



INSTRUCTION MANUAL REPAIR

MODEL 612A (SPHER-FLO)

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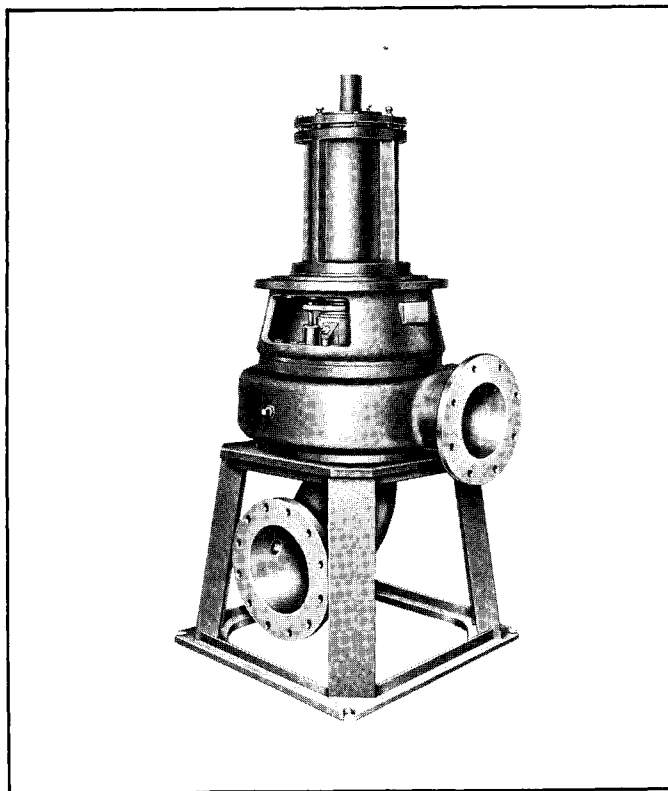
SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, lubrication and occasional cleaning. The intent of inspection is to prevent breakdown, thus obtaining optimum service life.

LUBRICATION OF BEARINGS

Regreasable bearings require periodic lubrication, which can be accomplished by using the lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality.

At the time of initial start-up it is important to note that the pump bearings have been factory lubricated. Do not add additional lubrication until completion of initial break-in period, which is the first 10 hours of continuous operation, or an equivalent intermittent operation. After break-in period, while unit is operating, add fresh grease (American Oil Company's Rykon #2 or equivalent) through zerk fitting near bearings.



Lithium-base grease is recommended as a lubricant for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands, which could damage the bear-

ings. Avoid vegetable- or animal-base grease, which can develop acids; as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should grease be reused.

Over lubrication should be avoided, as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 2,000 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least every 1,000 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, the weather, or heavy condensation such as is found in unheated and poorly ventilated underground locations.

The 5E, 5F, 5G, 5H, 6D and 6E bearing frames have back-to-back angular contact bearings as the outboard thrust bearing (50). This style bearing requires more frequent lubrication intervals. It is suggested that it be lubricated every 1,000 hours of running time.

The 4D, 5F, 5H, 6D and 6E power frames have a spherical roller bearing as the inboard radial bearing (49). This style bearing requires lubrication every 500 hours.

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200°F. While rotating it on a spindle, wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry the bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.



Use normal fire caution procedures when using any petroleum cleaner.

The motor that drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustration accompanying the disassembly instructions shows an exploded view of the pump. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect parts removed at disassembly to determine their reusability. Cracked castings should never be reused. All packing and gaskets should be replaced at reassembly simply as a matter of economy they are much less expensive to replace routinely than to replace as the need occurs. In general, it is economical to return the motor and motor controller to the manufacturer for repair.

SPHER-FLOW MODELS 612A DISASSEMBLY

This pump has been designed with back pull-out features, which allow the frame and rotating element to be removed without disturbing the suction and discharge piping.

1. Disconnect power so that drive unit cannot be accidentally energized during disassembly.
2. Close all valves or flow devices that control movement of liquids to or from the pump. Drain pump by removing drain plug (70) from suction elbow (65). Remove any flushing, lubrication, pressurization, venting, drain or cooling lines from pump. Remove handhole cover (19) and gasket (18) from casing (I) by removing capscrews (20).
3. Disconnect flexible shafting from pump. This may be accomplished by removing caps screws from flanged point adjacent to universal joint. It is recommended that flexible shafting be swung out of the way to allow removal of power frame and rotating element.
4. Remove capscrews (34) that secure bracket (8) to casing (1). Screw an eyebolt into outboard end of shaft (48) to aid in lifting power frame and rotating element from casing. The size of eyebolt is as follows:

- a. Power Frames 4C and 4D require 5/8-11 NC eyebolt.
- b. Power Frames 5E and 5F require 3/4-10NC eyebolt.
- c. Power Frames 5G, 5H, 6D and 6E require 1-8NC eyebolt.

5. Remove gasket (17) from its position between bracket (8) and casing (1). Inspect the sealing surface to ensure that it is clean and free of any gasket material that has stuck to parting surfaces. Replace this gasket with a new one when pump is reassembled.

6. Inspect casing and impeller wearing rings (3 & 6) (optional) and replace if necessary. Removal can be accomplished by removing capscrews (4 & 7).

7. Remove capscrews (10), o-ring gasket (11), washer (12) gasket (13) which allow impeller (2), key (14), and gasket (38) to be removed.

NOTE

Spher-Flo Pumps have a tapered hub impeller to facilitate impeller removal. Use caution in removal of impeller as it only has to be moved only a few thousandths of an inch to become entirely free.

The easiest method for removing impeller is to suspend entire power frame and rotating element about 1/32 of an inch above floor or work area. Apply pressure to impeller by means of jackscrews (60 and 61) located on bearing cap (50). When impeller is firmly against bracket (8) it should drop free after turning the jackscrews evenly, a flat at a

time, three or four flats.

8. Insure external retaining ring (snap ring, 39) is located in the groove on the inboard side of the shaft sleeve. Unscrew capscrews (34) to allow removal of stuffing box (27), shaft sleeve (36), gland (44) and seal or packing (47, 40).

NOTE

The shaft sleeve incorporates a snap ring designed to interfere with the base of the seal box assembly. When removing the stuffing box the shaft sleeve is also removed.

Slide complete assembly including shaft sleeve (36) off the shaft (48) with the aid of a pinch bar or other lever. Place the stuffing box assembly on a suitable work surface for further disassembly.

For further disassembly of the stuffing box proceed as follows:

a. Packing box (Standard)

Remove cap screws (45), and split accumulator gland halves (44) from stuffing box. Slinger (43) is now exposed and can be removed from shaft sleeve. Remove O-ring gasket (42) from the stuffing box. Remove and discard old packing (40). Clean all parts to remove any packing that may have adhered during removal. Leakage accumulator gland (44) on vertical units, may be further disassembled by moving cap screws (44A), pipe plugs (44D), tubing (44C) and hose connectors (44B).

B. Double Seal (optional).

1. Remove seal gland bolts (45) and remove gland (44) carefully exposing seal (47).
2. Stationary insert can now be carefully pressed out of the gland (44).
3. The exposed outboard seal ring in the stuffing box may be removed at this time if seal O-ring has not locked it into place. Do not attempt to pry the rotating face out of the stuffing box, leave rotating face in place if it cannot be readily removed. Liberally apply either a commercial mechanical seal lubricant or a non-abrasive liquid dish washing soap to the seal/shaft sleeve area.

4. Press the shaft sleeve (36), pressing from the outboard end of the sleeve, out of the stuffing box (27). Care should be taken to protect the rotating face from damage if the O-ring under the face should break loose and spring pressure force the face upward.

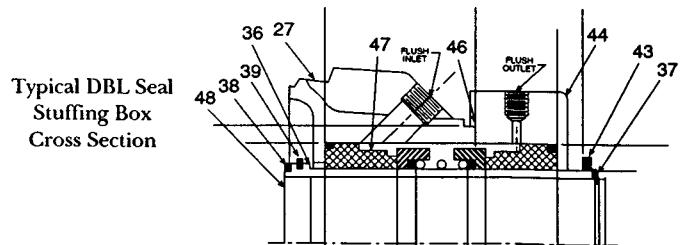
5. The stationary insert can now be carefully pressed out of the stuffing box (27).

The retaining ring (37) can be removed from the groove in the shaft by twisting it in a spiral movement toward the end of the shaft. Remove grease seal (53).

10. Place power frame on two benches, so that its shaft rests between them or on a bench with a hole cut in it large enough for shaft.

11. Remove capscrews (59) and lift out shaft assembly from the power frame.

12. The inboard radial bearing is either a ball bearing or spherical roller bearing design and can be identified by power frame as listed below.



Typical DBL Seal Stuffing Box Cross Section

4C, 5E, 5G Power Frames use ball bearings.

4D, 5F, 5H, 6D and 6E use spherical roller bearings.

13. Remove coupling half and key (55) from shaft. Remove plug (57) and zerk fitting (58).

14. Retainer ring (50B) is removed with a pair of truarc internal pliers so that grease retainer (50A) can be removed allowing bearing cap (51) to be removed from shaft assembly. Grease seal (52) may be removed if necessary.

15. With a pair of truarc external pliers, remove snap ring (50C) (PF#4 only), or remove locknut (50D) and lockwasher (50C) on power frame(s) #5 and #6.

16. Both inboard bearing (49) and outboard bearing (50) are pressed onto shaft. To remove bearings, use a wheel puller or press them off the shaft.

NOTE

When removing the inboard bearing (49) avoid damaging the separate grease shield (49A). This shield can be removed when bearing is removed from shaft.

17. If total disassembly is required, break connections to suction and discharge pipe and remove nuts from foundation bolts that hold support (21) to its foundation.

18. Secure casing and support assembly in sling and move it away from piping. Invert this assembly and set casing (1) on wood blocks, so as not to mar surface that mates bracket (8).

19. Suction gage (71) can now be removed from suction elbow (65). Unscrew capscrews (69), washers (69B), and nuts (69A), and remove handhole cover (68) and gasket (67) from suction elbow (65).

20. Place rope sling through elbow and cover opening. Remove capscrews (66) and lift suction elbow (65) away from cover (5). Remove gasket (64).

21. Unscrew capscrews (15) that hold support (21), cover (5) and casing (1) together. Lift support away and then set casing with discharge up. Gently tap cover loose with a rubber mallet. Remove gasket (16) to complete disassembly.

SPHER-FLOW MODEL 612A REASSEMBLY

These instructions are for a pump that has been completely disassembled. Use those parts that apply to your reassembly program.

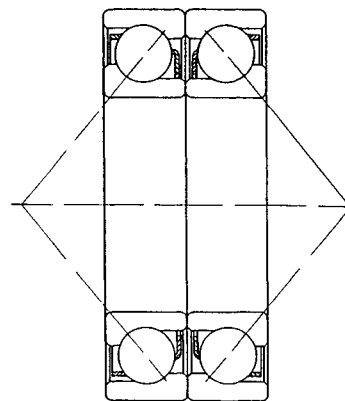
1. Place casing (1) with its outboard side down and position gasket (16) in place. Set cover (5) in place so the gasket position is neither lost nor damaged. Next align support (21) on cover. Use care not to disturb location of other parts. When all the above parts have been aligned, they are fastened together with capscrews (15). Tighten capscrews evenly to insure perfect register of mating parts. Replace pipe plugs (25) and (26) in casing.

2. Position gasket (64) on cover and carefully lower suction elbow (65) into place. Fasten suction elbow in place with capscrews (66).

3. Slip gasket (67) onto shoulder of handhole cover (68) and secure it to suction elbow (65) with capscrews (69), washers (69B) and nuts (69A). Place pipe plug or suction gauge (71) and drain plug (70) back into suction elbow.

4. Return casing and support assembly to its normal position. Fasten suction and discharge piping to pump. Secure this assembly in place by tightening nuts on foundation bolts. If pump has wearing ring (6) fasten it to cover (5) with screws (7). If handhole cover (19) was removed, place gasket (18) on cover and secure with capscrews (20).

5. Hand pack the outboard bearing (50) with grease and pack the grease retainer (50A) cavity one half full. Slide the grease retainer onto the shaft. Press the outboard bearing onto the shaft until it hits the shoulder of the shaft. Make sure outboard bearing set is properly matched with back-to-back configuration before pressing on shaft. Assemble snap ring (50C) onto the shaft with the beveled side outward to match the bevel in the shaft groove (PF#4 only). Install lockwasher (50C) and locknut (50D) to secure outboard bearing (50) to shaft (48) for P.F. #5 and 6. Torque to approximately 100 ft. lbs. Press or gently tap grease seal (52) into bearing cap (51). Slide the bearing cap (51) over the bearing (50). Lock in the assembly with snap ring (50B), matching the snap ring bevel to the groove bevel.



Back-to-Back
Bearing Configuration

6. Hand pack the inboard bearing (49) and the recessed area of its grease shield (49A). Slide the grease shield onto the shaft with the raised lip toward the bearing. Press on the bearing. Press the bearing on until all parts are shouldered tight together on the shaft. The grease shield may wear into the bearing outer race during break-in and is considered normal.

7. Place grease seal (53) into place on inboard end of power frame (56).

8. Lower sub-assembly from steps 5 through 7 into outboard end of power frame (56), which has been set on a bench with hole in it to accommodate the shaft.

9. Position jack screws so that they extend past the bearing caps as given in the following chart. This will position impeller hub end of the shaft in a axial position which will allow mounting impeller and closing down liquid end without any adjustment during the intermediate assembly

step. Final adjustment will have to be made by evenly tightening capscrews (59)

	Gap Clearance	Bolt Extension
Power Frame #4	1/8 in.	1/4 in.
Power Frame #5	1/4 in.	9/16 in.
Power Frame #6	1/4 in.	9/16 in.

10. Place plug (57) and zerk (58) back in bearing cap (51).

11. Place plug (62) and zerk (62A or 63) back on inboard end of power frame (56).

12. Retaining ring (37) can be set in its groove by turning it in a spiral motion up shaft. When in position, the outside diameter of this ring should slope toward inboard tapered shank end of shaft.

13. Position bracket (8) to power frame (56) and secure in place by evenly tightening capscrews (35).

14. The following procedure is used in assembling the appropriate sealing box:

A. Packing Box (Standard)

- I. Place two pieces of packing (40) into the stuffing box cavity (27) being careful to get each piece firmly in place. Install lantern ring (41), then add remaining three pieces of packing. When packing is tightened, lantern ring should align with holes for bushing (29), flushing lines, or cooling lines.

NOTE

Be sure to stagger joints of packing rings to avoid excessive leakage.

- II. Replace bushing (29) and grease zerk (30) in body of stuffing box (27).
- III. Snap retainer ring (39) onto shaft sleeve (36) with a pair of truarc external snap ring pliers. Slide shaft sleeve carefully into inboard end of packing box.
- IV. Place o-ring gasket (42) in stuffing box on top ring of packing (40). Be sure o-ring remains concentric against inside diameter of the stuffing box. Slide slinger (43) over shaft extension and adjust to ¼ in. below top of leakage accumulator after stuffing box assembly has been reattached to bracket. For pumps on #6 power frames, place slinger (43) over shaft sleeve (36), ½ in. from outboard end of sleeve. Replace pipe plugs (44D), hose connector (44B) and tubing (44C) in leakage accumulator gland (44). Place one half of leakage accumulator gland in stuffing box with connection for hose to drain positioned properly. Apply General Electric* Silicon Rubber Sealant (75) on both ends of this gland half. Thread capscrews (45) into stuffing box (27) approximately ¼ in. Insert other half of gland (44) into stuffing box being careful not to disturb o-ring gasket (42). Insert capscrews (44A) into each side of gland (44) to hold the two halves together. Tighten packing adjusting capscrews (45) to obtain proper sealing.

- V. Ensure capscrews (45) are now tightened enough to hold assembled gland in place. Final adjustment of packing box will have to be made after pump is returned to operation.

When pump is running, gland capscrews (45) should be evenly turned down a flat at a time, allowing packing to work in until a leakage rate of approximately 60 to 120 drops per minute is obtained.

NOTE

Do not over tighten packing as this will cause packing box to overheat and the shaft sleeve (36) to wear excessively.

- VI. Place gasket (38) in radial corner groove that is machined on the end of the shaft sleeve to complete assembly.

B. Double Seal (Optional)

NOTE

Do not put mechanical seal back into service until seal ring and stationary seat faces have been relapped or replaced.

- I. Thoroughly inspect the seal box cavity (27), checking for burrs or nicks which could damage the o-ring of the mechanical seal. Apply a film of liquid dishwashing detergent or rubber lubricant (do not use oil or grease) to the o-ring and seal seat. Press one stationary seat with o-ring gently into the seal box cavity (27) and the other into the gland plate (44).
- II. Place gasket (46) in position in the gland register.
- III. Snap retaining ring (39) onto sleeve (36) with a pair of truarc external pliers.
- IV. Slide sleeve through bottom of stuffing box and place one seal ring (47) over sleeve and slide it down to the stationary seat. Place metal parts over shaft and then second seal ring.
- V. Position gland over shaft sleeve and fasten to seal box with capscrews (45).

15. Place gasket (32) in groove of bracket (8).

16. Place key (54) in its keyway on shaft. Slide stuffing box assembly onto shaft, so that key and keyway in the shaft sleeve mate. Continue to slide assembly forward until shaft sleeve is in contact with retaining ring (37).

17. Align seal box (27) with gasket (32) and bracket (8). Fasten seal box to bracket with capscrews (33).

18. If pump has impeller wearing ring (3) fasten it to suction face of impeller (2) with setscrew (4).

19. Place impeller key (14) in keyway on the tapered portion of shaft (48) and set impeller (2) in position. Put gasket (13) inside impeller suction eye with washer (12) next and o-ring gasket (11) last. Secure impeller in place with capscrew (10) according to the following chart.

IMPELLER BOLT TORQUE

Power Frame	Impeller Bolt Size	Torque Value
4C, 4D	5/8 in.	75 FT-LBS
5E, 5F	3/4 in.	100 FT-LBS
5G, 5H	1 in.	100 FT-LBS
6D, 6E	1 in.	125 FT-LBS

20. Place gasket (17) on casing (1) and lower power frame (56) and rotating element assembly into place; fasten this assembly to casing with capscrews (34).

21. Using jackscrews (60) and nuts (61) located on bearing cap (51), adjust impeller and shaft assembly axially down until impeller bottoms out on its suction cover (5) or wearing rings (3) and (6). Then, loosen capscrews (59) and turn jacking screws (60) inward 3 or 4 flats to raise impeller to running clearance of .015/.025. Tighten jam nuts (61) and capscrews (59) to lock in adjustment.

22. Make one last check that all parts of the rotating element turn freely.

23. Connect any flushing lines or cooling lines that were removed. Remove the lifting eye and secure the flexible shafting in place. Ideal joint operating angle is 1° to 5°.

24. Open all valves or flow devices that control flow of liquid to and from pump.

25. Connect Power.

NOTE

Do not start up a pump until all air and vapor have been bled, making sure that there is liquid in the pump to provide the necessary lubrication. It is possible that the mechanical seal may drip during the first few minutes of operation.

Turn on power momentarily to check for proper rotation. Rotation should be clockwise as viewed from driver (see arrow on casing).

*General Electric is a registered trademark of the General Electric Corporation.

MODEL 612A LIST OF PARTS

1. Casing	33. Capscrew	58. Grease Fitting
2. Impeller	34. Capscrew	59. Capscrew
3. Wear Ring	35. Capscrew	60. Capscrew
4. Set Screw	36. Sleeve	61. Jam Nut
5. Suction Cover	36A. Sleeve Adapter	62. Pipe Plug
6. Wear Ring	37. Retaining Ring	62A. Fitting Grease (P.F. 6&6E Only)
7. Set Screw	38. Gasket	63. Grease Fitting or Pipe Plug
8. Bracket	39. Retaining Ring	64. Gasket
10. Imp. Bolt	39A. O-Ring	65. Suction Elbow
11. Imp. Bolt Seal	40. Packing	66. Capscrew
12. Imp. Washer	41. Lantern Ring	67. Gasket
13. Imp. Washer Gasket	42. O-Ring	68. Handhole Cover
14. Impeller Key	43. Slinger	69. Capscrew
15. Capscrew	44. Gland	69A. Nut
16. Gasket	44A. Capscrew	69B. Washer
17. Gasket	44B. Hose Connector	70. Pipe Plug
18. Gasket	44C. Hose	71. Suction Gauge or Pipe Plug
19. Handhole Cover	44D. Pipe Plug	72. Drive Pins
20. Capscrew	45. Capscrew	73. Name Plate
21. Pump Support	46. Gasket	75. Sealant
25. Pipe Plug	47. Mechanical Seal	
26. Pipe Plug	48. Shaft	
27. Stuffing Box	49. Inboard Bearing	
27A. Adapter Plate	49A. Grease Shield	
27B. Split Packing Box	50. Outboard Bearing	
27C. Gasket	50A. Grease Shield	
27D. Pin	50B Retaining Ring or Capscrew (P.F. 6E)	
27E. Capscrews	50C. Lockwasher or Retaining Ring	
27F. Capscrews	50D. Locknut	
28. Pipe Plug	51. Bearing Cartridge	
29. Bushing	52. Grease Seal	
30. Fitting	53. Grease Seal	
31. Pipe Plug	54. Sleeve Key	
31A. Pipe Coupling	55. Shaft Key	
31B. Nipple	56. Power Frame	
32. Gasket	57. Pipe Plug	

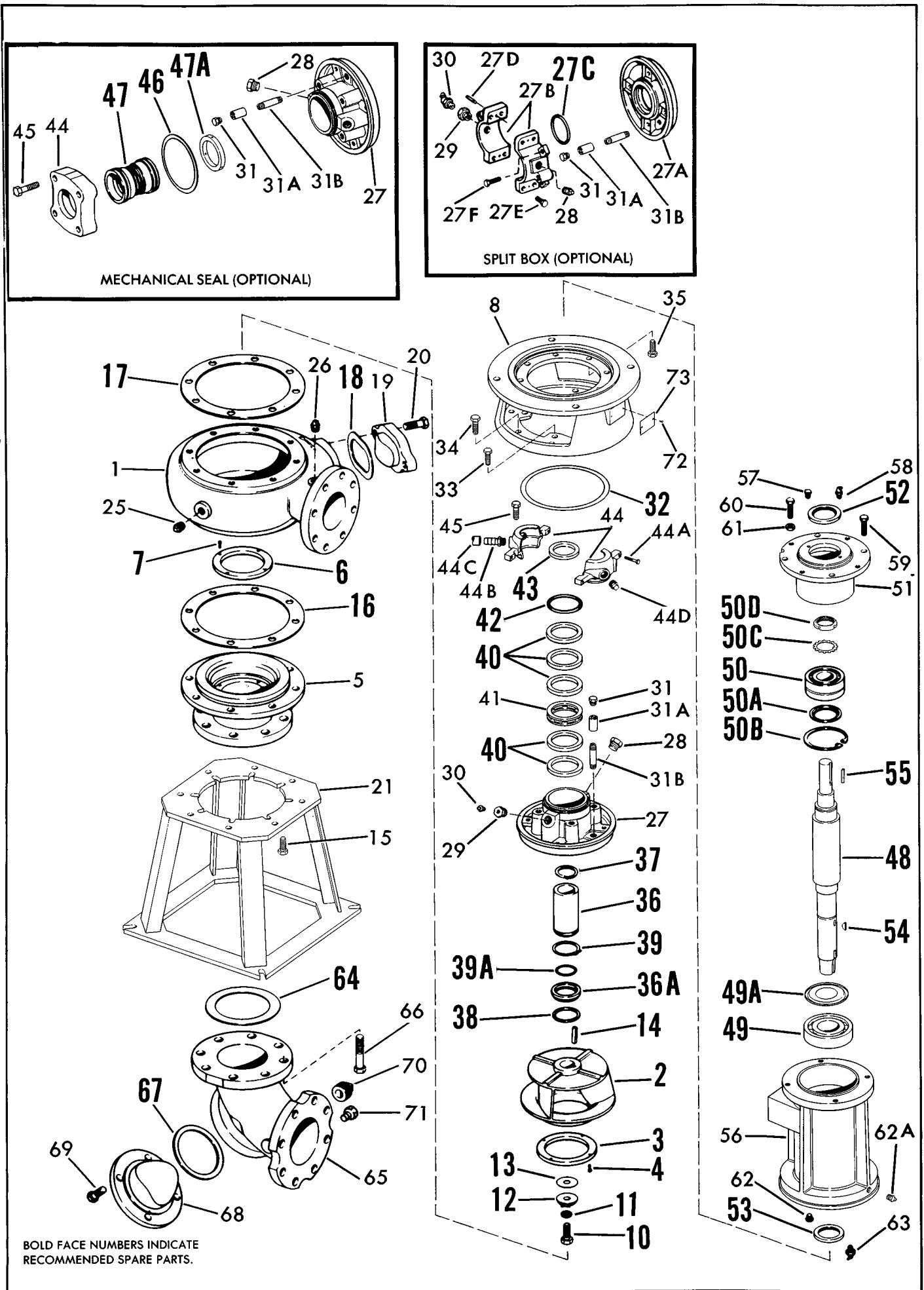


Figure 3. Model 612A Exploded View