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Instruction I-170

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS FOR L&H Vertical Pump

ISO 9001 CERTIFIED

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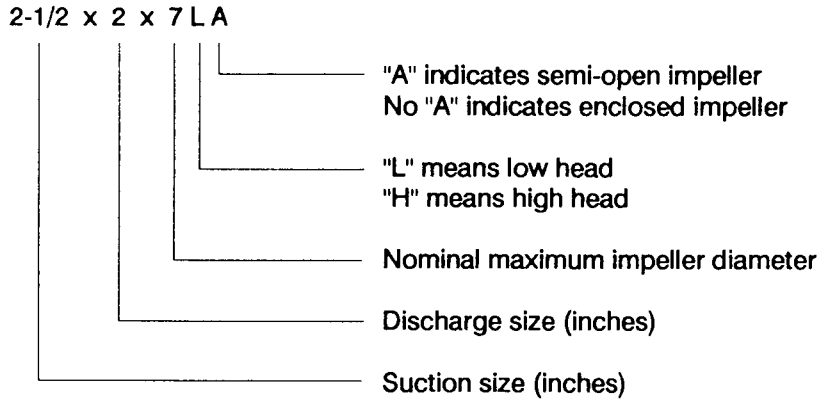
I. GENERAL DESCRIPTION AND SAFETY PRECAUTIONS.

A. GENERAL DESCRIPTION. L & H Vertical Pumps are designed to pump hot alkaline or corrosive liquids in a variety of applications such as industrial washers, paint spray booth service, coolant, plating machines, test stands, or sumps.

The 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, backhead or suction head, columns, baseplate, discharge piping, bearing frame, and bearings. The bearing 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 L & H Vertical Pump are either enclosed or semi-open. Some pumps with enclosed impellers contain a renewable wear ring in the suction head for maximum efficiency and capacity.

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



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.

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 bearing 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.

When pump is supplied with coupling, motor, and baseplate, 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 fairly level. Bolt 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 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 and coupling packed, initial greasing will not be necessary unless pumping unit has been in storage for an extended period of time.
5. 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. 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 cap 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 + .015 inches tolerance.

On chair mount pumps, the distance between the centerline of the pump shaft to the back of the chair is one-eighth 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 bolts until correct alignment is achieved.

On barrel mount pumps, misalignment is usually caused by an unlevel baseplate. Insert full shims under baseplate 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 the 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 that direction of rotation is clockwise when viewed from the top. Direction of rotation must agree with the arrow stamped on the pump frame or base.
5. Partially open discharge valve.
6. Start the pumping unit in accordance with the directions on the motor controller.
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 motor controller.
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.

A. STUFFING BOX. The stuffing box is equipped with a teflon bushing which requires no maintenance.

B. 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 damage that requires checking. The most common cause of high bearing temperature is overgreased bearings.

C. 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, a 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 grease type, the bearings, bearing housings, and bearing

cover should be thoroughly cleaned and flushed with suitable solvent to remove all traces of old grease. Disassemble pump, remove shaft and bearings from bearing housing and follow this procedure:

1. Place bearings, bearing housings, and bearing covers 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 housings, and bearing covers 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 in this manual.
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 the troubleshooting table to eliminate some of the most common causes of those problems.

Troubleshooting Table

SYMPTOM	PROBABLE CAUSE	REMEDY
Motor will not start.	1. No input power.	1. Check connections to controller. Check fuses or circuit breakers. Check terminals at source of power input.
	2. Improper voltage.	2. Check voltage at motor terminals.
	3. Motor overload.	3. Refer to "Overload on motor."
	4. Mechanical obstruction that prevents rotor from turning.	4. Examine and clean pumping unit thoroughly. Check for bearing failure or bent shaft.
Motor overheats.	1. Motor overload.	1. Refer to "Overload on motor."
	2. Improper voltage.	2. Check voltage at motor terminals.
	3. Obstruction in ventilation.	3. Check ventilation opening of motor. Keep clear of obstructions at all times.
	4. Insufficient cooling medium.	4. Check ambient temperature. Motor temperature should not exceed ambient temperature plus the rated temperature increase of the unit.
	5. Overgreased motor bearings.	5. Remove lubricant from bearing chamber until the proper amount of grease is in chamber.
	6. Improper motor grease.	6. Remove grease and replace with grease recommended by motor manufacturer.
Failure to deliver liquid.	1. Discharge valve closed.	1. Check discharge valve.
	2. Discharge head above shutoff.	2. Consult with nearest Carver Pump Company representative or factory.
	3. Impeller or suction partially clogged.	3. Inspect impeller and suction pipe and clean.
	4. Wrong rotation.	4. Check power connection to motor.
	5. Liquid level in tank too low.	5. Add liquid to system.
Reduced capacity and/or pressure.	1. Discharge valve closed.	1. Check discharge valve.
	2. Damaged impeller.	2. Replace impeller.
	3. Impeller or suction pipe partially clogged.	3. Inspect impeller and suction pipe and clean.
	4. Wear ring clearance too great (if pump is equipped with wear ring).	4. Replace wear ring.
	5. Suction pipe too close to bottom of tank.	5. Reduce length of pipe.
	6. Liquid level in tank too low.	6. Add liquid to system.
	7. Total head too high.	7. Consult with nearest Carver Pump Company representative or factory.
	8. Wrong rotation.	8. Check power connections to motor.
	9. Speed too low.	9. Consult with nearest Carver Pump Company representative or factory.

Troubleshooting Table - continued

SYMPTOM	PROBABLE CAUSE	REMEDY
Pump surges.	1. Liquid level in tank too low.	1. Add liquid to system.
Pump loses prime after starting.	1. Suction lift over six feet. 2. Liquid level in tank too low.	1. Check with vaccum gauge. 2. Add liquid to system.
Overload on motor.	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.	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.	1. Oil or water soaked windings. 2. Excessive vibration. 3. Wrong voltage.	1. Disassemble motor; clean and dry windings. 2. Refer to "Vibrates or is noisy." 3. Check voltage at motor terminals.
Vibrates or is noisy.	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.	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.	1. Misalignment. 2. Bent shaft.	1. Align pump and motor as outlined in section IV of this manual. 2. Replace shaft.

VIII. DISASSEMBLY AND REASSEMBLY.

All L & H Vertical Pumps are of the same basic design, but parts do vary between the 12V frame size and 30V frame size and even from model to model within each of these frame sizes. The larger 30V frame pumps are equipped with a column spacer and a bearing cartridge that houses the thrust bearing. Parts that may vary from model to model within each frame size are as follows: semi-open or enclosed impeller, wear ring (on enclosed impeller pumps only), shaft sleeve, backhead or suction head, and chair or barrel mount.

After extended operation, it may be difficult to separate some components. Rust solvent may be used and suitable extricating tools where possible. Use hammers with plastic or rubber heads; hammers with metal heads could damage the pump. Hoisting equipment should be used for lifting heavy parts. It is recommended that safety shoes be worn while working on this equipment.

A. DISASSEMBLY.

Disassembly of 12V Frame Pumps:

1. Disconnect, lock out, and tag electrical power supply to motor. Disconnect wiring from motor.
2. Close all system valves.
3. Disconnect suction and discharge piping.
4. If necessary, flush pump to remove corrosive or toxic liquids.
5. Remove nuts (40) and washers (41) from baseplate mounting bolts (39). Remove pumping unit from its foundation to a work area. On chair mount pumps, it is easier to work on pumping unit if chairback is against the floor and both L-braces extend away from the floor.
6. Drain casing (2) by removing drain plugs (11).
7. On barrel mount pumps remove capscrews and washers securing guard plates to intermediate (61). Remove guard plates.
8. Disconnect coupling.
9. 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 intermediate (61) to bearing frame (30). Remove intermediate (61) and motor from pumping unit.
10. On pumps equipped with a suction head (3), remove capscrews (10) securing suction head (3) to casing (2). Remove suction head (3). Remove suction head gasket (5). On pumps with a backhead (6), remove capscrews (10) securing backhead (6) to casing (2). Remove casing (2) from pumping unit. Remove casing gasket (5) from casing (2).

NOTE

To attach hoisting equipment to casing (2), remove pipe plugs (11) from casing (2) and insert lifting eyes into pipe plug holes.

11. Remove impeller capscrew (A3) and impeller washer (A1).
12. Pull impeller (1) from end of shaft (33).
13. On pumps with a suction head (3), remove capscrews (36) and washers (37) securing column (31) to casing (2). Remove casing (2).

NOTE

To attach hoisting equipment to casing (2), remove pipe plugs (11) from casing (2) and insert lifting eyes into pipe plug holes.

14. On pumps with a backhead (6), remove capscrews (36) and washers (37) securing column (31) to backhead (6). Remove backhead (6). Remove backhead gasket (5).
15. Remove shaft sleeve (34), if equipped.
16. If throttle bushing (B3) needs to be replaced, remove capscrews (B4) securing locking ring (B1) to casing (2) or backhead (6). Remove locking ring (B1) with throttle bushing (B3). Remove setscrews (B5) securing throttle bushing (B3) to locking ring (B1). Remove throttle bushing (B3).
17. Loosen, but do not remove, setscrews (B6) in slinger (B2). Remove slinger (B2).
18. Remove capscrews (G9) securing bearing cap (G1) to bearing frame (30).
19. Pull out shaft (33) from inboard side of pumping unit.
20. Using a puller, remove coupling hub from shaft (33). Remove coupling key (G11).
21. Remove bearing cap (G1) from shaft (33).
22. Remove bearing locknut (G4).
23. Using a puller, remove radial bearing (G3) and thrust bearing (G2).
24. Remove shaft seals (G5) from column (31) and bearing frame (30). Remove shaft seal (G6) from bearing cap (G1).

Disassembly of 30V Frame Pumps.

1. Disconnect, lock out, and tag electrical power supply to motor. Disconnect wiring from motor.
2. Close all system valves.
3. Disconnect suction and discharge piping.
4. If necessary, flush pump to remove corrosive or toxic liquids.
5. Remove nuts (40) and washers (37) from baseplate mounting bolts (39). Remove pumping unit from its foundation to a work area. On chair mount pumps, it is easier to work on pumping unit if chairback is against the floor and both L-braces extend away from the floor.
6. Drain casing (2) by removing drain plugs (11).
7. On barrel mount pumps remove capscrews and washers securing quard plates to intermediate (61). Remove guard plates.
8. Disconnect coupling.
9. 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), lockwashers (72), and capscrews (63) securing intermediate (61) to bearing frame (30). Remove intermediate (61) and motor from pumping unit.
10. On pumps equipped with a suction head (3), remove capscrews (10) securing suction head (3) to casing (2). Remove suction head (3). Remove suction head gasket (5). On pumps with a backhead (6), remove capscrews (10) securing backhead (6) to casing (2). Remove casing (2) from pumping unit. Remove casing gasket (5) from casing (2).

NOTE

To attach hoisting equipment to casing (2), remove pipe plugs (11) from casing (2) and insert lifting eyes into pipe plug holes.

11. Remove impeller capscrew (A3) and impeller washer (A1).
12. Pull impeller (1) from end of shaft (33). If impeller (1) does not detach easily, remove capscrews (G9) from bearing cap (G1), loosen nuts (G15), and tighten forcing bolts (G14) down evenly. This serves to pull the shaft (33) back and should loosen the impeller (1). If this does not work for pumps with a suction head (3), the casing (2) can be used to pry the impeller (1) forward.
13. On pumps with a suction head (3), remove capscrews (36) and washers (44) securing column (31) to casing (2). Remove casing (2).

NOTE

To attach hoisting equipment to casing (2), remove pipe plugs (11) from casing (2) and insert lifting eyes into pipe plug holes.

14. On pumps with a backhead (6), remove capscrews (36) and washers (44) securing column (31) to backhead (6). Remove backhead (6). Remove backhead gasket (5).
15. Remove shaft sleeve (34), if equipped.
16. If throttle bushing (B3) needs to be replaced, remove capscrews (B4) securing locking ring (B1) to casing (2) or backhead (6). Remove locking ring (B1) with throttle bushing (B3). Remove setscrews (B5) securing throttle bushing (B3) to locking ring (B1). Remove throttle bushing (B3).
17. Loosen, but do not remove, setscrews (B6) in slinger (B2). Remove slinger (B2).
18. If not already removed, remove capscrews (G9) securing bearing cap (G1) to bearing cartridge (G12) to bearing frame (30).
19. Pull out shaft (33) from inboard side of pumping unit.
20. Using a puller, remove coupling hub from shaft (33). Remove coupling key (G11).
21. Remove bearing cap (G1). Remove bearing cartridge (G12).
22. Uncrimp bearing lockwasher (G13). Remove bearing locknut (G4). Remove bearing lockwasher (G13).
23. Using a puller, remove radial bearing (G3) and thrust bearing (G2).
24. Remove shaft seals (G5) from spacer column (43).

B. PARTS INSPECTION.

After disassembly, 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, bearings, gaskets, and locking devices with a nylock feature be replaced with new.

C. REASSEMBLY.

Reassembly of 12V Frame Pumps:

1. Install new shaft seals (G5) in column (31) and bearing frame (30). Install new shaft seal (G6) in bearing cap (G1).
2. Pack new bearings half full with recommended grease (refer to section VI in this manual). Install radial bearing (G3) and thrust bearing (G2) on shaft (33).

CAUTION

Use a new locknut (G4) during reassembly. Locknut (G4) has a self-locking feature, and once used may not provide adequate security.

3. Install and tighten bearing locknut (G4).
4. Install bearing cap (G1).
5. Install coupling key (G11). Install coupling hub.
6. Install shaft (33) through bearing frame (30).
7. Install slinger (B2) on shaft (33) and secure with setscrews (B6).
8. If throttle bushing (B3) was removed, secure new throttle bushing (B3) to locking ring (B1) with capscrews (B5). Install new throttle bushing (B3) and locking ring (B1) in the casing (2) or the backhead (6) and secure the locking ring (B1) with capscrews (B4).

9. Install shaft sleeve (34), if equipped.
10. On pumps with a backhead (6), install new backhead gasket (5) on backhead (6). Install backhead (6) on column (31) and secure with capscrews (36) and washers (37).
11. On pumps with a suction head (3), install casing (2) on column (31) and secure with capscrews (36) and washers (37).
12. On pumps equipped with a wear ring (4), install new wear ring (4) in suction head (3) or casing (2), if necessary.
13. Install impeller key (A2), making sure slot in shaft sleeve (34), if equipped, lines up with keyway in shaft (33).
14. Install impeller (1) and secure with impeller washer (A1) and impeller capscrew (A3).
15. On pumps with a backhead (6), install casing (2) and secure to backhead (6) with capscrews (10).
16. On pumps with a suction head (3), install new suction head gasket (5) on suction head (3). Install suction head (3) and secure to casing (2) with capscrews (10).
17. Remove lifting eyes from casing (2). Install pipe plugs (11).
18. On barrel mount pumps, install intermediate (61) and motor on pumping unit. Secure intermediate (61) to bearing frame (30) with nuts (64) on capscrews (63).
19. On chair mount pumps, install motor on pumping unit and secure to chairback with capscrews (66) and lockwashers (67).
20. Reconnect coupling. Realign coupling as outlined in section IV in this manual.
21. On barrel mount pumps, install guard plates and secure to intermediate (61) with capscrews and washers.
22. Reinstall pumping unit on foundation. Secure baseplate (4) to foundation with nuts (40) and lockwashers (41) on mounting bolts (39).
23. Relubricate bearings as outlined in section VI in this manual.
24. Reconnect suction and discharge piping.
25. Reconnect wiring to motor. Reconnect electrical power supply to motor. Start pump.
26. Open all system valves.

Reassembly of 30V Frame Pumps:

1. Install new shaft seals (G5) in spacer column (43).
2. Pack new bearings half full with recommended grease (refer to section VI in this manual). Install radial bearing (G3) and thrust bearing (G2) on shaft (33).
3. Install bearing lockwasher (G13). Install and tighten bearing locknut (G4). Recrimp bearing lockwasher (G13).
4. Install bearing cartridge (G12) and bearing cap (G1).
5. Install coupling key (G11). Install coupling hub.
6. Install shaft (33) through bearing frame (30).
7. Install slinger (B2) on shaft (33) and secure with setscrews (B6).
8. If throttle bushing (B3) was removed, secure new throttle bushing (B3) to locking ring (B1) with capscrews (B5). Install new throttle bushing (B3) and locking ring (B1) in the casing (2) or the backhead (6) and secure the locking ring (B1) with capscrews (B4).
9. Install shaft sleeve (34), if equipped.
10. On pumps with a backhead (6), install new backhead gasket (5) on backhead (6). Install backhead (6) on column (31) and secure with capscrews (36) and washers (44).
11. On pumps with a suction head (3), install casing (2) on column (31) and secure with capscrews (36) and washers (44).
12. On pumps equipped with a wear ring (4), install new wear ring (4) in suction head (3) or casing (2), if necessary.
13. Install impeller key (A2), making sure slot in shaft sleeve (34), if equipped, lines up with keyway in shaft (33).
14. Install impeller (1) and secure with impeller washer (A1) and impeller capscrew (A3).
15. On pumps with a backhead (6), install casing (2) and secure to backhead (6) with capscrews (10).
16. On pumps with a suction head (3), install new suction head gasket (5) on suction head (3). Install suction head (3) and secure to casing (2) with capscrews (10).
17. Remove lifting eyes from casing (2). Install pipe plugs (11).
18. On barrel mount pumps, install intermediate (61) and motor on pumping unit. Secure intermediate (61) to bearing frame (30) with nuts (64) and lockwashers (72) on capscrews (63).

19. On chair mount pumps, install motor on pumping unit and secure to chairback with capscrews (66) and lockwashers (67).
20. Reconnect coupling. Realign coupling as outlined in section IV in this manual.
21. On barrel mount pumps, install guard plates and secure to intermediate (61) with capscrews and washers.
22. Reinstall pumping unit on foundation. Secure baseplate (4) to foundation with nuts (40) and lockwashers (37) on mounting bolts.
23. Relubricate bearings as outlined in section VI in this manual.
24. Reconnect suction and discharge piping.
25. Reconnect wiring to motor. Reconnect electrical power supply to motor. Start pump.
26. Open all system valves.

IX. PARTS LIST.

Below is a general L & H Vertical parts list. For location of all parts in the list, refer to the sectional assembly drawings.

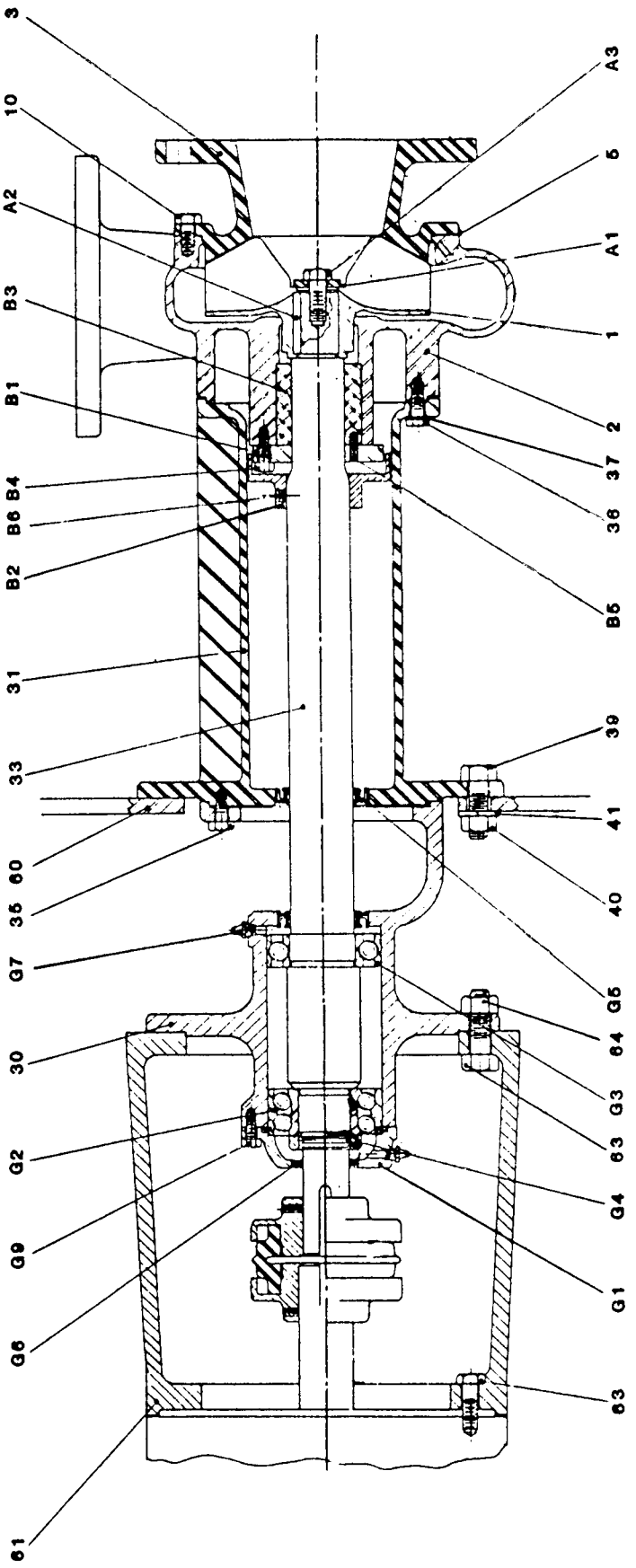
Parts List

Item No.	Part Name
1	Impeller
2	Casing
3	Suction head
4	Wear ring
5	Gasket (suction head or backhead)
6	Backhead
10	Capscrew (suction head-casing or backhead-casing
11	Plug (casing)
30	Bearing frame
31	Column
33	Shaft
34	Shaft sleeve
35	Capscrew (frame-column)
36	Capscrew (column-casing or column-backhead)
37	Lockwasher (column-casing or column-backhead on 12V; column spacer-base on 30V)
39	Capscrew (column-base on 12V; column spacer-base on 30V)
40	Hex nut (column-base on 12V; spacer-base and frame-column on 30V)
41	Washer (column-base on 12V; column-frame on 30V)
42	Lockwasher* (column-base)
43	Column spacer**

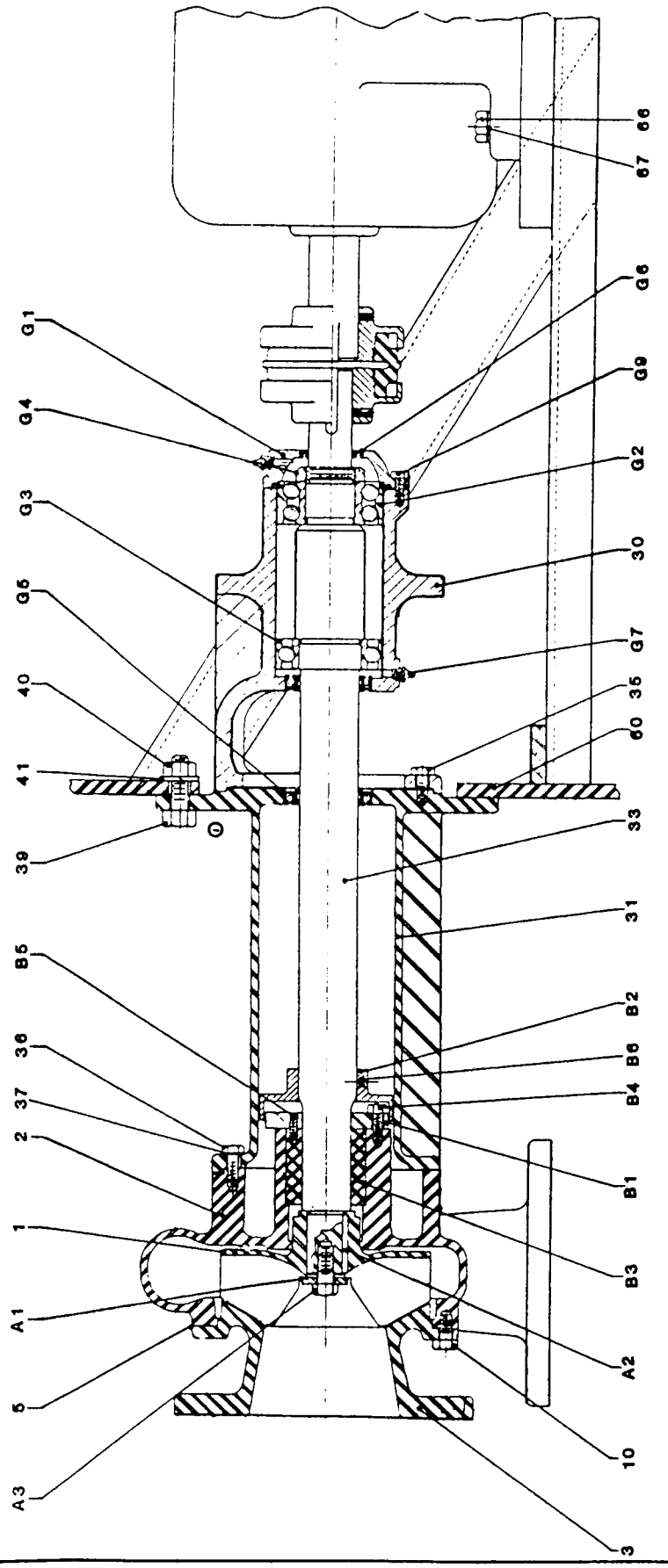
Parts List — continued

Item No.	Part Name
44	Washer** (column-casing or column-backhead)
60	Baseplate
61	Intermediate (barrel mount only)
63	Hex head bolt (barrel mount only, frame-intermediate and motor-intermediate on 12V; intermediate-frame on 30V)
64	Hex nut (barrel mount only, frame-intermediate on 12V; intermediate-frame and motor-intermediate on 30V)
66	Capscrew (chair mount only, motor-base)
67	Lockwasher (chair mount only, motor-base)
A1	Impeller washer
A2	Impeller key
A3	Impeller socket head screw
B1	Locking ring
B2	Slinger
B3	Throttle bushing
B4	Capscrew (locking ring-casing or locking ring-backhead)
B5	Setscrew (locking ring-bushing)
B6	Setscrew (slinger)
G1	Bearing cap
G2	Thrust bearing
G3	Radial bearing
G4	Bearing locknut
G5	Shaft seal
G6	Shaft seal* (bearing cap)
G7	Grease zerk
G9	Hex head bolt (bearing cap-frame)
G10	Plug
G11	Coupling key
G12	Bearing cartridge**
G13	Bearing lockwasher**
G14	Hex head bolt** (cover-cartridge)
G15	Hex nut** (cover-cartridge)

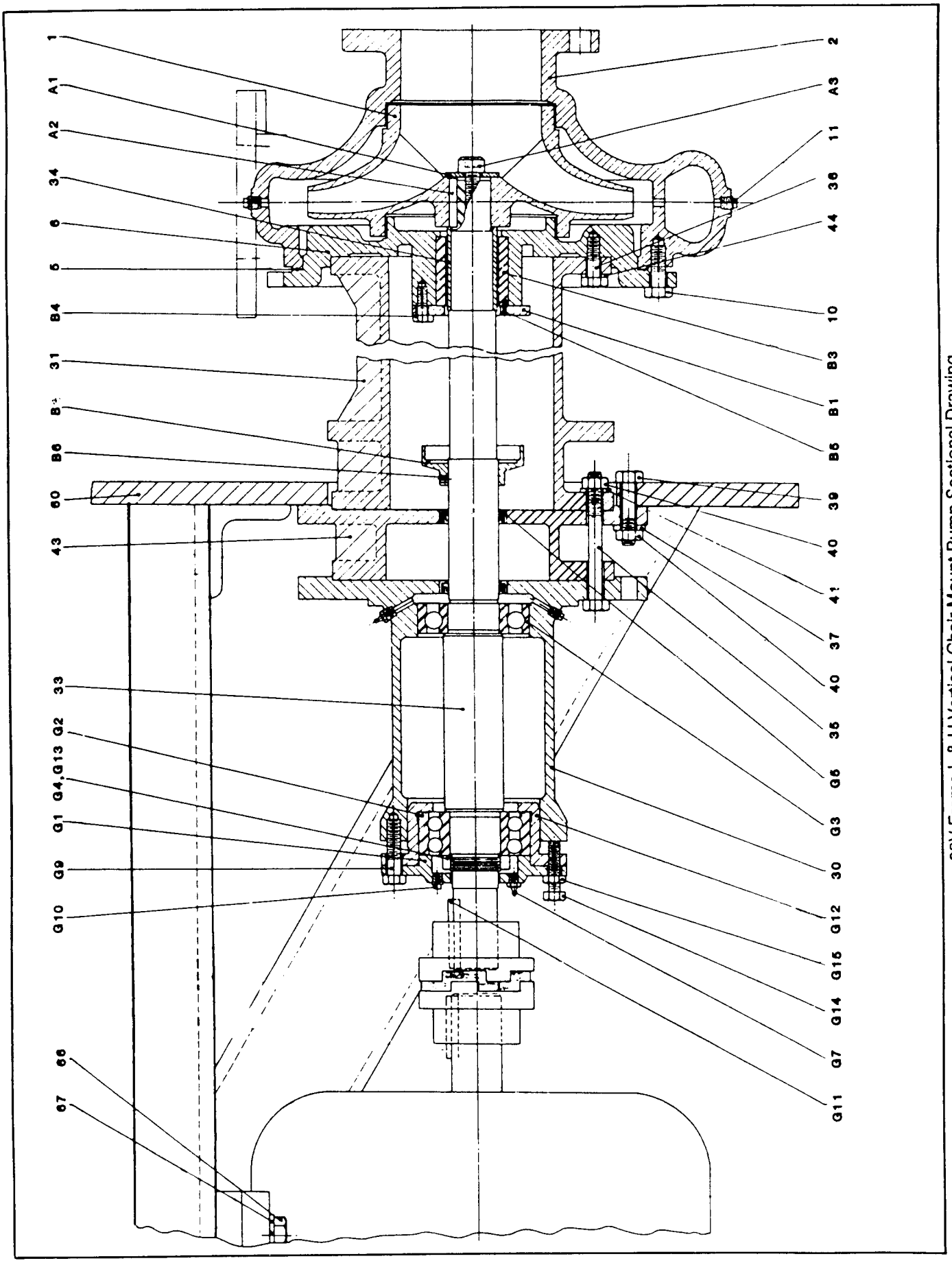
* indicates part appears on 12V frame pumps only
** indicates part appears on 30V frame pumps only



12V Frame L & H Vertical Barrel Mount Pump Sectional Drawing



12V Frame L & H Vertical Chair Mount Pump Sectional Drawing



30V Frame L & H Vertical Chair Mount Pump Sectional Drawing

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