ENGLISH: PAGES 2-36

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

1. Seller warrants products of its own manufacture and workmanship under normal use and service according to previously submitted terms and conditions letter or form KC585.

2. Accessories and components not manufactured by seller are warranted only to the extent of the original manufacturer's warranty.

3. No allowances will be made for repairs or alterations effected without specific written authorization from seller.

4. Repairs or alterations made with other than genuine Fairbanks Nijhuis™ original equipment parts may void the warranty and relieve the seller of all product responsibility.

5. This warranty is void unless the purchaser provides protective storage, installs and maintains the equipment in accordance with manufacturer's instructions.

6. Under the terms of this warranty, seller shall not be responsible nor liable for:

   a. Consequential, collateral or special losses or damages.

   b. Equipment conditions caused by fair wear and tear, abnormal conditions of use, accident, neglect, or misuse of said equipment.

   c. Labor charges, loss or damage resulting from supplying of defective part(s) or improper repairs by unauthorized person(s).

   d. Damage caused by abrasive materials, chemicals, scale deposits, corrosion, lightning, improper voltage or mishandling.

7. The above listed warranty highlights do not constitute our total terms and conditions regarding warranty.

Pertinent nameplate information is shown below. It will aid in obtaining the correct replacement parts for your pump. The serial number is stamped on the discharge flange.

Pump	
Serial Number	
Model Number	
Pump Size	
Number Stages	
GPM	
Head (feet)	

*To be copied from motor nameplate.

These warnings apply to pumps supplied by Fairbanks Nijhuis™. Refer to the manuals supplied by the driver or control manufacturers for additional warnings before operating this equipment.

Before attempA3,n m(vacting thto p,rmili clzefor yself Itthing thm th manent.)TjETEMC /Span /Lang (en-GB)/MCID1337 BDC BT/TT1 1 T4

Short-term storage is when the pump will be stored for periods not exceeding three months. The following are the short-term storage requirements:

A. Rotate the shaft for several revolutions at least once every two weeks to:

   1. Coat the bearing with lubricant.

   2. Retard oxidation or corrosion.

   3. Prevent possible false Brinelling.

Long-term storage is when the pump will be stored for periods exceeding three months. The following are long-term storage requirements:

1. Remove gland halves, packing and seal water ring from the stuffing box. Package them in a suitable container to prevent loss or damage. Coat the inside of the stuffing box with grease.

2. Fill the bearing housings with specified lubricating grease until grease exits from relief fittings.

3. Wipe clean all exposed machined surfaces and coat with a heavy layer of grease or other equivalent rust prevention material.

4. Cover the suction and discharge of the pump with cardboard or wood to prevent entry of foreign material or varmints.

5. Rotate the pump shaft several times by hand repeating this every two (2) weeks during storage. Rotation of the shaft will coat the bearings and retard oxidation, preventing possible false Brinelling.

1. Remove gland halves, packing and seal water ring from the stuffing box. Package them in a suitable container to prevent loss or damage. Coat the inside of the stuffing box with grease.

2. Fill the bearing housings with specified lubricating grease until grease exits from relief fittings.

3.

5. All internal surfaces in contact with water should be sprayed with Grade 5 of MIL-C-ISI73 Corrosion Preventive

NPSH can be defined as the head (energy) that causes liquid to flow through the suction pipe and enter the eye of the impeller.

NPSH is expressed in two values:

1. NPSH required (NPSHR).

2. NPSH available (NPSHA).

It is essential that NPSHA always be greater than NPSHR to prevent cavitation, vibration, wear and unstable operation.

NPSHR is a function of the pump design and therefore varies with the make, size, capacity and speed of the pump. The value for your pump can be obtained from your pump performance curve or the factory.

NPSHA is a function of your system and may be calculated as follows:

A. When the source of liquid is above the pump:

   1. NPSHA = barometric pressure (feet) + static suction head (feet)* – friction losses in suction piping (feet)

The pump foundation should have a level surface and be of sufficient mass to prevent vibration and form a permanent rigid support for the unit. The most satisfactory foundations are concrete with anchor bolts of adequate size embedded in the foundation in pipe sleeves with an inside diameter 2-1/2 times larger than the bolt diameter. This will allow for final accurate positioning of the unit.

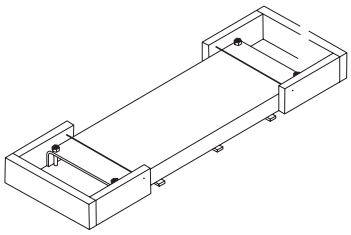
Recommended anchor bolt design is available from the factory.

Lower the unit onto the foundation and position the base so the anchor bolts are aligned in the middle of the holes in the base. Disconnect the coupling halves and do not reconnect until all alignment operations are complete.

Set the base on metal shims or metal wedges placed directly under the part of the base carrying the greatest weight, and spaced close enough to give uniform support and stability.

Adjust the metal shims or wedges until the shaft of the pump and driver are level or vertical as appropriate and until pump and driver shaft are aligned with each other. Make sure that all shims or wedges fit firmly between the foundation and the base.

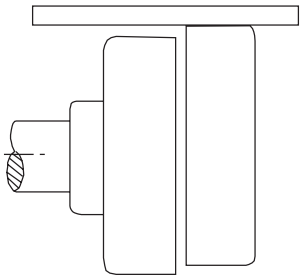
If leveling nuts are installed on the anchor bolts and are used for alignment, follow the same procedure as with shims or wedges. Support the base with additional shims or wedges if necessary. Make sure that all nuts and shims are in firm contact with the base. Tighten the foundation bolts snugly, but not too firmly, and recheck the shafts for alignment before grouting.



Grouting the base plate prevents lateral movement of the base plate, and improves the vibration absorbing characteristics of the foundation by increasing its mass. A wooden dam should be constructed around the base plate to contain the grout while it is being poured. The dam can be built tight against the base plate, or slightly removed from it as desired. . The entire base plate should be completely filled with nonshrinkable type grout. Be sure to remove all air bubbles from the grout.

Do not fill the pipe sleeves with grout.

If leveling nuts are used, make sure they are not embedded in grout. Provide access in the grout to the leveling nuts so that they can be backed off after the grout has cured.



To check parallel alignment, a straight edge should be held against the edges of the coupling halves at any four places 90° apart around the coupling. The straight edge should be parallel to the pump and driver shafts at all times. Insert shims until the straight edge lies flat against both coupling halves at all four checkpoints. The pump and driver will then be in proper parallel alignment.

A dial indicator should be used when greater alignment accuracy is required. Use the following alignment tolerances unless specified otherwise by the coupling manufacturer. On sleeve type couplings make sure there is at least 1/8" end clearance between the sleeve and the two coupling halves.

To check angular misalignments, mount the dial indicator base to the coupling half, and position the dial indicator button on the front or rear face of the opposite coupling half. Set the dial to zero, rotate both coupling halves together, making sure the indicator button always indicates off the same spot. Misalignment values within 0.004 inches TIR per inch of coupler radius is permissible.

To check parallel misalignment, mount the dial indicator base to one coupling half, or shaft and position the dial indicator button on the outside diameter of the opposite coupling half. Set the dial to zero. Rotate both coupling halves together, making sure the indicator button always indicates off the same spot. Misalignment within 0.004 inches TIR is permissible.

Realign the base after piping from time to time while the unit and foundation are new. Coupling misalignment can occur because of shifts in grouting, foundation or because of large objects going through the pump causing shock loading conditions.

Coupling alignment should be checked periodically for changes. Coupling misalignment can lead to or cause bearing failure, coupling failure, shaft breakage, high power consumption, etc.

Install any additional piping connections your pump may require such as water seal piping, stuffing box drain, baseplate drain, and pressure gauges.

The priming procedure is different for positive and negative suction head systems and the following procedures should be followed:

A. Positive suction head.

1. Open the vent on the highest point on the pump casing.
2. Open all suction valves.
3. Allow the liquid to flow from the vent hole until all air bubbles are vented, and then close the vent.
4. The pump is now primed.

B. Negative suction head.

1. Install the priming system on the vent on the highest point of the pump casing.
2. Close the discharge valve.
3. Open the suction valve.
4. Start the priming system.
5.

Check the following before normal start-up:

A. Driver lubrication.

B. General condition of all equipment.

Start-up after a week or more downtime:

A. Repeat those procedures covered by initial start-up.

Pump stations are usually designed to have the pumps started and stopped automatically using a controller. Since this is a function of station design, the operators should be thoroughly familiar with the system's operating parameters and in the use of the controller. The general procedure to shut down the pump is as follows:

A. Disconnect the electrical power.

   1. Lock out the power to the driver.

B. If the pump is to be removed for repair, close the suction and discharge valves.

In the event of an emergency, shut off the power at the nearest switch. The operator or persons working around the equipment should be familiar with locations of emergency shut-off points.

Many installations are equipped with emergency shut-off switches near the pump location. These locations should be plainly marked and be readily accessible at all times.

The control panel (if used) may be equipped with an emergency stop button or switch.

These pumps are designed to operate over a wide ambient temperature. The temperature, when measured on the outside surface of the bearing housing, should not exceed 190°F. Temperatures in excess of 190°F may indicate a lack of lubricant, or bearing problems. If the temperature exceeds this limit, the pump should be stopped and the cause investigated and corrected.

7. Pump is noisy or has excessive vibration.	a. Magnetic hum.	a. Consult motor manufacturer.
	b. Motor bearings are worn.	b. Replace bearings.
	c. Foreign material in impeller.	c. Remove foreign material.
	d. Impeller is binding.	d. See 6f above.
	e. Motor shaft is bent or worn.	e. See 6g above.
	f. Drive and pump are misaligned.	f. See 6h above.
	g. Power frame shaft is bent.	g. See 6i above.
	h. Foundation is not rigid.	h. Strengthen foundation; change method of mounting pump unit.
	i. Worn bearing in power frame.	i. Replace bearing.
	j. Impeller is damaged.	j. See 3h above.
	k. Lack of lubrication in power frame.	k. Lubricate power frame bearing; replace bearings if damaged.
	l. Pump is not properly leveled.	l. Check levelness of pump.
	m.Piping is not supported.	m. Provide support for suction and discharge piping.
	n. Pump is cavitating.	n. Re-evaluate pump application; consult local Fairbanks Nijhuis™ sales office.

The trouble or symptoms, their probable causes and the suggested remedies contained in this troubleshooting guide will assist you in quickly determining and correcting most problems should they occur. It is not the intention of Fairbanks Nijhuis™ to replace the recommendations of the motor manufacturer in regard to operation and maintenance. Rather, this guide is offered as a supplement to such data. Any specific questions or problems should be directed to the manufacturer of the motor. Be sure to supply the relevant data from the motor nameplate when inquiring about motor service or maintenance.

Electrical power should be disconnected and locked to prevent the motor from accidentally starting during mechanical systems check.

1. Motor does not start.	a. Break in power supply circuit. 1. Blown or defective primary fuses or open circuit breakers. 2. Blown or defective secondary fuses or opened circuit breakers.	a. Close break in circuit. 1. Check voltage across all phases above the disconnect switch. Replace fuses or reset circuit breakers as necessary. 2. Check voltage across all phases below disconnect switch (with disconnect switch closed). Replace fuses or reset circuit breakers as necessary.
	b. Open control circuit. 1. Overload trips are open. 2. Defective holding coil in magnetic switch. 3. Loose or poor connections in control circuit.	b. Complete control circuit. 1. Push reset button. 2. Push start button and allow sufficient time for operation of time delay, if used, then check voltage across magnetic holding coil. If voltage is measured, coil is defective. If no voltage is measured, control circuit is open. 3. Make visual inspection of all connections and retighten as necessary.
	c. Magnetic switch closes. 1. Poor switch contact. 2. Open circuit in control panel. 3. Open circuits in leads to motor. 4. Leads improperly connected.	c. Check switch operation. 1. Open manual disconnect switch, close magnetic switch by hand and examine contactors and springs. 2. Check voltage at TI-TI-T3. 3. Check voltage at leads to outlet box. 4. Check lead numbers and connections.

2. Motor fails to come up to speed.	a. Low or incorrect voltage.	a. Check voltage at TI-T2-T3 in control panel.
	b. Incorrect connections at motor.	b. Check for proper lead connections at motor, compare with connection diagram on motor.
	c. Overload–mechanical.	c. Check impeller setting. Check for tight or locked shaft.
	d. Overload–hydraulic.	d. Check impeller setting. Check GPM against pump capacity and head.
4. Motor vibrates.		

Oil lubricated bearings are optional on Model 1920 pumps. A fixed oil level is maintained within the bearing cartridge by an oiler which allows visual indications of reserve oil.

At initial installation and before starting a unit that has been shut down for repairs or for any extended length of time, run enough lOW-30 weight motor oil through the oiler to maintain a constant oil level to ensure that the bearing will never be without an oil supply. Oil will have to be added at intervals to maintain a constant level in the oiler. This interval can be determined only by experience.

Under working conditions, oil will break down and need to be replaced at regular intervals. The length of these intervals will depend on many factors. Under normal operation, in clean and dry locations, the oil should be changed about once a year. However, when the pump is exposed to dirt contamination, high temperatures (200°F or above) or a wet location, the oil may have to be changed every 2 or 3 months.

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

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 Fairbanks Nijhuis pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. All packing and gaskets should be replaced with new ones 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 to the manufacturer for repair only the motor and motor controller.

Disassemble only what is needed to make repairs or accomplish inspection. Proceed to disassemble the pump as follows: (See Figure 6 for Models 1920 and 1920F, Figure 7 for Model 1910 and Figure 8 for Model 1940.)

1. Break electrical connection to motor or take similar steps to make certain that drive unit will not be unintentionally energized during disassembly.

2. Close such valves or flow-control devices necessary to make certain that flow of liquid will not take place during disassembly.

3. Drain liquid from pump by removing plugs (3B and 3A). Disconnect bypass lines if applicable.

4. Loosen and remove capscrews (2A) securing casing half (3) to remainder of pump assembly.

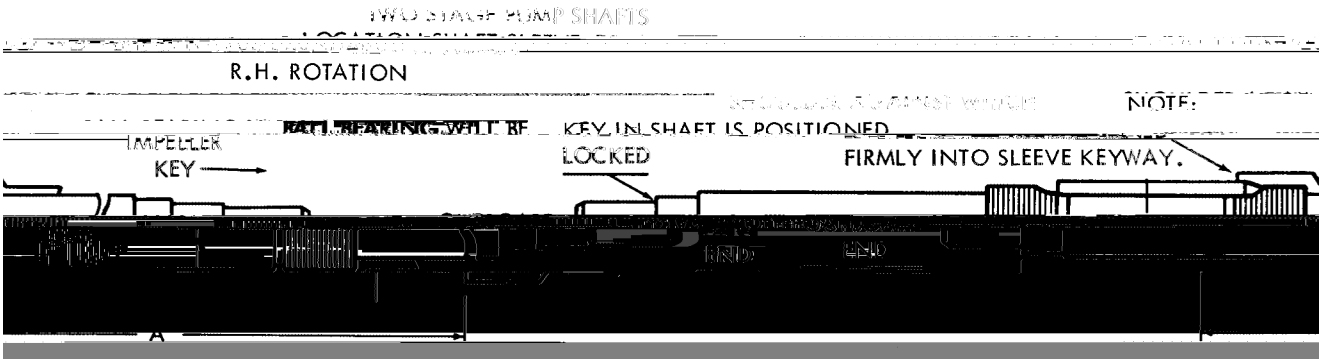
5. Make certain that all securing capscrews are removed, then carefully remove casing half (3) using hoist or crane with sling attached to cast hooks.

6.

14. If pump is grease lubricated remove zerks (164) and pipe plugs (168A) from cartridge caps (A159 and B159). If pump

wearing rings and impeller. The opposite surface of the impeller should be protected from damage throughout the procedures by resting it against soft wood on the surface of work bench.

4. On right-hand unit proceed to assemble the rotating element as follows:

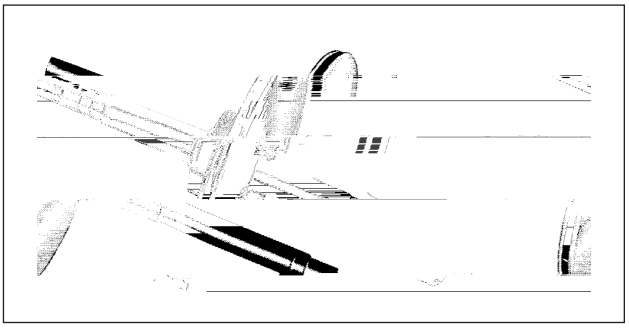

TWO STAGE PUMP SHAFTS
R.H. ROTATION
NOTE:
IMPELLER
KEY
LOCKED
FIRMLY INTO SLEEVE KEYWAY.
A

11. Press grease seal (159C) into cartridge cap (B159). Position gasket (159E) and cartridge cap against bearing cartridge and secure it in place with capscrews (159G). Be sure to align grease zerk holes and pipe plug hole on opposite sides.
12. Place slinger (B126) onto shaft. Place grease zerks (164) in bearing cartridges and pipe plugs (168A) in bearing caps. If pump is oil lubricated, Model 1920 only, breather tubes are placed in each bearing cartridge. Oilers with nipples and elbows are placed in cartridge caps.

13. Slide casing wearing rings (16) over impeller hub or optional wearing rings (17) and set rotating element into casing half (2). Make certain that drill holes in bottom surface of casing wearing rings are located over pins (17A). The drill hole in casing bushing (39) is over pin (39C) previously set in casing half (2).

14. Install key (272) in motor end of shaft (4). Check positioning and alignment of packing rings or seal components, install swing bolts (19D) and split gland halves (19) if pump has packing. Position clamps (19C), washers (19B), and nuts (19A), securing loosely in place. Swing bolts (19D) are set over pins (19F) on 3" 1913A, 3" 1923A, 3" 1843A or smaller units. On larger units, swing bolts are held in place by capscrews (2B) after casing half (3) is in position.

15. Place pins (158A) into bearing cartridges. Place bearing caps (6) in position and secure with capscrews (6A).



J. Impeller separator sleeve removed from shaft.

16. Position new casing gaskets (157) on casing half (2). Set casing half (3) in place. Secure it to casing half (2) with capscrews (2A). Pins (2C) are used as a means of locating the position of casing halves.

17. On pumps larger than 3" 1913A, 3" 1923A, 3" 1843A thread in capscrews (2B) making sure they are placed through eye of swing bolts (19D).

18. Place drain plugs (3B) and (3A) back in casing halves.

19. On Model 1940 pumps, set the motor on motor bracket (74) and fasten them together with capscrews (74A) and nuts (77C). Slide flexible coupling half onto pump and motor shafts. Attach motor bracket to casing half (2) with capscrews (74B). Connect flexible coupling halves.

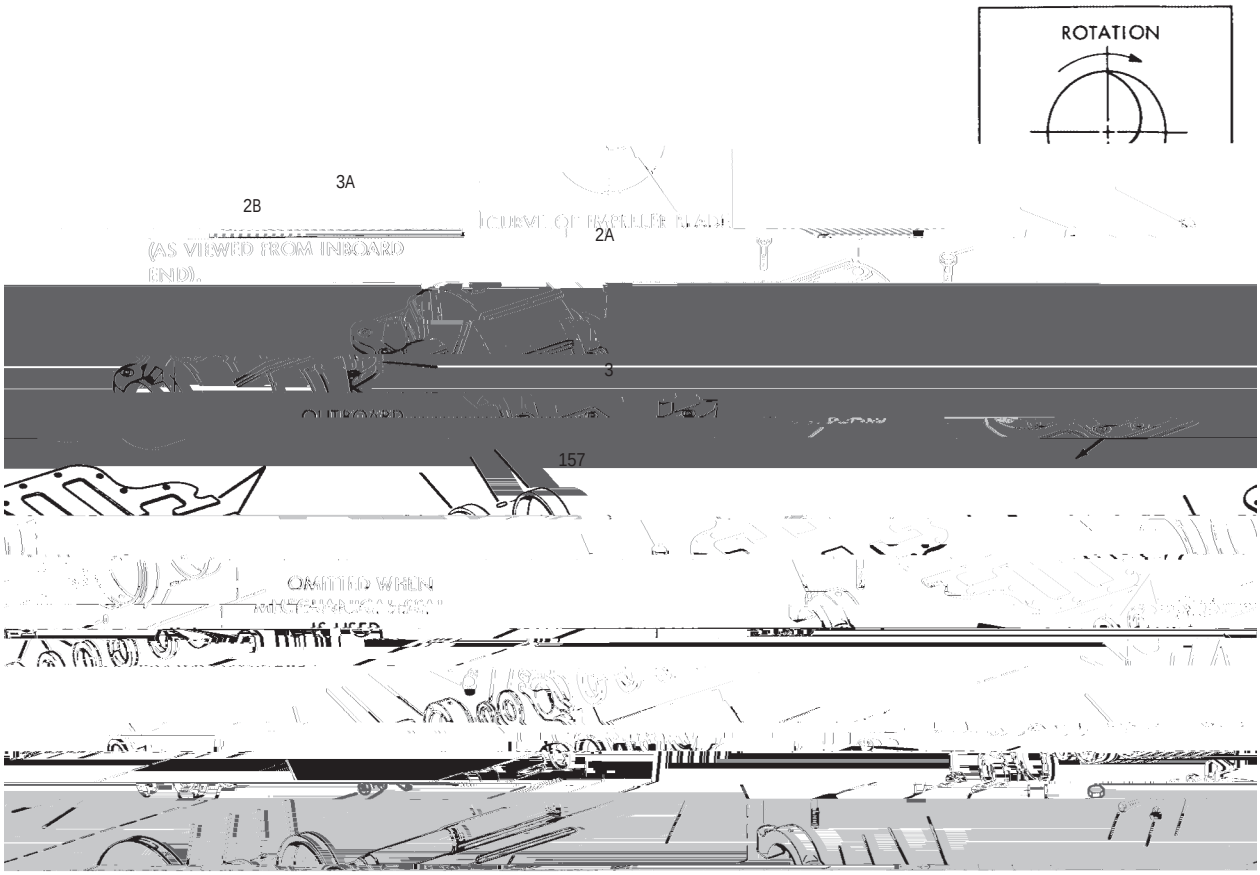
20. If the casing half (2) was removed from base, see section on installation for proper methods of realigning pump to motor and piping. On Model 1910 pumps see this section for realigning pump to flexible shafting. Attach flexible shafting to pump. Ideal joint operating angle is 1° to 5°.

21. Replace any flushing or cooling lines that were removed. Connect electricity back to motor.

Overtightening the packing will cause stuffing box to overheat. The shaft sleeve will also receive excessive wear.

K. Inboard impeller removed. Shaft sleeve in place.

*Recommended for severe duty applications.


ROTATION
3A
2B
CURVE OF BAFFLE PLATE
2A
(AS VIEWED FROM INBOARD
END).
3
OUTBOARD
157
OMITTED WHEN
IS USED

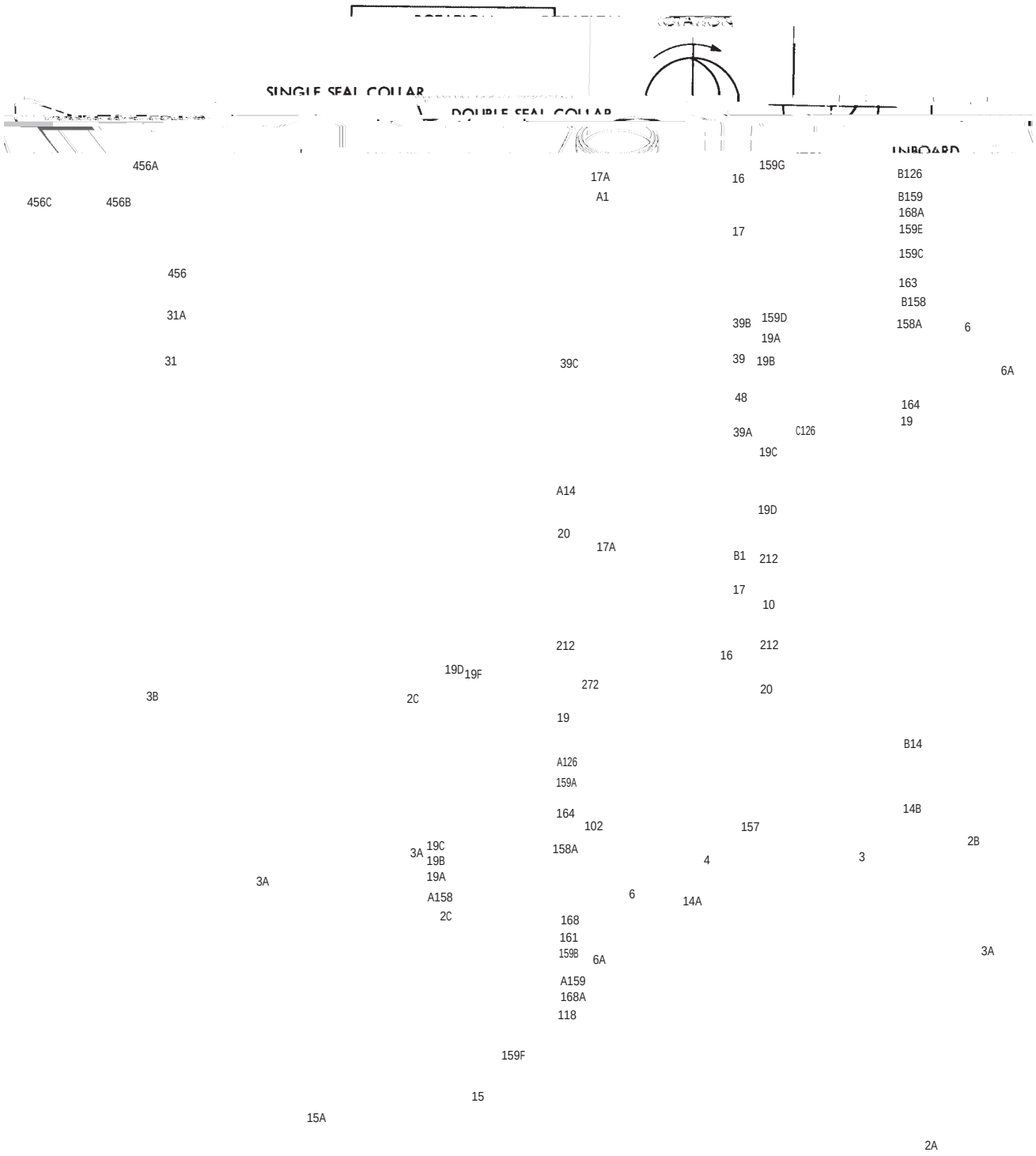

SINGLE SEAL COLLAR
456A
456C
456B
456
31A
31
17A
A1
39C
A14
20
17A
212
19D
19F
3B
2C
19
A126
159A
164
102
158A
3A
19C
19B
19A
A158
2C
168
161
159B
6A
A159
168A
118
159F
15
15A
159G
16
17
39B
159D
19A
39
19B
48
39A
C126
19C
19D
B1
212
17
10
212
16
20
272
4
6
14A
157
B126
B159
168A
159E
159C
163
B158
158A
6
6A
164
19
B14
14B
2B
3
3A
2A

Figure 8. 1940 Pump Exploded View

DELIVERY: Buyer agrees to inspect all deliveries immediately. Any claim for shortages must be made in writing within ten (10) days after Buyer receives a shipment, and if not made, shall be deemed waived. Any other claim by Buyer, other than claims under the warranty stated in Paragraph 13, shall be made within thirty (30) days after Buyer receives shipment, and if not made shall be deemed waived. Seller is not responsible for loss or damage in transit after having received an "In Good Order" receipt from the carrier. Buyer will make all claims for loss or damage in transit against the carrier.

Buyer is fully responsible for (including payment of the cost of) installation and start-up of all equipment sold under the Order.

PATENT INFRINGEMENT: Seller will defend Buyer and the user of the equipment against any claim that any equipment and parts of Seller's manufacture furnished under the Order infringe upon any published United States patent, and Seller will pay all damages and costs awarded by a court of competent jurisdiction with respect to such claim. The Buyer or user must promptly notify Seller of any such claim, and cooperate fully with Seller in the defense of such claim, or Seller will have no duty under this paragraph. Buyer will defend and indemnify Seller against patent infringement claims relating to equipment