using locking ring (B1) as a guide, until the throat bushing (B3) and backcover (2B) are flush. Install locking ring (B1), securing it to backcover (2B) with capscrews (B4). Drill and tap new holes for setscrews (B5) in locking ring (B1). Install setscrews (B5).
8. Install shaft sleeve (B7), if equipped.
9. Install backcover (2B) on column (31) and secure with capscrews (36) and washers (37).
10. Install O-ring (2C) on backcover (2B). Install casing (2) and secure to backcover (2B) with capscrews (2D).
11. Install impeller key (A2), making sure slot in shaft sleeve (B7), if equipped, lines up with keyway in shaft (33).

NOTE

On semi-open impellers, install impeller shims as needed to achieve proper impeller clearance.

12. Install impeller (1) and secure with impeller washer (A1) and impeller socket head capscrew (A3).

NOTE

On semi-open impellers, install gasket(s) (5) as needed to achieve proper impeller clearance between suction cover (3) and impeller (1).

13. Install gasket(s) (5) on suction cover (3). Install suction cover (3) and secure to casing (2) with capscrews (10).

CAUTION

To lift motor, a hoist or suitable device must be used.

14. On barrel mount pumps, attach hoist to motor and install motor bracket (61) and motor on pumping unit. Secure motor bracket (61) to bearing frame (30) with nuts (64) on capscrews (63).

CAUTION

To lift motor, a hoist or suitable device must be used.

15. On chair mount pumps, attach hoist to motor and install motor on pumping unit and secure to chairback with capscrews (66) and lockwashers (67).
16. Connect coupling.

CAUTION

To lift pumping unit, a hoist or suitable device must be used.

17. Attach hoist to pumping unit. Reinstall pumping unit on foundations. On chair mount pumps, realign coupling as outlined in section IV in this manual. Attach coupling guard.
18. Connect suction and discharge lines.
19. Reconnect wiring to motor. Remove tags from electrical power supply. Unlock and connect electrical power supply to motor.
20. Remove tags from system valves. Open all system valves.
21. Start pump according to section V, paragraphs A and B.

E. REPLACEMENT OF OPTIONAL WEAR RING ON PUMP EQUIPPED WITH ENCLOSED IMPELLER.

If your pump is equipped with an enclosed impeller, it may have an optional, replaceable wear ring (4) in the suction cover (3). If your pump is equipped with the optional wear ring (4), follow these instructions for wear ring replacement.

The clearance between the wear ring (4) and impeller (1) hub will increase with wear. Internal leakage will result and pump performance will decrease. Refer to section VIII, paragraph C, step 7 and table 2.

Usually wear ring material is matched to impeller as listed in table 3.

Table 3. Impeller and Wear Ring Matching Materials

IMPELLER MATERIAL	WEAR RING MATERIAL
Cast Iron	Steel
Bronze	Bronze
Stainless Steel	Alloy 20 or 17-4PH Stainless Steel

To replace wear ring, use the following procedure:

1. Prepare for disassembly according to section VIII, paragraph A.
2. Disassemble pump according to section VIII, paragraph B, steps 1 through 7.
3. Take suction cover (3) and impeller (1) to a work area with access to machine shop equipment.
4. Remove wear ring (4) from suction cover (3). This can be best accomplished on a lathe.
5. Inspect impeller (1) hub for damage.
6. Press new wear ring (4) into suction cover (3). Beveled edge of wear ring (4) is installed toward impeller (1).
7. Place impeller (1) on an arbor and mount between centers in a lathe or a grinder. Indicate back of impeller (1) hub to within 0.002 T.I.R. maximum to be sure arbor and impeller (1) are running square.
8. Turn wearing surface of impeller (1) until a 63 RMS or better finish is obtained.
9. Measure outside diameter of front impeller (1) hub and record the value.
10. Mount suction cover (3) with new wear ring (4) installed in a lathe. Indicate male rabbet to within 0.002 T.I.R. maximum.
11. Bore wear ring (4) to within specified tolerance listed in table 2 in section VIII, paragraph C, step 7, over recorded size of outside diameter of front impeller (1) hub.
12. Reassemble pump according to section VIII, paragraph D, steps 11 through 21.

F. PARTS INVENTORY GUIDE. Spare parts should be kept on hand to avoid maintenance delays.

For every one to three pumps keep in stock one spare parts set, as listed in table 4.

G. PARTS ORDERING. When ordering parts from Carver Pump Company, prompt accurate service will be provided if you include the following information.

1. Serial number of pump on nameplate.
2. Part name from table 5.
3. Item number from table 5 and figure 1, figure 2 or figure 3.
4. Quantity of parts needed.

Carver may ship an interchangeable part that is not identical in appearance or symbol. This is done only if the part has been improved. Examine the parts carefully on receipt before questioning the factory or representative. Never return parts to the factory without authorization from Carver Pump Company.

If an impeller is ordered, specify diameter across blade tips to be sure there was not further trim on diameter than shown on Carver Pump Company records. If a motor or motor parts are ordered, specify the name of the driver manufacturer and all data on the driver nameplate.

Table 4. Recommended Spare Parts

Item No.	Qty.	Description
1	1	Impeller
2C	1	O-ring
4	1	Wear Ring (if equipped)
5	3	Gasket
A1	1	Impeller Washer
A2	1	Impeller Key
A3	1	Impeller Socket Head Capscrew
B3	1	Throat Bushing
B7	1	Shaft Sleeve (if equipped)
G2	1	Thrust Bearing
G3	1	Radial Bearing
G4	1	Bearing Locknut
G5	2	Grease Seal
G6	1	Grease Seal
G11	1	Coupling Key

XI. PARTS LIST AND FIGURES.

Refer to table 5 for the parts list of the 12V Frame L&H Pump. For location of parts in the list, refer to figure 1 for chair mount pumps and figure 2 for chair mount units. For additional part options refer to figure 3.

Table 5. Pump Parts List

Item No.	Part Name	Item No.	Part Name
1	Impeller	2	Casing
2B	Backcover	2C	O-ring
2D	Hex Head Capscrew	3	Suction Cover
4	Wear Ring (if equipped)	5	Gasket
10	Hex Head Capscrew	11	Plug (casing)*
30	Bearing Frame	31	Column
33	Shaft	35	Hex Head Capscrew
36	Hex Head Capscrew	37	Lockwasher
39	Hex Head Capscrew	40	Hex Nut
41	Washer	42	Washer
60	Baseplate	61	Motor Bracket
63	Hex Head Capscrew	64	Hex Nut
66	Hex Head Capscrew (chair mount)	67	Lockwasher (chair mount)
70	Coupling	A1	Impeller Washer
A2	Impeller Key	A3	Impeller Socket Head Capscrew
B1	Locking Ring	B2	Slinger
B3	Throat Bushing	B4	Hex Head Capscrew
B5	Setscrew	B6	Setscrew
B7	Shaft Sleeve (if equipped)	E1	Coupling Guard
G1	Bearing Cap	G2	Thrust Bearing
G3	Radial Bearing	G4	Bearing Locknut
G5	Grease Seal	G6	Grease Seal
G7	Grease Zerk	G9	Hex Head Capscrew
G10	Plug* (bearing cap, bearing frame)	G11	Coupling Key

* Not shown on figures 1, 2, or 3.

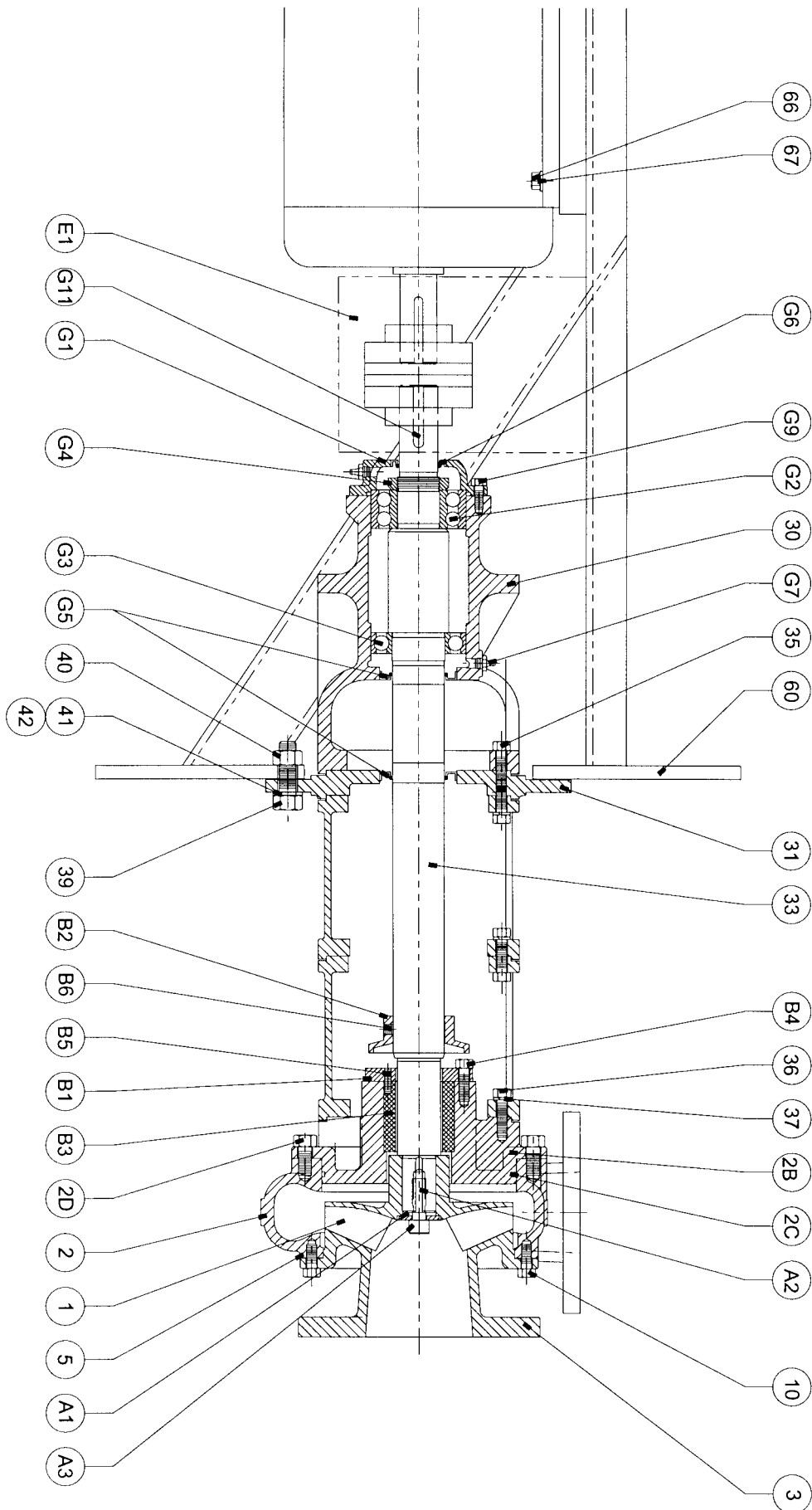


Figure 1. Chair Mount Pump Sectional Drawing

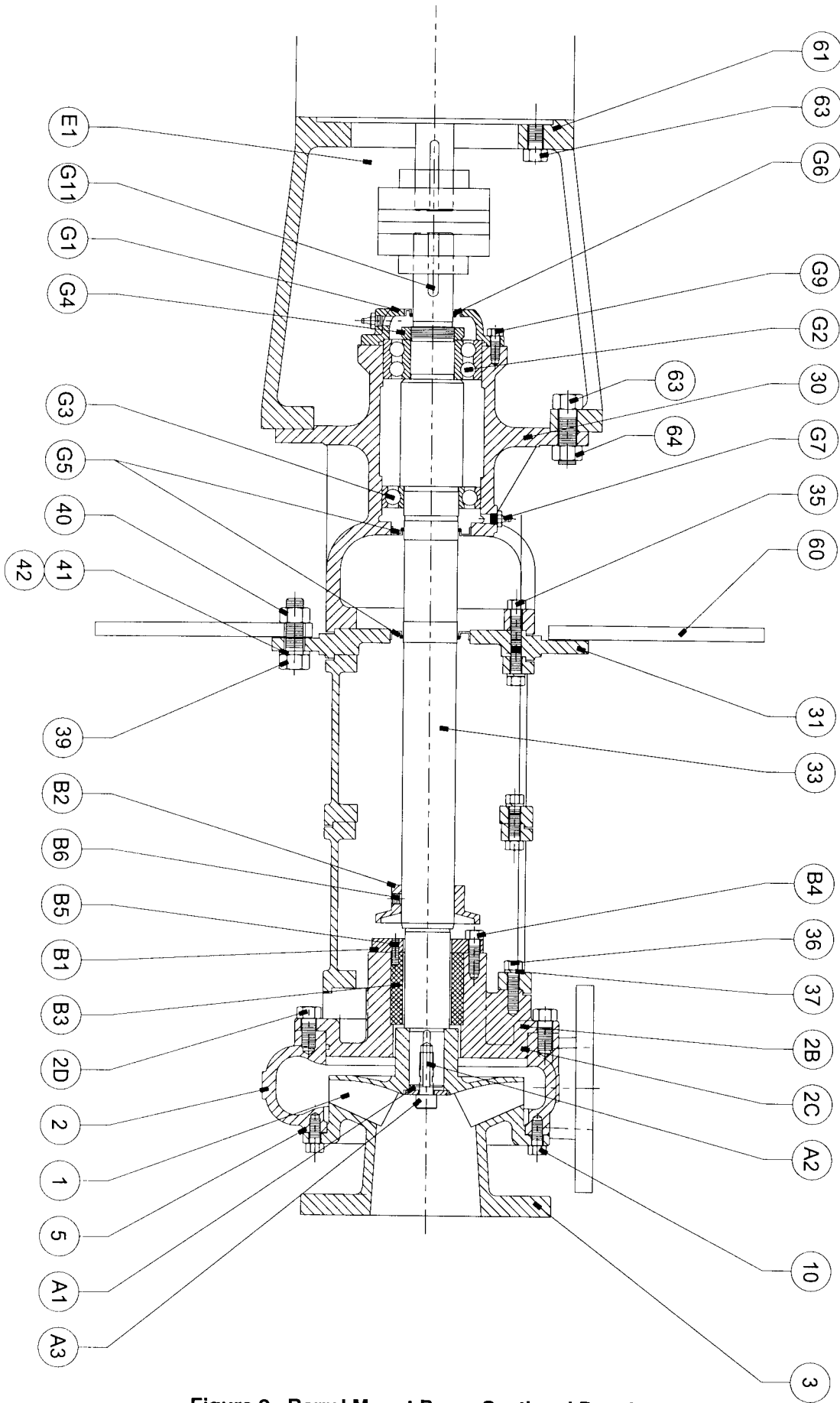
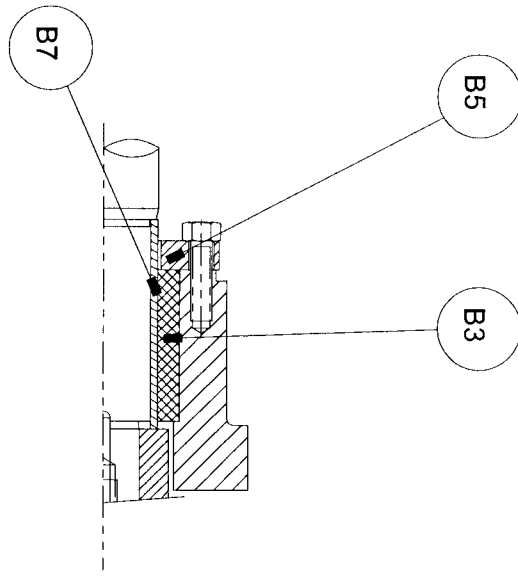
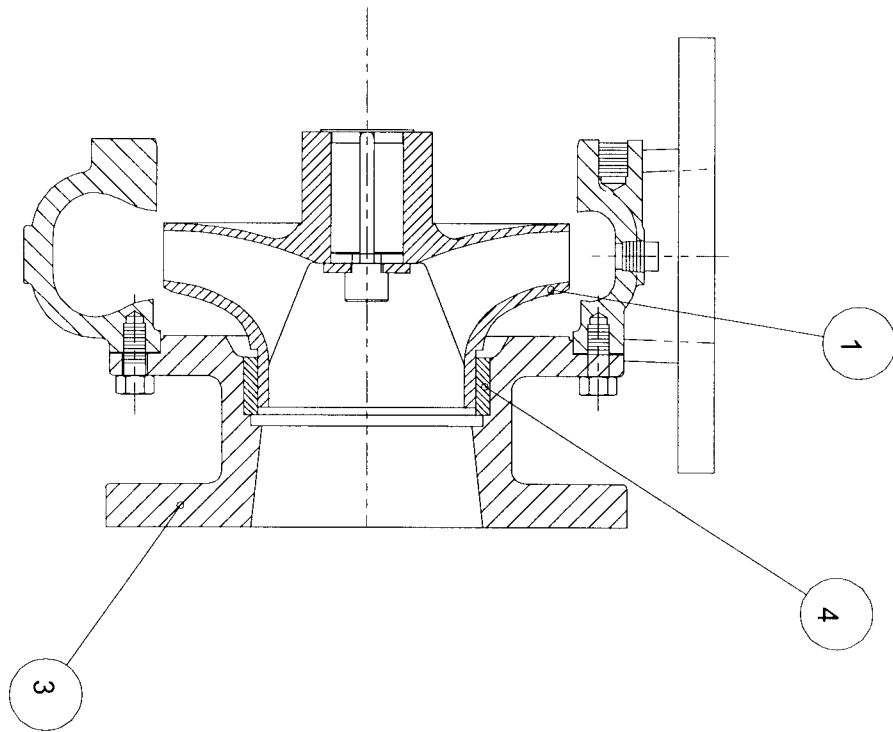


Figure 2. Barrel Mount Pump Sectional Drawing



OPTIONAL SLEEVE



ENCLOSED IMPELLER WITH OPTIONAL WEAR RING

Figure 3. Part Options for Chair or Barrel Mount Pump

X. Pump Service Record

Serial No. _____ Size and Type _____ Make _____

Cust. Order No. _____ Date Installed _____

Install. Date	Location	Application

PUMP RATING

Capacity (GPM) _____ Total Head (ft) _____

Suction Pressure _____ Speed (RPM) _____

Liquid _____ Temperature _____

Specific Gravity _____ Viscosity _____

Impeller Diameter (inches) _____

PUMP MATERIALS

Casing _____ Backcover _____ Suction Cover _____

Impeller Capscrew _____ Shaft _____ Impeller _____

Bearing Frame _____ Bearing Cap _____ Wear Ring _____

MOTOR DATA

Motor _____ Make _____ Serial No. _____

Type _____ Frame _____ AC or DC _____

Volts _____ Phase _____ Cycles _____

HP _____ RPM _____

Notes on Inspection and Repairs

Inspect Date	Repair Time	Repairs	cost	Remarks

Notes: _____

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