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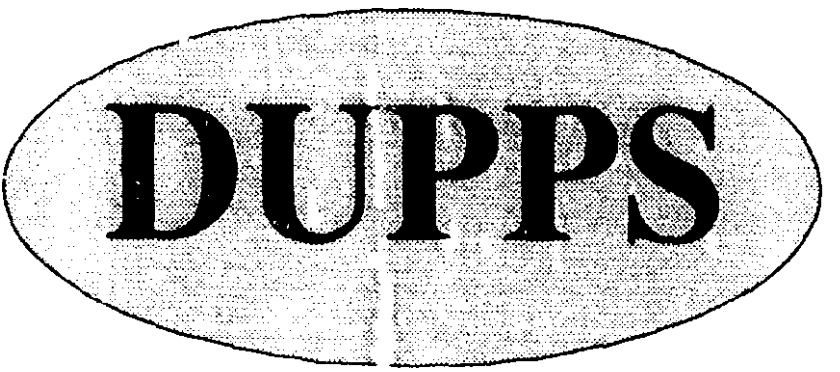

Instruction Manual
for:

DUPPS
2400 Series
Dewatering Press

- **Installation**
- **Operation**
- **Maintenance**
- **Repair**

Publication No. DP-9103

Introduction

This manual contains specifications. operating and service procedures, and an illustrated parts listing for Dupps 2400 Series Dewatering Presses.

This manual includes information that pertains to all of the models in the 2400 Series of Dewatering Presses. The Configuration Sheet in this section of the manual lists specifications for your press.

The service procedures in this manual describe regular maintenance, troubleshooting, disassembly, and assembly of selected press components. Appendix A includes information provided by the manufacturers of commercial components that are not covered in the service instructions. Contact your Dupps service representative or the component manufacturer before performing service procedures that are not described in this manual.

Carefully read the instructions and safety precautions given in this manual. Do not service the press until you have read this manual thoroughly.

At the time of writing. this manual was completely up-to-date. However, due to continual design improvement, some descriptions and/or illustrations in this manual could vary slightly from the machine delivered to you. If you have questions regarding safety, construction. or service of this machine, please contact:

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Chapter 1

General Description and Specifications

1.1 General Description

The Dupps 2400 Series Dewatering Presses are designed toremovc liquid from paper waste sludge. The Dewatering Press performs one operation in the dewatering process, producing a dry cake which is suitable for further processing.

Pre-thickend sludge enters the feed hopper. Flights on the rotating press shaft convey the sludge toward the discharge box. As the material moves toward the discharge box, compression resulting from the increasing root diameter of the press shaft forces the water out through the screens surrounding the shaft. A pneumatically controlled, adjustable choke at the press discharge allows the operator to control the amount of pressure exerted on the cake. The dried cake is discharged at the choke and drops into the discharge box. Liquid pressed out of the cake is collected in the liquid drain pan and discharges through a suitable flanged opening.

Figure 1-I identifies the major press components.

1.2 Installation Information

This section lists the general specifications, dimensions, and required installation clearances for the Dupps 2420 Dewatering Press. Full specifications for each press component are listed in the next section.

Utility Requirements

The Dupps 2400 Series Dewatering Press requires the following utility supplies:

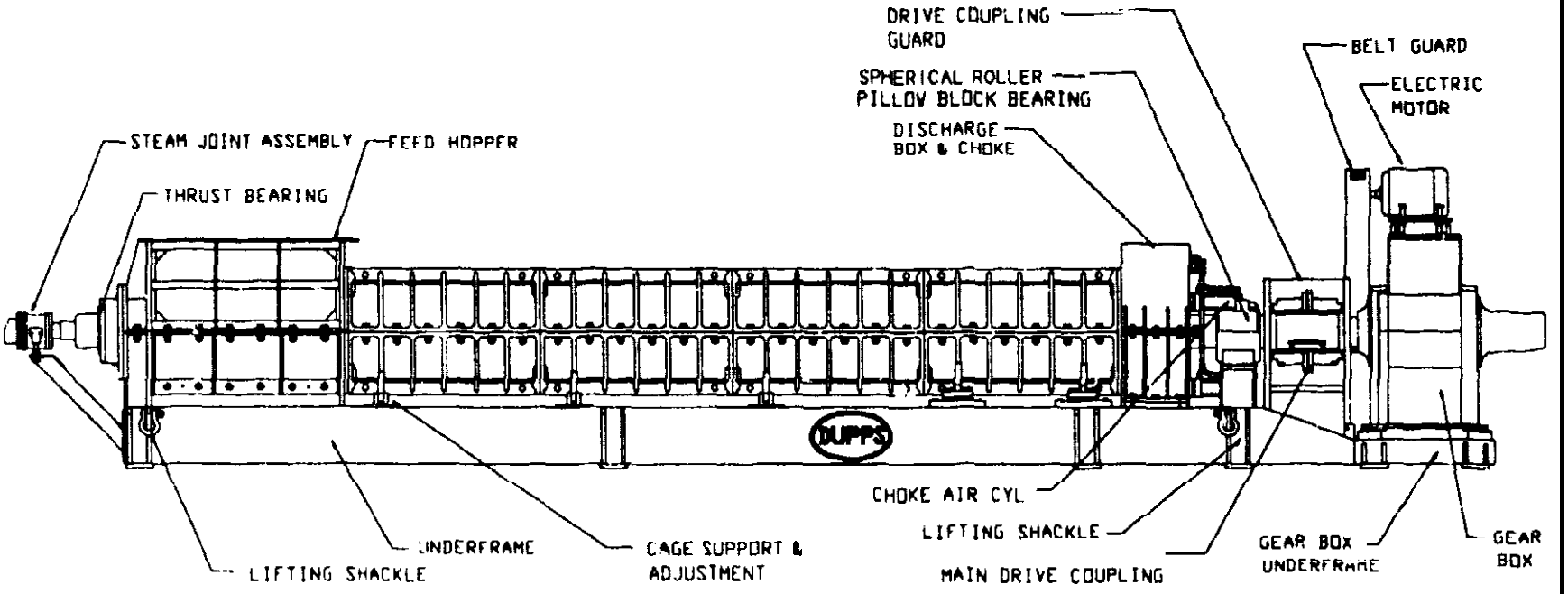
Electrical:

Volts: 460
Amps: 340
Hertz: 60

Compressed Air:

Start-up: 40 scfm @ 100 psi
Operating: 5 scfm @ 100 psi

Figure 1-1
Series 2400P



WARNING - ILLUSTRATION: To clearly show certain details in the illustration, the press may be shown with some covers. guards, or other safety equipment removed or in the open position. Be sure all covers and guards are in place before operating the press. Failure to follow this instruction can result in serious personal injury.

Steam (optional):

600 lbs/hr @ 15psig max.

Connections

The sizes and types of connections for the utilities are:

Compressed Air Inlet/Outlet: ¾" NPTF

Steam Inlet: 3" NPTF

Condensate Drain: 1 ½" NPTF

The piping required for the steam inlet and condensate drain is shown schematically in Figure 1-2. The figure also lists the materials required for proper connection to the facility supply and drain.

Working Clearances

Figure I-2 shows minimum working clearances required to perform maintenance on the press.

Lifting the Press

The press can be lifted by means of an overhead device attached to the lifting shackles at the four lift points (see Figure I-I) provided in the underframe. Remove the gear box prior to lifting in this manner. If the gear box is mounted on the underframe when the press is lifted. the cantilevered weight of the gearbox could damage the underframe. The weight of the Model 2420 press without the gear box is 29,000 pounds.

CAUTION: Remove the gear box before lifting the press with an overhead device. Attach the lifting device at the four points provided. Use a spreader beam to obtain a vertical lii at all four lift points. Failure to follow this instruction can result in damage to the press.

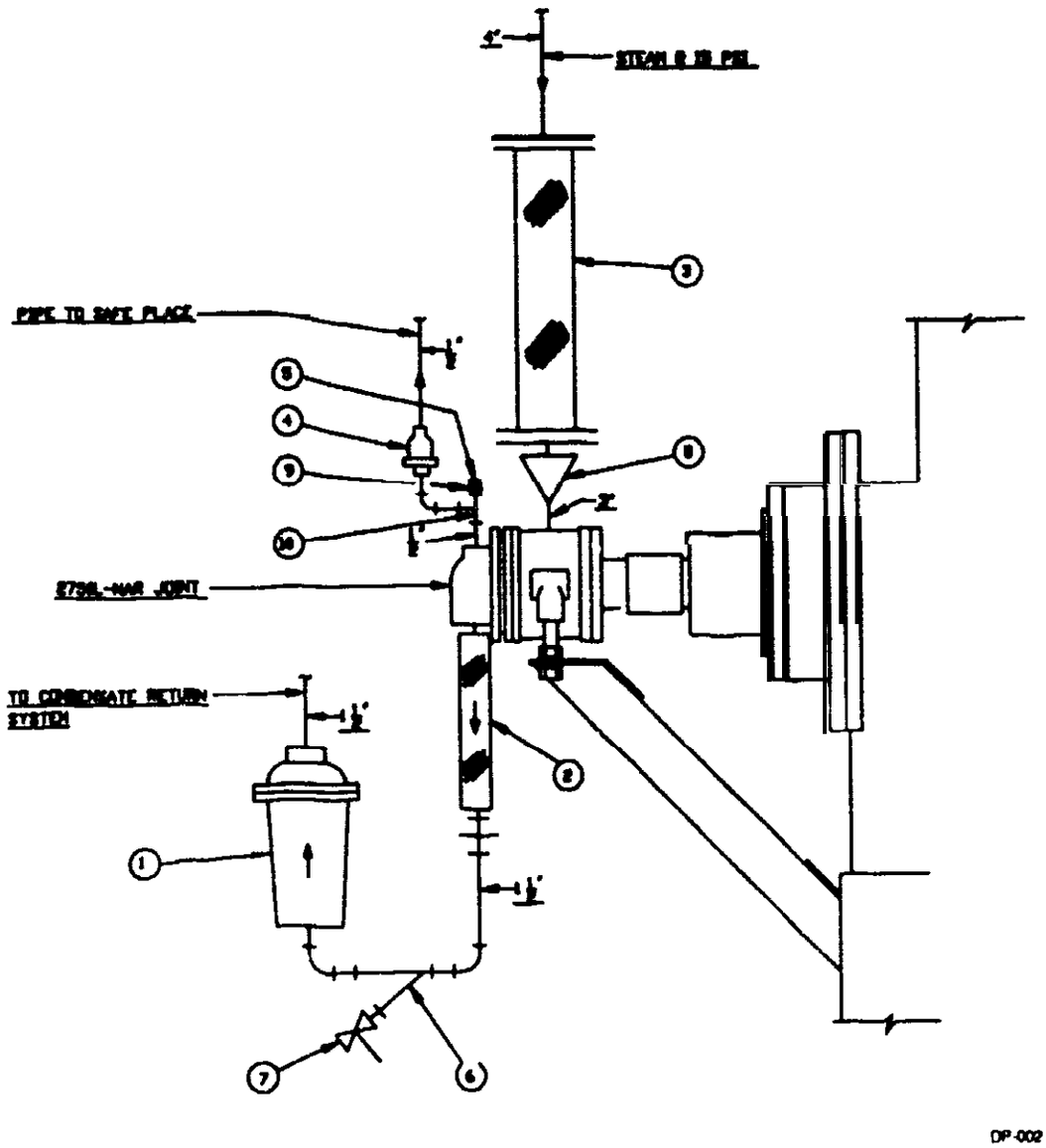
Use a spreader beam to obtain vertical lifting at all four lift points. Make sure the chains or cables used for lifting do not contact the cage covers. This condition could result in damage to the covers or their supporting framework.

Removal of Shipping Braces

Shipping braces are provided to protect the cages and cage adjustment assemblies from damage during shipment. The braces are welded to the underframe at the locations of the innermost cage adjustment assemblies and bolted to the cages at the split flange. The words, "REMOVE BRACE SHIPPING ONLY", arc stenciled on each brace.

After moving the press to its final position:

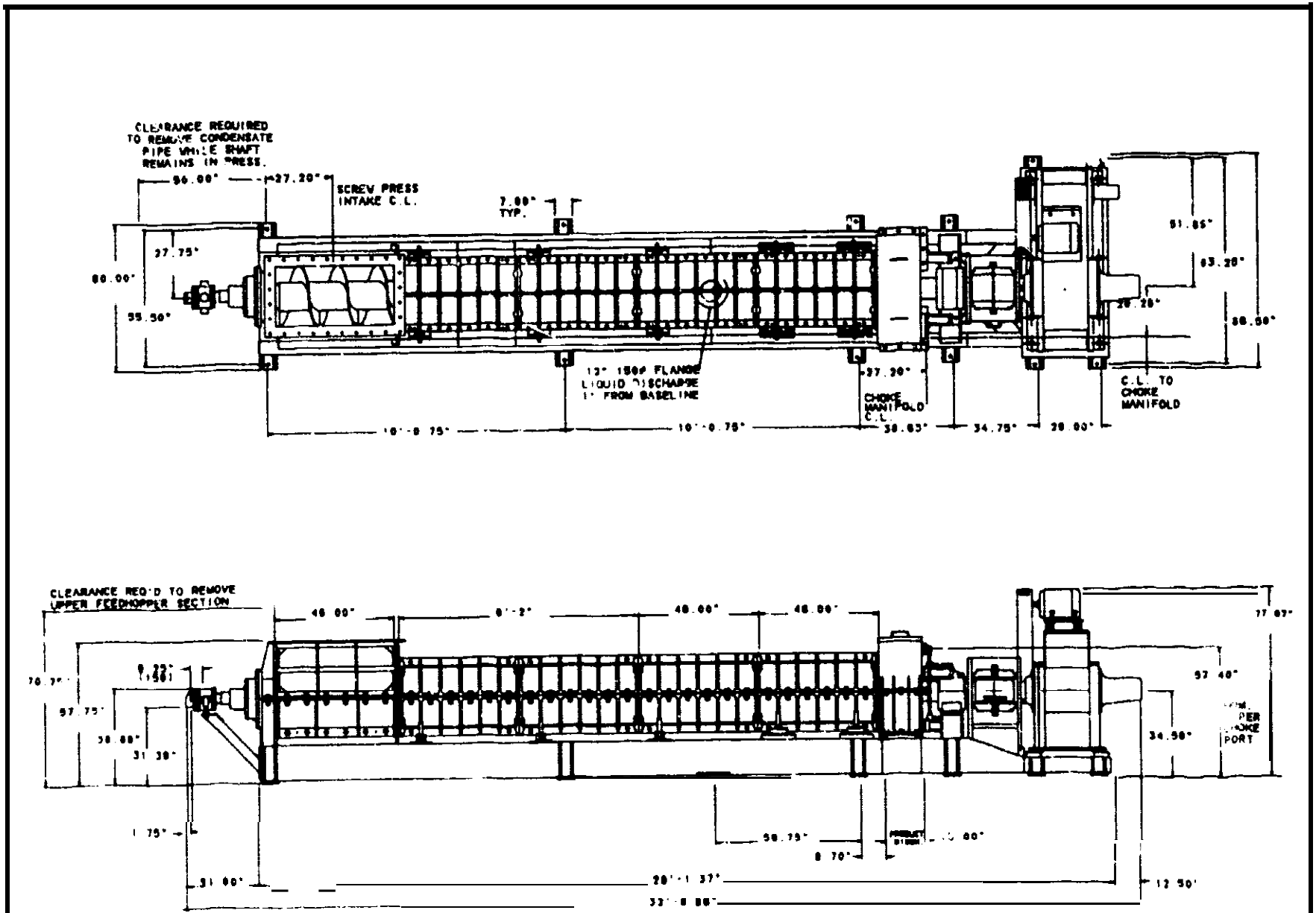
I Remove the bolts securing the braces IO the cage flange;



REF	QTY	DESCRIPTION
1	1	1 ½" #215 Armstrong Inverted Bucket Steam Trap with ¾" Orifice & internal Check Valve
2	1	1 ½"x18" OAL SS Braided Hose w/NPT Nipples
3	1	4"x27" OAL SS Braided Hose w/Flanges
4	1	½" Erwel #AS-225 Thermostatic Air Vent
5	1	½" Johnson #VB8-51-BR-TSE Vacuum Breaker
6	1	1½" "Y" Strainer
7	1	Strainer Blowout Valve
6	1	4"x3" Std Concentric Weld Reducer
9	1	¾"x½" Pipe Bushing
10	1	¾"x½"x½" Blk 150 lb Reducing Tee

Figure 1-2
Steam and Condensate Piping Requirement

Figure 1-3
Working Clearances — 2420



DP-084

1. Remove the bolts securing the braces to the cage. flange;
2. Cut the welds that secure the braces to the underframe;
3. Remove and discard the braces;
4. Re-install the flange bolts through the cage flanges, assemble the lock washers and nuts to the bolts. Torque the bolts to 300 lb-ft. Install and tighten the jam nuts.

Gearbox Installation

After moving the press into position, install the gearbox on the frame. Refer to the manufacturer's gearbox and gear coupling installation instructions in Appendix A for alignment procedures. Refer to the drive and gear box installation instructions in Chapter 5 for setting the proper gap between the hubs of the gear coupling.

CAUTION: Set the gap between the drive coupling hubs according to the procedure in Chapter 5 of this manual. Failure to follow this instruction could result in damage to the press.

Securing Press Underframe to Foundations

Install the press gearbox and align the gearbox and coupling before securing the press underframe to its foundations. This is the procedure used to estabiish initial gearbox and coupling alignment at the factory. If this procedure is not followed. proper alignment of the gearbox and coupling may not be possible.

Gearbox Lubrication

The gear box features oil dams to hold lubricant in the bearings when the shafts are not turning. Since the gearbox has been idle for an extended period during shipment these oil dams could be empty. Starting the unit with dry bearings will result in early bearing failure. Therefore, prior to starting the unit for the first time, remove the inspection cover and flood the oil troughs and the input shaft hearings with oil. Install the inspection plate.

Check the level of the lubricant in the gearbox. If it is low. add oil to the level marked on the dipstick.

Refer to Chapter 2 for recommended lubricants. See The manufacturer's literature in Appendix A for further information on gear box maintenance.

Drive Coupling Lubrication

The drive coupling is shipped in two pieces. One half is attached to the press shaft and the other half is attached to the output shaft of the gear box. After installing the gear box and joining the coupling halves, fill the coupling with lubricant before putting the press into service. For first-time lubrication at installation. follow the instructions in Chapter 2 for drive coupling lubrication at six month intervals.

Chapter 2

Cleaning, Inspection, and Lubrication

2.1 Cleaning and Inspection

Before performing service on the press. turn off the Dcwatering Press main circuit breaker and lock it to prevent the press from being started during service operations.

DANGER: Turn off the **Dewatering** Press main **circuit** breaker and lock it before petforming maintenance. Failure to follow this instruction can result in serious personal injury or death.

Cleaning

Clean the press using the following procedure prior to inspection or service:

1. Clean the press with water spray.
2. Remove all dirt and debris from the press.
3. Spray the drain pan clean, remove any obstructions in the drain pan and facility drain.

Inspection

Figure 2- 1 lists inspection requirements.

COMPONENT	INTERVAL	PROCEDURE
Air FLR (Filter/Lubricator/ Regulator) Unit	Daily	Check oil level in tube reservoir; add oil (specified in Section 2.2) to maintain indicated level. Open drain valve to blow water from filter/separator and drip leg.
Compressed Air, Steam and Water Lines	Daily	Inspect all compressed air, steam and water lines and connections for teaks.
Seals. Gaskets, O-Rings	Daily	Look for leaks around seals gaskets and O-rings. Tighten fasteners at leaking joints. If a leak persists. install a new seal.
Drain Pan and Facility Drain	Daily	Inspect for blockage. Remove obstructions.
Drive Belts	Weekly	Open inspection hole cover on belt housing. Check belt condition and tension. Replace worn or damaged belts.
Cage Jacking Screws	Weekly	If screws are loose, aujust screen to flight clearance and tighten jacking screws (Section 4-2).
Thrust Bearing Seal Drain	Monthly	See Figure 2-5, Step 5. Check thrust bearing seat drain for blockages. Drain allows liquid which leaks past seal to return to press drain pan. Remove any obstructions lo allow free drainage.

Figure 2-i
Inspection Schedule

2.2 Lubrication

Figure 2-2 shows the locations oithe majordewateringprcsscomponents requiring regularly scheduled lubrication. Figure 2-3 specifies the lubricant to use for each component. Figure 2-4 gives the lubrication schedule and procedures.

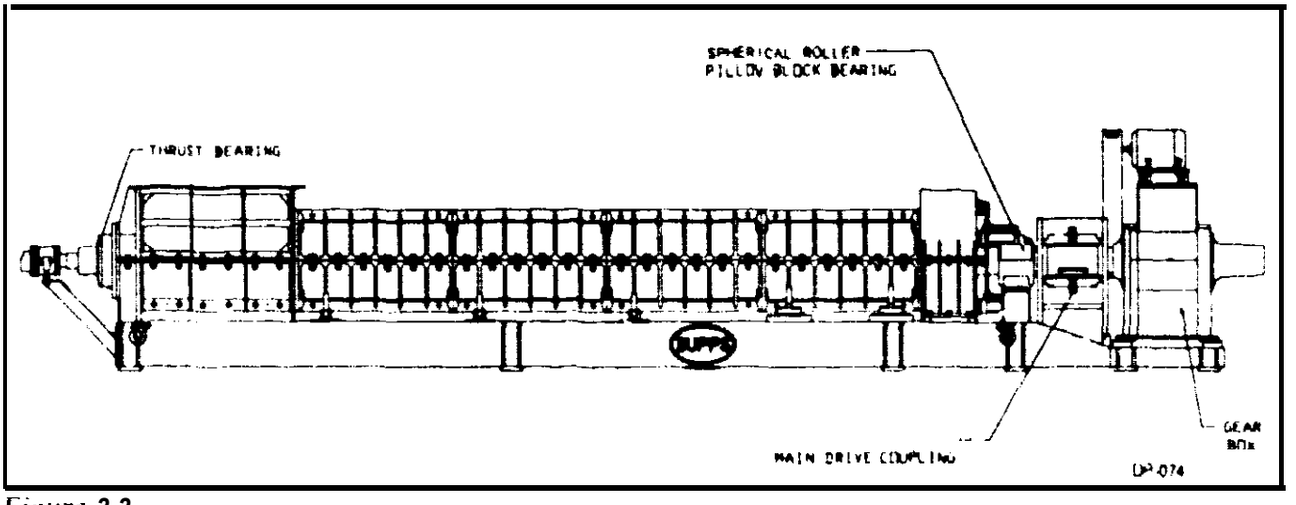


Figure 2-2
Lubrication (Component Locations)

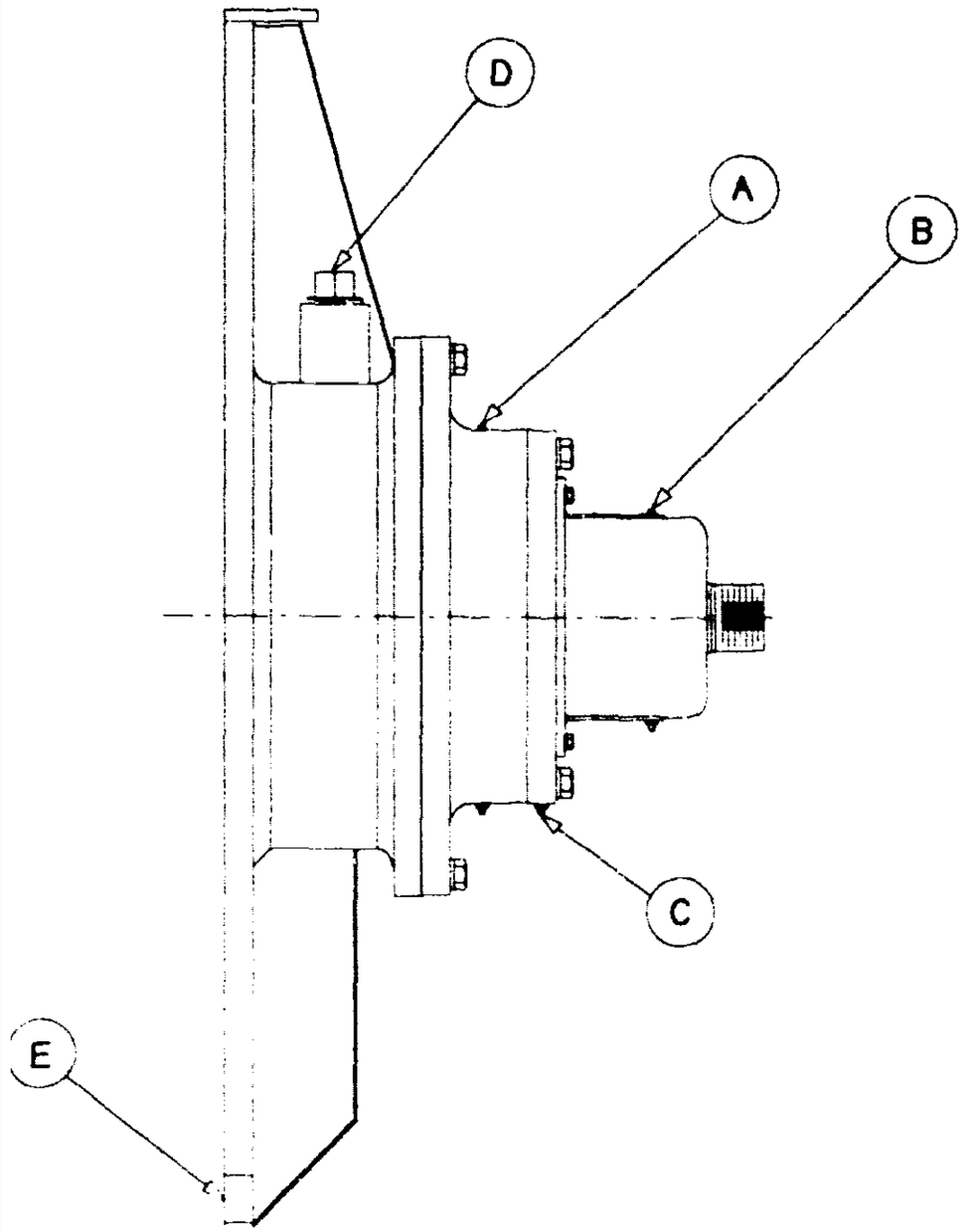
COMPONENT	LUBRICANT SPECIFICATION
Thrust Bearing	Mobilith® SHC1500 grease. or equivalent
Preload Bearing	Mobilith® SHC1500 grease. or equivalent
Gear Coupling	Mobilux® EPO grease. or equivalent
Gear Box	Mobilgear® 632 oil, or equivalent
P i Block Brg	Mobilith® SHC1500 grease, or equivalent
Air FLR unit	Mobil DTE 26 oil, or equivalent

Mobilith and Mobilux are trademarks of theMobil Oil Co.

Figure 2-3
Lubricant Specifications

COMPONENT	INTERVAL	PROCEDURE
Thrust and Preload Beating	1 Week	Use the procedure given in Figure 2-5.
Gear Coupling	1 Week	Check the coupling for grease leakage around the hub and at the flanges. If significant leakage is notii. relubricate the coupling by following the instructions below for six-month interval.
Gear Box	1 Week	Check oil level when drive is stopped and at ambient temperature. Add specified lubricant to level marked on dipstick.
Pillow Block Bearing	6 Months	Remove the pipe plug in the beating cap. Add specified lubricant through the grease fitting in the base of the bearing housing until 5 oz of grease is expelled from the hole In the cap. Install the pipe plug In the cap.
Gear Coupling	6 Months	With the shaft at operating temperature. remove the plugs from the diameter and the faces of the gear coupling. Install a grease fitting into one of the holes and pump in grease. Fill until new grease begins to flow out one of the holes. Then, plug the hole and continue filling. Continue this procedure until all the holes are plugged. The displaced volume of grease will be about 6 pints of grease. or about 6 pounds.
Gear Box	6 Months	Drain and refill to level marked on dipstick with specified lubricant
Gear Box Input & Output Seals	6 Months	Purge contaminated grease from seals as follows: Slowly pump NLGI #2 grease with a hand grease gun until fresh grease flows out along the shaft. Wipe off purged grease. CAUTION: Rapid regreasing with a power grease gun can force grease inward past the seats and plug the drainback system causing seal to leak,
Thrust Beating	1 Year	Disassemble, clean, and repack with fresh lubricant.

Figure 2-4
Lubrication Schedule



1. To lubricate thrust and preload bearings: Remove pipe plugs at points **A** and **B**.

2. Slowly pump grease through fitting at point **C** using a hand grease gun.

3. When grease comes out plug hole **A**, install plug in hole **A**.

4. *Continue pumping grease through fitting* **C** *until 7 oz. of grease is* expelled from plug hole **B**.

5. Make sure drain cavity and drain am not clogged with grease by *running water into plug hole* **D**. *Water should drain freely out hole* **E** into drain pan.

Figure 2-5
Thrust and *Preload* Bearing *Lubrication*

Chapter 3

Operating Instructions

3.1 Introduction

This chapter gives operating instructions for the Dupps 2400 Series Dewatering Presses. Section 3.2 contains a functional description of typical operating controls. Section 3.3 explains how to start up the press and make running adjustments to maximize performance. Section 3.4 describes both normal and emergency shutdown procedures. Potential operating problems and their solutions arc given in Section 3.5.

The Dupps 2400 Series Dewatering Press performs a single operation in a processing system. Because of the many variables that influence the design and operation of each system, it is unlikely that any two installations will be exactly alike. For this reason, the control descriptions and operating procedures in this chapter are general in nature. Specific operating instructions and detailed descriptions of the controls are not within the scope of this manual.

3.2 Controls and Indicators

In a typical installation, the operating controls for the Dupps 2400 Series Dewatering Press arc mounted on a control panel in combination with controls for other equipment in the system. Consequently the placement, type, and nomenclature used for the controls depends upon the design of the overall system. The control devices used in a particular installation could be different from those described in this manual. If your system uses different control devices for the press, understand their location. function and operation before operating the press.

> WARNING: Understand the location, function, and operation of the controls and indicators used in your particular installation before operating the press, Failure lo follow this instruction can result in serious personal injury.

The remaining paragraphs in this section give a functional description of the typical control devices that apply to the press.

I. PRESS SPEED meter. Indicates press shaft speed in percent of maximum.

2. PRESS MOTOR LOAD meter. Indicates load on the press drive motor in percent of full load

   Two adjustable set points on the meter permit setting operating limits. When the press motor load exceeds the. first set point (#1), the choke retracts automatically. If the press motor load exceeds the second set point (#2), the feed system automatically stops and the press speed increases to a predetermined maximum speed or is shut down.

3. CHOKE PRESSURE gauge.Indicates air pressure applied to the pneumatic choke cylinders in pounds per square inch (psi).

4. PRESS FEED START/STOP switch. Starts or stops material flow into the feed hopper.

5. PRESS START/STOP switch. Starts or stops the press.

6. HIGH MOTOR LOAD indicator light. Lights when motor load exceeds the first limit (#1) set on the PRESS MOTOR LOAD meter.

7. CHOKE ON/OFF switch. Controls compressed air supply to the pneumatic cylinders, to advance or retract the choke.

R. DISCHARGE CONVEYOR START/STOP switch. Starts or Stops the discharge system.

9. PRESS SPEED selector. Selects press operating speed. The press runs at full speed when the selector is set IO FULL. Press speed is controlled by the PRESS SPEED dial when the switch is set to the VARI position.

10. PRESS SPEED dial. Controls press speed when the PRESS SPEED selector switch is set IO the VARI position.

3.3 Operation

Before putting the press into operation. make sun it is clean and free of obstructions.

Be sure the press is properly lubricated and in good working order (see Chapter 2). Make sure all covers and guards are properly installed.

WARNING: Before starting the press. be sure all covers and guards are properly installed. Failure lo follow this instruction can result in serious personal injury.

DANGER: Stop the press it it K necessary to clear Obstructions from the press Failure to follow this instruction can result in serious personal injury or death.

1. Turn the **choke off.**

CAUTION: Be sum the choke is off before starting the prers. Failure to follow **this instruction** can ret ult in **damage** to **the press.**

2. **Start the cake discharge handling equipment.**

3. **Turn on the steam supply to the press, if so equipped.**

4. Pull out the PRESS START/STOP button to start the press.

5. Adjust the press **speed** to normal **operating speed.** If **a "normal"** speed has not **teen** established, use 10 rpm as a starring point.

6. Set the PRESS SPEED selector to VARI.

7. Start the press feed system to begin feeding material into the press **feed hopper.**

8. When cake appears **at the** discharge end of the press, turn the choke on. Adjust the choke **pressure** to **10** psi.

9. Check the cake 'being discharged. If the cake is thin or discharges in spurts, increase the press feed rate until the incoming material covers the shaft flighting in the feed hopper.

10. Operating conditions will determine whether further adjustments to the press are necessary. **The** desired output rate and consistency of discharge cake can be obtained by balancing the press speed, choke **pressure,** and feed **rate** as described below:

    a. The feed **rate** must be **sufficient** to keep **the** press shaft flighting in the **feed** hopper covered with incoming material without **overfeeding** the hopper. A constant level of material in the feed hopper is best for proper operation. The feed rate is directly affected by the press speed. For example, an increase in press speed requires a corresponding increase in feed rate.

    b. The press speed and **choke pressure** togethe: determine the consistency (dryness) of the discharge cake. In general. dry cake results from low press speed and high choke **pressure;** and **wet** cake results from high press speed and low choke pressure.

    c. **Press speed and choke pressure** also determine **press output** rate. Low **press speed** and high choke **pressure** reduce **the** rate of output: **high** press speed and low choke **pressure** increase the output rate. Under cenain conditions, it may be necessary to **sacrifice** discharge cake dryness to **obtain** the **desired output rate.**

11. If the desiredconsistency **or output** cannot be achieved, shut **the** press down (**see** Section 3.4) and **refer to** Section 3.5, TROUBLESHOOTING or contact your Dupps service representative.

12. **Plug Length.** The section of the **press** shaft between the end of the shaft **flighting** and **the** discharge box is **referred** to as **the** "plug". **The**

length of this plug directly affects cake dryness. Generally, the longer the plug is, the dryer the cake will be.

The plug length on each press is adjusted by startup personnel m give the best cake dryness for each application. If feed characteristics change after startup, the plug length may nad to be adjusted m give the best press performance and cake dryness. Adjustment of the plug length is a sensitive procedure and should be performed only by factory trained personnel. An incorrect plug length could yield poor performance and lockup and damage the press.

If plug length adjustment is necessary , contact your Dupps service representative.

3.4 Shutdown Procedures

This section gives procedures for normal and emergency shutdown of the press.

Normal Shutdown

The normal shutdown procedure allows sufficient time to clear all material from the press.

1. Stop the feed system.
2. Turn off the steam supply to the press shaft.

NOTE: Turn off the steam immediately after stopping the feed system. Steam applied to the shaft will cause the cake plug to harden at the discharge opening. The hardened cake plug could prevent the press from re-starting. In this event, the cake plug must be removed manually prior tore-starting the press.

3. Continue to opcnte rhc press with the choke on until all material has been processed through the press.
4. Turn the choke off and allow sufficient time for the press todischarge my residual material
5. Stop the press and turn off the cake discharge handling system.

Emergency Shutdown

Use the cmcrgcncy shutdown procedure if operator safety is at risk; or if the press is not operating correctly (excessive noise or vibration). or stops suddenly while in operation.

1. Push in the PRESS START/STOP button. This action stops the press and the feed system simultaneously.
2. Stop the cake discharge handling system.

3. Turn the choke off.

4. Turn off compressed air and steam supply connected to the press. Relieve air and steam pressure from lines.

> DANGER: Relieve air and steam pressure from lines prior to maintenance. Failure to follow this instruction can result in serious personal injury of death.

5. Turn off the Dewatering Press main circuit breaker and lock it out.

6. Refer to the Troubleshooting section of this chapter to locate and correct the cause of the problem.

NOTE: Ciear the material out of the ptess as soon as possible after shutting down. If the press is left shut down in a loaded condition for an extended period of time (12 hours or more, depending on conditions), the material in the press can dry out, making the ptess difficult or impossible to start

3.5 Troubleshooting

Figure 3-1 lists problems that can occur while the ptess is operating. If a problem occurs during start-up check power, compressed air, and steam supplies to the press. Clean and inspect the press (refer to Chapter 2) before attempting to isolate the cause of a malfunction,

Probable causes are listed for each problem. In most cases the remedy is obvious from the statement of the cause.

PROBLEM	CAUSE	REMEDY
Level in feed hopper is rising (Press being overfed)	Feed rate too high.	Reduce feed rate.
	Press speed too low.	Increase press speed.
	Chigh. ssure too	Reduce choke pressure.
Liquid not draining through cage screens.	Clogged drain screens.	Clean screens.
	Drive bell slipping.	Tighten loose belt; if belts are worn. install new bells.
	Cages out of alignment	Adjust cage screen-to-flighting clearance. See Chapter 4.
	Wom pess shaft flighting.	Rebuild shaft flighting. See Chapter 4.
Low cake outnut	Feed rate too low.	Increase feed ate.
	Choke pressure too high	Reduce choke pressure.
	Press speed too low.	Increase press speed.
Choke retracting frequently	Drive motor overloaded	Reduce choke pressure an&of increase press speed.
Cake too dry.	Choke pressure too high.	Reduce choke pressure
	Press speed too low	Increase press speed.
Feed stopping frequently	Drive motor overloaded	Reduce choke pressure and/or increase press speed.
Cake too wet	Press speed too high	Reduce press speed.
	Cages out of alignment	Adjust cage screen-to-flighting clearance. See Chapter 4.
	Worn press shaft flighting	Rebuild shall flighting. See Section 4.3.
	Choke pressure too low.	Look for leaks in compressed air lines, defective choke control valve; insufficient air supply
	Choke malfunctioning due to worn or damaged choke ring or pneumatic cylinders	Replace choke ring; repair pneumatic cylinders.
Drive motor slops under bad (It may be necessary lo manually clean out the press before the press will re-start	Choke pressure loo high and/or choke not relieving under high motor bad	Check choke pressure and operation of motor overload c We controls
	Press speed too low for feed characteristics	Increase press speed

Figure 3-1
Troubleshooting Chart

PROBLEM	CAUSE	REMEDY
Discharge cake OK bul choke moves too slowly or erratically	Insufficient supply of compressed air.	Make sure choke pressure regulator is set correctly. Repair any leaks in compressed air lines or pneumatic cylinders.
Unusual noise or vibration.	Loose covers, housings, or guards: bose sheaves or drive belts.	Tighten all loose fasteners. Replace missing fasteners.
	Foreign material in press.	Small amount of small material will pass through the press. Remove large material by removing cage(s) to gain access. Find and eliminate the source of the material.
	Gear box malfunction.	Repair gearbox.
	Worn thrust bearing or pillow block bearing.	Replace the worn bearing(s).
	Shalt flighting contacting cage screens.	Adjust cage screen-to-fliihling clearance. See Chapter 4.

Figure 3-1 (Cont'd.)
Troubleshooting Chart

Chapter 4

Service Instructions

This chaptercontains service procedures for the 2400 Series Dewatering Press. Procedures for some commercial components are not covered in this chapter. Appendix A contains specific instructions provided by the manufacturers of these components.

WARNING: Contact your Dupps service representative before performing service procedures that are not described in this manual. Failure to follow this instruction can result in serious personal injury.

4.1 Cage Adjustments

The clearance between the cage screens and the flighting on the press shaft increases in service because the flighting diameter is reduced by wear. The wear rate depends upon a number of variables, but the abrasiveness of the material being pressed is the most significant.

With most materials. the press will perform properly as long as the radial clearance between the cage screens and the press shaft flighring is less than 5/32 inch. Processing some materials, however, requires less than 5/32". Although the clearance should be equal at all points around the shaft flighring, proper clearance in the bottom half of the cages is more important than in the top cage half. Furthermore, properclearance is more critical in the primary cages than in the intermediate anddischargecages.

If press performance deteriorates due to excess clearance, the screen-to-flighting clearance can be reduced to restore performance. The cages are provided wirh two means of adjustment for this purpose:

1. Vertical (up/down) and lateral (side-to-side) adjustment of the cage position is provided at each point where the cage is attached to the underframe cross member. This provides the means of keeping the cage concentric with the shaft.
2. The diameter of the cage can be made smaller by removing shims from the horizontal split flange of each cage. This adjustment reduces the radial clearance between the cage screen and the shaft flighting.

Measuring the Screen-to-Flighting Clearance

There are two ways IO measure the clearance between the screen and the flighting. Which method to use depends upon **whether the press is partially** disassembled or not at the time of checking:

a. If the clearance is being checked with the top half of the cages removed, use a feeler gauge inserted between the shaft flighting and the screen.

b. If the cages are in place, measure with a depth gauge (a pin or wire) inserted through the screen and subtract the screen thickness IO determine the clearance. AI the 3 and 9 o'clock positions, measure the clearance **below the split flange** because the clearance in the lower half of the cage is more important than the clearance in the upper half.

General Adjustment Procedure

Some of the steps in the procedure for the discharge cages are different than for the primary and intermediate cages. This is because rhe high pressure cage mounting lugs are different from those on the rest of the cages. This section gives a briefdescription of the procedure for adjusting the screen-to-flighting clearance. Details of this procedure are given in the two sections that follow. One section details the steps for discharge cages and one for the rest of the cages.

The general procedure for adjusting the cages is:

1. Check the clearance at the 12, 3, 6, and 9 o'clock positions. (Use the top of the cage as the 12 o'clock position.)
2. Set the proper clearance on the **bottom** half of al! the cages. Begin at the high pressure end and work back to the feed end.
3. Check the clearance in all the **bottom** cage halves at the 3.6. and 9 o'clock positions. When these are determined to be correct, tighten a:. the cage lug attachment bolts.
4. Check the clearance at the 12 o'clock position. Adjust IO specification by removing (or adding) shims between the split flanges. Since the cage is pinned at the split flange, the clearance at the 3 and 9 o'clock positions of the upper cage half was determined in step 2.

Aligning the Cages to the Press Shaft

Use the following procedure to align the primary and intermediate cages to the shaft:

I. Measure the distance from the shaft flighting to the cage screen with depth gauge or ieeier gauge, as previously described. Measure the clearance at the 12, 3, 6, and 9 o'clock positions (see Figure 4-1) at each end of each cage section,

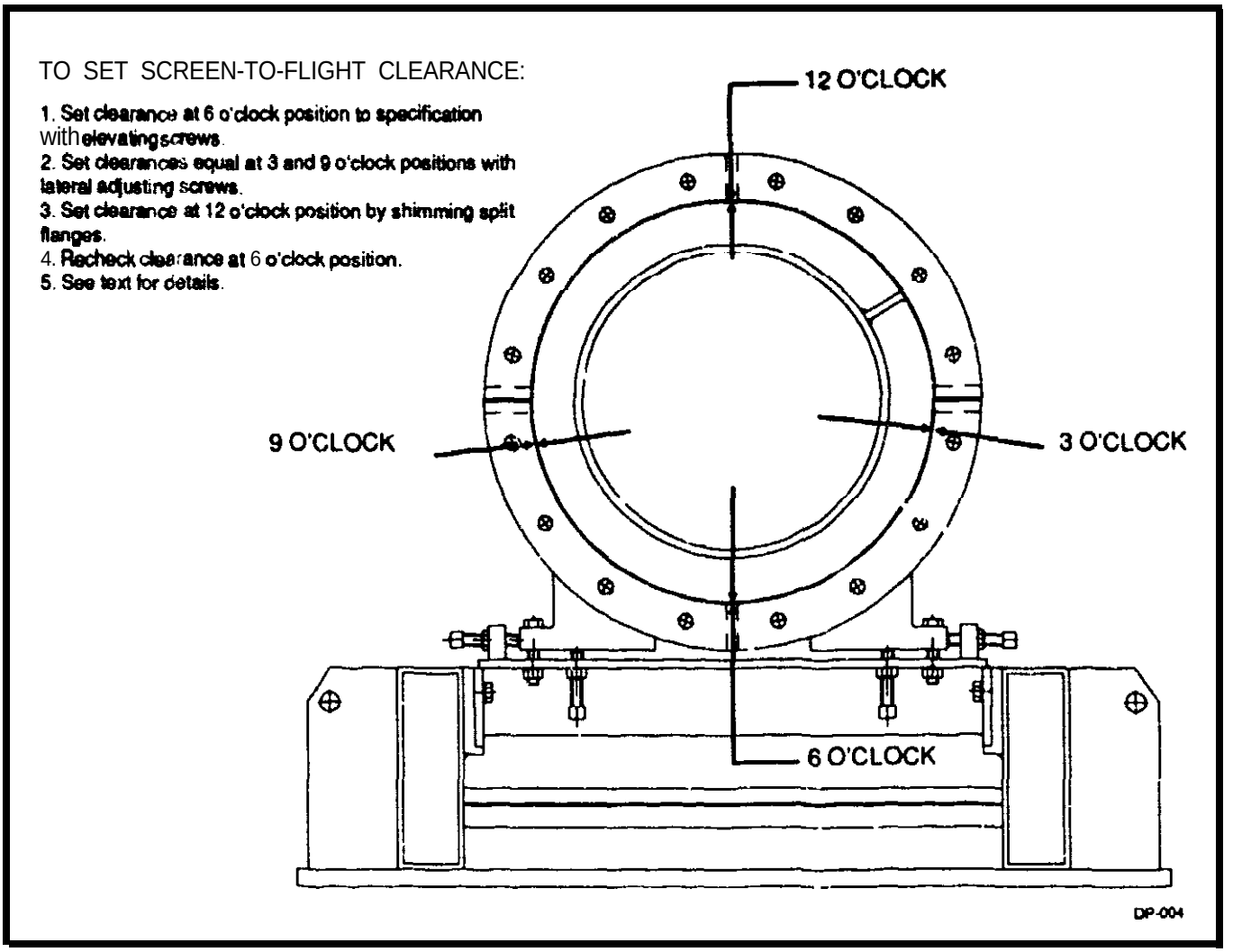


Figure 4-1
Cage-ro-Flighting Clearance

2. If measurements taken at the 12 and 6 o'clock positions are both between 3/32 and 5/32 inch, the clearance is correct (except as previously noted for certain materials). If either measurement is not within this range. align the cage vertically. Use ***the procedure in Step 3 for discharge cages. Use*** *the procedure* in ***Step 4 for primary and intermediate cages.***

3. Use this step for vertical alignment of discharge cages.

   a. Refer to Figure 4-2. Remove the attaching bolts on both (left and right) cage lugs. Loosen the jam nuts and back off the lateral adjusting screws ½ turn (both sides).

   b. Loosen the bolts in the end flanges of the cage(s) being adjusted.

   c. Set the clearance at the BOTTOM (6 o'clock) first, as it is more critical. Raise or lower the cage by adding or removing shims between the cage lug and the underframe cross member to obtain the correct screen-to-flight clearance.

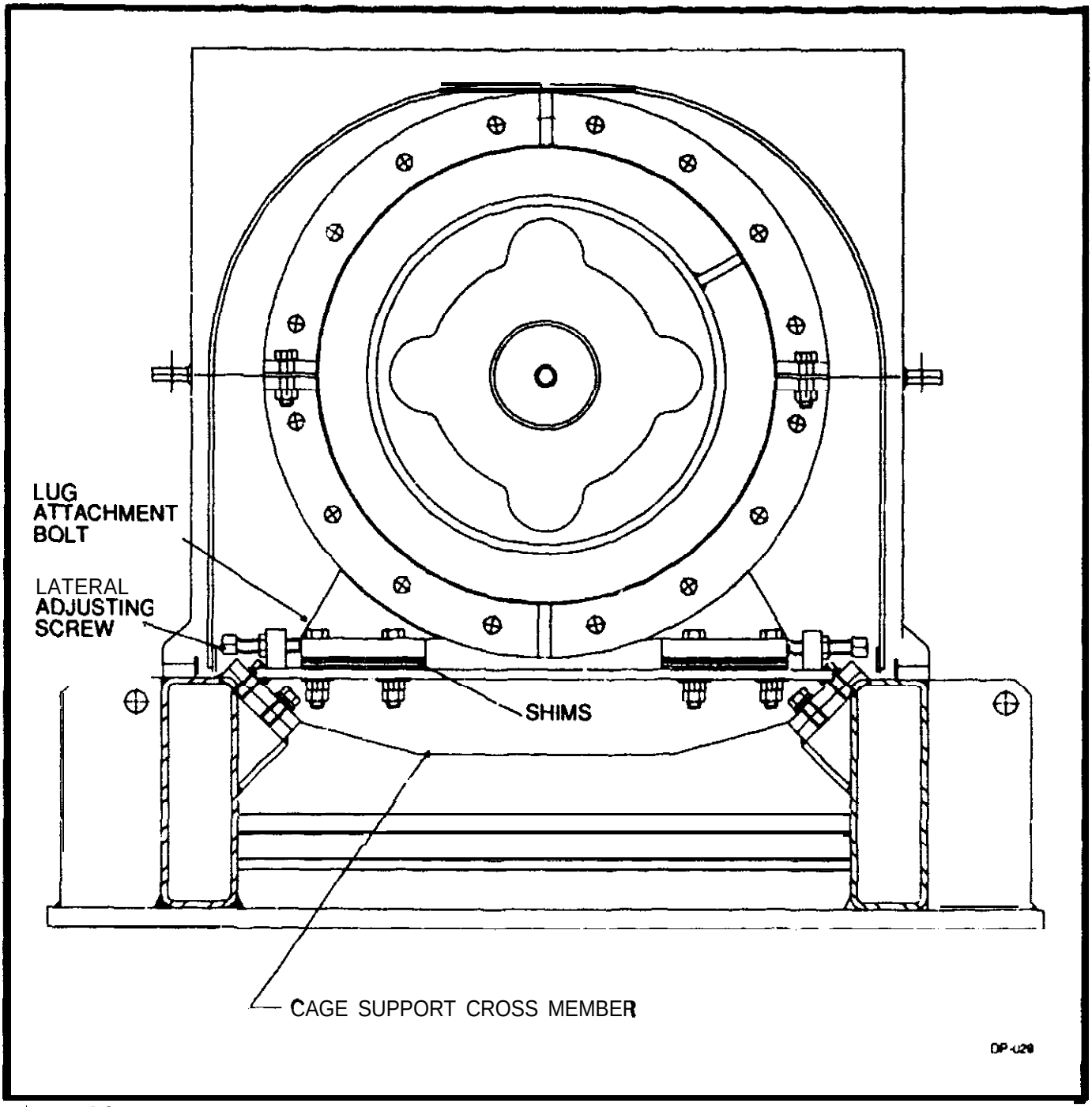


Figure 4-2
Cage Adjustment Screws--&charge Cup

To add or remove shims, lift the cage by means of an overhead lifting device and shackle attached to the lifting bole in the upper cage half. Refer to Figure 5-7. If the upper cage half has been removed from the machine, the cage may be lifted by means of a sling under the lower cage half.

d When vertical alignment is correct, install the lug attachment bolts. Do not tighten the lug attachment bolts until after making any necessary lateral adjustments (see Step 5).

4. Use this step for vertical alignment of primary and intermediate cages.

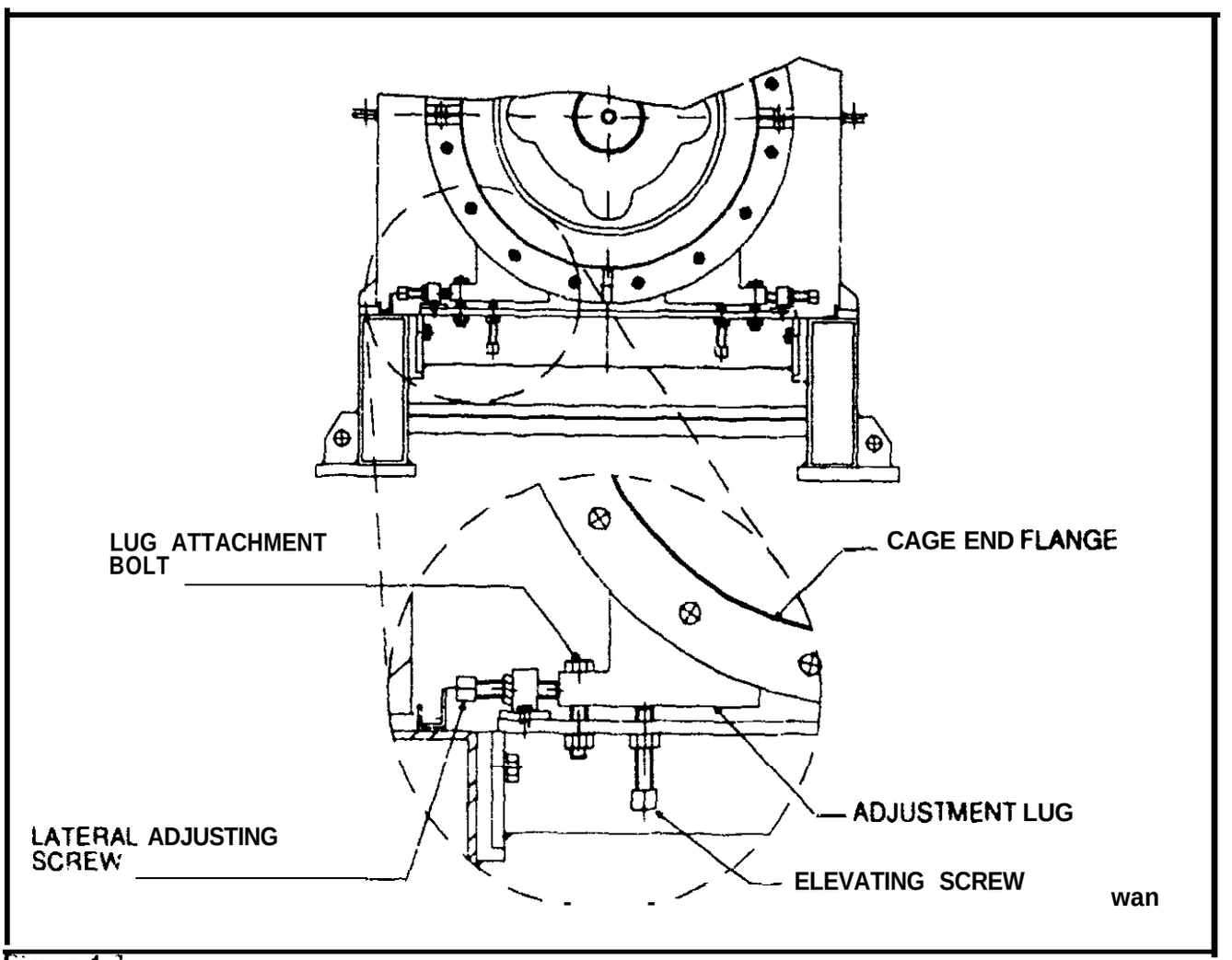


Figure 4-3
Cage Adjustment Screws- Primary and Intermediate Cages

a. Kcfer to Figure 4-3. Loosen the jam nuts on the elevating screws. Loosen the attaching bolts on both (left and right) adjustment lugs. Loosen the jam nuts and back off the lateral adjusting screws ½ turn (both sides).

b. Loosen the bolts in the end flanges of the cage(s) being adjusted.

c. Set the clearance at the BOTTOM (6 o'clock) first, as it is more critical. Turn the elevating screws to raise or lower the cage. Alternate between the two screws of the same cage, turning each screw a half turn at a time. Check screen to flighting clearance frequently to avoid over correction.

d. When vertical alignment is correct, tighten the elevating screw jam nuts.

5. Check the horizontal cage clearance (3 and 9 o'clock positions) In the BOTTOM half of the cages. The diameter of the cage cannot be changed horizontally. Therefore adjust the cage position to obtain equal clearance on both sides.

   a. Loosen the bolts in the end flanges of the cage(s) being adjusted.

   b. Turn the lateral adjusting screws to move the cage in the required direction to achieve the correct clearance amount.

      For example, to move from left to right, first back off the tight side screw about two turns. Then turn the left side screw in the direction of tightening. Check screen to flighting clearance frequently to avoid over correction. If the lug becomes tight against the right side before alignment is achieved, repeat the process until the cage clearance is equal on both sides. Tighten the right side screw.

   c. When horizontal clearance is equal on both sides, tighten the jam nuts on the lateral adjusting screws; tighten the lug attachment bolts to 300 lb-ft.

6. When the cages arc properly aligned with the shaft flighting. check the screen-to-flighting clearance at the top (12 o'clock). If the clearance is more than 5/32 inch, the cage diameter must bc reduced by removing shims from the split flanges between the cage halves. The procedure is described in the following section.

Removing/Adding Cage Shims

Use the following procedure to remove or add cage shims:

1. Loosen the cage split flange bolts on the cage being adjusted. See Figure 4-4. Some of the bolt holes in the shims are slotted to permit shim removal or installation without having to remove all the bolts. Only two of the bolts have to be removed to get the shims in or out. The locations of the bolts that must be removed are indicated in Figure 4-5.

2. Loosen the bolts in the end flanges of the cage being adjusted.

3 Remove an equal number of shims from both horizontal flanges of the cage.

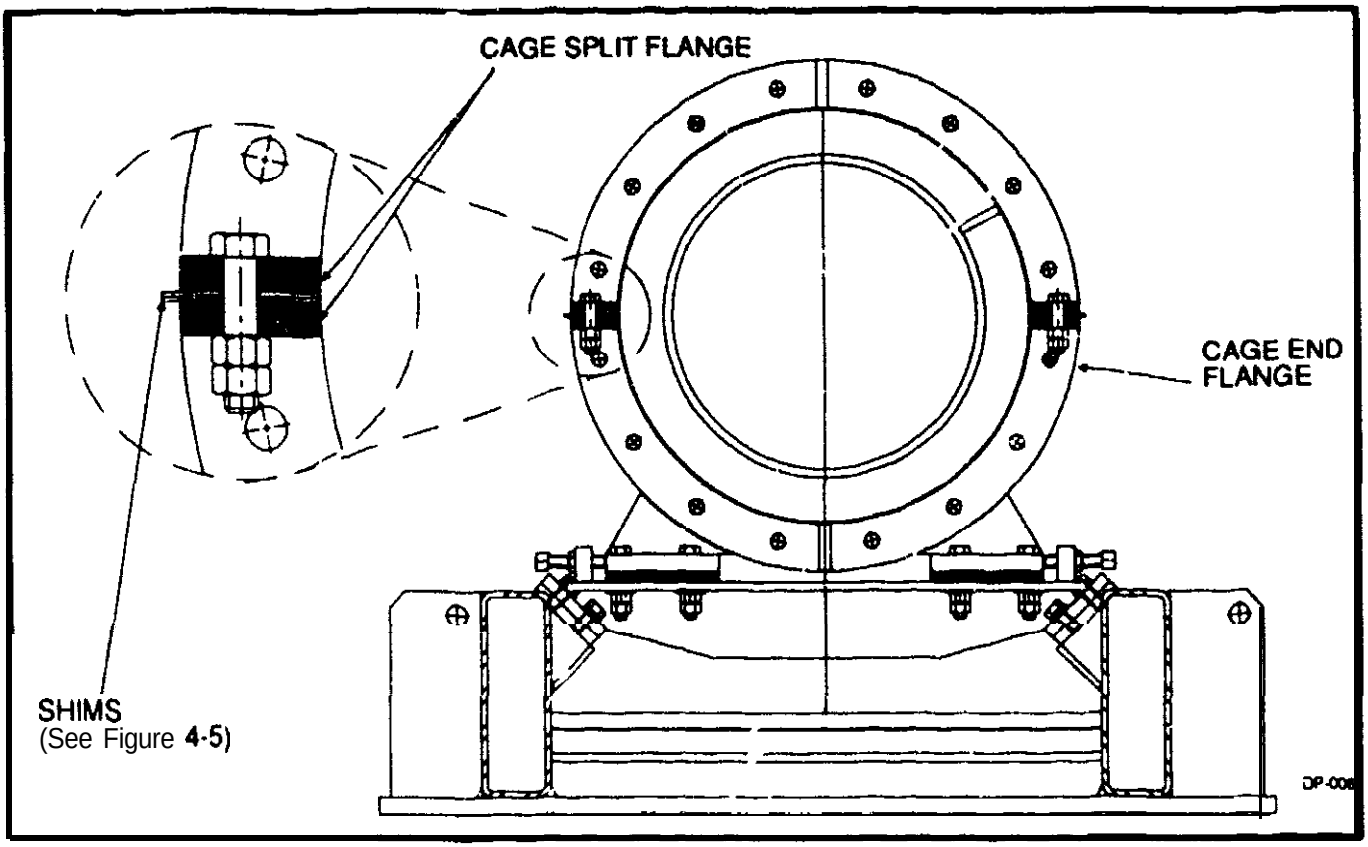
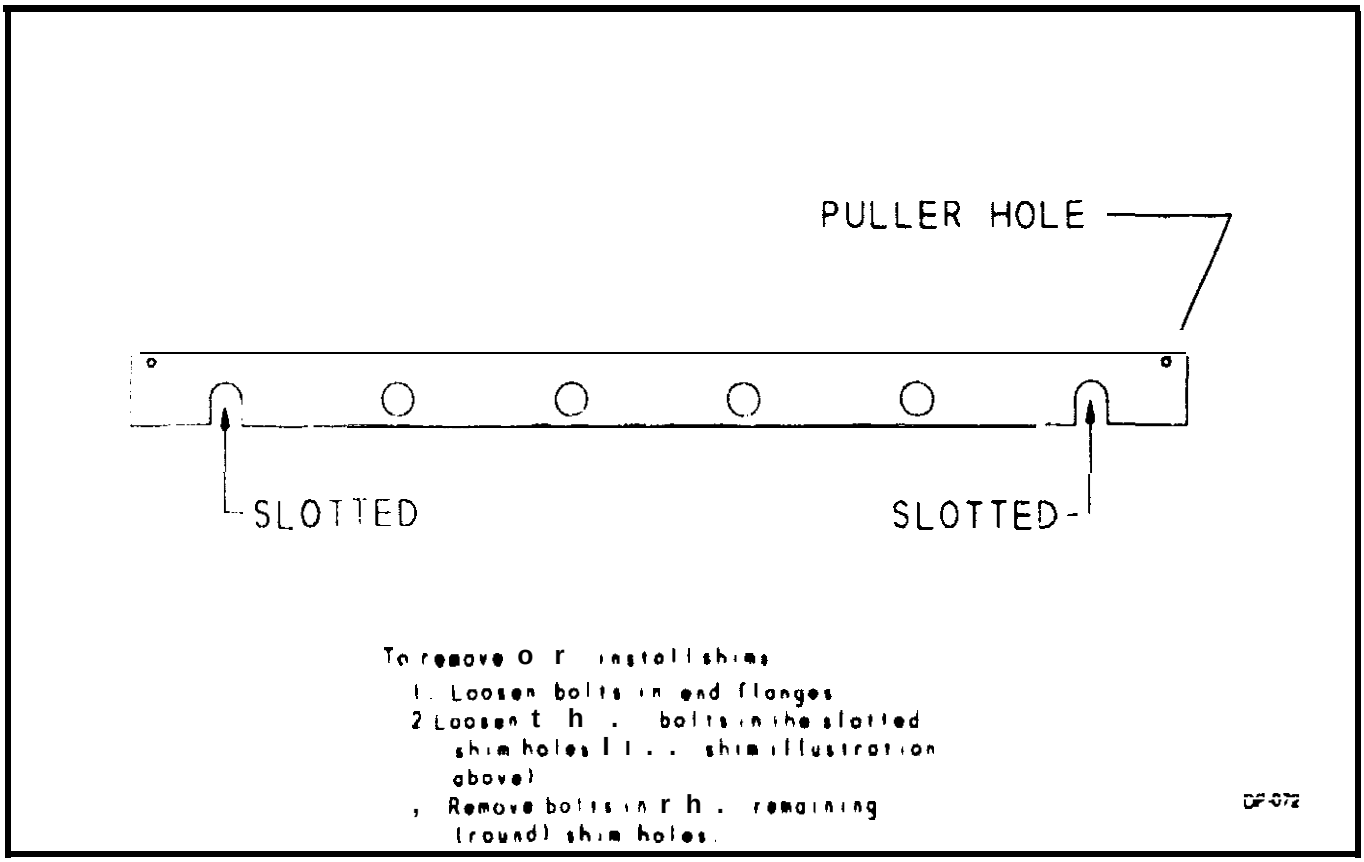


Figure 4-4
Cage Split ***Flange und Shims***



igure 4-5
Split Flange Adjustment Shims

4. Tighten the cage split flange bolts to 800 lb-fr. In the primary and intermediate cages, tighten to 300 lb-ft. In thedischargecages, tighten to 450 lb-ft. Install and tighten the jam nuts.

5. Tighten the end flange bolts to 800 lb-ft. Install and tighten the jam nuts.

4.2 Renewing the Shaft Flighting

The press shaft is subject to wear from abrasion. Such wear is usually noticeable only near the discharge end of the shaft, due to the high pressure on thematerialin that region. Nearthedischargeendoftheshaft, the flighting is protected by a hardened facing strip. The facing strip consists of a series of helical segments called “shoes” that are welded to the base flighting. The hardened shoe covers both the outer edge and the face of the base flighting. See Figure 4-6.

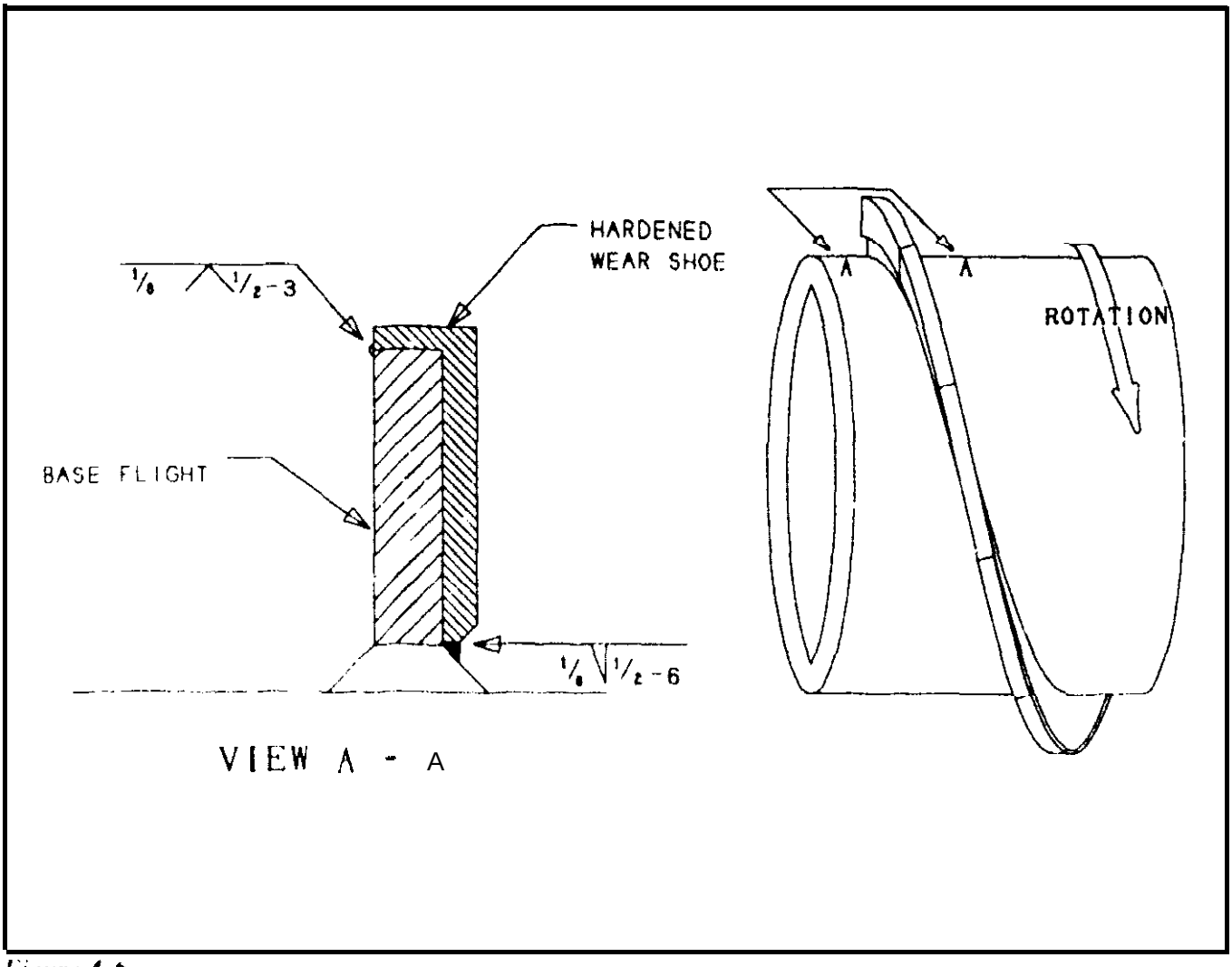


Figure 4-6
Press Shaft Replaceable Flight Facing

Compensation for worn flighting is accomplished by removing shims from the cage split flanges. Shim removal is explained in Section 4.2. If wear on the shaft flighting advances to the stage where the correct cage-to-flighting clearance cannot be obtained with all the cage shims removed, thcshaft flighting must be restored to its original diameter. This is accomplished by replacing the worn facing shoes with new ones.

It is not necessary to remove the shaft from the press to replace the flight facing. To gain access to the renewable flight facing, remove one (two, if necessary) upper cage half from the discharge end of the press. Cage removal is described in Chapter 5.

Use the following procedure to remove the old and install new flight facing:

1. Remove the weld metal holding the worn flighting shoes to the base flight. This can be done with an air-arc, disc grinder, or other suitable device. Take care not to damage the base flight during this operation.
2. Be sure to remove all replaceable flighting weld metal from the base flighting with a disc grinder. It is important that the new flighting be installed on clean, smooth base flighting.
3. Position the new facing shoe on the base flighting. The screen of the cage half remaining on the press may be used to set the height of the new flighting (assuming the cage screen to flighting clearance was properly adjusted prior to disassembly).
4. Begin at the discharge end of the shaft, tack weld each piece of new replaceable flighting in position on the base flighting as shown in Figure 4-6. Use a suitable stainless steel welding material.

NOTE: Do not apply more weld material than specified; this practice increases the difficulty of subsequent flight removal.

5. The gap between adjacent wear shoes should normally be about 1/16" wide or less and does not require welding. If a gap in excess of 1/16" exists, fill the gap with suitable stainless steel welding material. Use the minimum amount of welding material. Grind the welds smooth.

4.3 Choke

The choke assembly, shown in Figure 4-8, is located in the discharge box. The choke surrounds the press shaft. It is supported by the press shaft, but does not rotate with it. The choke assembly consists of a frame that carries rhe replaceable wear ring. The frame is equipped with polymer bearing shoes that support the choke assembly on the press shaft. The choke position is controlled by three pneumatic cylinders which are mounted to the discharge box. See Figure 4-7.

Both the choke face and the frame of the choke are separable so they can be removed from the press without the necessity of removing the shaft.

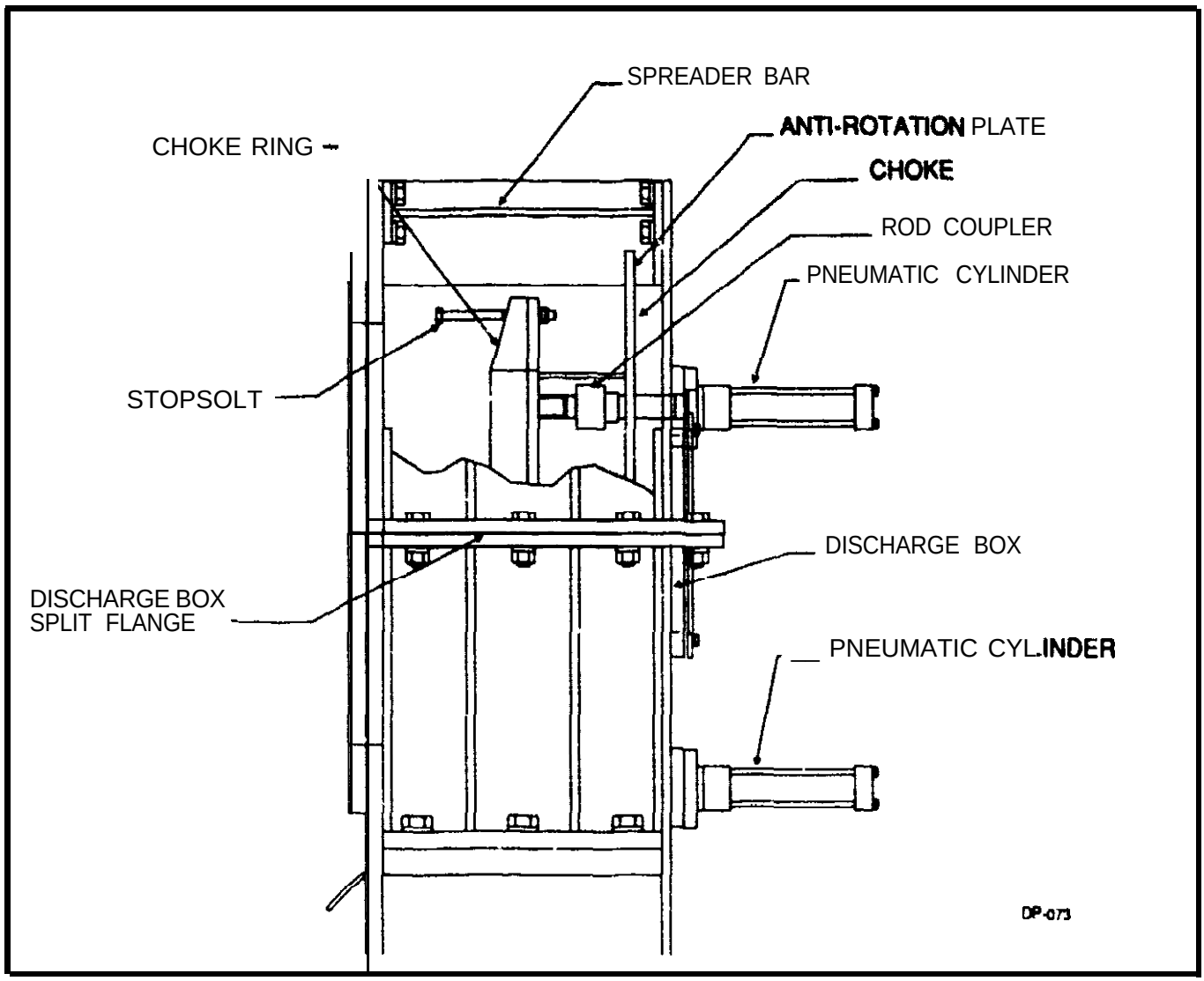


Figure 4-7
Discharge *Box and Choke*

This section describes adjustment and replacement of the bearing shoes, and renewal of the wear ring.

Adjusting the Choke Shoes

Periodically, the choke shoes require adjustment to compensate for wear. Except when installing new shoes, any adjustment required will usually be due to wear. It is not unusual for the shoe on top center of the choke to wear at a faster rate than the other shoes. Check the distance between the surface of the press shaft and the choke ring. (See Figure 4-g). If it is not equal all the way around the shaft, use the adjustment screws provided to obtain proper clearance. Each shoe has four adjustment screws. To adjust, loosen all four jam nuts, turn the screws in (or out, as requited) equally to obtain proper clearnce around the shaft. Do not overtighten. Tighten the jam nuts.

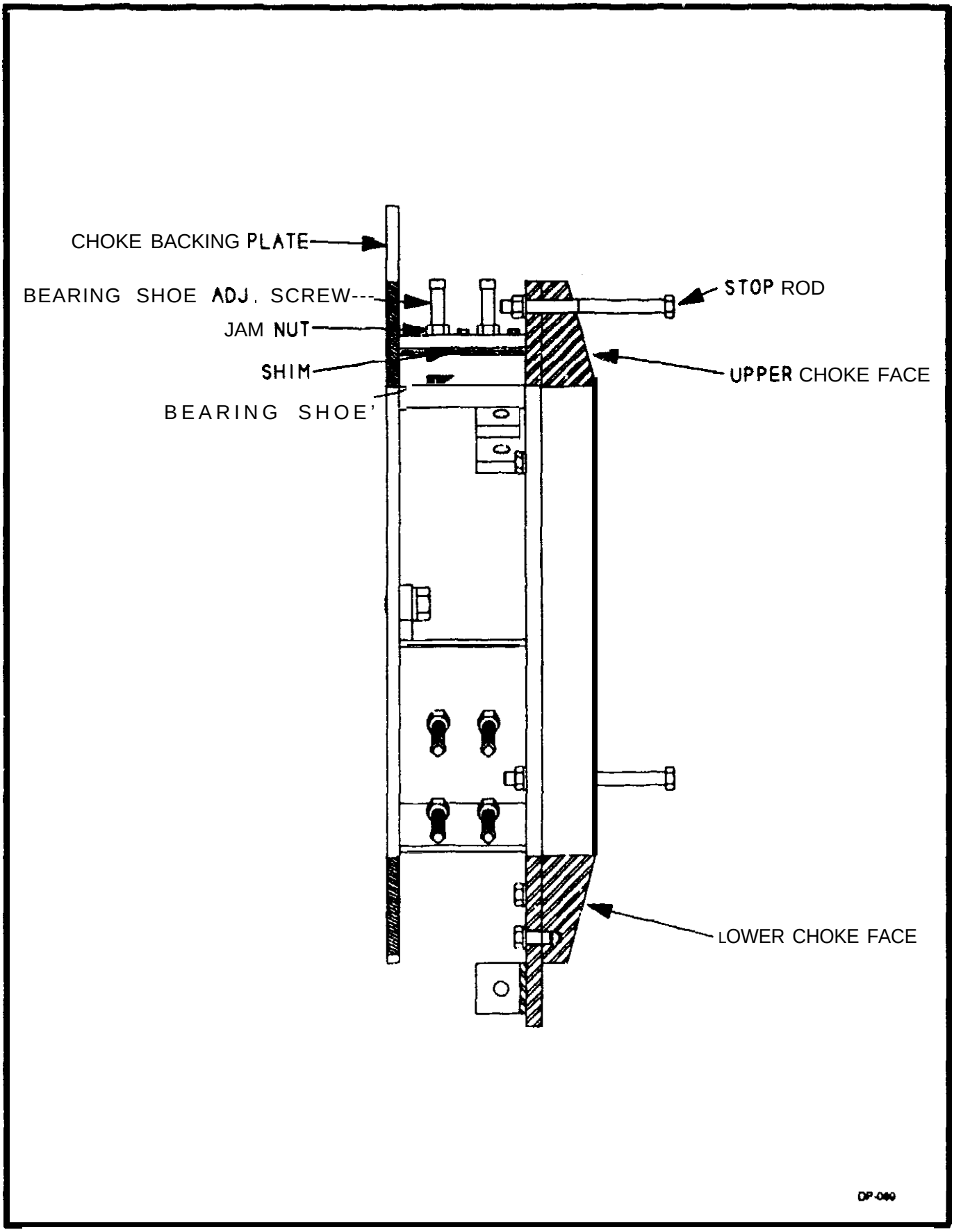


Figure 4-H
Choke Bearing Shoe

Renewing the Choke Face

A replaceable face ring protects the choke from wear and damage. If the choke face wears down enough to affect press performance, remove the choke face and install a new one.

The choke face is split into two semicircular segments so it can be removed while the press shaft remains in the machine,

Use the following procedure and Figure 4-8 to renew the choke face:

1. Remove the spreader bar from the discharge box.
2. Remove the clevis pins from the rod couplers that connect the pneumatic cylinders to the choke. Rorate the choke approximately 45' to a position that places the lifting hole in the face ring on top. See Figure 4-9.
3. Install a ⅜-16 UNC eyebolt in the hole provided in the top of the face ring, as shown in Figure 4-9. Attach a suitable overhead lifting device to the cyebolt. Each half of the face ring weighs 70 pounds.
4. Take up the slack in the lifting device. Remove the screws that attach the choke face half to the choke. Using the lifting device, remove the face ring from the machine.
5. Install a ⅜-16 UNC eyebolt in the lifting hole provided in the new face ring half, as in Step 3 above. Attach a suitable overhead lifting device to the cyebolt. The new face ring weighs 70 pe
6. Lift the new face ring into position on the choke. Inst. ching screws before removing the lifting device and eyebolt.
7. Tighten the attaching screws.

To nnew the lower half of the choke ring, proceed with Step 8. If both halves have been renewed, proceed with reassembly beginning with Step 10.

8. Rotate the choke on the press shaft to a position that gives overhead access IO the lower ring half.
9. Renew the lower half of the choke face by following Steps 3 through 7 of this procedure.
10. Return the choke to its correct orientation on the press shaft (i.e. with the anti-rotation guide on top). Connect the rod couplers that attach the pneumatic cylinders IO the choke by installing the clcvis pins.
11. Install the spreader bar in the discharge box. Make sure the spreader bar engages the anti-rotation guide.
12. Install and adjust the choke stop rods.

If proper clearance cannot be obtained by adjusting the shoes, install new shoes.

Replacing the Choke Shoes

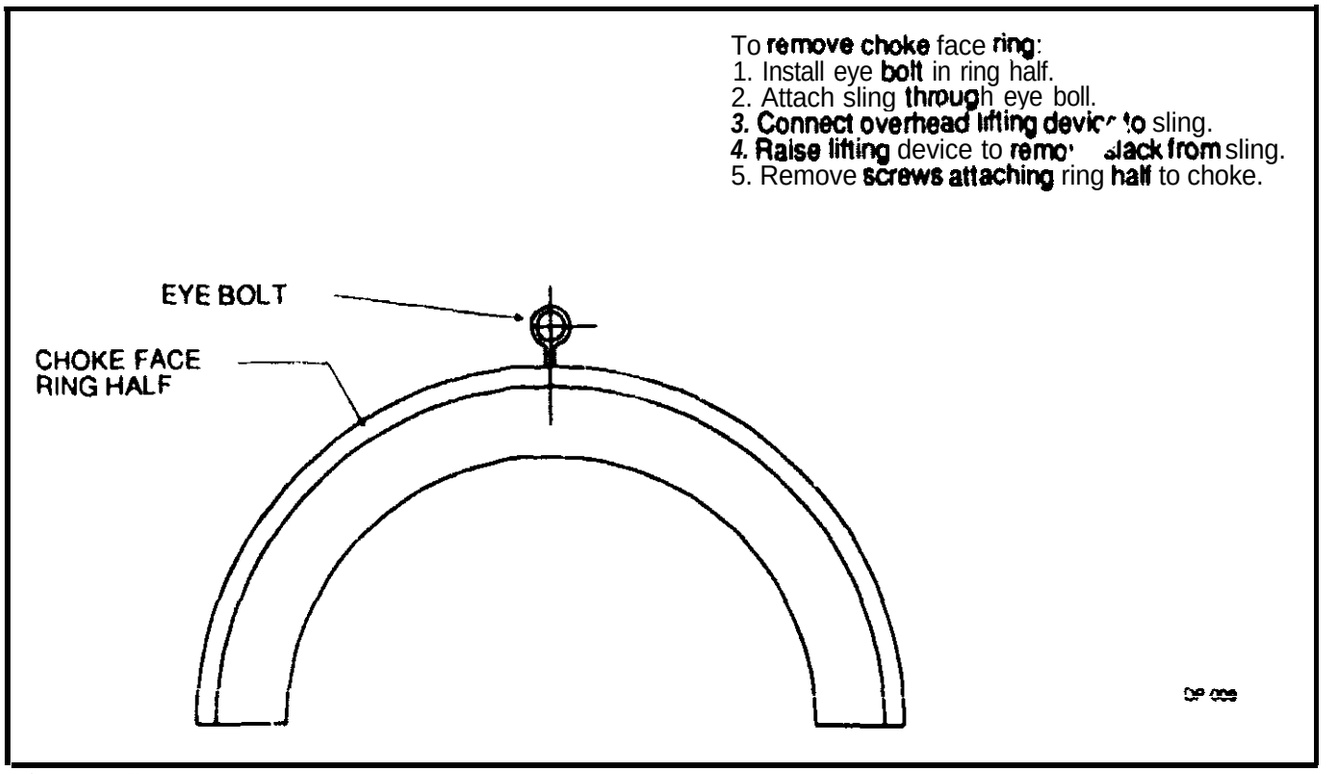
When replacing bearing shoes, replace all three shoes at the same time.

To remove the old bearing shoes (refer to Figure 4-8):

1. With the choke assembly properly supported, loosen the adjusting screws.
2. Remove the cap screws that attach the bearing shoe retainer to the bearing shoe housing.
3. Lift out the shim and bearing shoe.

To install new shoes:

1. Be sure the shim is in goodcondition. install the shoe into the housing first, then install the shim.
2. Install the shoe retainer and attach it to the bearing shoe housing with the cap screws.
3. Adjust the shoes as described in the previous section.



igure 4-9
Choke ring with eyebolt installed

Chapter 5

Component Disassembly and Assembly

5.1 Introduction

This section describes disassembly and assembly procedures for the majorcomponents of the Dewatering Press. Service procedures for some commercial components arc not covered in this chapter. Appendix A contains specific instructions pmvided by the manufacturers of these components.

Before performing service procedures that are not described in this manual, contact your Dupps service representative.

WARNING: Contact your Dupps service representative or the component manufacturer before performing service procedures not described in this manual. Failure to follow this instruction can result in serious personal injury.

Personal Safety

Wear suitable safety equipment when performing service on the press (eye protection, prorectivc head gear, etc.). Use a suitable iifting device to lift heavy components. Weights of major press components are listed in Chapter 1 (Appendix A for Gear Box).

Before performing service on the press, turn the Dewatering Press main circuit breaker Off and lock it. Shut off steam and compressed air supplies to the press. Relieve residual air and steam pressure from lines.

DANGER: Turn the Dewatering Press main circuit breaker OFF and lock it. Shut off steam and air supplies to the press. Relieve residual air and steam pressure from lines before performing service on the press. Failure to f. low these instructions can result in serious personal injury or death.

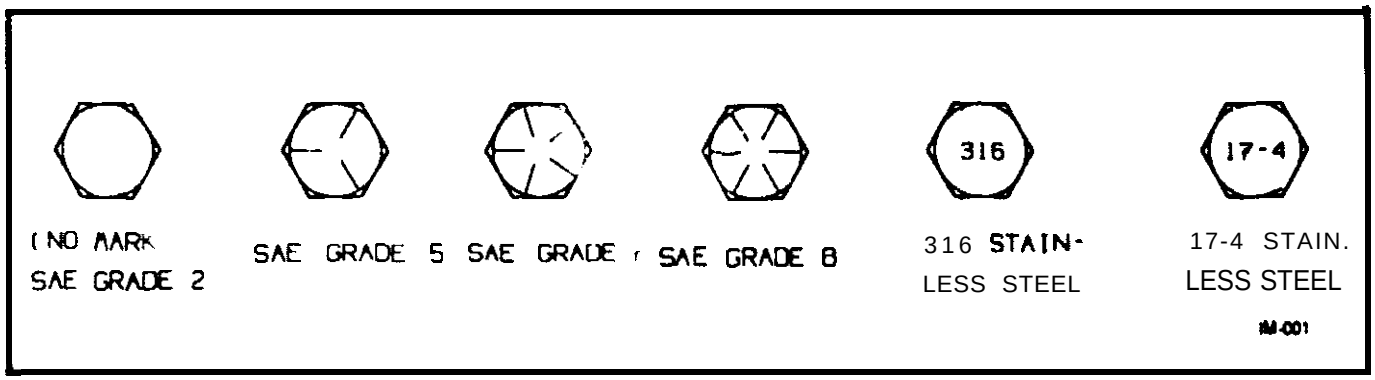


Figure 5-1
Bolt Head Markings

Replace damaged or lost fasteners only with a fastener of the same material.

When the press is operating, the bolted joints in the press structure are subjected to a high level of cyclical loading. Under these conditions, threaded fasteners can work loose or fail from fatigue if they are not tightened properly. Tighten fasteners that are loosened or removed during maintenance or repairs to the torque value specified in the instructions. The torque values specified in this manual are for dry (unlubricated) fasteners. If the fasteners arc lubricated, use 70% of the torque value specified.

5.2 Main Drive Assembly

An electric motor mounted above the gear box turns the input shaft through an enclosed multiple V-belt drive. The gear box is attached to the base. The main drive coupling connects the gear box output shaft to the press shaft.

Motor Drive and Gear Box Removal

Use the following procedure to remove the motor drive and gear reducer. Refer to Figure 5-2.

1. Remove the front half of the belt guard.
2. Loosen the motor plate adjusting bolts, and remove the V-belts.
3. Remove the sheave bushings and sheaves.
4. Remove the motor from the motor plate.
5. Remove the coupling guard. Remove the drain plug and drain the lubricant from the drive coupling.
6. Remove the bolts attaching the two halves of the drive coupling and separate the coupling.

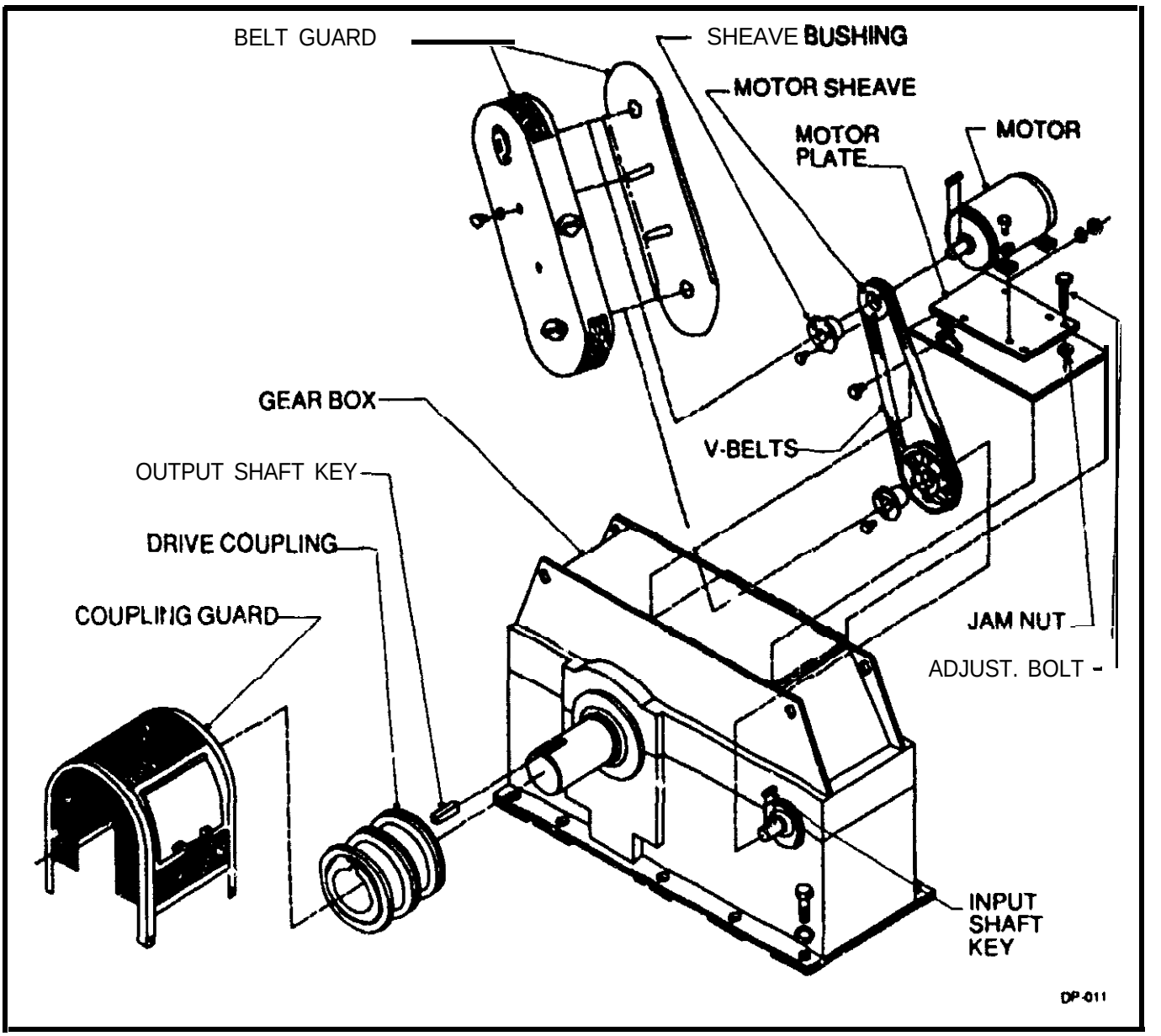


Figure 5-2
Main Drive Assembly

7. Remove the screws attaching the gear box to the base

8. Using the lifting rings provided on top of the gear box, attach a suitable lifting device to the gear drive. The gear box weighs 7100 pounds when filled with oil. but without the electric motor, motor plate, sheaves, or coupling half. With all of these components attached, the gear drive unit weighs IO.000 pounds.

9. Remove the gear box from the base. Note tbe markings on the shims under the gear box. The shims must bc returned to the same locations at reassembly IO insure that the drive coupling is properly aligned.

9. Remove the gear box from the base. Note the markings on the shims under the gear box. The shims must be ntumed to the same locations at reassembly to insure that the drive coupling is properly aligned.

Motor Drive and Gear Box Installation

Use the following procedure and Figure 5-2 to install the gear box and motor drive.

1. If the coupling half was removed from either shaft, install the gear coupling half and key. The coupling manufacturer's recommended procedures are included in Appendix A.

NOTE: The kcyways must be sealed to prevent leakage of coupling lubricant. Thiscanbeaccomplished by applying a bead of KTV silicone sealant to the joint, including the key and keyway, on the ends of both shafts after mounting the coupling hubs.

2. Return the gear box shims to their original locations noted in step 9 of disassembly.
3. Using a suitable lifting device, place the gear box into position on the base. Install the screws and lock washers that attach the gear box to the base. Do not tighten the screws.
4. Check the coupling alignment against the following specifications:

   Cap (hub separation;: 5/8 " min.. 11/16 " max
   Offset (max): .011"
   Angular (max): .026"

   Vertical offset and angular alignment may be adjusted by re-shimming between the gear box and base.

5. Tighten the screws that attach the gear box to the frame.
6. Attach the press shaft coupling half to the gear drive coupling half. Be sure to use the correct coupling bolts. Tighten the bolts to 250 lb-ft.
7. Fill the coupling with lubricant. See Chapter 2.
8. Install the coupling guard.
9. Install the motor plate tnd drive motor.
10. Install the rear half of belt guard.
11. Install thr keys in the motor shaft and gear box input shaft.
12. Mount the sheaves and install the sheave bushings.
13. Install the V-belts. Tension the drive belts hy turning the adjustment bolts. Tighten the jam nuts.
14. Install the front half of the belt guard.

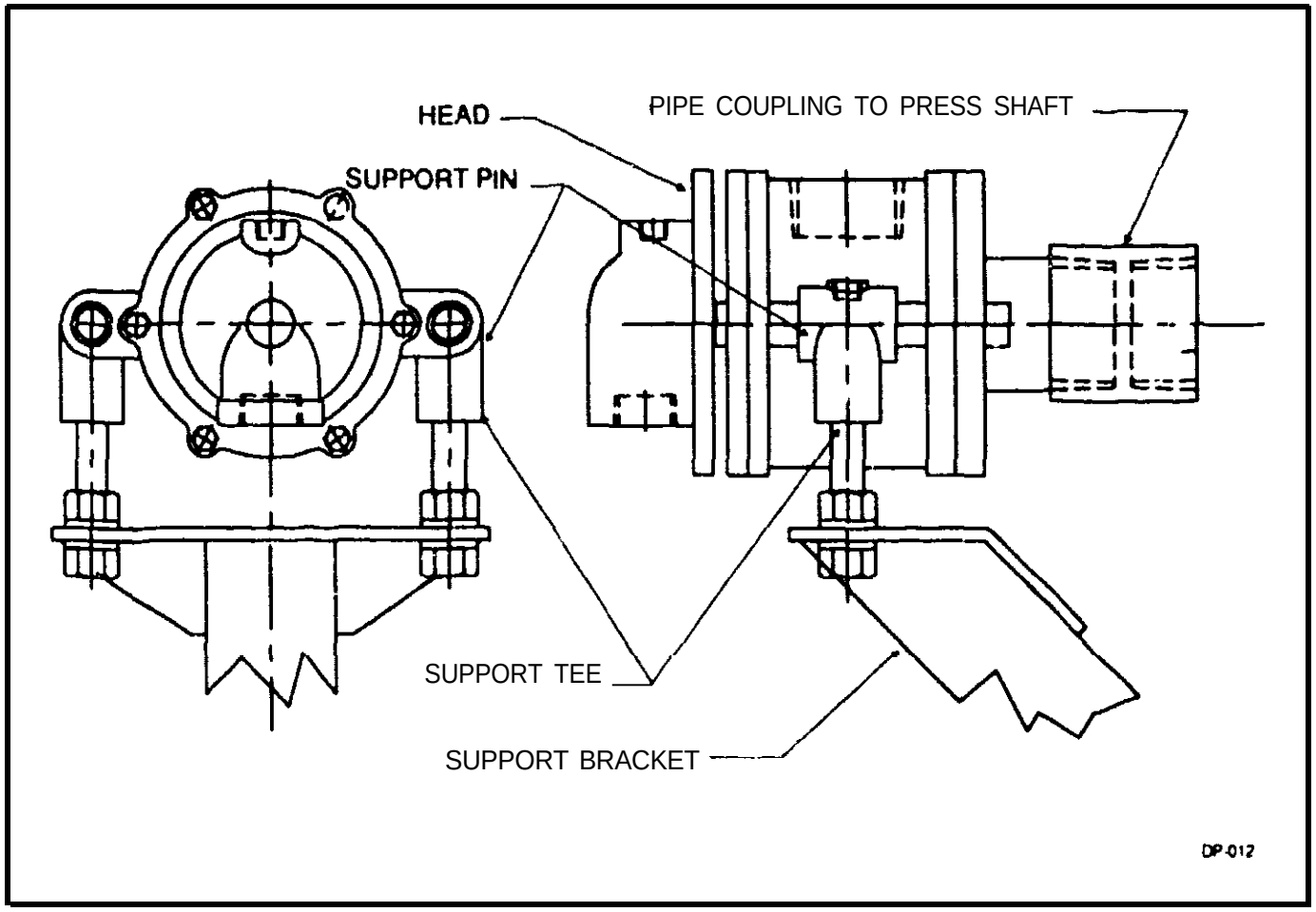
5.3 Rotary Steam Joint

The rotary steam joint directs steam into the feed end of the press shaft. Condensate from the steam returns through the steam joint. The internal seals of the rotary steam joint ate lubricated by the incoming steam.

NOTE: If the press is to be operated without steam applied to the shaft, remove the rotary steam joint before putting the press into service. Operating the rotary steam joint without steam will damage the seals in the steam joint.

Use the following procedure to remove the rotary steam joint from the press. Refer to Figure 5-3 and the manufacturer's parts list illustration in Appendix A.

1. Loosen the set screws in the support tees and remove the support pins.



igure 5-3
Rotary Steam Joint

2. Remove the steam joint supporting bracket.

NOTE'.: Leave the support bars and tees on the supporting bracket to maintain vertical alignment of the steam joint with the press shaft. If these parts are removed, the steam joint must be vertically realigned to the shaft after installation. If these parts must be removed due to damage, mark the position of the nuts and tees on the support bars. The marks on the damaged parts can then be transferred to the new support bars.

3. Arrange sling around the body of the steam joint and attach to a suitable lifting device to support the weight of the steam joint. The rotary steam joint weighs 100 pounds.

4. Remove the head from the end of the rotary steam joint to gain access to the condensate tube packing gland.

5. Loosen the packing gland locknut. then loosen the gland 1 to 2 turns.

6. Disconnect the pipe coupling from the end of the press shaft and remove the steam joint with the coupling. The condensate tube will remain in the shaft.

7. Unscrew the condensate tube from its connection inside the press shaft. Be careful not to mar the polished sealing surface at the end of the tube.

To install the rotary steam joint. reverse the removal procedure.

5.4 Thrust Bearing

The thrust bearing assembly (Figure 5-3) IS flange-mounted on the feed hopper. A Bellville spring, acting through the preload bearing, applies preload to rhe thrust beating. Grease fittings are provided for periodic lubrication. The thrust bearing assembly can be removed from the press shaft with the shaft remaining in the press.

Thrust Bearing Removal

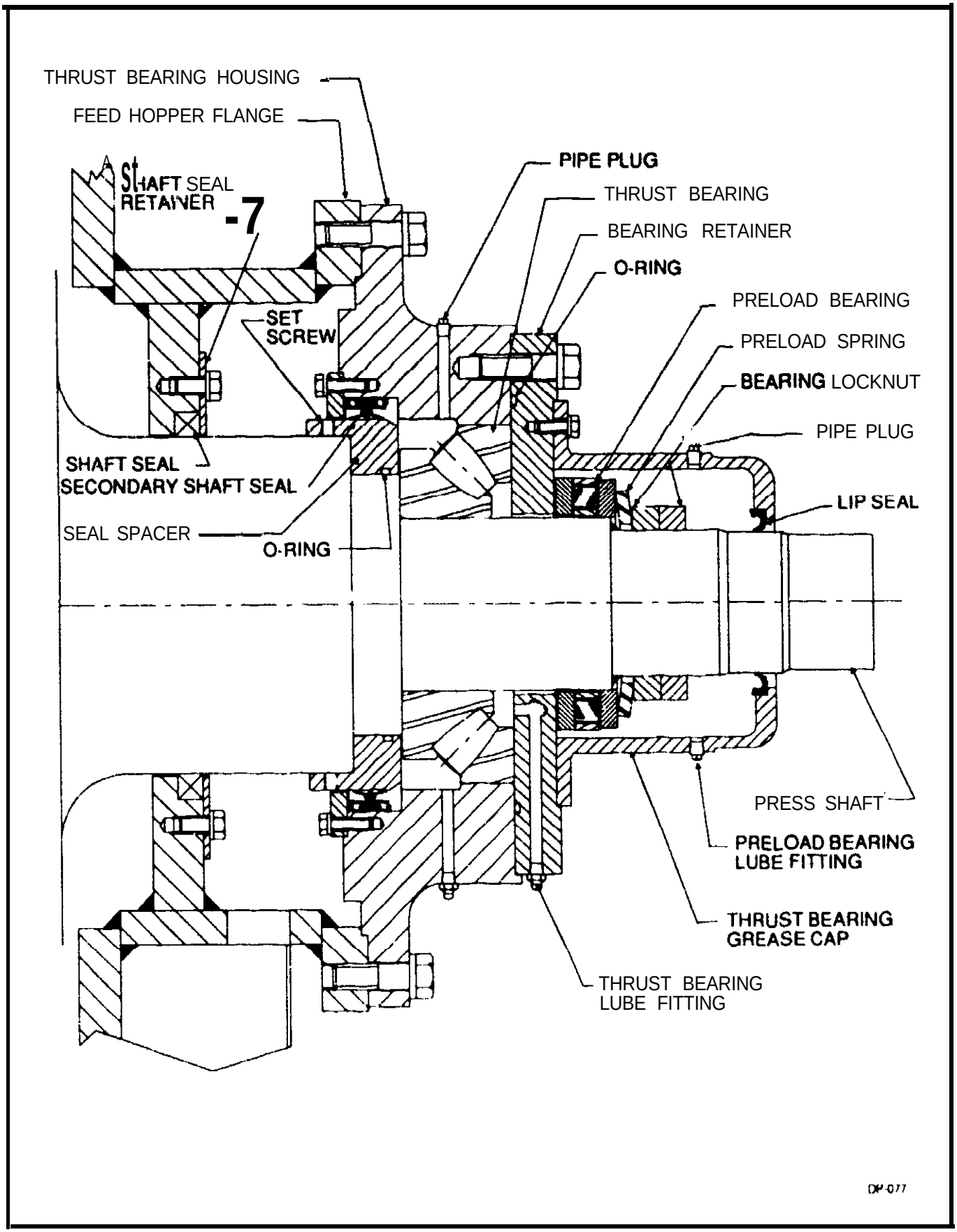
Use the following procedure to remove the thrust bearing assembly. Refer to Figure 5-3.

1. Remove the pipe cap on the end of the shaft that protrudes from the thrust bearing grease cap. Then remove the thrust bearing grease cap.

2. Attach a suitable overhead lifting device to rhe press shaft. The shaft weighs 5800 pounds. Use rhc lifting device to support the end of the shaft (access to the shaft is through the top of the feed hopper) so that it will not drop when the bearing locknut is loosened.

3. Remove the IWO bearing locknuts, disc spring. and preload bearing

4. Remove the bearing retainer.



gure 5-3
Thrust Bearing Assembly

5. Remove the attaching screws from the flange of the bearing housing. Install three of the screws into the threaded jacking holes in the flange. These screws will bc used to separate the bearing housing from the feed hopper flange.

6. Using the jack screws installed in step 5, separate the bearing housing from the feed hopper flange. Turn each screw about a half turn at a tirnc, advancing all three screws equally until the bearing housing is separated from the hopper.

7. Remove the jacking screws from the bearing housing flange, and insert a 3/4-10 UNC eye bolt in each of the two uppermos. jacking screw holes. Attach a suitable lifting device to the eye bolts. The housing weighs 250 pounds.

8. Remove the thrust bearing housing. The thrust bearing outer race and secondary lip seal will remain in the housing.

9. Remove the thrust bearing inner race/roller assembly from the shaft. One of the methods described below can bc used depending upon the condition of the bearing. Heating the bearing ring (up to 250' F) to expand the bearing race will facilitate removal:

   a. If the bearing is in good condition, and is to be re-mounted use one of the following methods:

      1. Use a bearing puller with a "splitter" attachment (such as OTC no. 1127). Use the splitter to separate the inner race from the seal ring first, then pull the inner race.

      2. Use a collet-type bearing extractor that engages behind the rollers.

      3. Loosen the set screws in the seal spacer. Arrange a 3-jaw bearing puller to grip on the seal spacer. Pull the spacer, forcing the bearing off the shaft.

   b. If the bearing is unserviceable, then it may be heated with a welding torch IO 660° F (3.50' C) and hosed with cold water. The heavy internal stresses thus produced in the ring will make it crack. Since the ring is likely to burst. the work area must be well screened to avoid accidents.

10. If the seal spacer was not removed with the bearing. loosen rhe seal spacer set screws, and remove rhe seal spacer.

I I. Remove the shaft seal retainer and shaft seal.

Thrust Bearing Installation

Use the following procedure to install the thrust bearing assembly. Use new seals and O-rings.

1. Support the end of the press shaft (see step 3 of the nmoval procedun) to provide clearance for installing the new seal.
2. Lubricate the lip of the new shaft seal with Mobilithe SHC® 150(grease, or equivalent. Install a new shaft seal. Install the felt sea. retainer.
3. Install a new O-ring in the seal spacer. Install the seal spacer on the shaft. Make sure the seal spacer is pushed back tightly against the shaft shoulder, so the thrust bearing can be pushed up tight against the shoulder (see Figure 5-3) and tighten the set screws in the seal spacer.
4. Heat the thrust beating inner race to 250-270° F with an induction heating device.

> WARNING: Wear heat resistant, insulated gloves when handling hot parts. Failure to follow this instruction can result in serious personal injury.

5. Rapidly push the heated thrust bearing inner race assembly onto the shaft. Allow the bearing to cool to room temperature before proceeding with the bearing installation.

> CAUTION: Allow the thrust bearing to cool to room temperature before installing the bearing housing. Failure to follow this instruction can result in damage to the lip seal.

6. Pack the thrust bearing rollers with Mobilith SHC® 1500 grease, or equivalent.
7. Install the thrust bearing outer race and new secondary lip seals in the bearing housing. Lubricate the lip seals with Mobilith SHC 1500 grease, or equivalent. prior to installing the bearing housing over the shaft.
8. Coat the mating flange surfaces of the thrust bearing housing and the feed hopper with non-hardening Permatcx.
9. Install a ¾-10 UNC eye bolt in each of the uppermost jack screw holes in the flange of the thrust bearing housing. (Orientation should be such that the grease fitting is on the bottom. and the pipe plug is on top.) Using a suitable lifting device through the eye bolts, and being careful not to damage the secondary lip seals, place the bearing housing on the press shaft. The bearing housing weighs 250 pounds.
10. Install the attaching screws into the flange of the bearing housing. Remove the eye bolts installed in the previous step. Tighten the screws evenly to 380 lb-ft.

11. Pack the preload bearing with Mobilith SHC 1500 grease, or equivalent.

12. Install a new O-ring, lubricated with Mobilith SHC 1500 grease in the bearing retainer and attach the bearing retainer to the bearing housing. Evenly tighten the screws to 380 lb-ft.

13. Slide the preload bearing onto the shaft

14. Install the preload bearing disc spring and one locknut on the shaft.

15. Preload the thrust bearing as follows:

    a. Thread the locknut onto the shaft far enough to remove the play between the locknut, disc spring, and preload bearing.

    b. Advance the locknut exactly ¼ additional turn (this requites approximately 560 lb-ft of torque and results in .022-inch compression of the disc spring) to apply the preload.

> CAUTION: Advance the bearing locknut ¼ turn after the locknut, disc spring, and praload bearing are making intimate contact. Failure to follow this instruction will result in premature thrust bearing failure.

16. Mount the second locknut and tighten it against the first.

17. Install a new lip seal in the grease cap Lubricate the lip seal with Mobilith SHC 1500 grease or equivalent. Attach the grease cap to the bearing retainer.

18. Install the pipe cap on the end of the shaft.

19. Lubricate the bearings. Refer to Chapter 2.

5.5 Feed Hopper

Material enters the press through the top of the feed hopper. As the material enters the feed hopper. liquid drains through the feed hopper cage. This drainage collects in the drain pan in the underframe.

A flange on the end of the feed hopper provides mounting support for the thrust hearing assembly. Dual lip seals between the feed hopper and thrust bearing protect the bearing from contamination by material in the feed hopper.

The feed hopper cage can be separated at the bottom to remove it from the press.

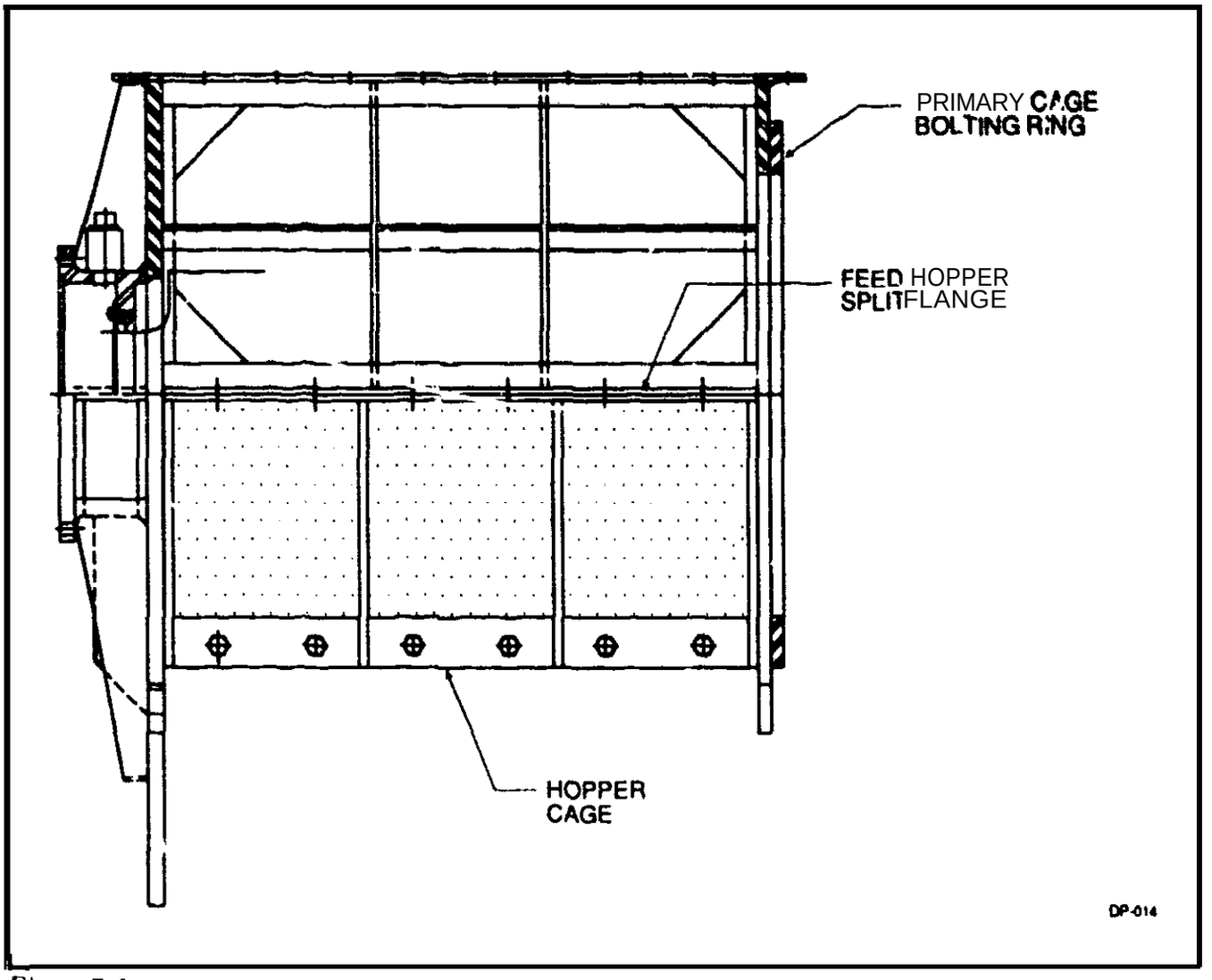


Figure 5-4
Feed Hopper Cross Section

1. Remove the thrust bearing assembly, as described in the pnvious procedure.
2. Remove the screws that attach the upper half of the primary cage to the feed hopper. These screws are through the end flange of the primary cage and thread into the bolting ring on the discharge end of the feed hopper.
3. Remove the bolts and drive out the IWO dowel pins from the feed hopper split flange. The dowel pin: are located on either side of the thrust bearing mounting flange.
4. Using a suitable lifting device, remove the upper half of the feed hopper.
5. Remove the shims from the hopper split flange
6. Remove the bolts and dowel pins attaching the two halves of the feed hopper cage together.

7. Attach a suitable lifting &vice to the feed hopper cage half to be removed. Each feed hopper cage half weighs 200 pounds.
8. Remove the screws that attach the hopper cage half to the ends of the feed hopper.
9. Using the lifting device installed in step 7. remove the feed hopper cage half from the press.
10. Repeat steps 7 through 9 for the other cage half.
11. If it is necessary to install new screens in the cage halves, grind the welds to remove the old screens. Tack weld new screens into the cage halves.

Feed Hopper Assembly

Assemble the feed hopper by reversing the disassembly procedure. Be sure to apply the correct thrust bearing preload, as described under "Thrust Bearing Insatllation".

Pressed cake leaving the press enters the discharge box (Figure 4-7), the bottom of which is open to the discharge cake handling system

The discharge box contains the adjustable choke, which controls back pressure on the material in the press. The weight of the choke is supported by the press shaft. which extends through the discharge box. The pneumatic cylinders that control the choke pressure are mounted on the wall of the discharge box, opposite the discharge opening. The anti-rotation plate (attached to the top of the choke ring and engaging the spreader bar in the top of the discharge box) prevents the. choke from turning with the press shaft.

The discharge box is split horizontally to permit press shaft removal.

Discharge Box Removal

Use the following procedure to remove the upper half of the discharge box from the lower half. Refer to Figure 4-7. If it is necessary to remove the lower half of the discharge box from the bax. the press shaft must be removed first to provide clearance.

1. Shut off the compressed air supply to the choke cylinders. Bleed off the residual air pressure in the lines and choke cylinders before disconnecting the air lines.

WARNING: Turn off the supply of compessed air to the choke cylinders and relieve the residual air pressure in the lines before performing work on the choke assembly. Failure to follow this instruction can result in serious personal injury.

2. Disconnect the compressed air lines from the choke pneumatic cylinders.

3. Loosen the rod couplers and disconnect the top twochokt pneumatic cylinder shafts from the choke.

4. Remove tht two choke pneumatic cylindm from the upper half of the discharge box.

NOTE: Step 4 is optional. It is possible to remove the discharge box without removing the choke cylinders. The cylinders add 100 pounds to the weight of the discharge box upper half.

5. Remove the screws attaching the top half of thr discharge cage to the top half of the discharge box

6. Drive out the dowel pins in the split flange (between the upper and lower halves) of the discharge box. Then remove the bolts from the split Ilangc.

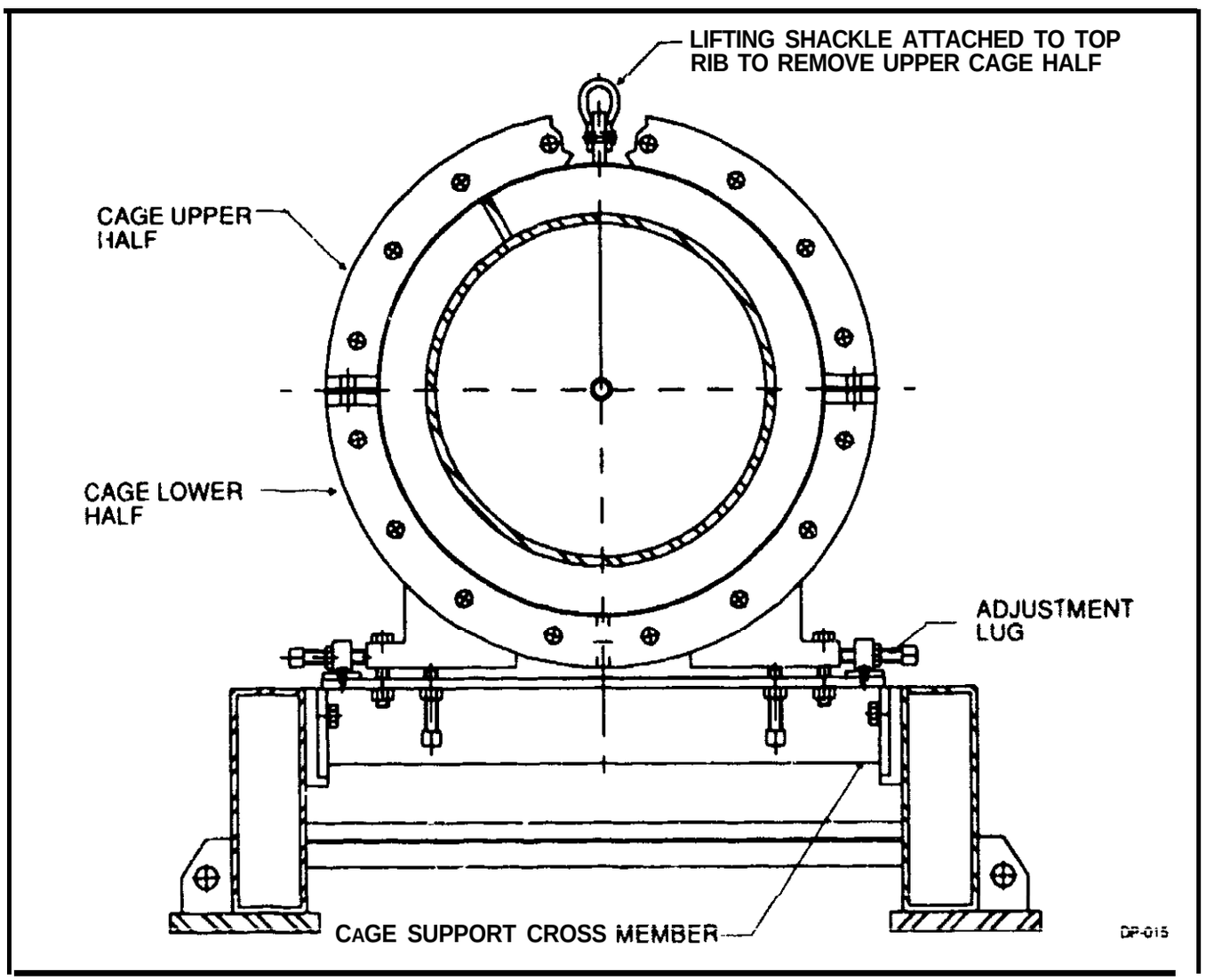
7. Using a suitable lifting device, remove the upper half of the discharge box. The upper half of the discharge box alone weighs 870 pounds. With the choke pneumatic cylinders attached, it weighs 970 pounds.

7. **Using a suitable lifting device, remove the upper half of the discharge** box. The upper half of the discharge box alone weighs 870 pounds. With the choke pneumatic cylinders attached. it weighs 970 pounds.

Discharge Box Installation

Reassemble the upper half of the discharge box by reversing the removal procedure. When installing the upper half of the discharge box, make sure the slot in the choke anti-rotation plate engages the discharge box spreader bar. Use the following torque values for the **fasteners:**

- Discharge box split flange bolts: 300 lb-ft.
- Discharge **box** to **underframe:** 300 lb-ft.
- Discharge cage to discharge box (1" dia. **screw): 800** lb-ft.



'igure 5 -5
End View *of Cage Assembly*

The pnss shaft is surrounded by the cages. The different models of the Dewatering Press have different numbers of primary (low compression) cage assemblies. The tine-mesh inner cage screens separate liquid from the compressed material. The intermediate and discharge cages are provided with backup screens to withstand the higher pressure.

As shown in Figure 5-5, the cages are split and bolted along the axis of the press shaft. Shims rue provided in the split flange between the cage halves to maintain pmper clearance between the cage screens and press shaft flighting. Compensation for worn flighting can be achieved by removing some or all of the shims. Cage adjustment blocks provide the means to align the cage assemblies with the press shaft. Cage alignment and shimming procedures are described in Chapter 4.

Removing the Upper Half of a Cage Assembly

The upper half of the cage(s) may be removed to gain access to the press shaft (i.e.. to manually clear debris, renew flight facing, or remove the shaft) while the lower half remains in the press.

1. Remove the bolts from the end flanges of the upper half of the cage assembly to be removed.
2. Loosen the bolts in the lower half of the discharge end flange of the cage being removed. Back the nuts off enough to allow the end flanges to be separated at least ¼ inch.
3. At each cage adjustment lug between the cage bcingremoved and the discharge box:
   a. Loosen the lateral adjusting screw and the elevnting screw (See Figun! 4-3). If this is a discharge cage, it has noelevating screws.
   b. Remove the lug nrtachment bolts
4. Loosen the discharge box mounting screws. Move the discharge box toward the pillow block bearing. This will separate the flanges where the bolts were loosened in step 2.
5. Remove the bolts and dowel pins from the split flange of the cage to be removed.
6. Attach lifting shackles through the holes provided in the longitudinal top rib of thr cage (see Figure S-6). Connect a suitable lifting device to the shackles. Each cage half weighs 600 pounds. Remove the slack from the lifting device.
9. Using the lifting device attached in Step 7, lift the upper half of the cage from the machine.

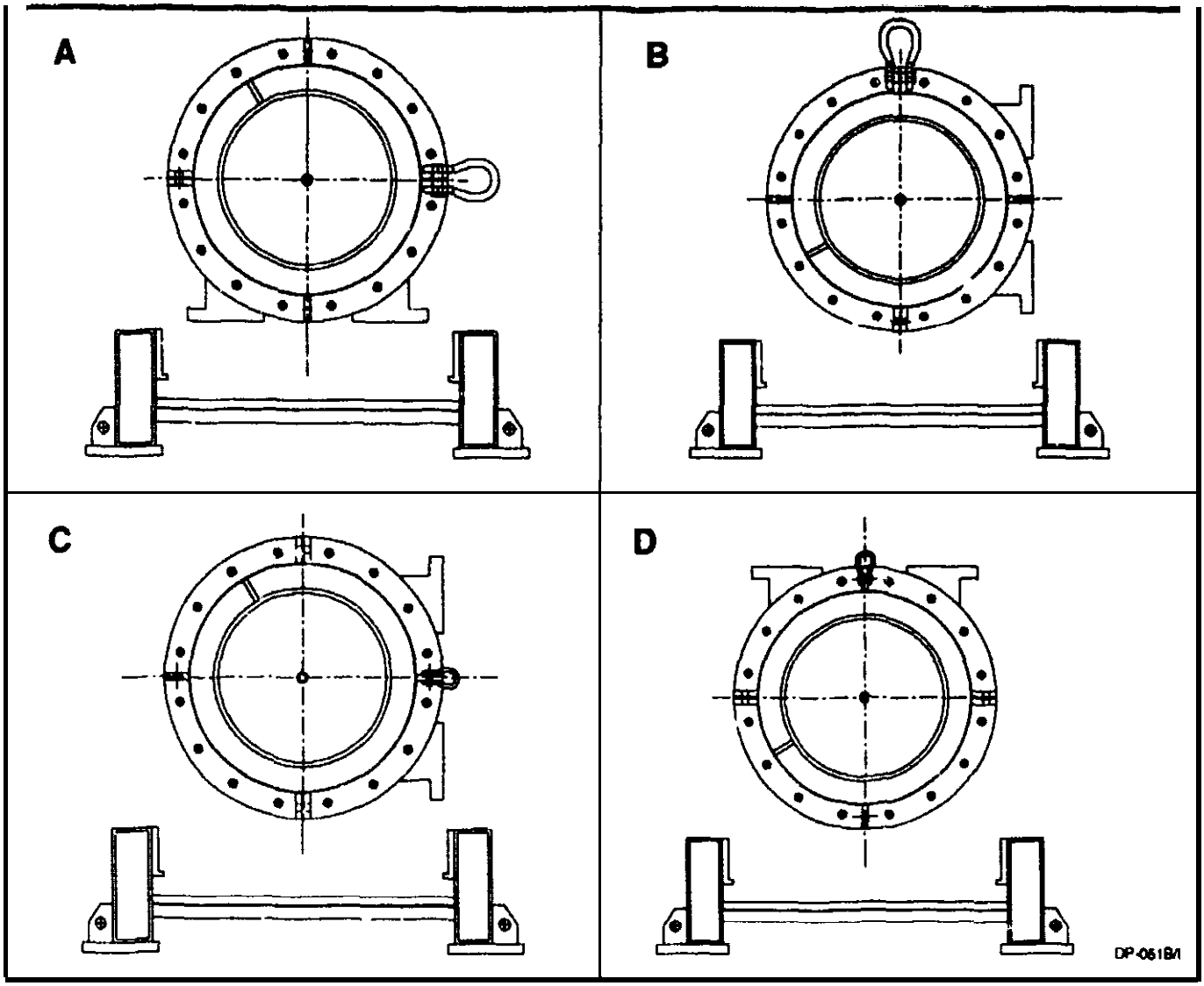


Figure 5-6
Steps in Removing a Lower Cage Half

If the shaft is to be removed from the press, it is usually easier to remove the upper halves of all the cages, then remove the shaft, and finally remove the lower halves of the cage(s).

Use the following procedure to remove the cage lower half from the press:

1. Remove the bolts from the end flanges of the cage assembly to be removed.
2. At each cage adjustment lug between the cage being removed and the discharge box:
   a. Loosen the lateral adjusting screw and the elevating screw (See Figure 4-3). If this is a discharge cage, it has noelevating screws.
   b. Remove the lug attachment bolts.
3. loosen the dixharge box mounting screws. Move the discharge box toward the pillow block bearing. This will separate the flanges where the bolts wen loosened in step 1.

4. If the cage half being removed is not equipped with an adjustment lug, start with Step 6

5. If the cage being removed is equipped with art adjustment lug (see Figures 4-2 and 5-5):

   a. loosen both lateral adjusting screws;

   b. remove the lug attachment bolts;

   c. back off the elevating screws (with discharge cage, remove shims) so they are no longer supporting the cage;

   d. remove the cage support cross member from the underframe.

6. Attach lifting shackles through two of the bolt holes on the same side of the split flange. Attach a suitable overhead lifting device to the shackles (see Figure 5-6, A).

7. Carefully lift up on the cage with the lifting device attached in Step 6. The cage should rotate about the press shaft approximately 90 degrees. The split flange should now be approximately vertical (see Figure 5-6, B).

8. Attach the lifting shackles to the bottom longitudinal rib (see Figure 5-6, C) and attach the lifting device to the shackles.

9 Using the lifting device attached in Step 6, roll the cage into the position shown in Figure 5-6, D.

10. Install bolts through two of the holes in each end flange of upper cage half (the cage half that is now in the bottom position). Thread a nut onto each bolt hand tight.

11. Remove the bolts and dowel pins from the cage split flange.

12. Lift the cage half off the press.

Installing New Screens

If it is necessary to install new screens in the cage halves, grind the existing welds to remove the old screen. Weld the new screen to the cage frame with 'h-inch tack welds on 6-inch centers, using suitable stainless steel welding material.

Installing Cage Assemblies

Installing the cages is basically a reversal of the removal procedun. If more than one cage has been removed. install one cage at a time, starting at the feed hopper end of the machine.

NOTE 1: The mating halves of each cage are machined together in process at the factory. They are not interchangeable. For this reason, both halves of each cage are numbered. The cage numher is stamped on the split flanges, near the end flange.

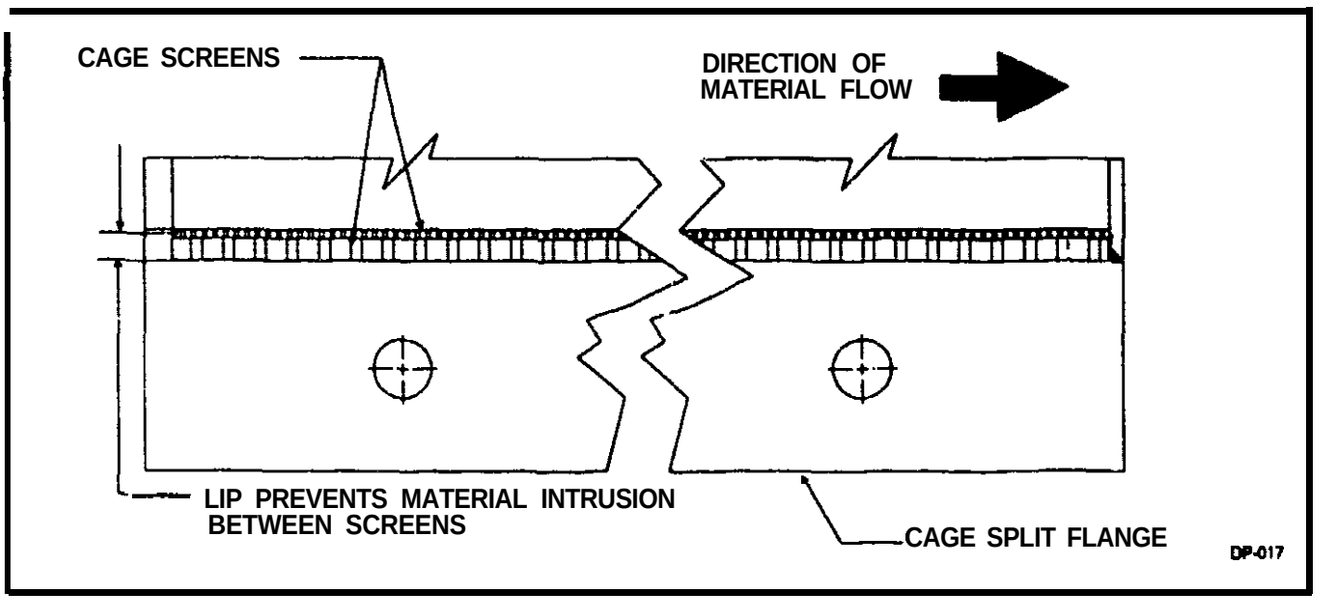


Figure 5-7
Orientation of Cages

NOTE 1: The mating halves of each cage are machined together in process at the factory. They are **not** interchangeable. For this reason, both halves of each cage ate numbered. The cage number is stamped on the split flanges, near the end flange. Be sun the two halves of each assembled cage have the same cage number.

CAUTION: Be sure both halves of the assembled cage have the same cage number. Failure to follow this instruction can result in damage to the machine.

NOTE 2: The cages are designed for material flow through the cage in onedirectiononly.The insidediameterat thefeedendofeach cage frame forms a lip that prevents materirl from migrating between the cage frame and the screen, causing separation of the screen from the frame. The discharge end of the cage has no internal lip. Be sure this internal lip is at the feed end of the cage when the cage is installed. See Figure 5-7.

CAUTION: Be sure the cage assemblies have the correct orientation. Failure to follow this instruction can result in damaae to the machine.

Tighten the fasteners as follows:

- Primary and intermediate cage cross members to underframe: 160 lb-ft.
- Discharge cage cross members to underframe: 300 lb-ft.
- Split flange bolts: 300 lb-ft.

After reassembly. align the cages to the shaft flighting as described in Chapter 4

5.8 Press Shaft

The press shaft is a tapered shaft with flighting. When the shaft is turning, the flighting pushes the material through the press while the increasing root diameter of the shaft increases pressure on the material, forcing the water through the screens. An electric motor drives the shaft through a speed reducing gear box at the discharge end of the press. The shaft is supported on two hearings: a preloaded thrust bearing in the feed hopper, and a pillow block bearing mounted on a pedestal between the discharge box and main drive coupling,

The press shaft can be steam heated to improve cake dryness. Steam feed and condensate discharge for the shaft are both at the feed hopper end of the shaft

Press Shaft Removal

Use the following procedure to remove the press shaft:

1. Remove the thrust bearing assembly, feed hopper, top half of the discharge box, and top half of all the cages, as previously described in this chapter.
2. Disconnect the lower choke rod cylinder from the choke by disconnecting the rod coupling.
3. Separate the gear coupling (see steps 5 and 6 of the main drive disassembly procedure).
4. Remove the four screws that attach the upper half (cap) of the pillow block housing to the lower half (base). Install an eyebolt in the lifting hole provided in the top center of the cap. Use a suitable overhead lifting device to remove the pillow block housing cap.
5. Attach a suitable overhead lifting device to the shaft. The weight of the shaft is 6700 pounds with the choke, pillow block bearing, and coupling half.
6. Using the lifting device attached in step 5, remove the shaft fmm the machine.
7. Remove the coupling half from the press shaft. Follow the manufacturer's instructions in Appendix A.
8. Mark the mounting position of the pillow block bearing on the shaft. If a new press shaft is being installed, mark the pillow block bearing position on the new shaft, according to that of the old shaft.
9. Remove the pillow block bearing nut. Remove the pillow block bearing assembly, then remove the bearing adapter from the shait.
10. Remove the choke assembly from the shaft.
11. If the shaft flighting is worn. install new flighting. See Chapter 4. or contact your Dupps service representative.

Press Shaft Installation

To install the press shaft, use the following procedure:

1. Assemble the pillow block beating and seal rings on the shaft in the position marked during disassembly. See also Step 6 below and the bearing manufacturer's mounting instructions in Appendix A.
2. Mount the drive coupling half (Figure 5-2) on the press shaft,
3. Mount the choke in position on the shaft.
4. Attach a suitable overhead lifting device to the shaft. The weight of the shaft is 6700 pounds with the choke, pillow block bearing, and coupling half.
5. Using the lifting &vice attached in step 4, place the shaft into position.

NOTE: Continue to support the feed end of the shaft until after the thrust beating is assembled

6. Make sure the pillow block bearing is installed in the housing without stabilizing rings. The bearing must float axially in the housing when the press is operating to accommodate thermal growth of the shaft. For this reason, the bearing must be not more than .020 inch from the housing shoulder on the discharge box side (the shaft will normally expand toward the gear box).
7. Install the pillow block bearing cap. Tighten the cap bolts evenly to 285 lb-ft (use 220 lb-ft if the bolts are lubricated).
8. Assemble the feed hopper, thrust bearing assembly, discharge box, and cages as previously described in this chapter.
9. Align the two halves of the drive coupling according to the manufacturer's specifications. See Appendix A and Section 5.2.
10. Attach the two halves of the drive coupling. Tighten the bolts to 250 lb-ft.
11. Fill the coupling with lubricant. See Chapter 2 for lubrication details.
12. Install the coupling guard,

Chapter 6

Illustrated Parts Lists

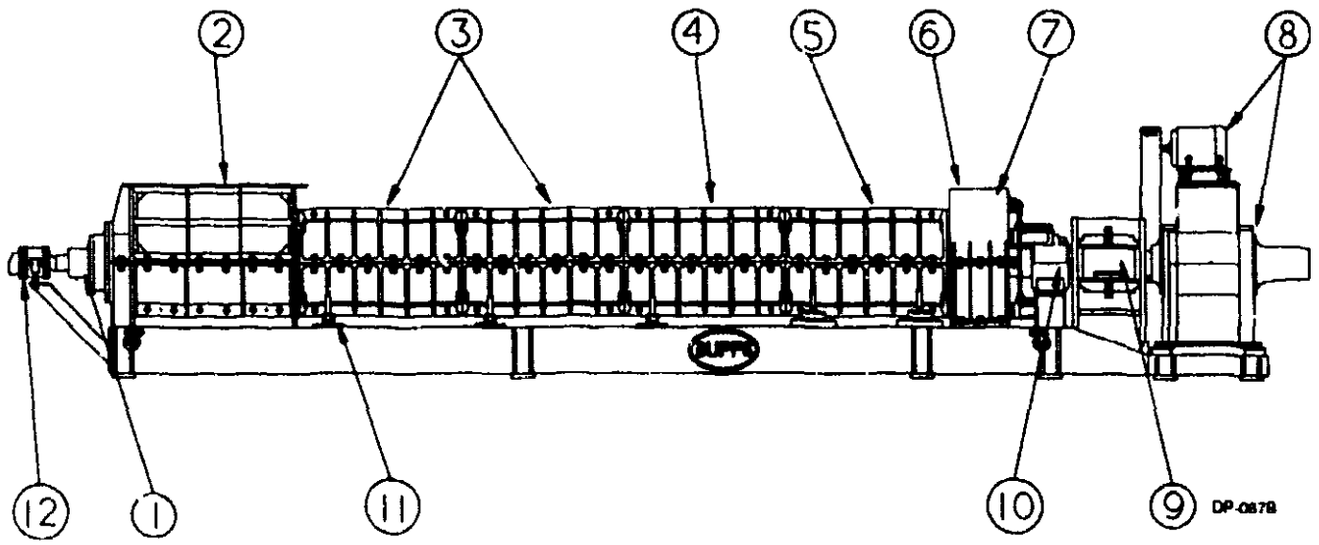
This chapter contains tabulated parts lists for the Dupps 2400 Dewateting Press. The three sections in this chapter contain the following:

- Illustrated Parts Lists. The lists in this section identify all the patts in the press. The PART NO column contains Dupps part numbers for repair parts. The word "config" in the PART NO column means the part number is listed on the Configuration Sheet in the Introduction section of this manual. More information is given for npair parts in the next section.
- Repair Parts List. Selected parts in this list are flagged as recommended spates. This list also identifies commercial components, which are cross-referenced in the next section.
- Commercial Parts List. This section provides a cross-reference to the commercial components in the press and their respective vendors and vendor's pan number.

Figure 6-l identifies the major sub-assemblies of the press and provides a key to the figure containing the parts listing for each sub-assembly.

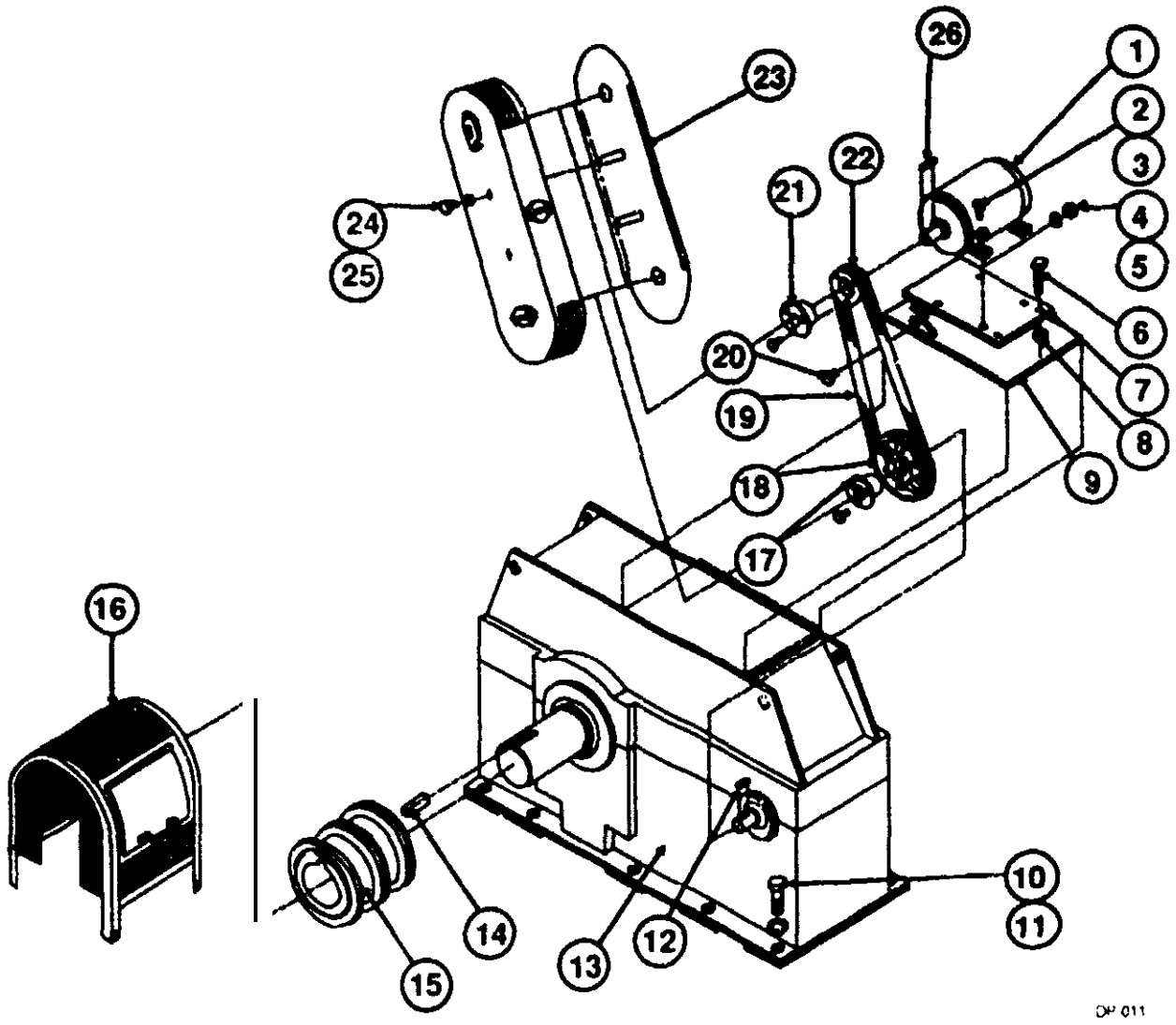
6.1 Illustrated Parts Lists

The parts lists include REP numbers keyed to the illustrations in the section. The PART NAME column gives the part description. Specific Dupps part numbers are given for service parts.



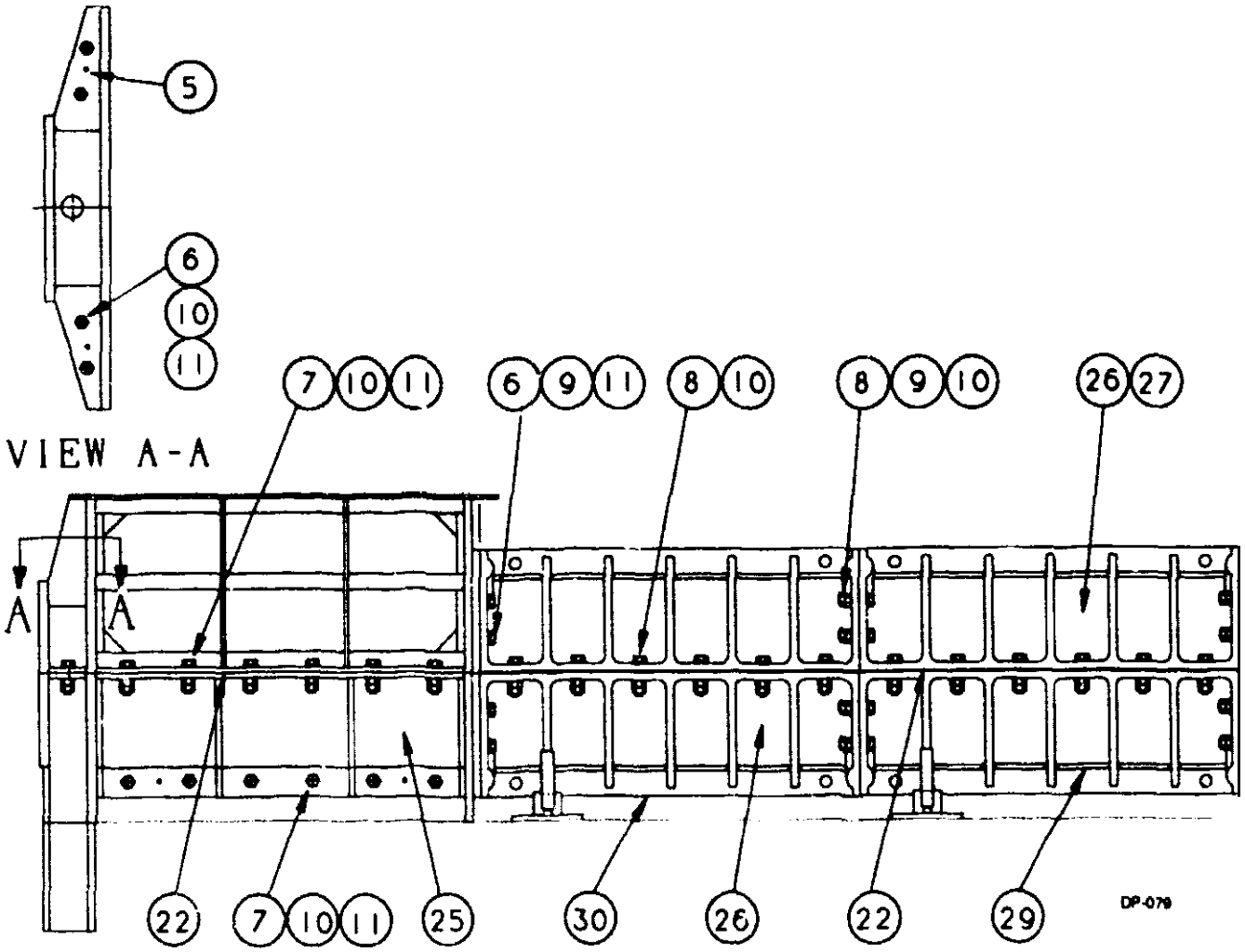
1. Thrust Bearing Assembly — See Figure 6-4
2. Feed Hopper — See Figure 6-3
3. Primary Cages — See Figure 6-3
4. Intermediate Cages- See Figure 6-3
5. discharge cages See- Figure 6-3
6. Discharge Box — See Figure 6-3
7. Choke Assembly — See Figure 6-5
8. Motor and Gear Box — See Figure 6-2
9. Drive Coupling — See Fiiure 6-2
10. Pillow Block Bearing — See Figure 6-3
11. Cage Adjustment — See Figure 6-6
12. Steam Joint Assembly — See Figure 6-7

Figure 6-I
Dupps 3600 Series *Dewatering Press*



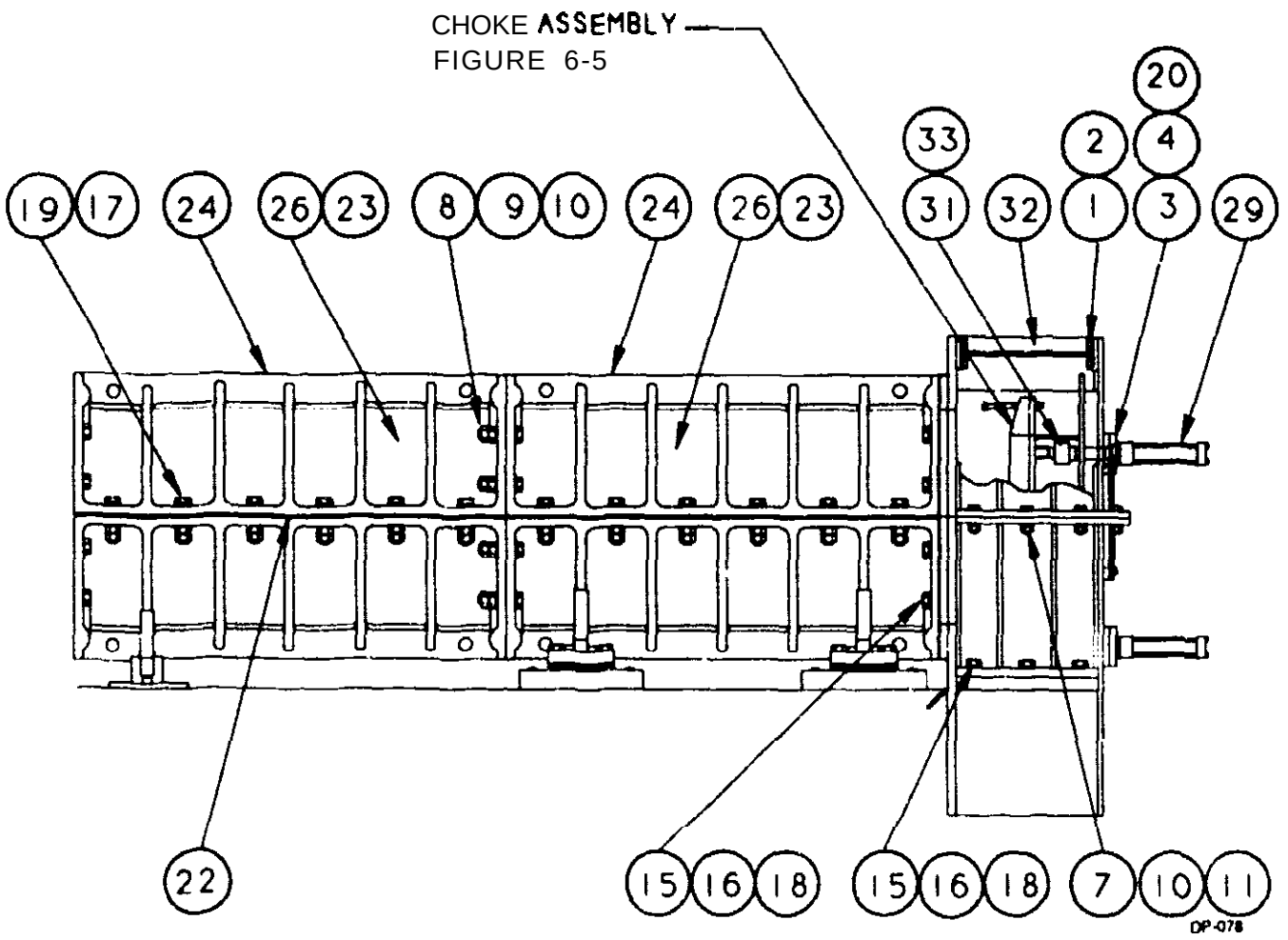
REF	PART NO.	PART NAME
1		Motor 20hp
2		HHCS
3		Lock Washer
4		Hex Nu!
5		Lock Washer
6		3/4 x 6" HHCS
7		Motor Plate
8		3/4 " Hex Nut
9		Reducer Plate
10		1%' Lock Washer
11		1% x 4" HHCS
12	124236	Key, Input Shaft
13		CONFIG Gear Reducer
14		Key, Output Shaft
15		CONFIG Drive Coupling
16		Coupling Guard
17		CONFIG Bushing, Drive Sheave
10		CONFIG Drive Sheave
19		CONFIG Drive Belt
20		3/4 x 3' HHCS
21		CONFIG Bushing. Motor Shaft
22		CONFIG Motor Sheave
23		Belt Guard
24		1/2 x 1" HHCS
25		1/2" Lock Washer
26		Key Motor Shaft

gure 0-2
Main Drive Assembly



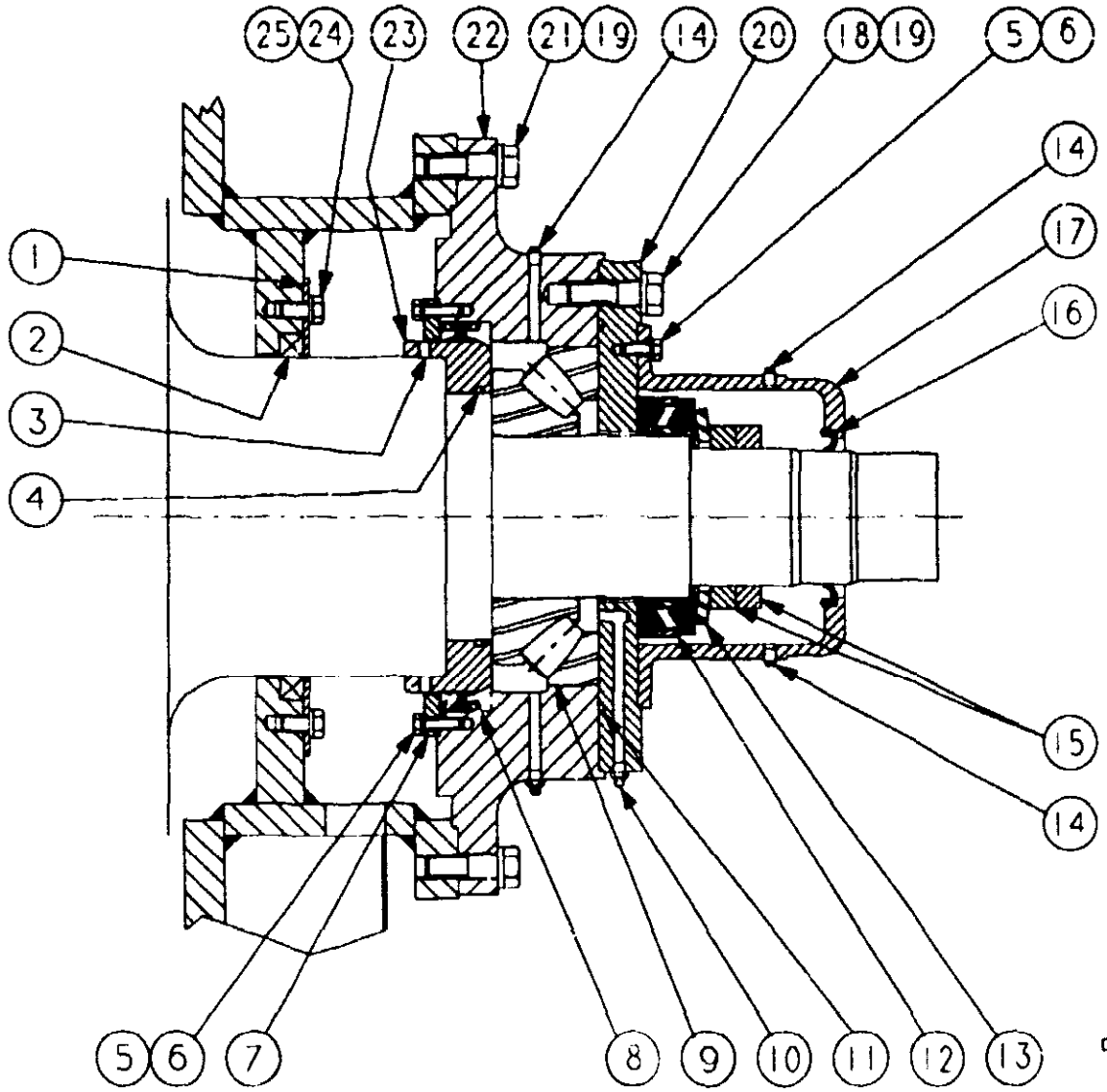
REF	PART NO.	PART NAME
1		½ x 1¼ Hex Hd Cap Scr, 316SS
2		½ Lock Washer, 316SS
3		⅝ x 2¾ Soc Hd Cap Scr
4		⅝ Hi-Collar Lock Washer
5		½ x 2 Dowel Pin
6		1 x 2' Hex Hd Cap Scr, 316SS
7		1 x 2¼ Hex Hd Cap Scr, 316SS
8		1 x 4 Hex Hd Cap Scr, 316SS
9		1' Flat Washer, 316SS
10		1-6 Hex Nut, 316SS
11		1" Lockwasher. 316SS
12		1½ x 5½ Hex Hd Cap Scr
13		1½ Flat Washer
14		1½" Lockwasher
15		1¼" Flat Washer, 316SS
16		1¼" Lockwasher, 316SS
17		1¼-7 Hex Nut

igure 6-3
Feed Hopper, Primary, and Intermediate Cages



REF	PART NO.	PART NAME
18		1¼-7 x 3 Hex lid Cap Scr, 316SS
19		1 ¼-7 x 5 Hex Hd Cap Scr, 316SS
20	123479	Adapter Plate. Air Cylinder
21	123269	Bearing. Plw Blk (not shown)
22	122423	Cage Shim, Interm & Disch
23	CONFIG	Back-Up Screen. Disch. 3/8
24	CONFIG	Cage Set, Discharge
25	CONFIG	Hopper Cage Screen
26	CONFIG	Inner Screen. 1/8
27	CONFIG	Backup Screen, Intermed ¼
28	CONFIG	Cage Set, Intermediate
29	123482	Pneumatic Cylinder
30	CONFIG	Cage Set, Primary
31	123283	Rod Coupler
32		Spreader Ear, Disch Box
33	123634	Clevis Pin

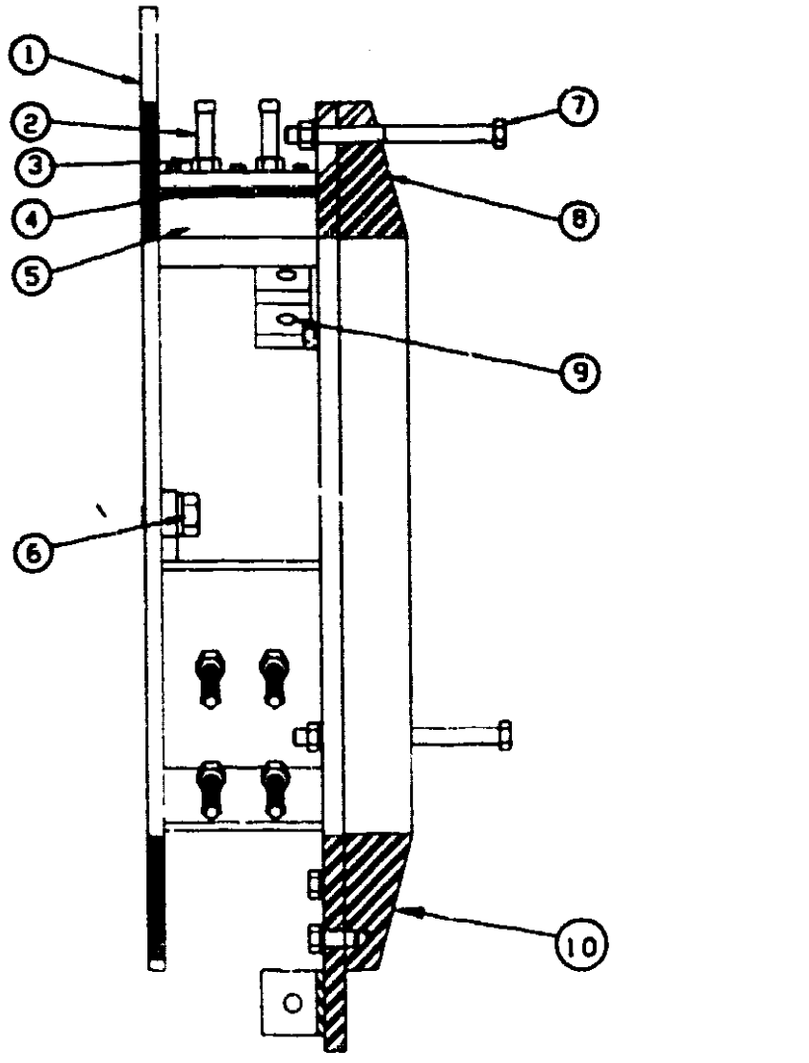
Figure 6-3 (cont'd)
Discharge Box and Discharge Cages



AEF	PART NO.	PART NAME
1	118650	Retainer, Shaft Seal
2	118704	Shaft Seal, Primary
4		3/8 x 3/8 Soc Set Scr
5	119588	O-ring, Seal Spacer
6		3/8 x 1 Gr2 Cap Scr
7		3/8 Med Lockwasher
	122814	Retainer, Shaft Seal
8	119585	Shaft Seal, Secondary
9	118616	Thrust Bearing, Spherical Roller
10		1/8 Grease Fitting
11	119589	O-ring. Brg Retainer
12	118617	Prebad Bearing

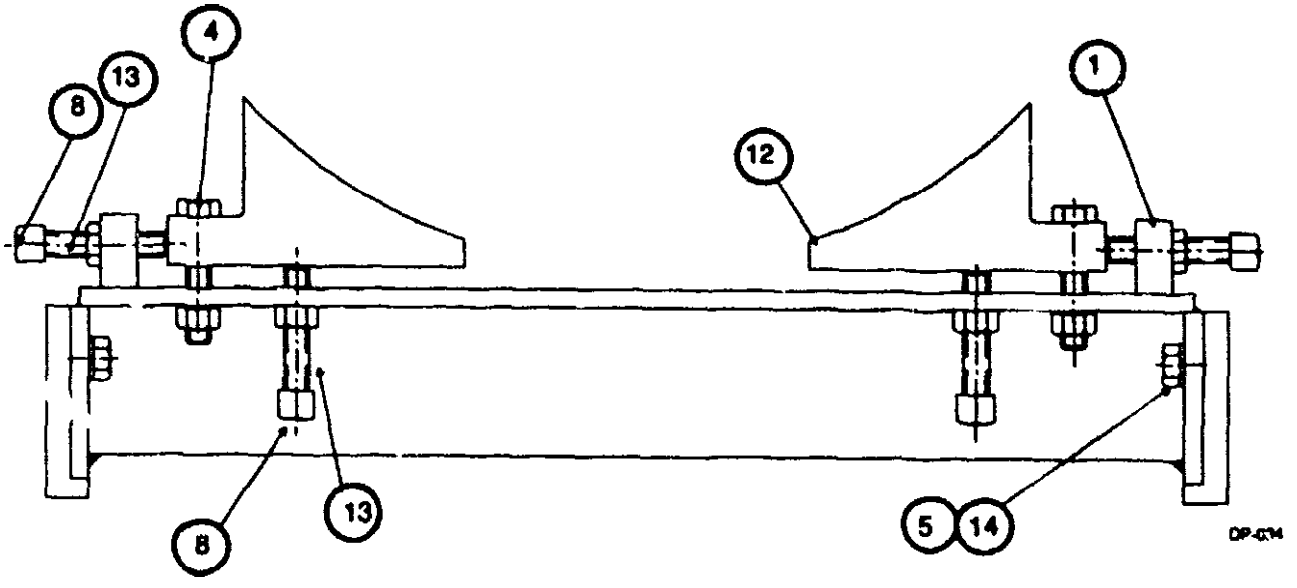
REF	PART NO.	PART NAME
13	120230	Disc Spring
14		1/8 Pipe Plug
15	120226	Bearing Locknut
18	120229	Lip Seal. Grease Cap
17		Grease Cap
18		3/4 x 2 1/4 Gr8 Cap Scr
19		3/4 Med Lockwasher
20		Bearing Retainer
21		3/4 x 2 1/2 Gr8 Cap Scr
22		Bearing Housing
23	119578	Seal Spacer
24		1/2 x 3/4 Cap Scr, 316SS

Figure 6-4
Thrust Bearing Assembly



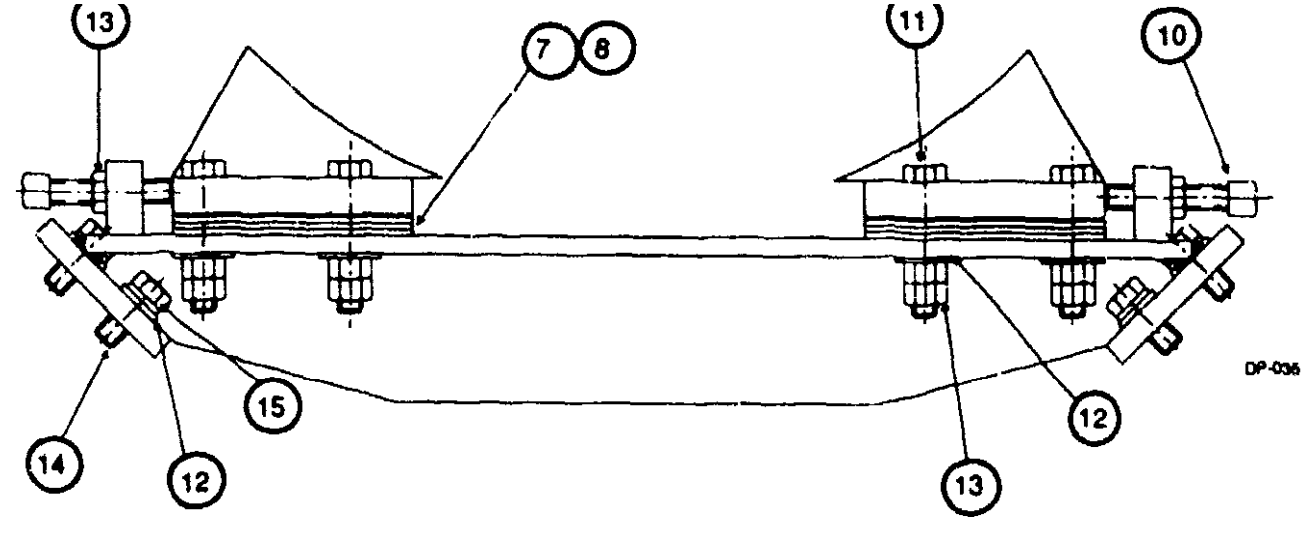
REF	PART NO.	PART NAME
1		Choke Backplate Assy
2		½ x 2½ Set Scr, 316SS
3		½ -13 Hex Nut, 316SS
4		½" Lock-washer, 316SS
5		½ -13 x 1¼ HHCS, 316SS
6		¾ -10 x 1¼ HHCS, 316SS
7		¾" Lockwasher, 316SS
8		¼ -20 x 1¼ HHCS, 316SS
9		¼" Lock-washer. 316SS
10		½ -13 x 6½ HHCS, 318SS
11		Choke Face, Upper
12		Choke Face, Lower
1:	122766	Shim, Choke Shoe
14	122751	Choke Shoe, Phenolic

Figure 6-5
Choke Assembly



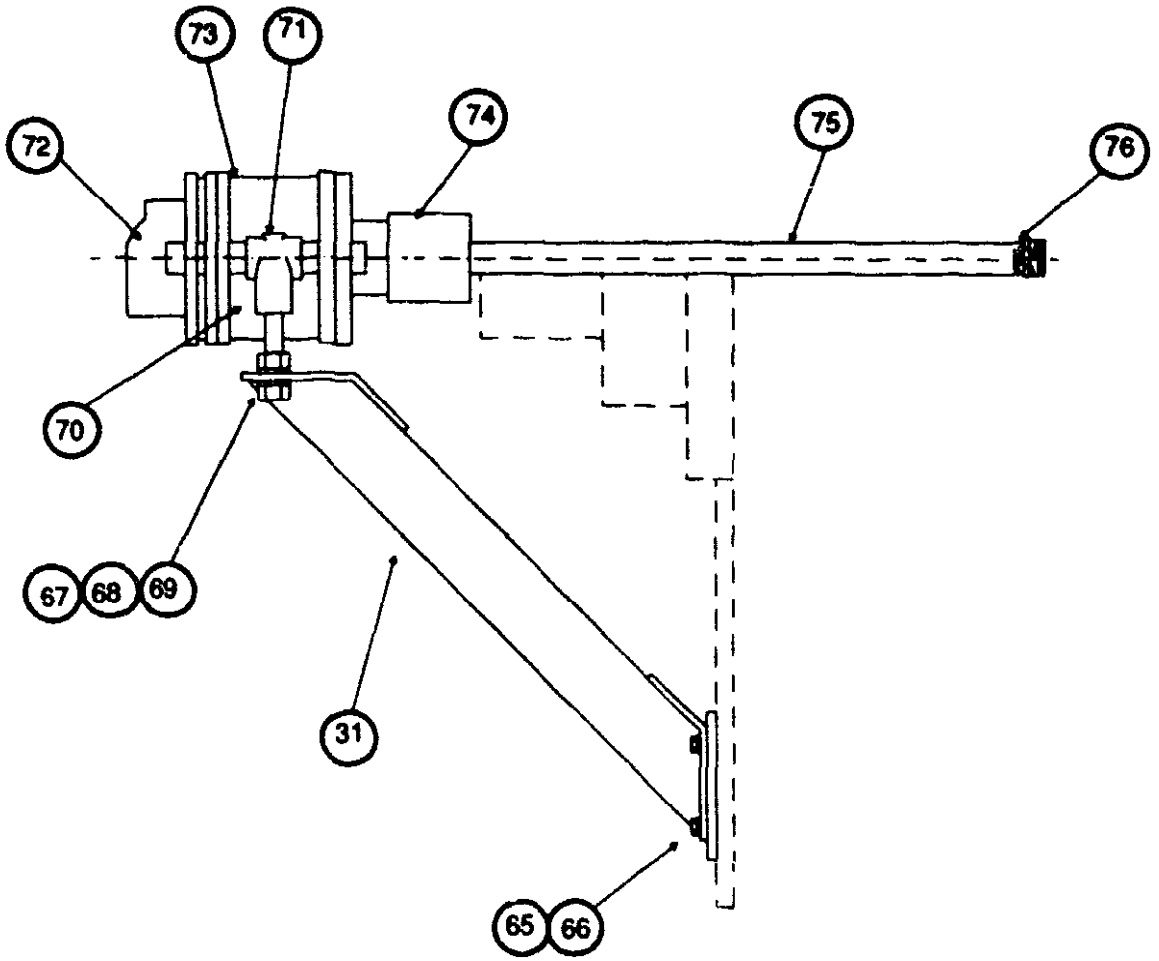
REF	PART NO.	PART NAME
1		Adjust Blk, Primry/Intermed
4		1-8 x 5 HHCS, 316SS
5		3/4 x 1% HHCS, 316SS
8		1-8 x 5 Set Screw, 316SS
12		Adjust Lug, Primry/Intermed
13		I-8 Hex Nut. 316SS

Figure 6-6
Cage Adjustment Assembly–Primary & Intermediate



REF	PART NO.	PART NAME
7	122325	Cage Block Shim, 1/16
6	121238	Cage Block Shim
10		1-8 x 5 Set Screw, 316SS
11		1-8 x 5 HHCS, 316SS
12		1' Flatasher. 316SS
13		I-6 Hlut, 316SS
14		f-6 x 2½ HHCS, 316SS
15		I' Lockwasher, 316SS

Figure 6-7
Cage Adjustment Assembly–Discharge



REF	PART NO.	NAME	REF	PART NO.	NAME
31		**Support,** Steam Joint	**71**		**Support** Tee
65		**½"** Lock Washer	**72**		Support Pln
66		**½ x** 1' HHCS	**73**	**120231**	2750 Steam **Joint**
67		**¾"** Hex Nut	**74**		**3½"** NPT **Full Coupling**
68		**¾" Lock** Washer	**75**		**Condensate** Tube
69		**¾"** Flat Washer	**76**		**Reducing** Rushing
70		Steam Joint Support Bar			

Figure 6-8
Rotary Steam Joint

6.2 Repair Parts

This section gives Dupps part numbers for service and repair parts. The "S" and "C" columns are used to identify recommended spare parts and commercial parts respectively. Recommended spare parts should be stocked at your facility. in the quantities shown, to reduce downtime for maintenance. - a l parts U C cross-referenced i n the next section of this chapter.

FIG	REF	PART NO	PART NAME	QTY	s	c
6-2	12	124236	Key, Input Shaft	I	S	
6-2	13	Config. Sheet	Gear Box			
6-2	14	124237	Key, Output Shaft	1	s	
6-2	15	Config. Sheet	Drive Coupling			
6-2	17	Config. Sheet	Bushing, Drive Sheave			
6-2	18	Config. Sheet	Drive Sheave			
6-2	19	Config. Sheet	Drive Belts	2	s	
6-2	21	Config. Sheet	Bushing. Motor Shaft			
6-2	22	Config. Sheet	Motor Sheave			
6-3	20	123479	Adapter Plate, Air Cylinder	3		
6-3	21	124143	Bearing, Spher Rlr (for Pillow Block)	1	s	c
6 3	21	124144	Adapter 6 Nut, Pillow Blk Brg	1	s	c
6-3	21	124234	Seal, Pillow Block	2	s	c
6-3	22	122423	Cage Shims	6	S	
6-3	23	Config. Sheet	Back-up Screen, Disch., 3/8		s	
6-3	24	Config. Sheet	Cage Set. Disch		S	
6-3	26	Config. Sheet	Inner Screen	6	S	
6-3	27	Config. Sheet	Back-up Screen. Intermed, 1/4"		S	
6-3	28	Config. Sheet	Cage Set. Intermed		S	
6-3	29	123452	Pneumatic Cylinder	3		C
6-3	30	Config. Sheet	Cage Set, Primary		S	
6-3	31	123283	Rod Coupler	3	s	
6-3	32	Config. Sheet	Cage Set, Feed Hopper		S	
6-3	33	123634	Clevis Pin	3	S	C
6-4	1	118650	Retainer, Primary Shaft Seal	I	S	
6-4	2	118704	Shaft Seal	1	S	
6-4	4	119566	O-ring, Seal Spacer	1	S	c
6-4	6	119565	Lip Seal	2	s	c
6 4	9	116616	Spherical Roller Thrust Bearing	IS		c
6-4	11	119569	O-ring, Bearing Retainer	1	S	C

Figure 6-9
Repair Puns List

I . **Recommended Spare Parts. C - See Commercial Parts List.**

FIG	REF	PART NO	PART NAME	QTY	S	C
6-4	12	118617	Pre-Load Bearing	1	S	C
6-4	13	120230	Preload Disc Spring	1	S	
6-4	15	120228	Bearing Locknut	2	S	C
6-4	16	120229	Lip Seal,,Grease Cap	1	S	C
6-4	23	119578	Seal Spacer	1	S	
6-5	11	Config. Sheet	Choke Face, Upper	1	S	
6-5	12	Config. Sheet	Choke Face, Lower	1	S	
6-5	14	122751	Choke Shoe, Phenolic	3	S	
6-7	7	122325	Shim, Cage Block, 1/16 in.		S	
6-7	8	122324	Shim, Cage Block		S	
—	—	124236	Air Cylinder Repair Kit	3	S	
—	—	120653	Steam Joint Repair Kit	1	S	

Figure 6-9 *(cont'd)*
Repair Parts List

S = Recommended Spare Parts. C = See Commercial Parts List.

6.3 Commercial Parts

This section provides a cross-nfercncc between the Dupps part number and the Vendor's part number for commercial pans used in the press. Many of these parts can be obtained locally.

-PART NO.	PART NAME	VENDOR	DESCRIPTION
116616	Bearing, Spher Rlr Thrst	FAG	26426 E.MB
116617	Bearing, Prebad	FAG	K.81226 MPB
119565	Lip Seal, Secondary	Garlock	59X3692, Viton
119566	O-ring, Seal Spacer		AS-366. Viton
119569	O-ring, Bearing Retainer		AS-381, Viton
120226	Bearing Locknut		AN-22
120229	Lip Seal, Grease Cap	Garlock	53X2636, Viion
122820	Shalt Seat. Feed Hopper	Chicago Rawhide	loo0243
123482	Pneumatic Cylinder	Parker	2"J-2AUV23AX6"
124142	Housing, Pi Block		SAF048-K/8½
124143	Bearing, Spher Roller	SKF	23048KW33C3BR
124144	Bearing Adapter	Miether	SNP 3048X8½
124234	Seal	Johns. Manville	JMR0850-09857RVP

Figure 6-10
Commercial Parts List

Appendix A

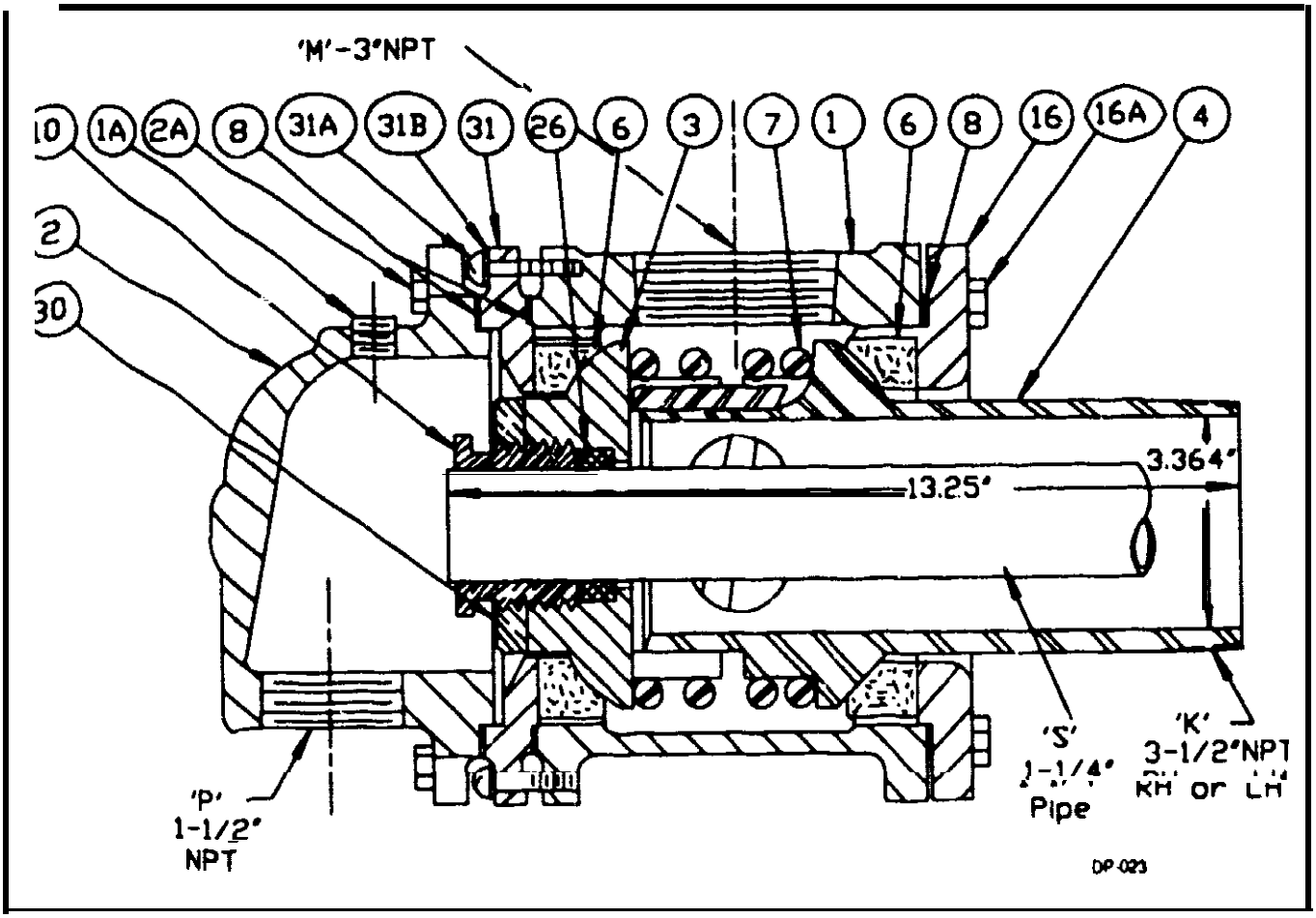
Vendor Information

A.1 Vendor Literature

This appendix contains service information provided by the manufacturer of certain commercial components used on the Dupps Dewatering Press. Contact the vendor or your Dupps service representative before performing service procedures that are not included in these instructions. Below is a list of literature included in this appendix:

Mfr.	Pub no.	Product	Subject
FAG	98410	Bearing	Adapter hltd Sphcr Rlr Pillow Block
Falk	128-010	Gear Box	Lubrication Specifications
Falk	148-050	Gear Box	Installation & Maintenance
Falk	148-130	Gear Box	Oil Seal Installation
Falk	458-010	Coupling	Lubrication
Falk	458-310	Coupling	Installation & Maintenance
Falk	45X-830	Coupling	Hub Installation & Removal
Johnson	IS-N-2	Steam Joint	Installation, Type N Joint
Johnson	IS-101	Steam Joint	Aligning Johnson Joints
Johnson	FMH-1004	Steam Joint	Flexible Metal Hose
Parker	0995-M1	Pneu Cyl	Piston Seal Kit
Parker	0995-M3A	Pneu Cyl	Gland Seal Kit

☐ Parts List: Johnson 3½" Type 2750L1-NAR Rotary Joint



REF	QTY	PART NAME	COMPUTER NO.	JOCO PART NO.	MATERIAL
1	1	Body	16325434	J2751L1R	Cast Iron
1A	2	Pipe plug	16648534	CSP660-0025-01	Sleet
2	1	Head	16327224	J2752NA	Cast Iron
2A	6	Cap Screw	16662920	562-12 x 3"	Grade5
3	1	Thrust Collar	16329334	J2753N-2	Cast Iron
4	1	Nipple Assembly	16607164	J2754S2N	Ductile Iron
*6	2	Seal Ring	16114984	J2756GS	Carbon Graphite
*7	1	Spring	163335.20	J2757S	Stainless Steel
*8	3	Gasket	16397284	SJ708	Asbestos
10	i	Gland	16315064	J2710	Brass
16	1	Wear Plate	1660648 4	J27516	Ductile Iron
16A	6	Cap Screws	16662334	562 12 x 2"	Grade5
*26	2	Packing	16648234	J2735.4	Preform Packing
30	1	Locknut	16316584	J2730	Brass
31	1	Assembly Plate	16334584	J27531	Cast Iron
31A	2	Machine Screw	16653034	312-18 x 1'	Stainless Steel
31B	2	Lock Washer	16674184	12-P	Steel

* Included in repair kit. Dupps no 120653

Lubricants listed in this manual are typical products ONLY and should not be construed as exclusive recommendations.

NOTE — Recommendations shown in Tables 1 thru 4 apply to Falk gear drives listed in Table 5 on Page 2.

PETROLEUM LUBRICANTS

Petroleum Based R & O Gear Oils (Table 2)

Industrial type petroleum based rust and oxidation inhibited (R & O) gear oils are the recommended lubricant for ambient temperatures of 15° to 125°F (-9° to 52°C). Carefully follow instructions on the unit nameplate, warning tags and installation manuals furnished with the unit.

Determine the required viscosity from Table 5 on Page 2. Select an oil with a pour point less than the expected minimum ambient starting temperature from Table 2.

Extreme Pressure Lubricants (Table 3)

For highly loaded units or for units loaded in excess of original estimates, industrial type petroleum extreme pressure lubricants are recommended. The EP lubricants currently recommended are of the sulfur phosphorus type.

CAUTION

EP LUBRICANTS IN FOOD PROCESSING INDUSTRY EP lubricants may contain toxic substances and should not be used in the food processing industry without the lubricant manufacturer's approval.

EP & AW LUBRICANTS AND INTERNAL BACKSTOPS Do not use EP lubricants or lubricants with anti-wear additives or lubricant formulations including sulfur phosphorus, chlorine, lead derivatives, graphite or molybdenum disulfides in units equipped with internal cartridge type backstops. Some oils in Table 2 may contain anti-wear additives. Oils in Table 3 do contain several of these additives.

VISCOSITY (IMPORTANT) The proper viscosity grade of Extreme Pressure lubricants is the same as specified for R & O oils and is found in Table 5. For cold climate conditions see section on synthetic lubricants.

Bearing & Seal Greases

[illegible]

[illegible]

SYNTHETIC LUBRICANTS

[illegible]

Cold Climate Conditions

[illegible]

[illegible]

Normal Climate Conditions

For temperatures of 15°F (-9°C) and above, use viscosity grades as recommended in Table 5. Select a lubricant from Table 1. Usable temperature ranges can sometimes be widened if specific application conditions are known.

CAUTION

SYNTHETIC LUBRICANTS IN FOOD PROCESSING INDUSTRY Synthetic lubricants may contain toxic substances and should not be used in the food processing industry without the lubricant manufacturer's approval.

SYNTHETIC LUBRICANTS AND INTERNAL BACKSTOPS Do not use synthetic lubricants in units equipped with internal cartridge type backstops. Synthetic lubricants may reduce friction coefficient and may contain anti-wear additives or formulations including sulfur phosphorus, chlorine, lead derivatives, graphite or molybdenum disulfides. Some oils in Table 1 may contain these derivatives.

TABLE 1 — POLYALPHAOLEFIN TYPE SYNTHETIC LUBRICANTS ★

AGMA Viscosity Grade		...	2	4	5	6
ISO Viscosity Grade		32	68	150	220	320
Viscosity at 104°F 40°C	SSU	135-164	284-347	626-765	918-1122	135-1632
	cSt	28.8-35.2	61.2-74.8	135-165	198-242	288-352
Ambient Temperature Range °F●		30 to +10	-15 to +50	0 to +80	+10 to +125	+20 to +125
Manufacturer		Lubricant				
[illegible]		[illegible] ●	[illegible] ●	[illegible] ●	[illegible] ● [illegible] ✱	[illegible] ● [illegible] ✱
[illegible]		●	●		✱	

★ [illegible]
● [illegible] temperature range can sometimes be [illegible]
● [illegible] operating temperature
✱ [illegible] operating temperature [illegible] EP.

OIL CHANGES

PETROLEUM LUBRICANTS [illegible]

SYNTHETIC LUBRICANTS [illegible]

TABLE 2 - PETROLEUM BASED R & O GEAR OILS Maximum operating temperature of lubricants 200°F (93°C)

AGMA Viscosity Grade		1	2	3	4	5	6
ISO Viscosity Grade		46	68	100	150	220	320
Viscosity at 104°F 40°C	SSU	193-235	284-347	417-510	626-765	918-1122	1335-1632
	cSt	41.4-50.6	61.2-74.8	90-110	135-165	198-242	288-352
Manufacturer		Lubricant	Lubricant	Lubricant	Lubricant	Lubricant	Lubricant
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 3—EXTREME PRESSURE LUBRICANTS
(Maximum operating temperature 200°F (93°C)

Manufacturer	Lubricant
Amoco Oil Co	Permagear EP
Atlantic Richfield Co	Permagear NL
Chevron U.S.A. Inc	NL Gear Compound
Cities Service Co	Citgo EP Compound
Conoco Inc	Gear Oil
Exxon Co. U.S.A.	Spartan EP
Gulf Oil Corp.	EP Lubricant HD Series
	Ultima EP
E.F. Houghton & Co.	MP Gear Oil
Imperial Oil Ltd.	Spartan EP
Kendall Refining Co.	Kendex NS MP
Keystone Div. Pennwalt Corp.	WG Series
Mobil Oil Corp.	Mobilgear
Phillips Petroleum Co.	Philube All Purpose Gr Oil
Shell Oil Co.	Omala Oil
Shell Canada Limited	Omala Oil
Standard Oil Co.	Gearep
Sun Oil Co.	Sunep 1000 Series
Texaco Inc.	Meropa
Texaco Canada Inc.	Meropa
Union Oil Co. of Calif. (East & West	Extra Duty NL Gear Lube

TABLE 4—GREASES FOR BEARINGS AND GREASE PURGED SEALS 0° to 200°F (−18 to 93°C)

Manufacturer	Lubricant
Amoco Oil Co	Amolith Grease No. 2
Ashland Oil Inc.	Multilube Lithium Grease
Atlantic Richfield Co	Litholine H EP 2 Grease
Chevron U.S.A. Inc.	Industrial Grease Medium
Cities Service Co	Premium Lithium Grease No 2
Conoco Inc.	EP Conolith Grease No 2
Exxon Company U.S.A.	Unirex N2
Gulf Oil Corp.	Gulfcrown Grease No 2
Gulf Canada Limited	Gulfcrown Medium
E.F. Houghton & Co.	Cosmolube 2
Imperial Oil Ltd.	Unirex N2L
Kendall Refining Co.	Multi Purpose Lithium Grease EP 2
Keystone Div. Pennwalt Corp.	81 Light
Mobil Oil Corp.	Mobilux 2
Phillips Petroleum Co.	Philube IB & RB
Shell Oil Co.	Alvania Grease 2
Shell Canada Limited	Alvania Grease R2
Standard Oil Co.	Factogard EP2
Sun Oil Co.	Prestige 42 Grease
Texaco Inc.	Premium RB Grease
Texaco Canada Inc.	Marfak MP2
Union Oil Co. of Calif. (East & West	Unoba EP

BLE 5—VISCOSITY REC(MENDATIONS◆

Unit Description	Classification Symbol (Unit Type)	Unit Size	SYNTHETIC HYDROCARBONS				R&O PETROLEUM OILS			
			Cold Climates				Normal Climates			
			−30° to +10°F (−34° to −12°C)		−15° to +50°F (−26° to +10°C)		15° to 60°F (−9° to +16°C)		50° to 125°F (10° to 52°C)	
			ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA	ISO-VG	AGMA
Parallel Shaft and Horizontal Right Angle ● Roller Bearings Fabricated Steel Housings										
Vertical Right Angle ● Fabricated Steel Housings										
Parallel Shaft ● Sleeve and Roller Bearings Cast Iron Housings										
Right Angle ● Horizontal and Vertical Cast Iron Housings										
Parallel Shaft Semi-High Speed ● Sleeve, Roller and Ball Bearings										
Parallel Shaft High Speed ● Sleeve Bearings										
Motoreducers Concentric Shaft Speed Reducers Shaft and Flange Mounted Drives										

◆ [illegible]

‡ [illegible]

INTRODUCTION

The following instructions apply to all standard Falk Speed Reducers shown at right. If a unit is furnished with special features, refer to the supplementary instructions shipped with the unit.

Credit for long service and dependable operation of a gear drive is often given to the engineers who designed it, or the craftsmen who constructed it, or the sales engineer who recommended the type and size. Ultimate credit belongs to the mechanic on the job who worked to make the foundation rigid and level, who accurately aligned the shafts and carefully installed the accessories, and who made sure that the drive received regular lubrication. The details of this important job are the subject of this manual.

WARRANTY The Falk Corporation (the Company), warrants that for a period of one year from the date of shipment, the product described herein will deliver successfully its rated output as indicated on the nameplate provided, it is properly installed and maintained, correctly lubricated, and operated in the environment and within the limits of speed, torque or other load conditions for which it was sold. Such product is expressly not warranted against failure or unsatisfactory operation resulting from dynamic vibrations imposed upon it by the drive system in which it is installed unless the nature of such vibrations has been fully defined and expressly accepted in writing by the Company as a condition of operation.

CAUTION

Consult applicable local and national safety codes for proper guarding of rotating members.

Lock out power source and remove all external loads from unit before servicing unit or accessories.

INSTALLATION INSTRUCTIONS

FOR SATISFACTORY PERFORMANCE.
CAREFULLY FOLLOW THESE INSTRUCTIONS

WELDING Do not weld the gear unit housing or accessories without prior approval from the Falk Corporation. Welding on the unit may cause distortion of the housing or damage to the bearings and gear teeth. Welding without prior approval could void the warranty.

NAMEPLATE Operate unit only at horsepower, speed and ratio shown on nameplate. Before changing any one of these, submit complete nameplate data and new application conditions to the Factory for correct oil level, parts and application approval.

TIGHTENING TORQUES Fasteners — See Page 2

GREASE LUBRICATED BEARINGS — See Page 3

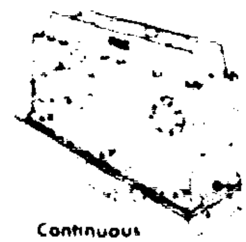
STORED AND INACTIVE UNITS — See Page 4

MOUNT HORIZONTALLY CAUTION Mount unit with base horizontal unless it has been specifically ordered for mounting in another position. If it is necessary to mount the unit in a different position from that for which it was ordered, consult The Falk Corporation for changes necessary to provide proper lubrication.

FOUNDATION, GENERAL To facilitate oil drainage, elevate the unit foundation above the surrounding floor level. If desired, replace the unit oil drain plug with a valve but provide a guard to protect the valve from accidental breakage.

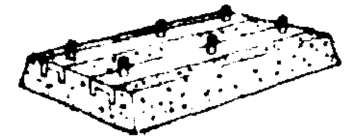
After [illegible] [illegible] [illegible] [illegible] [illegible]

FOUNDATION, STEEL When mounting unit on structural steel, it is recommended that an engineered design be utilized for a base plate or bed to provide sufficient rigidity to prevent induced loads from distorting the housing and causing gear misalignment. In the absence of an engineered design, it is recommended that a baseplate with thickness equal to or greater than the thickness of the unit feet be securely bolted to steel supports and extended under the entire unit as illustrated.



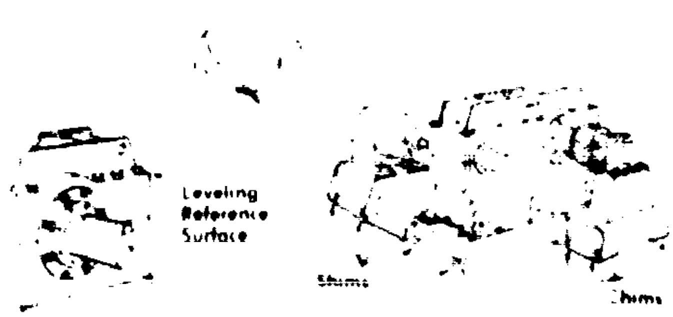
Continuous Plate

FOUNDATION, CONCRETE If a concrete foundation is used allow the concrete to set firmly before bolting down the unit. For the best type of mounting, grout structural steel mounting pads into the mounting base as illustrated, rather than grouting the unit directly into the concrete.



Motors and other components (whether mounted on motor plates or motor brackets) may become misaligned during shipment. ALWAYS **check alignment after installation. Refer to Page 2** for **coupling alignment instructions.**

UNIT ALIGNMENT Align unit with driven equipment by placing broad, flat shims under all mounting pads. Start at the low speed shaft side and level across the length and then the width of the unit. Check with a feeler gauge to make certain that all pads are supported to prevent distortion of housing when unit is bolted down. After unit is aligned with driven machine and bolted down, align prime mover to unit input shaft. See Page 2 for coupling alignment.



If equipment is received from Falk mounted on a bedplate, the components were accurately aligned at Falk with the bedplate mounted on a large, flat assembly plate. Shim under the bedplate foot pads until the bedplate is level and all feet are in the same plane.

Check the high speed shaft coupling alignment. If the coupling is misaligned, the bedplate is shimmed incorrectly. Reshim bedplate and recheck high speed coupling alignment. If necessary, realign motor.

MOTOR BRACKETS — The weight, location and starting torque of the motor will cause some brackets to deflect downward and to twist. This movement is within allowable engineered limits for unit-motor selections from the Falk bulletin. If the customer considers the movement excessive, jackscrew supports for the bracket extension are available from Falk whether the motor was mounted by Falk or the customer. To compensate for deflection caused by heavy motors AN3 to get CORRECT COUPLING ALIGNMENT, use more shims under the rear motor feet than the front feet.

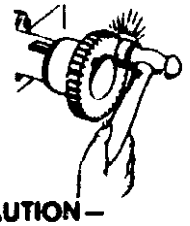
Motors and other components (whether mounted on motor plates or motor brackets) may become misaligned during shipment. ALWAYS check alignment after installation. Refer to coupling alignment instructions below.

SHAFT CONNECTIONS

COUPLING CONNECTION — The performance and life of any coupling depends largely upon how well the coupling is installed and serviced. Refer to the coupling manufacturer's manual for specific instructions.

CORRECT METHOD

Heat interference fitted coupling hubs, pinions, sprockets or pulleys to a maximum of 275°F (135°C) and slide onto unit shaft.



INCORRECT METHOD

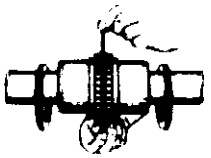
DO NOT drive coupling hub, pinion, sprocket or pulley onto the shaft. An endwise blow on the shaft may damage gears and bearings.

—CAUTION—
DO NOT HAMMER

Provide suitable guards in accordance with OSHA standards.

BACKSTOP — **To prevent damage to backstops due to incorrect motor shaft rotation at start up, couplings are NOT assembled when units are furnished with backstops. After completing the electrical connection, check motor and unit shaft rotations. Then complete alignment and assembly of coupling.**

FALK COUPLINGS — Detailed installation manuals OR available from the Factory and your local Falk Representative or Distributor — just provide size and type designations stamped on the coupling. Refer to Manual 428-010 for Steelflex couplings and Manual 458-010 for Gear couplings for lubricant requirements and a listing of typical lubricants meeting Falk specifications.



Steelflex Illustrated

The following instructions apply to coupling alignment:

Gap and Angular Alignment — If possible, after mounting coupling hubs, position the driving and driven units so that the distance between shaft ends is equal to the coupling gap. Align the shafts by placing a spacer block, equal in thickness to required gap, between hub faces, as shown above, and also at 90° intervals around the hub. Check with feelers.

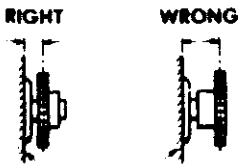
Offset Alignment Align shafts of driving and driven units so that a straightedge will rest squarely on both coupling hub, as shown to the right and also at 90° intervals. Tighten foundation bolts of the connected equipment and recheck alignment and gap.

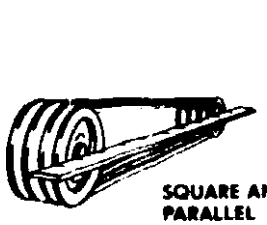
Steelflex Illustrated

PINION MOUNTING — **Mount the pinion as close to the unit as possible to avoid undue bearing load and shaft deflection. Refer to the Factory for pinion alignment instructions.**

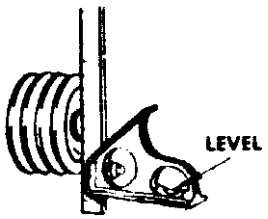
OUTBOARD BEARING — Mount the outboard bearing and unit on a common foundation so that they will shift as an assembly if settling should occur. Bring the outboard bearing to the correct horizontal position with broad flat shims under the mounting pad. Align accurately so that the load is equally divided between the two unit bearings and the outboard bearing. Mount a stop bar against the pillow block foot on the load side when large horizontal load components are exerted on the pillow block.

SPROCKET, PULLEY OR SHEAVE CONNECTION — **Mount power take-offs as close to the unit housing as possible to avoid undue** baring **load and shaft deflection.** Align the output shaft of the unit square and parallel with the driven shaft by placing a straightedge across the face of the sprockets or sheaves as illustrated. Check horizontal shaft alignment by placing one leg of a square against the face of the sheave or sprocket with the spirit level on the horizontal leg of the square.





SQUARE AND PARALLEL



DO NOT overtighten belts or chains. Adjust chains to manufacturer's specifications. Adjust belts as follows:

The ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Check the belt tension frequently during the first 24 to 48 hours of run-in operation. Overtightening belts will shorten belt and bearing life. Keep belts free from foreign material which may cause slippage. Inspect the V-drive periodically; tighten the belts if they are slipping

TIGHTENING TORQUES

Use the values specified in the table below for fastening motors and Falk units and accessories to their mounting surfaces with SAE Grade 5 or ASTM A449 non-lubricated fasteners. DO NOT use these values for "torque locking" fasteners or for fastening components with aluminum feet or with soft gaskets or vibration dampers on the mounting surface. If the tightening torque exceeds the capacity of the torque wrench, use a torque multiplier.

Tightening Torques — lb-in. — DO NOT LUBRICATE FASTENERS

Thread Dia-TPI	Metal to Metal	Metal to Concrete	Thread Dia-TPI	Metal to Metal	Metal to Concrete
.250-20	90	70	1.250-7	7600	10000
.3125-18	185	145	1.375-6	16500	13000
.375-16	330	255	1.500-6	22100	17500
.500-13	825	640	1.750-5	23700	18700
.625-11	1640	1280	2.000-4½	37000	29000
.750-10	2940	2290	2.250-4½	52000	41000
.875-9	4560	3550	2.500-4	72000	56000
1.000-8	6800	5600	2.750-4	98000	77000
1.125-7	8900	7000	3.000-4	127000	99000

LUBRICATION

UNIT LUBRICATION — **Read and carry out all instructions** on **lubrication plate and heed all warning tags** Determine minimum and maximum ambient temperatures in which the drive is to operate and read the SAE or AGMA lubricant number for those temperature conditions from the lubrication plate on the unit. Select a lubricant from Manual 128-010 corresponding to the SAE or AGMA lubricant number

OPERATING TEMPERATURE—If the unit is operated in an area where the temperatures vary with the season, change the oil viscosity to suit the season. For cold weather operation, use a light oil that will *circulate freely at all times.* The pour point of the oil should be less than the minimum external temperature encountered. During hot weather, use a high viscosity oil that will not thin out and lose its lubricating qualities.

ROOM TEMPERATURE

If a unit operates in the sun at ambient temperatures over 100°F (38°C), *then special measures should* be *taken to protect the unit* from solar energy. This protection can consist of a canopy over the unit or reflective paint on the unit. If neither is possible, a heat exchanger or other cooling device may be required to prevent the sump temperature from exceeding the allowable maximum of 200°F (93°C).

EXTREME PRESSURE LUBRICANT-DO NOT **use extreme pressure lubricant** in **units equipped with** an internal **backstop.** Units sometimes are severely overloaded due to a change in design of the driven machine, or a change in the nature of the material that is being processed. This also occurs when power requirements are in excess of that originally estimated. As a result, the gear teeth may show signs of distress in the nature of scuffing, scoring or pitting. For applications of this nature, an extreme pressure lubricant is recommended. This gives added protection to the gear teeth and may retard scoring and scuffing. However, this is not a cure-all. Applications which are severely overloaded should be referred to the Factory for further study and recommendations. Extreme pressure lubricants are listed in Manual 128-010.

SYNTHETIC LUBRICANTS Synthetic lubricants of the polyalphaolefin type have been used successfully in gear drives to provide certain advantages beyond that available with Mineral Oil or Extreme Pressure Oil. Depending upon operating conditions these advantages may include longer service life between lubricant changes, elimination of need to change lubricant to suit the season, operating capabilities beyond the high and low temperature limits of Mineral or EP oils.

Select synthetic lubricants in accordance with specifications in Manual 128-010.

Splash Lubricated Units Standard type Y units are splash lubricated. The lubricant is picked up by the revolving elements and distributed to all bearings and gear meshes.

Units with Heat Exchangers—Check immediately after starting to see that the external pump is circulating oil properly. Install a shut-off or control valve in the water line into the heat exchanger to regulate the water flow **through the** exchanger. **Also install a** ***water flow gauge between the control valve and the exchanger to determine actual flow rate.*** **Discharge water to** an OPEN DRAIN **to prevent back pressure.**

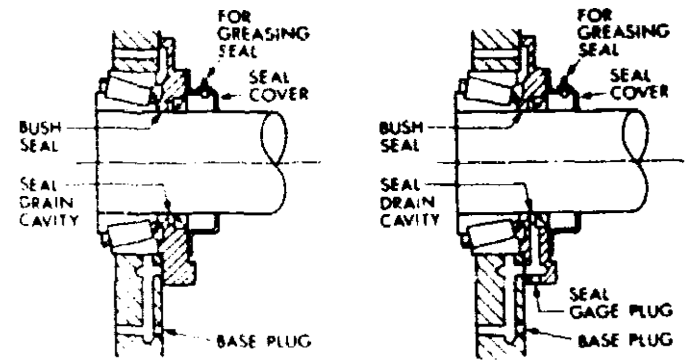
Pressure Lubricated Units Check immediately after starting to see that the internal or external pump is circulating oil properly. Refer to Manual 148-931 for detailed instructions.

OIL LEVELS Approximate capacities of oil are shown on the nameplate. Prior to filling Types Y and YB reducers, remove the inspection plate and FLOOD THE OIL TROUGHS to insure a generous flow of oil to the bearings. For Type "RX" remove sight glass and flood oil passages. This priming action lubricates and protects the bearings until sufficient oil is circulated by the rotating gears. After operating unit a few minutes, shut down and recheck oil level. Add oil to compensate for cooler, filter, etc. oil capacities.

GREASE LUBRICATED AND GREASE PURGED **SEALS** Type 7 units are furnished with grease purged seals which minimize the entry of taconite and other abrasive dusts into the unit. Units are shipped with NLGI #2 grease in the seal housing cavities unless otherwise specified. If grease could contaminate the product, as in the food and drug industries, it should be removed.

Periodically [illegible] grease [illegible] [illegible] [illegible] [illegible] purged [illegible] grease [illegible] by slowly pumping fresh [illegible] grease [illegible] **with a** hand **grease gun** [illegible] purged grease [illegible] [illegible] [illegible] [illegible] seal [illegible] [illegible] seal leaks.

TYPICAL SEAL ASSEMBLIES



HIGH OIL LEVEL
All Sizes
Inner Bush Seal and Outer
Lip **Type Seal**

LOW OIL LEVEL
All Sizes
Inner Bush Seal and Outer
Lip Type Seal

GREASE **LUBRICATED BEARINGS** — When changing oil in the unit, grease bearings with a NLGI #2 bearing grease. Regrease these bearings as part of the standard maintenance program. Before installing a unit, note the location of all of the bearing grease fittings and grease labels for future maintenance reference. Note that some fittings may be ABOVE the oil level line and others BELOW. If a grease fitting will become inaccessible after the unit is installed, replace the fitting with a pipe extension (and the fitting) so that the grease fitting will be in an accessible location after the unit is installed.

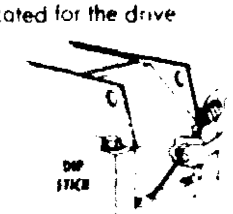
DO NOT confuse the grease fittings for grease lubricated seals with those for **grease lubricated bearings. If seal is inadvertently greased, grease** will **appear along the shaft at the shaft cover.**

All low speed shaft (bottom) bearings of YBX units are grease lubricated. *Always remove the purge plug (when provided) when greasing bearings* so that the old grease can escape. Wipe off purged grease and replace the plug after greasing bearings.

OIL CAPACITIES

ADD **OIL TO THE LEVEL MARKED ON THE UNIT DIPSTICK**

LARGE SPEED **REDUCERS** Oil capacities for the large speed reducers vary with the unit size, reduction, input speed and ratio. Refer to the Factory for oil capacity of these units. Before starting any unit, fill with oil to level indicated for the drive.



PREVENTIVE MAINTENANCE

AFTER **FIRST** WEEK Check alignment of the total system and realign where necessary. Also tighten all external bolts and plugs where necessary. DO NOT readjust the internal gear or bearing settings in the reducer; these were permanently set at the Factory.

AFTER FIRST MONTH'S **SERVICE** Proceed as follows:

1. Operate unit until sump oil reaches normal operating temperature. Shut the unit down and drain immediately.
2. Immediately flush unit with an oil of the same type and viscosity grade as the original charge, warmed to approximately 100°F (38°C) in cold weather. Rapidly pour or pump a charge equal to 25-100% of the initial fill into the unit or until clean oil flows thru the drain.
3. Close the drain and refill the unit to the correct level with new or reclaimed oil of correct type and viscosity. If determined to be in good condition by the supplier, reclaimed oil may be used if it is [illegible] filtered [illegible] 40 [illegible] [illegible] filter.

PERIODICALLY – Carefully check the oil level of the unit when it is stopped **and at ambient temperature, add** oil if **needed. If the oil level is ABOVE the high level mark on the dipstick or the oil level** plug, **have the** dl **analyzed for water content. Moisture** in **the** dl **may indicate that the heat exchanger or a seal** is **leaking. If so, replace the defective part immediately and change the oil. DO NOT fill above mark indicated as leakage** or **undue heating may** mutt. Also **check coupling alignment to make certain that foundation** settling **has** not **caused excessive misalignment.** If "nit is **equipped with a fan, periodically clean accumulated foreign matter from the fan, fan guard** and deflector to **allow adequate uir flow.**

OIL CHANGES-For normal operating conditions, change gear oils every 6 month, a 2500 operating hours, whichever occurs first. Compounded oils may require more frequent changes. In dusty creas or where temperatures are high, more frequent changes may be required. Lubricant suppliers can test oil samples from the drive periodically and recommend econominal change periods based on the raio d lubricant contamination and degradation.

I, the drive is operated in on area where temperatures vary with the seasons, change the oil viscosity grodc to suit the temperature

Refer to Manual 128-010 lo, viscosity recommendations and typical lubricants meeting Falk specifications.

GREASE PURGED SEALS-See **Page** 3

BEARINGS – Some units hove me or more grease lubricated bearings See GREASE LUBRICATED BEARINGS. When changing oil in the unit, grease bearings with a NLGI #2 bearing grease.

COUPLINGS – Lubricate Falk Steelflex couplings in accordance with instructions in Manual 428-010 ond Falk Gear coupling, in accordance with instructions in Manual 458-010

DISMANTLING-CAUTION: **Lock out power source** and **remove all** ● xtg,ng+l loads from "nit **before servicing** "nit or **accessories.** Service manuals and parts guides are available from the Factory and Falk Representatives When writing, please give complete data from the nameplate on the unit, Model, M O , Date, RPM, and Ratio

SPARE AND REPAIR PARTS- When ordering parts, always give complete data from the nameplate on the Falk drive. This complete nameplate data will assure you of receiving the correct parts If a new nameplate I, received with the new parts (for exampie, when the drive ratio is changed), replace the old nameplate on the drive with the new nameplate for future reference.

STORED AND INACTIVE **UNITS**

Each drive is **spin-tested with rust preventive** oil **that will protect parts against rust for a period of 4 months in an outdoor shelter or 12** months in **a** dry building **after** shipment from **the** Factory.

If **a drive** is to be **stored, or is inactive after installation beyond the** above periods. dmin oil **from housing and spray all internal parts** with **a rust preventive oil that is soluble** in **lubricating oil or** add **"Motorstor"* vapor phase rust inhibitor** in **the amounts tabulated** below. **Before operating, units** which have been **stored** or inactive **must be** filled **to** the proper level with oil meeting **the specifications** given in **Manual** 128-010.

Periodically inspect stored or inactive unit' **and spray, or add rust inhibitor, every six months or more often, if necessary. Indoor dry storage** is **recommended.**

Units ordered **for** extended **storage** con be **treated at the Factory with a special preservctive and sealed to rust-proof** pods **for** periods longer **than** those **cited above, if specified** on **the order.**

The **vent is replaced** with **a** plug (**vent** is **then attached to the unit) so that the protective rust inhibiting atmosphere** is **sealed** inside **the unit.** Replace plug **with vent** when preparing **unit for operation.**

MOTORSTOR★ – Add to Stored or Inactive Units

UNIT TYPE	UNIT SIZE	MOTORSTOR★ OUNCES PER UNIT
All Y Types and 2000 GHB	1080-1090, 2050-2090	2
	1100-1135, 2100-2135	6
	1140-1145, 2140-2145	10
	1150-1165, 2150-2165	20
	1170-1195, 2170-2195	45
	2200-2235	100

● Product of Daubert Chemical Company Chicago III (Formerly known as Nucle Oil

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INTRODUCTION

The fc llowing instructions <over replacement of shaft seals on Types Y, YB, YF and YBX speed reducers These instructions also apply to the above mentioned unit types with features i.e lowered foundation, Type YN and extra capacity low speed bearings, Type YT, etc. Drawings are representative and may not agree in exact detail with all unit sizes. When ordering parts or requesting information, specify the MO number unit size, model number, rpm, ratio and dale stamped on the reducer nameplate

Falk has developed several different types of seal assemblies (Figures 1 thru 7), below and at right For units operating in atmospheres laden with taconite or other similar severely abrasive dusts or in areas that are periodically hosed down with water under pressure, grease purgeable assemblies are recommended. (Figures 2 thru 7). This feature is being incorporated as standard on new model units along with a bush type seal The split seal assembly, for emergency field replacement only, is used when it is impractical to break shaft connections to replace solid ring seals, (Figures 5 & 7)

CAUTION

Lock out power source and remove all external loads from unit before servicing unit or accessories

Consult applicable local and national safety codes for proper guarding of rotating members.

GENERAL INSTRUCTIONS

Before removing seals clean external surfaces of reducer to prevent dirt from entering unit

Record mounting dimensions o, rho,, accessories for reference when reassembling

During disassembly note and record type of seals (single or dual lip, split or solid, single or dual seal) used and direction seal(s) garter spring(s) are facing

TYPES OF SEAL ASSEMBLIES

Single Seal Assembly Consists of a solid seal cage, one single or dual lip solid seal with one of the following baffle seal cover or split cage as illustrated in Figures 1 2 & 6

Double Seal Assembly Consists of a solid seal cage, two single or dual lip solid seals and a split cage as illustrated in Figures 3 & 4

Split Seal Assembly — Emergency Field Replacement Only Consists of a solid seal cage one or two single lip split seals and a split cage as illustrated in Figures 5 & 7

SEAL ASSEMBLY IDENTIFICATION

[illegible] assembly by [illegible] all the parts of the assembly with one of Figures 1 thru 7 below and at right Make [illegible] of the assembly as only one of the Figures [illegible]

[illegible]

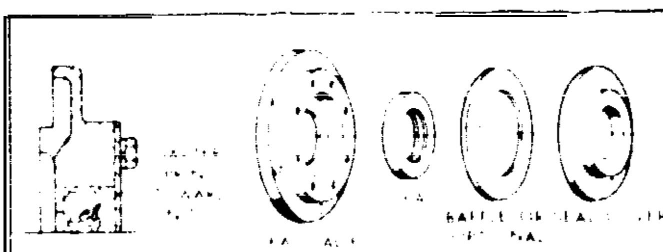

Figure 1 **Refer to Section I**

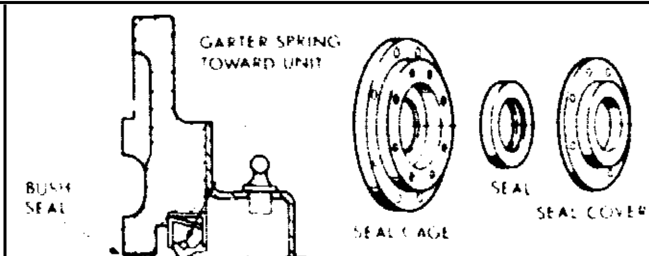

Figure 2 **Refer to Section I**

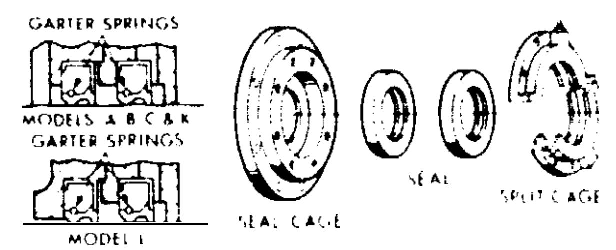

Figure 3 **Refer to Section II**

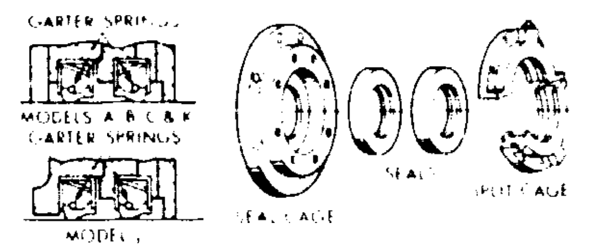

Figure 4 **Refer to Section II**

Figure 5 **Refer to Section II**

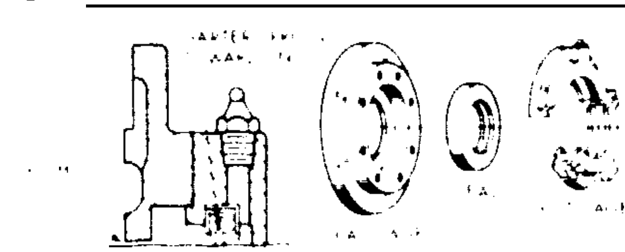

Figure 6 **Refer to Section IV**

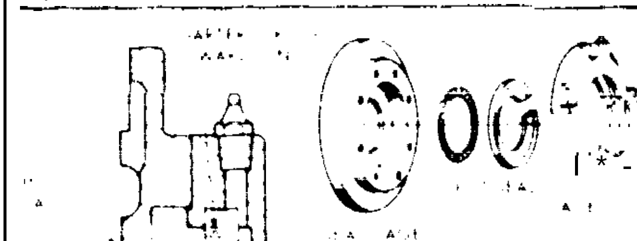

Figure 7 **Refer to Section IV**

SECTION I, FIGURES 1 & 2

1. Remove seal baffle or cover (Figure 1) or seal cover (Figure 2).
2. Slide a well lubricated piece of smooth brass shim dock under the ml lip to protect the shaft rubbing surface during removal.

DO NOT MAR REDUCER SHAFT

3. If solid seal cage has been removed from reducer, block up seal cage ond press or drive out seal. Refer to appropriate Disassembly and Assembly Instructions for seal cage installation instructions.
4. II seal cage has not been removed from reducer. use one of the following procedures for seal removal:

A Cut through the steel coring of the seal in two placer 180° apart with a small cold chisel and pry up the metal to form a lip. Grasp the lip, alternately with pliers and remove seal, Figure 8.

B. Punch three equally spaced holes in the steel casing of the seal. Insert three sheet metal screws so the heads remain outside the seal cage. Pry out seal, Figure 9.

5. Clean shaft seal rubbing surface. CAUTION: DO NOT use on" abrasive materials on the rubbing surface polished by the seal. New seals will leak if the seal rubbing surface on the shaft is altered or if seal lips are cut.
6. Remove old waling compound from seal cage bore ond recoat with Permatex # 3 or equivalent. Generously coo, the seal lips ond pocket between the lips with #2 ball bearing grease or SAE 40 oil.

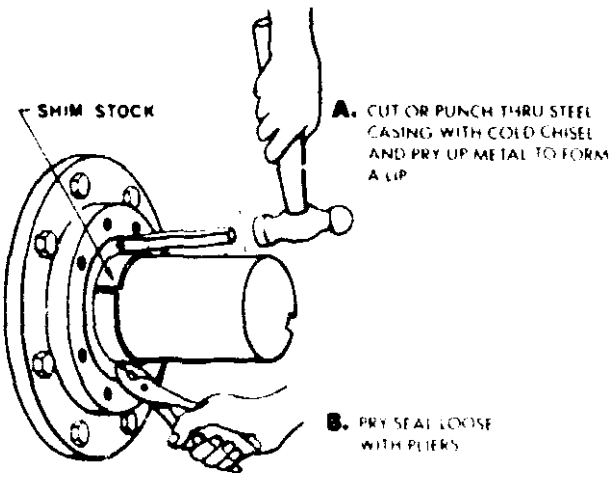

Figure 8

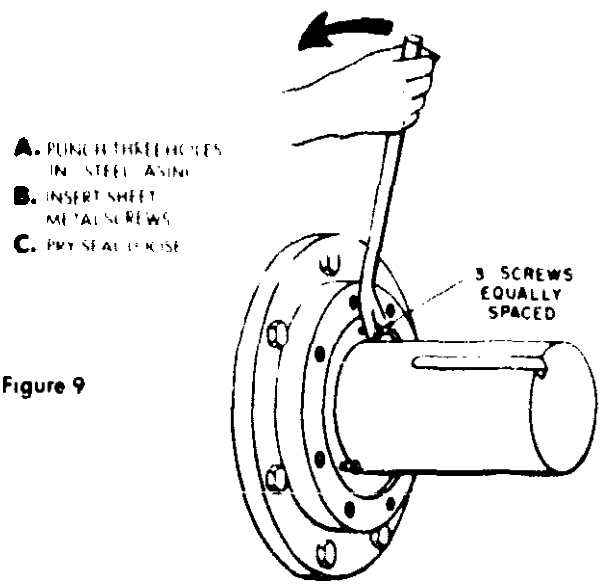

Figure 9

7. NOTE: Position the garter spring toward the inside of the unit as shown in Figures 1 & 2. Protect seal lips from the sharp edges of the keyway by wrapping a thin, strong paper around the shaft and coating it with grease before sliding the seal into position. Do no+ expand the seal lips more than .03" diameter.
8. Drive seal into seal cage with a square faced cylindrical tool such as a piece of tubing.
9. Install seal baffle or cover (Figure 1) or seal cover [Figure 2)
10. Coat seal cover (Figure 2) flange with Permatex #3 or equivalent and mount on seal cage. See PREVENTIVE MAINTENANCE OF GREASE PURGED SEALS. Page 3.
11. Reinstall the reducer and accessories as instructed in Service Manual 128-050

SECTION II, FIGURES 3 & 4

1 Remove fasteners holding split seal cage halves together and fasteners holding split seal cage to solid seal cage.

2 Carefully pry the split seal cage away from the solid seal cage.

3 Remove the exposed outer seal.

4 Refer to Section I, Step, 2 thru 8 to remove ond reinstall the inner shaft seal.

5. Slide the outer seal on the shaft. DO NOT expand the seal lips more than 03" diameter.

Figure 3 - Garter springs must fate toward the inside of unit for both dual lip seals.

figure 4 — Model L - Garter spring must face toward the inside of unit for both ungk lip seals. Models A. B, C & K Garter spring of inner single lip seal must face toward the inside of unit and the outer single lip seal must face toward the outside of unit.

6 Cwt split seal cage bore flange face and joints with Permatex #3 or equivalent. Mount each hall over outer seal and fasten halves together.

7 Pack chamber between inner and outer seal with NLGI #2 bearing grease. Fasten split and solid seal cages together. See PREVENTIVE MAINTENANCE OF GREASE PURGED SEALS, Page 3

8 Reinstall the reducer and accessories as instructed in Service Manual 128-050

SECTION III, FIGURE 5

1 Remove fasteners holding the split seal cage halves together and fasteners holding the split seal cage to solid seal cage.

2 Carefully pry the split seal cage away from the solid seal cage

3. I+ the outer seal is split, remove it If the outer seal is a solid ring, cut if off with a tin snips.

4 If the inner seal is split pry it out at the split and remove it.

5 If the inner seal is a solid ring, refer to Section I, Steps 2 thru 4 Cur off loosened inner seal with a tin snips

b Clean the rhoh seal rubbing surface CAUTION DO NO, use any abrasive materials on the rubbing surface polished by the seal New seals will leak if the seal rubbing surface on the shaft is altered or if seal lips are cut

Coat seal surface on shaft and seal rubbing surface with NLGI # 2 bearing grease

8 Split seals are furnished with , A integral finger type springs or B detachable garter springs

A To mount the finger type seal spread the seal and slip it over the shaft

8 To mount split seals with the detachable garter spring, pass the spring around the shaft and connect the hook and eye ends. Spread the seal apart and slide it over the shaft. Form two welding rods into flat paddles with curved ends. Make certain that the hook and eye are not in line with the se.,, split, and then tuck the spring into the carrier groove with one paddle. Slide the other paddle around the groove until the spring is fully seated. as illustrated in Figure 10.

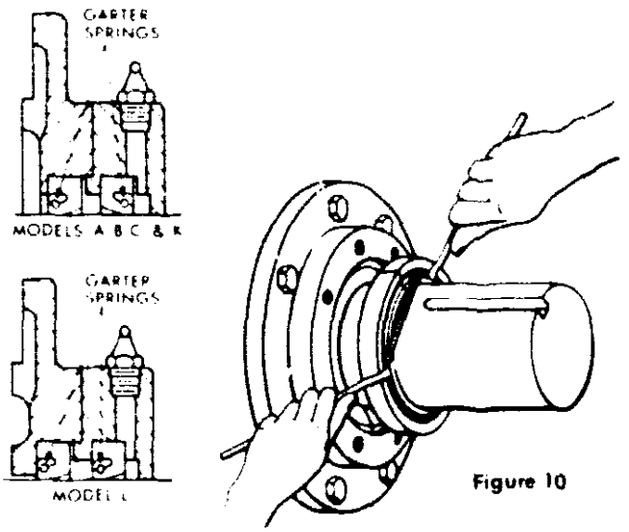

Figure 10

9 Apply a small amount of Permatex #3 to seal O D. Install inner seal into seal cage with built-in finger or garter spring toward the inside of the unit Position the seal split at an angle 45° above the housing spl t Place paddles or screw drivers behind the heel of the seal and press the assembly evenly into the seal cage

10. Mount the outer seal on the shaft with built in finger or garter spring facing the outside of the unit for Model, A. B. C and K. mount seal with garter spring toward the inside of the unit for Model L Position the seal split at an angle 4 5 ' above the housing split

11 Coo, split seal cage bore Range face and joints with Permatex #3 or equivalent Mount each half over outer seal and fasten halves together

12 Pack chamber between inner and outer seal with NLGI #2 bearing grease fasten split and solid seal cages together See PREVENTIVE MAINTENANCE OF GREASE PURGED SEALS Page 3

13 Reinstall the reducer and accessories as instructed I" Service Manual 128-050

SECTION IV, FIGURES 6 & 7

1 Remove fasteners holding split seal cage halves together and fasteners holding split seal cage to solid seal cage.

2 Carefully pry the split seal cage away from the solid seal cage.

3 Remove seal from shaft.

4 Clean the shah seal rubbing surface. CAUTION: DO NOT use any abrasive materials on the rubbing surface polished by the seal. New seals will leak if the seal rubbing surface on the shaft is altered or if seal lip, ore cut.

5 Coat seal surface on shaft and seal rubbing surface with NLGI #2 bearing grease

6 Slide the ml on the shah with the garter spring facing toward the unit. Refer to Section III, Steps 8 & 10 for split seal assembly,

7 Coat split seal cage bore flange face ond joints with Permatex #3 or equivalent. Mount each half over outer seal and fasten halves together.

8 Fasten split and solid seal cages together. See PREVENTIVE MAIN. TENANCE OF GREASE PURGED SEALS, Page 3.

9 Reinstall th.e reducer and accessories a, instructed in Service Manual 128-050.

REPLACEMENT OF SINGLE SEAL ASSEMBLY WITH GREASE PURGED SEAL ASSEMBLY—Models A thru K

To remove single seal assembly, refer to Section I, Steps 1 thru 5.

To mount d u a l seal assembly with solid seals, refer to Section II, Steps 4 thru 8

To mount dual seal assembly with split seals, r e f e r to Section III. Steps 6 thru 13.

PREVENTIVE MAINTENANCE OF GREASE PURGED SEALS

The option of adding grease is the purchaser s. The use of this feature is recommended for units operating in abrasive atmospheric conditions, but is NOT RECOMMENDED where grease could contaminate the product as in the food and drug industries.

To make use of this feature, pump NLGI # 2 bearing grease into the seal housing cavity through the seal grease fitting unt l grease appears on the shaft Periodically (at least every six months) depending upon the frequency and degree of contamination purge contaminated grease from seals by slowly pumping fresh bearing grease through the seal with a hand grease gun until fresh grease flows out along the shaft Wipe off purged grease CAUTION Use of a power gun can force grease inward past the seals and plug the drainback system causing seal leaks

INTRODUCTION

Adequate lubrication is essential for satisfactory operation. This manual provides a list of typical lubricants ond specifications for general purpose grease, long term grease and oil.

The use of general purpose grease requires re-lubrication of the cowling or least every six month,, By initially "sing Falk long term grease (LTG), re-lubrication will not be required for up to three years

LONG TERM GREASE (LTG)

The high centrifugal forces encountered in couplings separate the base oil and thickener of general purpose greases. Heavy thickener which has no lubrication qualities, accumulates in the tooth mesh area of gear couplings resulting in premature mesh failure unless periodic lubrication cycles ore maintained.

LTG Falk LTG was developed specifically for couplings. It resists separation of the oil ond thickener. LTG is on extreme pressure grease manufactured to a NLGI #1 consistency. While in the container, the consistency changes to a NLGI #3. In working areas of couplings. such os the tooth mesh area of gear couplings, LTG is in a semifluid condition providing the necessary lubrication. In non-working areas near seals and gaskets, the consistency is comparable to NLGI #3.

Gear couplings initially lubricated with Folk Long Term Grease (LTG) will not require re-lubrication for up to three years. If coupling leaks grease. is exposed to extreme temperatures, excessive moisture or experiences frequent reversals; more frequent lubrication may be required

CAUTION

Do not use LTG for low speed coupling applications where NLGI #0 general purpose grease would normally be specified

Do not use LTG in bearings or n couplings operating in the food processing industry

SPECIFICATIONS

Ambient **Temperature Range**: 0°F (-18°C) to 150°F (66°C)

Minimum Base Oil Viscosity 3000SSU (643cSt) 100°F (38°C)

Thickener: 7.5% lithium soap & polyethylene

Separation Characteristics (Proposed ASTM **Centrifuge Test)**

K_{36} 1.5 very high resistance to centrifuging

NLGI Grade (ASTM D 217): #1

Minimum Dropping Point 225°F (108°C)

Minimum Timken O **K Load** 50 lbs

Additives Rust and oxidation r hibitors that do not corrode steel or swell or deteriorate synthetic seals

INSPECTION-When connected equipment is serviced or at least every three years, disassemble the coupling ond inspect for wear Replace worn parts. Clean the grease from the coupling and repack with fresh LTG. Install coupling using new gasket as instructed in the appropriate installation manual

PACKAGING

3½ oz. Tubes – Suitable for initial handpacking Sizes 1010 ond 1015G.

14 **oz. Cartridges** – For "se in standard grease gun, Sufficient quantity to initially lubricate Sirs 1030G.

35 lb. **Pail** – Ideal for larger size couplings or many smaller sizes

380 lb. Drum: For plants with central storage areas. A pump with a pressurized follower plate is required for dispensing grease.

Case lots of 150-3½ oz tubes ond 24.14 oz cartridges are also available.

GENERAL PURPOSE GREASE

Bi-annual Lubrication – The following specifications and lubricants for general purpose grease apply to Falk gear couplings that ore lubricated b:-annually ond operate within ambient temperatures of 30°F (-34°C) to 200°F (93°C). For temperatures beyond this range, consult the Factory. For normal service, "se a NLGI #1 extreme pressure (EP) grease EXCEPT when the coupling speed is less than the minimum specified in Table 3. Page 2 At these lower speeds, use a NLGI #0 extreme pressure (EP) grease A ere one or more gear couplings in an application require NLGI #0 grease, the same grease may be used in all of the couplings DO NOT "se cup grease

If coupling leaks grease, is exposed to extreme temperatures, excessive moisture or experiences frequent reversals, more frequent lubrication may be required Where heavy shock loads, frequent axial movement large speed variation or extreme temperature are encountered, submit application details to the Factory lo, a lubricant recommendation

GENERAL PURPOSE GREASES AND OILS MEETING FALK SPECIFICATIONS

Lubricants listed in Tables 1, 2 & 4 on Page 2 are typical products only and should not be construed as exclusive recommendations

... page

Table 1 NLGI #1 GREASE

Coupling speed range	See Table 3
Temperature range	30°F to + 200°F (- 34°C to + 93°C)
Worked penetration at 77°F (25°C)	310-340
Dropping point	300°F (149°C) or higher
Texture	Smooth or fibrous
Minimum Timken O.K. load	30 lbs
Does not corrode steel or swell or deteriorate synthetic seals	

Manufacturer	Lubricant ♦
Amoco Oil Co.	Rykon Grease # 1 EP
Ashland Petroleum Co	Val-Lith # 1 EP
Atlantic Richfield Co	Litholine HEP 1
Chevron U.S.A. Inc.	Chevron Dura-Lith Grease EP
Cities Service Co.	Citgo HEP-1
Conoco Inc	EP Conolith # 1
Exxon Company, U.S.A	Lidok EP 1
Gulf Oil Corporation	Gulfcrown Grease EP# 1
E. F. Houghton & Co.	Cosmolube 1 EP
Imperial Oil Limited	Ronek # 1
Kendall Refining Co	Kendall L-416 Grease
Keystone Div. Pennwalt Corp	Zeniplex # 1
Mobil Oil Corp.	Mobilux EP1
Phillips Petroleum Co	Philube EP-1
Shell Oil Co	Alvania EP Grease # 1
Standard Oil Co. (Ohio)	Factran EP 15
Sun Oil Co	Sun Prestige 741 EP
Texaco Inc.	Multifak EP 1
Union Oil Co. (Calif.)	Union Unoba EP1

Table 2 NLGI #0 GREASE

Coupling speed range	See Table 3
Temperature range	- 30°F to + 200°F (- 34°C to + 93°C)
Worked penetration at 77°F (25°C)	355-385
Dropping point	300°F (149°C) or higher
Texture	Smooth or fibrous
Minimum Timken O.K. load	30 lbs
Does not corrode steel or swell or de	orate synthetic seals.

Manufacturer	Lubricant ♦
Amoco Oil Company	Rykon Grease #0 EP
Chevron U.S.A. Inc.	Dura-Lith Grease EPO
Exxon Company, U.S.A.	Lidok EP-O
Gulf Oil Company	Gulfcrown Grease EP #0
Kendall Refining Co.	Kendall L-406 Grease
Keystone Div. Pennwalt Corp.	Zeniplex #O
Mobil Oil Company	Mobilux EPO
Phillips Petroleum Co	Philube EP-O
Shell Oil Company	Alvania EP RO
Standard Oil Co. (Ohio)	Bearing Gard LT-O
Sun Oil Co.	Sun Prestige 7.0 EP
Texaco Oil Company	Multifak EPO
Union Oil Co. (Calif.)	Union Unoba EPO

♦ Lubricants listed may not be suitable for use in the food processing industry; check with lube manufacturer for approved lubricants.

Table 3 GREASE SPEED RANGE—rpm

		1010	1015	1020	1025	1030	1035	1040	1045	1050	1055	1060	1070	1080	1090
Speed Range with NLGI #1 Grease★	Min	1030	700	550	460	380	330	290	250	230	210	190	160	140	120
	Allow.	7000	6000	5000	4750	4400	3900	3600	3200	2900	2650	2450	2150	1750	1550
COUPLING SIZE		1100	1110	1120	1130 2130	1140 2140	1150 2150	1160 2160	1180 2180	1200 2200	1220 2220	1240 2240	1260 2260	1280 2280	1300 2300
Speed Range with NLGI #1 Grease★	Min	110	100	94	88	82	76	72	64	58	52	48	44	40	38
	Allow.	1450	1330	1200	1075	920	770	650	480	370	290	270	250	230	220

. Information shown for Sizes 1010 thru 1070 also applies to Size 10 thru 70 respectively, e.g. 1010 '3 etc

• Coupling speed range with NLGI #0 grease is from zero to the maximum shown

OIL LUBRICATION

EP oils may be a more effective lubricant than grease when the required coupling speed is one half of the minimum speed range of NLGI # 1 grease listed in Table 3 (Minimum rpm 2). Oil lubricated couplings must be sealed to prevent leakage, i.e. keyways, etc. Couplings must be drained and refilled with new oil every six month, for operating temperatures up to 160°F (71°C) and every three months for couplings operating at temperatures of 160°F (71°C) up to 200°F (93°C). For temperatures beyond this range, consult the factory. The minimum operating temperature must not be lower than the pour point of the oil. The specified amount of grease listed in coupling service manuals is in pounds and also applies to the volume of oil in pints.

SPECIFICATIONS

Type: Mild EP gear oil that meets AGMA Specifications 75" 04

Grade: AGMA #8EP ISO VG 680)

Viscosity: 612 748 cSt @ 104°F (40°C)

Pour Point: 20°F (-7°C) Maximum

Must not corrode steel or swell or deteriorate synthetic seals

Table 4 OIL LUBRICANTS

Manufacturer	Lubricant .
Amoco	Permagear EP 160
Chevron U.S.A.	NL Gear Compound 680
Exxon Co. U.S.A.	Spartan EP 680
Gulf Oil CO.	EP Lubricant HD 680
Mobil Oil CO.	Mobilgear 636
Shell Oil Co.	Omala Oil 680
Texaco Inc.	Meropa 680
Union Oil CO. of Calif.	Extra Duty NL Gear Lube 8EP

♦ Lubricants listed may not be suitable for use in the food processing industry, check with lube manufacturer for approved lubricants.

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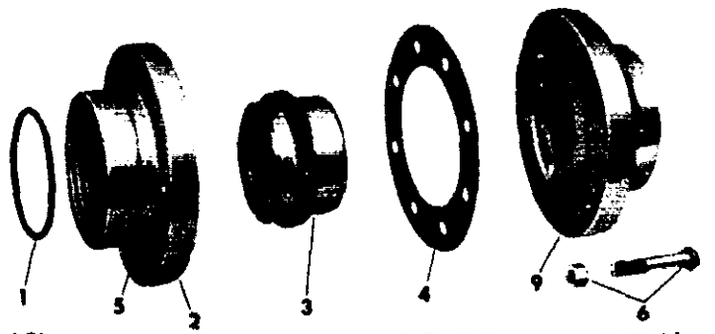
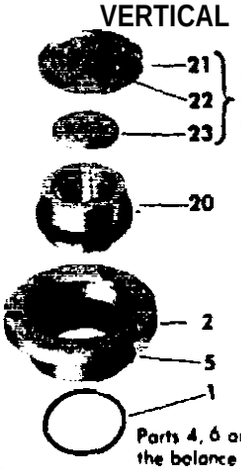
HORIZONTAL Types G51 and 52



1. Seal Ring
2. G Flanged Sleeve
3. G Flex Hub (Specify Bore and Keyway)
4. Gasket
5. Lube Plug
6. Fasteners
9. Rigid Hub

VERTICAL Types GV51 and 52



1. Seal Ring
2. G Flanged Sleeve
5. Lube Plug
20. GV Flex Hub (Specify Bore and Keyway)
21. Centerplate
22. Thrust Button
23. Thrust Plate

Parts 4, 6 and 9 shown at left complete the balance of the coupling

INTRODUCTION – This manual applies to standard coupling Types G51 and GV51 with shrouded bolts, and G52 and GV52 with exposed bolts. Their performance and life depend largely upon how you install and service them. Carefully follow the instructions in this manual for optimum performance and trouble free service.

IMPORTANT: When couplings are mounted on a floating shaft, use a gap disc in each coupling as illustrated in Manual 458-330.

IDENTIFICATION – All coupling parts have identifying part numbers. Always specify the part number on the flex hub, flanged sleeve and rigid hub. This is especially important when ordering bolts, flanged sleeves and rigid hubs. Longer bolts are used in the G52 and GV52 than in the G51 and GV51. Also note that GV Rex hubs are counterbored to receive the thrust plate.

APPLICATION – Single engagement Type G couplings are recommended for horizontal applications, but can be used vertically if the coupling gap specified in Table 1 is maintained. Use Type GV couplings for vertical applications; do not use GV couplings for thrust applications, refer to the Factory.

DYNAMICALLY BALANCED – Dynamically balanced couplings are match marked and must be assembled with the mating match marks aligned. Use a dial indicator when aligning these couplings.

DIAL INDICATOR – For best results, always use a dial indicator. Mount the indicator on the rigid hub flange and take readings for the OFFSET check on the OD of the flex hub. The total indicator reading (TIR) divided by two must not exceed the OFFSET limit in Table 1. For the ANGULAR check, mount the indicator on the flex hub and sweep the rigid hub flange face thru 360°. The TIR must not exceed the ANGULAR limit specified in Table 1.

LUBRICATION – Adequate lubrication is essential for satisfactory operation. Lubricate couplings at least once every six months. Couplings may require more frequent re-lubrication if subjected to heavy shock loads, rapid reversing, frequent axial movement, excessive misalignment, extreme temperature variations or excessive moisture.

CAUTION

Consult applicable local and national safety codes for proper guarding of rotating members. Observe all safety rules when installing or servicing couplings. During assembly, seal keyways of all lubricated couplings.

Extreme pressure (EP) greases are recommended for normal service, use NLGI #1 grease EXCEPT when the coupling speed is less than the minimum specified in Table 1. At these low speeds, use NLGI #0 grease. When one or more gear couplings in an application require NLGI #0 grease, the same grease may be used in all of the couplings. Refer to Table 1 for maximum speed.

Refer to Manual 458-010 for a list of NLGI #1 and #0 greases for an ambient temperature range of -30°F to +200°F (-34°C to +93°C). DO NOT use cup grease.

LONG TERM GREASE (LTG) Gear couplings initially lubricated with Falk LTG will not require re-lubrication for up to three years. Refer to Manual 458.010.

LIMITED END FLOAT Where limited end float is required or where sleeve bearing motors are used, consult the Factory.

Table 1 INSTALLATION DATA■

COUPLING SIZE			1010	1015	1020	1025	1030	1035	1040	1045	1050	1055	1060	1070
G	"X" Dimension-in.		.056	.056	.056	.088	.088	.118	.121	.152	.144	.144	.146	.170
	Gap-Inches		.156	.156	.156	.188	.188	.218	.281	.312	.344	.344	.406	.500
GV	"X" Dimension-in.		.140	.140	.140	.200	.200	.260	.300	.360	.316	.316	.315	.380
	Gap-Inches		.500	.500	.500	.640	.640	.710	.865	1.000	1.000	1.000	1.218	1.340
Installation Alignment Limits*		Offset Max	.001	.001	.001	.002	.002	.004	.004	.004	.004	.004	.004	.004
		Angular Max	.005	.005	.010	.010	.015	.015	.020	.020	.020	.030	.030	.030
Coupling Speed Range (rpm)	NLGI #0 Grease-Max★		7000	6000	5000	4750	4400	3900	3600	3200	2900	2650	2450	2150
	NLGI #1 Grease	Min	1030	700	550	460	380	330	290	250	230	210	190	160
		Allow	8000	6500	5600	5000	4400	3900	3600	3200	2900	2650	2450	2150
Grease – pounds		G	.05	.09	.15	.26	.40	.60	1.03	1.25	2.00	2.50	3.75	5.00
		GV	.08	.13	.20	.30	.40	1.00	1.50	2.00	3.00	4.00	5.00	7.00
G & GV51	Flange Bolt Torque—lb-in.		108	372	372	900	900	1800	1800	1800	3000	3000		
G & GV52	Flange Bolt Torque—lb-in.		108	372	900	1800	1800	3000	3000	3000	3000	3000	3000	3000

★ Flexible couplings are designed to accommodate changes in operating conditions. Coupling life expectancy between initial alignment and maximum operating limits is a function of load, speed and lubrication. Application requirements in excess of 1.4° misalignment per flex half coupling should be referred to Falk for review.

★ Couplings with NLGI #0 grease may be operated at any speed between zero and the maximum shown.

■ Refer to Bulletin 458-330 for alignment procedures and Engineering 458-108 for spacing instructions.

TYPE G HORIZONTAL COUPLING INSTALLATION

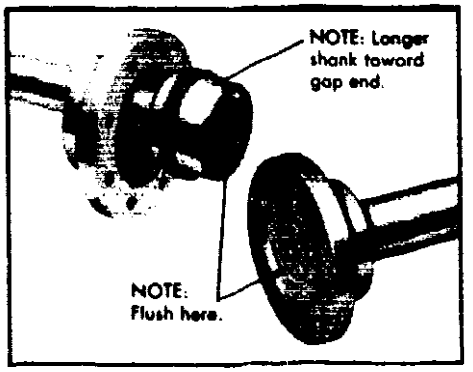
1 CAUTION

Lock out starting switch of prime mover. Clean all parts. Heat hubs in an oil bath or an oven to a maximum of 275°F (135°C). The oil flashpoint must be 350°F (177°C) or higher. DO NOT rest gear teeth on the bottom of the container or apply a flame directly to the gear teeth.

Use a lubricant that meets the specifications on Page 1. Pack sleeve teeth with grease and lightly coat seals with grease BEFORE assembly.

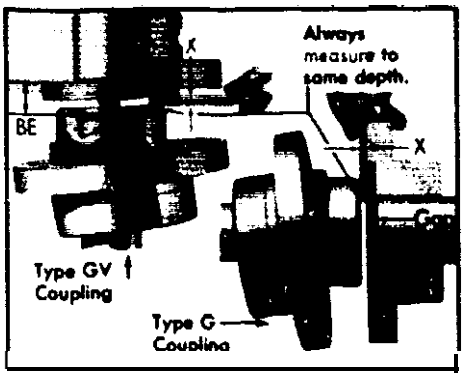
For best alignment results, use a dial indicator. See Page 1.

Use a dial indicator to align dynamically balanced couplings and assemble parts with mating match marks aligned.



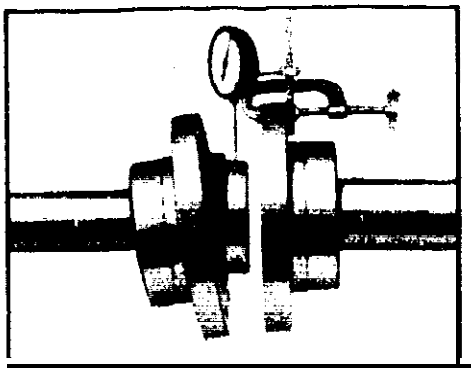
2 MOUNT FLANGED SLEEVE, SEAL AND HUBS

Place the flanged sleeve WITH seal ring on the shaft BEFORE mounting the hubs. Mount hubs on their respective shafts, as shown above, so that each hub face is flush with the end of its shaft. Position ● pujoment in approximate alignment with approximate gap specified in Table 1.



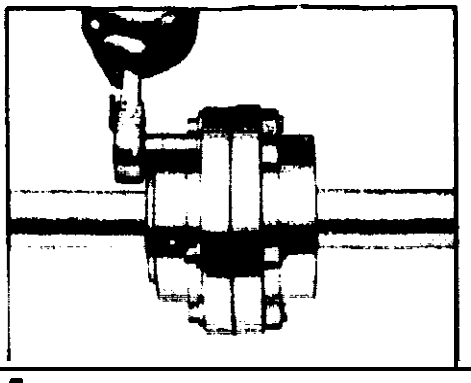
3 GAP AND ANGULAR ALIGNMENT

Use a spacer bar equal in thickness to the "X" dimension specified in Table 1. Insert the bar, as shown above, to the same depth at 90° intervals and measure the clearance between the bar and hub face with feelers. The difference in minimum and maximum measurements must not exceed the ANGULAR limit specified in Table 1.



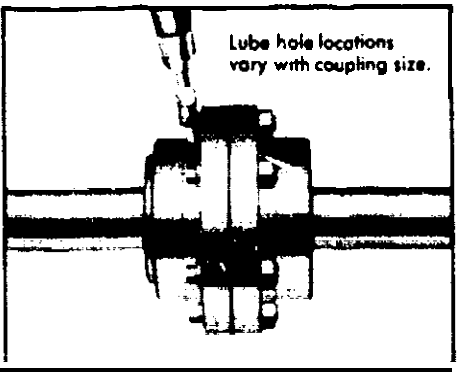
4 OFFSET ALIGNMENT

Clamp a dial indicator to the rigid hub as shown and rotate the rigid hub one complete turn. The total indicator reading DIVIDED by two must not exceed the OFFSET limit specified in Table 1. Tighten all foundation bolts and repeat Steps 3 and 4. Realign coupling if necessary. Grease the hub teeth.



5 INSERT GASKET AND JOIN fLANGED SLEEVES

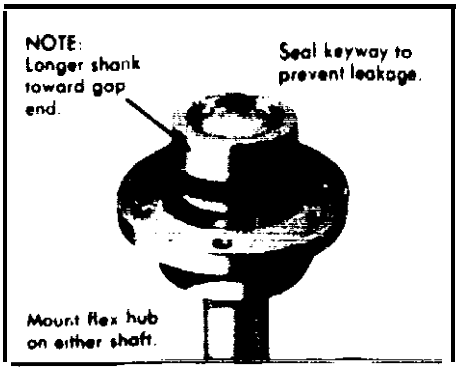
Insert gasket between flanges and draw flanges together. Use only the fasteners furnished with the coupling. IMPORTANT: Tighten fasteners to torque specified in Table 1.



6 LUBRICATE

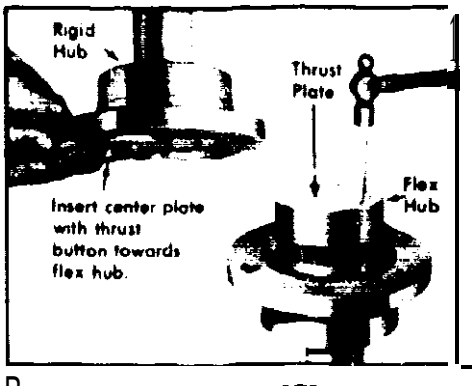
For TYPE G couplings, fill with recommended grease until excess appears at the open hole; then insert plug. For TYPE GV couplings, proceed as outlined above. IN ADDITION, when flex hub is on TOP, vent by inserting a .010 thick SMOOTH feeler gauge between seal and hub. Fill until excess appears at feeler. Repeat at 90° intervals. CAUTION: Make certain all plugs are inserted after lubricating

TYPE GV VERTICAL COUPLING INSTALLATION



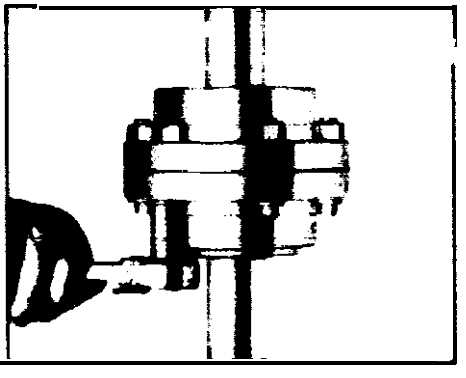
A MOUNT FLANGED SLEEVE, SEAL AND HUBS

Refer to Stup 1 above Place the flanged sleeve WiTH seal ring on shaft BEFORE mounting the hubs. Mount hubs on their respective shafts so that the counterbore face is flush with the end of the shaft.



B INSTALL PLATES

Seat the CENTERPLATE in the RIGID hub and the THRUST plate in the FLEX hub. Stake thrust plate in place. Note the direction shown for the thrust button. Insert gasket. Position the movable unit and align per Steps 3 and 4 above.



C ASSEMBLE COUPLING

Bolt flanges together. Use only the fasteners furnished with the coupling. IMPORTANT: Torque fasteners to Table 1 specifications. Lubricate per Step 6 above.

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Installation of **Interference Fit Hubs**

(See Page 2 for Removal of Interference Fit Hubs)

INTRODUCTION – Use this manual as a supplement to the manual furnished with the coupling when mounting interference fit hub,. Ob. serve applicable safety codes during installation. Check shaft, hub bore and key for nicks and burrs and remove.

CAUTION

Consult applicable local and national safety codes for proper guarding of rotating members. Observe all safety rules when installing or servicing couplings. During assembly, seal keyways of oil lubricated couplings.

Normally, Falk furnishes hubs bored for the following interference fits:

Steel hub, .0005" per inch of shaft dia
EXAMPLE: steel hub with 2 bore
Interference Fit = 2 x .0005" .001"

Accurately measure the hub bore and shaft diameter to determine if the fit is as specified

CHECK FIT OF KEY AND MOUNT COUPLING PARTS – Check fit of key in both keyways. The key should fit snugly against the sides of keyway A slight clearance should be present from top to bottom when the hub is on the shaft Insert key flush with end of shaft

NOTE: When sealing of keyway is required, coat key and keyways with Permatex #3 or equivalent.

Mount sleeves, seals, end plates and Type T20 covers on shafts before mounting hubs Locate seals on shafts so they do not come in contact with the hot hub,.

HEAT HUBS Heat hubs to 275°F (135°C) using one of the following methods:

Oxy-Acetylene or Blow Torch Mark the hub with a 275°F (135°C) temperature sensitive crayon (melts at prescribed temperature) in several places near the teeth (Figure 1) Direct the flame toward the hub bore and keep in motion while heating to avoid overheating on area (Figures 2 and 3) Do not apply heat directly to the hub teeth When using an oxy-acetylene torch use an excess acetylene mixture

CAUTION Do not use on open flame in a combustible atmosphere or near combustible materials

Oven Heating Set the oven thermostat at 275°F (135°C) and heat the hub at least one hour for each inch of wall thickness Do not allow hub teeth to come in contact with heat source (Figure 4)

$$\text{Wall Thickness} \qquad \frac{\text{shank dia minus bore}}{2}$$

MOUNT **HUBS** Mount the hub on the shaft as quickly as possible to avoid heat loss Make certain that position of hub teeth relative to shaft end is correct BEFORE assembling Carefully line up bore and keyway with shaft and key and slide hub onto shaft until hub face is flush with end of shaft If it is necessary to drive the hub into position lightly tap with a soft brass or lead hammer DO NOT strike hub teeth Avoid excessive pounding which can cause damage to bearings or connected equipment On inclined or vertical shafts hold hubs in place until the assembled position can be maintained

Allow the hubs to cool and then follow alignment and assembly instructions furnished with the coupling


Figure 1

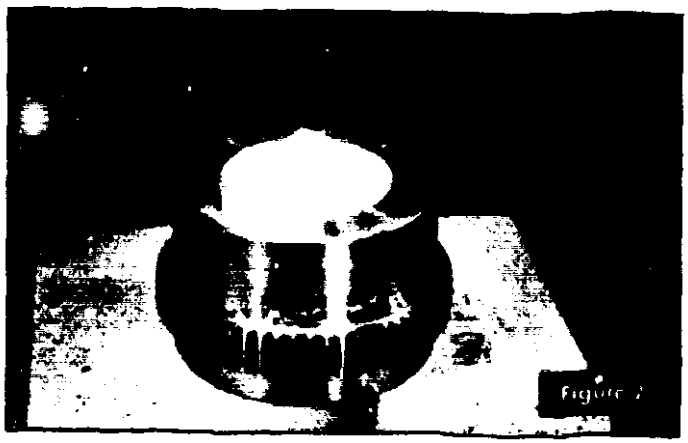


Figure 2


Figure 3

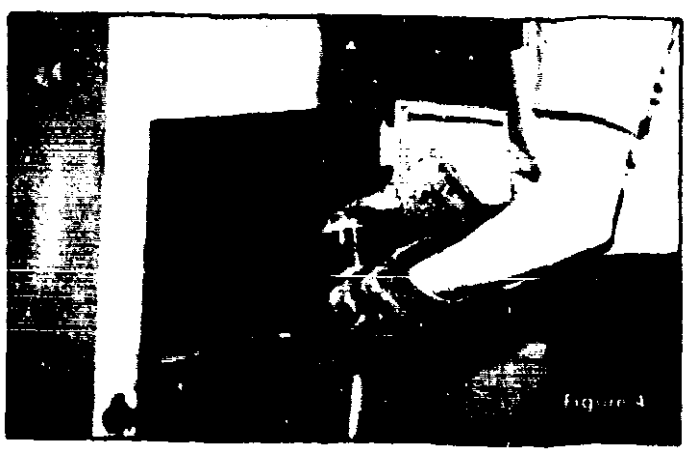


Figure 4

REMOVAL OF INTERFERENCE FIT **HUBS**

Introduction The following instructions apply to all Folk. shaft couplings with standard interference fits, Refer to the factor, if couplings were furnished as specials.

The illustration and photos show how heat, in conjunction with mechanical or hydraulic pullers, ore used to remove interference fit coupling hubs. These applications and systems depict typical field dismounting procedures and suggested tooling.

In setting up similar systems to fit your operation, care must be take" to select the proper components and design to ensure appropriate integration with your operations and existing equipment Appropriate safety measures mu,, be used to avoid the risk of personal injury and property damage during the removal process.

The Falk Corporation cannot be responsible for damage or injury caused by unsafe use of hydraulic or mechanical equipment that is suggested in this manual Contact the manufacturer of hydraulic pullers for guidance when you are i" doubt as lo the proper safety precautions to be token in designing and setting up your particular application.

SMALL SIZE COUPLINGS

Parts identification Refer to the appropriate Falk Service Manual(s) for parts identification and maintenance information to supplement this manual.

Required Equipment In addition to standard mechanic's tools, the following is required:

A suitable size mechanical or hydraulic puller with an adjusting assembly and a crosshead leg assembly (SAE Grade 8 studs required)

Two rosebud torches

Metal slings.

Heat resistant gloves.

Fire extinguisher.

Procedure The procedure for removing small size couplings, with a bore range of 2 to 9 and a weight range of 8" to 400#, is as follows

1 Make sure driven equipment is safely locked out.

2 Work area should be free from clutter and have the proper equipment on hand

3 Disassemble coupling and thoroughly , lean hubs of grease and solvents to avoid combustion when heat is applied

4. Drill and tap the face of the coupling hub for the puller leg thread size, as shown in Figure 5

5 Assemble puller as shown in Figure 6 Chec h to make sure that the puller has enough stroke to pull the hub off

6 Heat the hub evenly with rosebud torch to approximately 300° to 500°F while applying pressure as shown Figure 7 The temperature may he measured with a heat sensitive crayon Avoid placing the flame directly on the hub teeth Apply puller pressure until the hub clears the shaft as shown in Figure 8

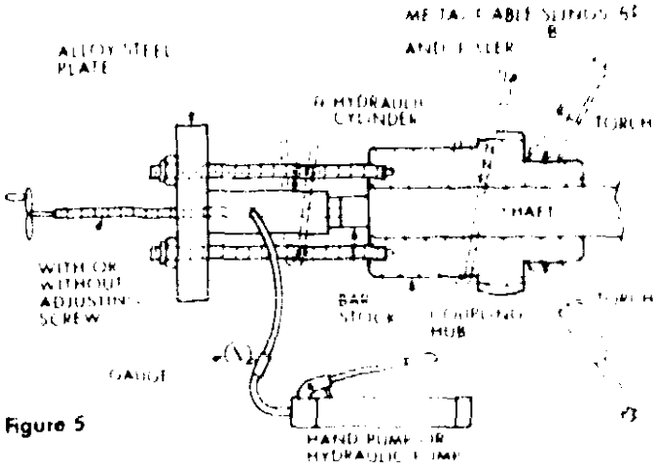


Figure 5

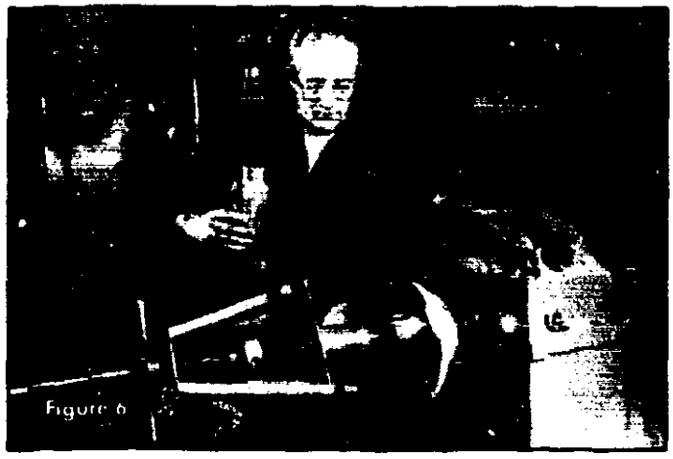


Figure 6

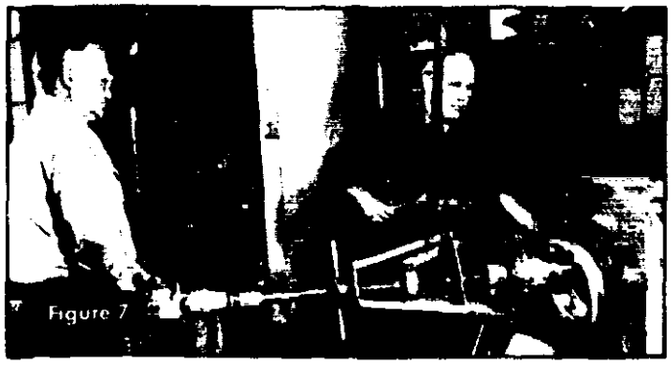


Figure 7

Figure 8

LARGE SIZE COUPLINGS

Parts Identification Refer to the appropriate Falk Service Manual(s) for parts identification and maintenance information to supplement this manual

Required Equipment In addition to standard mechanic s tools, the following is required

A hydraulic puller with the required stroke and a hand pump or an electric powered pump

An alloy steel plate of least 2 " thick

Two Grade 8 studs threaded to fit puller holes in the hub and four Grade C nuts

Two rosebud torches

Metal slings

Heat resistant gloves

Fire extinguisher

NOTE A The alloy steel plate thickness and maximum permitted pressure should be determined by a qualified engineer

B Hydraulic pump recommended that is equipped with a pressure gauge so the user will know exactly how much force is being applied

Procedure -- The procedure for removing large size couplings, is as follows:

1. Make sure driven equipment is safely locked out
2. Work area should be free from clutter and hove the proper equipment on hand.
3. Disassemble the coupling and thoroughly clean hubs of grease and solvents to ovoid combustion when heat is applied
4. In some cases, the key will have to he drilled out to facilitate hub removal as shown in Figure 9.
5. Fr ubs without puller hole,. drill and tap two holes in the hub to re e the threaded stud bolts, Figure 10 Assemble the alloy tool ste plate on the threaded stud bolts as shown in Figure 11 Refer to T les 1 thru 5 for a listing of Falk recommended puller bolt hole es.
6. Position the h, traulic puller as shown in figure 12
7. Apply heat to the huh. using one or more rosebud torches, as shown in Figure 13 Heat should be applied evenly until the hub reaches a temperature of 300° to 500°F. Heat sensitive crayons or paint can be used to indicate the huh temperature. Heat the outside of the hub first. the,, move slowly towards the shaft As this is being done. start applying pressure with the puller Be patient in doing this, since the heating-pulling operation on a large hub could take 30 or more minutes A distinct cracking sound will be heard as the b releases from the shaft Continue the pulling action as needed removal is complete, making sure the hub is securely supported by the sling

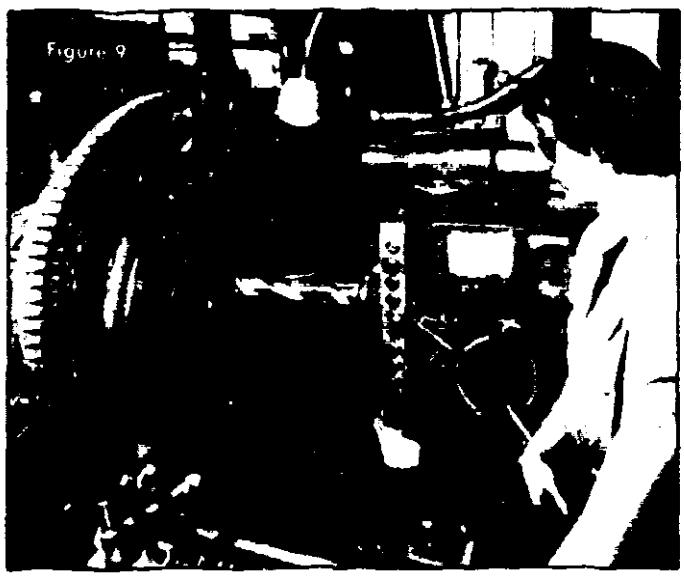
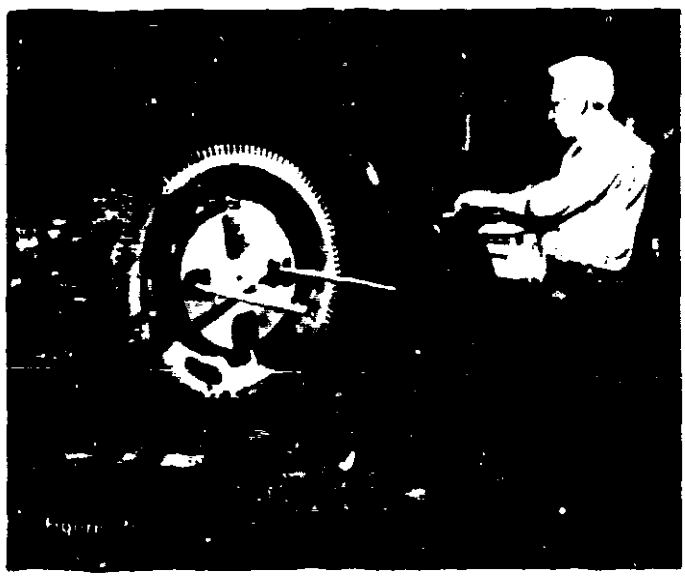


Figure 9



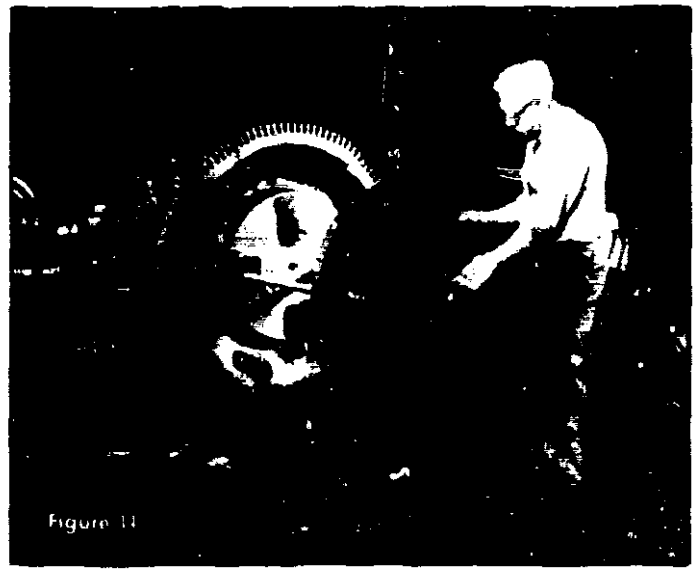


Figure 11


Figure 12

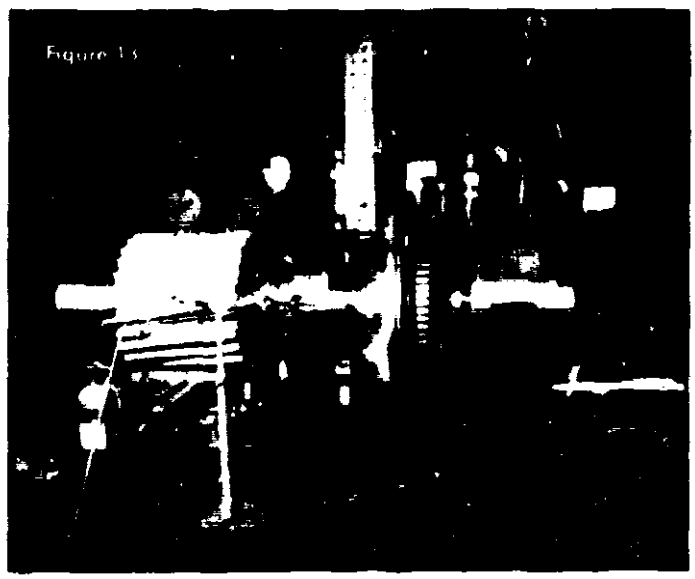


Figure 13

Table 1 Type T Steelflex Coupling Puller Bolt Holes

Cplg. Size	T-Hub		Shaft Hub	
	B.C.	Tap Size	B.C.	Tap Size
1020T	1.531	# 6-32 UNC	1.562	250-20 UNC
1030T	1.875	# 6-32 UNC	1.812	250-20 UNC
1040T	2.125	#10-24 UNC	2.500	250-20 UNC
1050T	2.500	#10-24 UNC	2.812	250-20 UNC
1060T	2.875	250-20 UNC	3.312	312-18 UNC
1070T	3.312	250-20 UNC	3.562	375-16 UNC
1080T	3.937	250-20 UNC	4.062	375-16 UNC
1090T	4.562	312-18 UNC	4.562	500-13 UNC
1100T	5.250	375-16 UNC	5.750	625-11 UNC
1110T	5.875	437-14 UNC	6.562	625-11 UNC
1120T	6.625	437-14 UNC	7.500	750-10 UNC
1130T	7.750	625-11 UNC	7.937	875- 9 UNC
1140T	9.125	625-11 UNC	9.125	1.000- 8 UNC
1150T	10.375	750-10 UNC		
1160T	11.750	875- 9 UNC		
1170T	13.250	1.125- 7 UNC		
1180T	14.875	1.250- 7 UNC		
1190T	16.250	1.500- 6 UNC		
1200T	17.937	1.500- 6 UNC		
1210T	19.562	1.500- 6 UNC		
1220T	21.312	1.500- 6 UNC		
1230T	23.062	1.500- 6 UNC		
1240T	24.938	1.500- 6 UNC		
1250T	27.188	1.500- 6 UNC		
1260T	29.500	500- 6 UNC		

Table 2 Type F Steelflex Coupling Puller Bolt Holes

Cplg. Size	F-Hub		Shaft Hub	
	B.C.	Tap Size	B.C.	Tap Size
3F	1.312	250-20 UNC		
4F	1.562	250-20 UNC		
5F	1.812	312-18 UNC		
6F	2.312	312-18 UNC	1.937	312-18 UNC
7F	2.625	375-16 UNC	2.312	312-18 UNC
8F	3.125	375-16 UNC	2.875	375-16 UNC
9F	3.500	375-16 UNC	3.062	375-16 UNC
10F	4.062	500-13 UNC	3.750	375-16 UNC
11F	4.437	500-13 UNC	3.937	500-13 UNC
12F	4.750	625-11 UNC	4.437	500-13 UNC
13F	5.250	625-11 UNC	4.937	625-11 UNC
14F	5.750	750-10 UNC	5.500	625-11 UNC
15F	6.250	750-10 UNC	5.750	750-10 UNC
16F	7.125	750-10 UNC	6.750	750-10 UNC
17F	8.003	875- 9 UNC	7.562	875- 9 UNC
18F	9.000	875- 9 UNC	8.437	875- 9 UNC
19F	9.750	1.000- 8 UNC	10.000	1.000- 8 UNC

Table 3 Type A Airflex Coupling Puller Bolt Holes

Cplg. Size	Standard Hub		Inverted Hub	
	B.C.	Tap Size	B.C.	Tap Size
15A	1.875	312-18 UNC	1.875	312-18 UNC
16A	2.125	375-16 UNC	2.000	375-16 UNC
18A	2.500	375-16 UNC	2.437	375-16 UNC
21A	3.125	500-13 UNC	3.125	500-13 UNC
24A	3.750	500-13 UNC	3.750	500-13 UNC
28A	4.500	750-10 UNC	4.375	750-10 UNC
33A	5.375	750-10 UNC	5.500	750-10 UNC
39A	6.375	1.000- 8 UNC	6.500	1.000- 8 UNC
44A	7.500	1.000- 8 UNC	7.500	1.000- 8 UNC
53A	9.250	1.000- 8 UNC	9.250	1.000- 8 UNC
62A	11.250	1.000- 8 UNC	11.500	1.000- 8 UNC
72A	13.000	1.000- 8 UNC	13.000	1.000- 8 UNC
85A	15.250	1.000- 8 UNC	15.250	1.000- 8 UNC

Table 4 Type WA Torus Coupling Puller Bolt Holes

Cplg. Size	No. 1 Hub		No. 6 Hub	
	B.C.	Tap Size	B.C.	Tap Size
20WA	1.625	250-20 UNC	2.688	312-18 UNC
30WA	2.125	250-20 UNC	2.969	312-18 UNC
40WA	2.438	250-20 UNC	3.594	375-16 UNC
50WA	2.780	250-20 UNC	4.062	375-16 UNC
60WA	3.190	312-18 UNC	4.725	375-16 UNC
70WA	3.690	312-18 UNC	5.000	375-16 UNC
80WA	4.440	375-16 UNC	5.750	500-13 UNC
90WA	5.000	500-13 UNC	6.875	500-13 UNC
100WA	6.500	500-13 UNC	a m	500-13 UNC
110WA	6.750	500-13 UNC	6.880	625-11 UNC
120WA	7.000	625-11 UNC	7.500	625-11 UNC
130WA	7.250	750-10 UNC	8.120	750-10 UNC
140WA	8.800	750-10 UNC	8.800	750-10 UNC
150WA	9.380	875- 9 UNC	9.380	875- 9 UNC
160WA	9.880	875- 9 UNC	9.880	875- 9 UNC

Table 5 Type G Gear Coupling Puller Bolt Holes

Cplg. Size	B.C.		Tap Size
	Flex Hub	Rigid Hub	
1010G*	2.960	2.625	375-16 UNC
1015G*	2.750	3.375	375-16 UNC
1020G	3.500	4.250	375-16 UNC
1025G	4.440	5.240	375-16 UNC
1030G	5.060	6.160	375-16 UNC
1035G	6.000	7.180	500-13 UNC
1040G	7.125	8.260	625-11 UNC
1045G	7.875	9.360	625-11 UNC
1050G	8.500	10.200	750-10 UNC
1055G	9.375	200	0 UNC
1060G	10.475	2.460	000-10 UNC
1070G		4.900	1.000- 8 UNC
1080/2080G	2.500	438	1.000- 8 UNC
1090/2090G	4.000	50	1.250- 7 UNC
1100/2100G	5.500	6	1.500- 6 UNC
1110/2110G	500	7.500	500- 6 UNC
1120/2120G	500	6.625	500- 6 UNC
1130/2130G	000	4.685	500- 6 UNC
1140/2140G	3.000	26.188	500- 6 UNC
1150/2150G	000	25.500	500- 6 UNC
1160/2160G	000		1.500- 6 UNC
1180/2180G	10.500	33.875	1.500- 6 UNC
1200/2200G	44.000	37.375	2.000-4.5 UNC
1220/2220G	37.500	41.875	2.000-4.5 UNC
1240/2240G	41.000	44.625	2.000-4.5 UNC
1260/2260G			2.000-4.5 UNC
1280/2280G	45.000		2.000-4.5 UNC
1300/2300G	000		2.000-4.5 UNC

* Size 1010G Max Bore
Flex Hub 1.500
Rigid Hub 2.125
Size 1015G Max Bore
Flex Hub 2.000
Rigid Hub 2.750

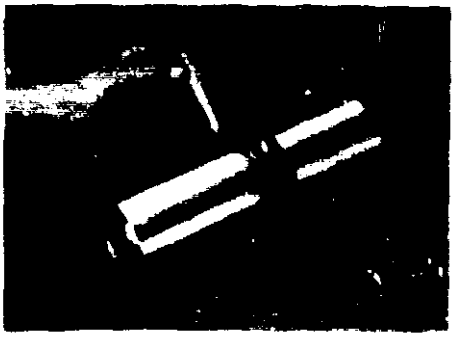
FAG ADAPTER MOUNTED SPHERICAL ROLLER BEARING PILLOW BLOCKS

Note: Leave bearing in protective wrapping until ready lo assemble it on the shaft Do not wash oh the preservative coating; it protects the bearing and is compatible with standard lubricants. Gather all necessary parts and tools before starling

1. **Measure Shaft** Diameter. (See Figure 1) Check shaft for nicks. burrs and dimensional accuracy Recommended diameter lolrrances for adapter mounted bearing are as follows

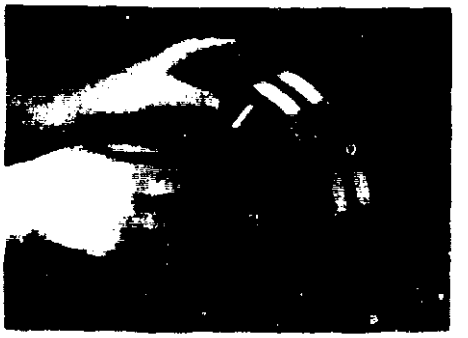
TOLERANCE **TABLE** 1

Shaft Diameter (S-1)		Tolerance
Over	To	
2"	4"	+ .000" to .004"
4"	6"	+ .000" to .005"
6"		+ .000" to .006"



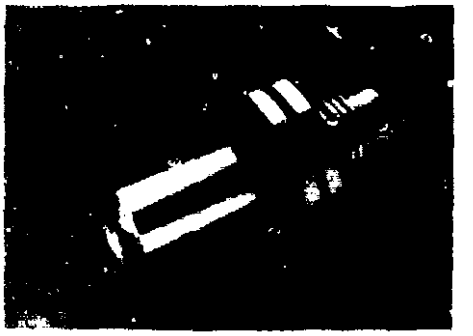
2. Mount Inboard **Triple Seal** Ring. (See Figure 2) Slide inboard triple seal ring on shaft This seal will slide freely into position

3. Mount Adapter Sleeve. (See Figure 3) Slide adapter sleeve on shaft with threads on outboard side. Position sleeve to the approximate location of the bearing centerline Apply light coating of oil lo the sleeves outside drameler surface to facilitate bearing mounting If one end of housing is closed wilh an end cover, the shaft should not protrude past sleeve more than 1/8 inch



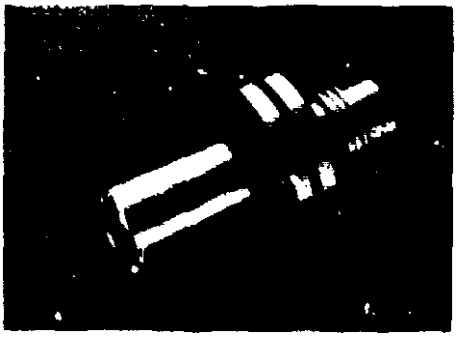
4. Measure Unmounted **Radial Internal** Cleamnce. (See Figure 4) With bearing resting upright on a smooth surface. select the largest feeler gauge that will slide between the most vertical unloaded rollers and the outer ring sphere Do not rotate inner ring This is the unmounted radial clearance and it must be recorded The reading should fal within the values shown in Table A on page 2

Note: Large thin section bearings will distort from their own weight resulting in an incorrect reading These bearings should be suspended by a sling through the inner ring and the reading should be taken at the bottom most rollers



5. **Mount Bearing.** (See Figure 5) Mount bearing on adapter sleeve. starting with the large bore of inner ring so that the taper of the bearing matches the taper of the adapter With the bearing hand tight on the adapter, locate bearing lo the correct axial position on the shaft

Note: Do not install lockwasher at this time because the drive up procedure may cause damage to it



6. **Install** Locknut. (See Figure 6) Install locknut with chamfered lace toward bearing A coating of graphite or molykote on face of locknut where it contacts bearing will make the mounting easier Tighten the locknut with a heavy duty spanner wrench to obtain the required reduction in radial clearance Do not attempt to tighten locknut with hammer and cold chisel The locknut could be damaged and chips could enter the bearing The required tight fit is

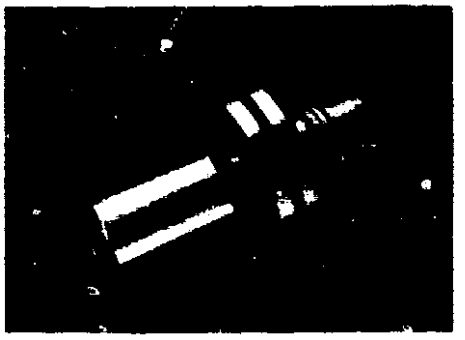
obtained by forcing the beanng up the sleeve The reduction in radral clearance serves as a measure of the tightness of the Ct. or. where the radral clearance reduction cannot be measured, the distance the beanng is forced onto the seat can be used as reference value. During mounting, the radral clearance or the axial drive-up distance must be constantly measured until the specified value is reached The clearance of the mounted spherical roller bearing must not be smaller than the indicated value "Smallest Radial Clearance after Mounting" (See Table A) The values indicated !or the drive-up distance apply only to solid shafts made of steel and hollow shafts whose bore diameter does not exceed half the outstde diameter With shafts made of materials other than steel or thin-walled hollow shafts please contact FAG,

Exam ple Spherical roller bearing
FAG 22338K.MB
Bore Diameter 190mm
Taper, 1 12
Radial clearance reduction
00035.. .0 0051'
Axial displacement
on the sleeve 0.059...0.087"
Smallest radral clearance after mounting 0 0028"

Note: FAG also offers a full range of hydraulic adapter sleeves, withdrawal sleeves and **piston presses to** facilitate **the mounting** and **dismounting** of large **bearings**

TABLE A—RADIAL CLEARANCE **REDUCTION OF** FAG **SPHERICAL** ROLLER BEARINGS **WITH** TAPERED **BORE**

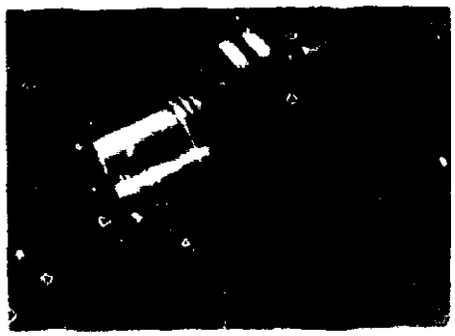
Bearing Bore (mm)		Reduction in Radial Clearance (0.0001 Inch)		Axial Displacement on 1:12 Taper (Inch) Sleeve		Radial Clearance Prior to Mounting (0.0001 Inch)				Smallest Radial Clearance after Mounting (0.0001 Inch)	
						Normal		C3			
Over	To	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Normal	C3
30	40	8	1[illegible]	0 014	0 018	14	20	20	26	6	10
40	50	10	1[illegible]	0 018	0 022	18	24	24	32	8	12
50	65	12	16	0 02	0 026	22	30	30	37	10	14
65	80	16	20	0 028	0 033	28	37	37	47	10	16
80	100	18	24	0 03	0 039	32	43	43	55	14	20
100	120	20	28	0 031	0 047	39	53	53	67	20	26
120	140	26	35	0 047	0 059	47	63	63	79	22	31
140	160	30	39	0 051	0 067	51	71	71	91	22	35
160	180	31	43	0 055	0 075	55	79	79	102	24	39
180	200	35	51	0 059	0 087	63	87	87	114	26	39
200	225	39	55	0 087	0 094	71	98	98	126	31	47
225	250	43	59	0 071	0 102	79	106	106	138	35	51
250	280	47	67	0 079	0 114	87	118	118	154	39	55
280	315	51	75	0 087	0 126	95	130	130	169	43	59
315	355	59	83	0 102	0 142	106	142	142	185	47	67
355	400	67	91	0 114	0 154	118	158	158	205	51	75
400	450	79	102	0 134	0 173	130	173	173	224	51	79
450	500	83	110	0 142	0 189	146	193	193	248	63	91
500	560	94	126	0 161	0 213	161	213	213	268	67	98
560	630	102	138	0 173	0 232	181	236	236	299	79	114
630	710	118	157	0 201	0 268	201	264	264	335	83	122
710	800	134	177	0 228	0 299	224	295	295	378	91	138
800	900	146	197	0 248	0 335	252	331	331	421	106	154
900	1000	161	217	0 276	0 37	280	366	366	469	118	169
1000	1120	177	236	0 299	0 402	307	402	402	512	126	189
1120	1250	193	256	0 327	0 433	339	441	441	559	134	213



7. **Install Lockwasher** (See Fgure 7a) **and Locknut.** (See Figure 7b) When correct radial clearance is achieved, remove locknut and then mount lockwasher on adapter sleeve with inner prong of lockwasher pointing towards the bearing and in slot of the adapter sleeve Reapply locknut and tghten until it presses firmly against the lockwasher Do not drive bearing further on the adapter as it may after the radial clearance Check to assure that clearance is not changed Find a lockwasher tang nearest to a locknut slot If a slot does not line up with the tang, loosen the nut to meet a washer tang and bend tang of lockwasher into slot in the nut

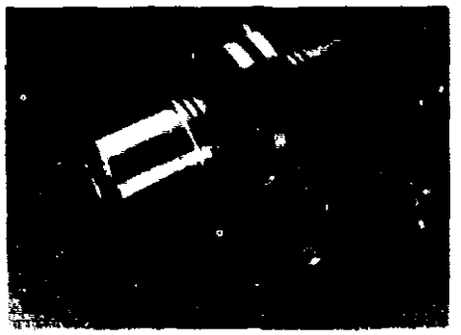
Note: For sizes larger than 8" shaft this step is eliminated since the lockplate is bolted to the outboard face of the locknut

8. Mount Outboard Triple Seal Ring. Gee Figure 8)
We outboard triple seal ring on shaft



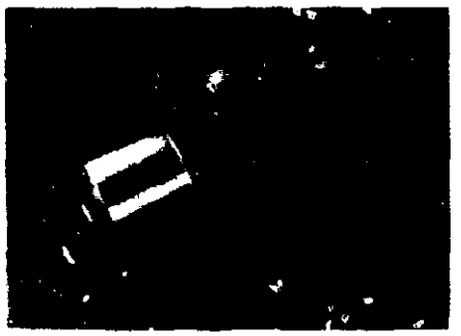
9. Position Lower Half of Housing (Base). (See Figure 9.)
Remove any paint dirt and / or burrs from the mating surfaces at the splits and thoroughly clean housing. The vertical oil return hole at the bottom of each enclosure groove must be free from foreign matter for proper lubrication. Set lower half of housing in place and oil bearing seat. Place shaft with bearing into lower half of housing while carefully guiding the triple seal rings into the enclosure grooves. Make sure that the outer ring of the bearing is not cocked in the housing. Bolt fixed pillow block securely in place.

10. Insert Stabilizing Ring For Fixed Bearing. (See Figure 10.)
Move shaft axially or shift block base so that the stabilizing ring(s) can be inserted between fixed bearing outer ring and housing shoulder. If one stabilizing ring is required, place on locknut side of bearing. If two stabilizing rings are required, place one on each side of bearing. All other bearings (floating) on the same shaft should be centered in their housing without stabilizing rings.



11. **Lubrication.**
If grease lubrication is used the bearing should be packed 100% full and the housing cavity 1/3 to 1/2 full. If oil bath is used the oil should be at the centerline of the lowermost roller while the bearing is stationary. For further details on lubrication, see page 8.

12. Mount Upper Half of Housing (Cap). (See Figure 11.)
The bearing seal in the upper half of the housing should be deburred, thoroughly cleaned, oiled and placed over bearing. If oil lubrication is used a sealing compound such as Permatex 2 may be applied very thinly at the split surfaces of the cap and base to prevent lubricant leakage. If the pillow block is to have one closed end, an end cover is supplied which fits snugly into triple seal ring groove. It is inserted



in lower half of housing before upper half (cap) is bolted to lower half (base). The two tapered dowel pins will align upper half of housing with the base.

NOW **Caps and base of pillow blocks are not interchangeable. Each cap and base must be assembled with its mating part.**

To complete assembly install and tighten cap bolts to the recommended torque values in Table B shown below.

TABLE B — RECOMMENDED CAP BOLT TIGHTENING TORQUE (FOOT-LBS.)

Pillow Block Size	Torque		Bolt Size Diameter (inch)	Grade
	Min.	Max		
SAF 515	50	70	3/4 UNC	GRADE 5 CAP BOLTS ARE COMMONLY USED WITH FAG PILLOW BLOCKS
SAF 516 SAF 517 SAF 518	100	140	7/8 - 9 UNC	
SAF 520 SAF 522 SAF 524	180	250	1 - 8 UNC	
SAF 526	300	400	1 1/4 - 7 UNC	
SAF 528 SAF 530 SAF 532 SAF 534 SAF 536	450	600	1 1/2 - 6 UNC	
SAF 538 SAF 540 SAF 548	800	1100	1 3/4 - 5 UNC	
SAF 544 SAF 552 SAF 556 SDAF 060 SDAF 064 SDAF 068 SDAF 072 SDAF 076	1300	1800	2 - 4 1/2 UNC	

FAG CYLINDRICAL BORE MOUNTED SPHERICAL ROLLER BEARING PILLOW BLOCK

Note: Leave bearing in protective wrapping until ready t assemble it on the shaft. Do not wash off the preservative coating. it protects the bearing and is **compatible** with standard lubricants. Gather all necessary parts and tools before starting.

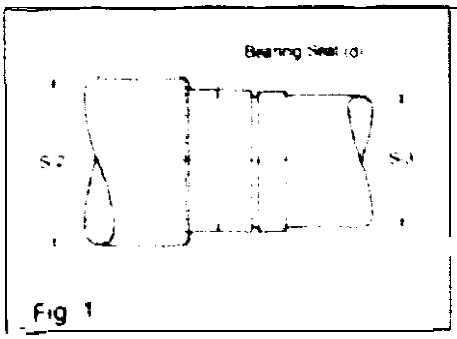


Fig 1

1. **Measure Shaft Diameters S-2 and S-3 and Bearing Seat (d).** (See Figure 1.) Check shall for nicks burrs and dimensional accuracy Recommended shaft diameters S-2 and S-3 tolerances are as follows

TOLERANCE TABLE 2

Shaft Diameter (S-2 & S-3)		Tolerance
Over	Including	
2"	4	.000" to .004"
4"	6	.000" to .005"
Over 6		.000" to .006"

Refer to Table C at right for the recommended fit at the bearing seat (d).

TABLE c — **SHAFT SEAT DIAMETERS FOR CYLINDRICAL BORE MOUNTED** PILLOW BLOCKS

BEARING BORE DIAMETER			NORMAL LOAD			HIGH LOAD		
Mm	Inches		Shaft Diameter		MEAN FIT	Shaft Diameter		MEAN FIT
Nom.	Max.	Min.	Max.	Min.		Max.	Min.	
80	3.1496	3.1490	3.1508	3.1501	0012T	3.1511	3.1504	0015T
85	3.3464	3.3457	3.3479	3.3470		3.3484	3.3475	
90	3.5433	3.5425	3.5447	3.5438		3.5452	3.5443	
95	3.7402	3.7394	3.7416	3.7407		3.7421	3.7412	
100	3.9370	3.9362	3.9384	3.9375	0014T	3.9389	3.9380	0019T
105	4.1338	4.1331	4.1353	4.1344		4.1358	4.1349	
110	4.3307	4.3299	4.3321	4.3312		4.3326	4.3317	
115	4.5276	4.5268	4.5290	4.5281		4.5295	4.5286	
120	4.7244	4.7236	4.7258	4.7249		4.7263	4.7254	
125	4.9212	4.9203	4.9229	4.9219		4.9235	4.9225	
130	5.1181	5.1171	5.1197	5.1187		5.1203	5.1193	
140	5.5118	5.5108	5.5134	5.5124		5.5140	5.5130	
150	5.9055	5.9045	5.9071	5.9061	0016T	5.9077	5.9067	0022
160	6.2992	6.2982	6.3008	6.2998		6.3014	6.3004	
170	6.6929	6.6919	6.6945	6.6935		6.6951	6.6941	
180	7.0866	7.0856	7.0882	7.0872		7.0888	7.0878	
190	7.4803	7.4791	7.4821	7.4809		7.4829	7.4817	0026T
200	7.8740	7.8728	7.8758	7.8746	0019T	7.8772	7.8760	0032T
220	8.6614	8.6602	8.6632	8.6620		8.6646	8.6634	
240	9.4488	9.4476	9.4506	9.4494		9.4520	9.4508	
260	10.2362	10.2348	10.2382	10.2370		10.2396	10.2384	
280	11.0236	11.0222	11.0256	11.0244	0021T	11.0270	11.0258	0035T
300	11.8110	11.8096	11.8130	11.8118		11.8144	11.8132	
320	12.5984	12.5968	12.6006	12.5992		12.6023	12.6009	
340	13.3858	13.3842	13.3880	13.3866		13.3897	13.3883	
360	14.1732	14.1716	14.1754	14.1740	0023T	14.1771	14.1757	0040T
380	14.9606	14.9590	14.9628	14.9614		14.9645	14.9631	
400	15.7480	15.7464	15.7502	15.7488		15.7519	15.7505	
420	16.5354	16.5336	16.5379	16.5363		16.5398	16.5382	
440	17.3228	17.3210	17.3253	17.3237		17.3272	17.3258	
460	18.1102	18.1084	18.1127	18.1111		18.1146	18.1130	0045T
480	18.8976	18.8958	18.9001	18.8985	0026T	18.9020	18.9004	
500	19.6850	19.6832	19.6875	19.6859		19.6894	19.6878	
530	20.8661	20.8641	20.8698	20.8678		20.8733	20.8720	0051T
560	22.0472	22.0453	22.0507	22.0489	0036T	22.0548	22.0533	
600	23.6220	23.6200	23.6259	23.6239		23.6298	23.6283	0059T

These fits apply to roller bearings carrying only circumferential load on the inner ring

Bearing Bore Diameter	Normal Load	High Load
Up to 8 inch	P/C = 0.10 to 0.15	P/C = 0.15
8 to 20 inch	P/C = 0.15	P/C = 0.15
Over 20 inch	P/C = 0.20	P/C = 0.25

Where
P = Equivalent Dynamic Load on the bearing, lbs.
C = Basic Dynamic Load Rating of bearing, lbs.

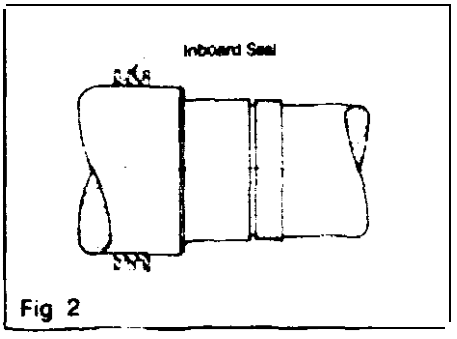


Fig 2

2. Mount Inboard (Large Bore) Triple Seal Ring. (See Figure 2) Slide inboard triple seal ring on S-2 shatt diameter. This seal slides freely into position

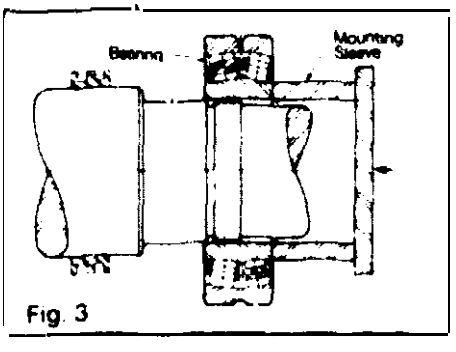


Fig. 3

3. Mount Bearing on Shaft
Small Bearing. (See Figure 3) To mount small bearings in cold condition, first apply a coat of light oil lo the shatt and bearing bore Then press on bearing by mechanical or hydraulic device

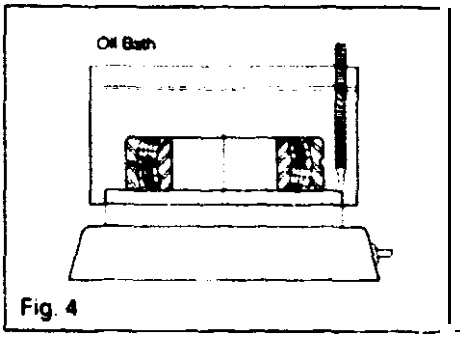


Fig. 4

Large Bearing. (See figure 4,) To mount large bearings that are not easily pressed on a shatt (especially when a light tit is required for the inner ring) the bearing should be heated for mounting. Sufficient expansion is obtained when beanng is heated in an oil bath between 175° F and 250" F (80° C and 120°C) for approximately 1/2 to 1 hour, depending on bearing size For uniform heating, be sure lo place Supports under bearing to isolate it from bottom of the lank A temperature controlled oven may also be used to heat the bearing For special mounting conditions. consult FAG Engineering Mount bearing on shatt against shaft shoulder Hold the bearing firmly against the shatt shoulder until it is tight on the shatt

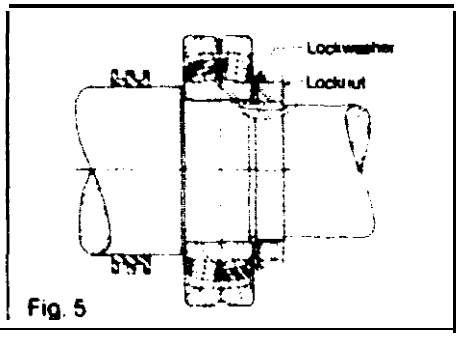


Fig. 5

4. Position Lockwasher. (See Figure 5) Positron lockwasher over threads with inner prong of lockwasher in the slot of the shaft, pointing towards the bearing

5. Install Locknut on Shaft. (See Figure 5) Mount the locknut with the chamfered face toward the bearing Tighten it with spanner wrench until it is firmly sealed Bend one of the lockwasher tangs into a slot in the locknut It slot is slightly past tang. tighten to meet a tang

Note: To complete the mounting proceed with steps 8 through 12 as for adapter mounting. See Page 3.

Pillow Block Seal

TO make the FAG pillow blocks more versatile, a variety of sealing arrangements are available to meet all requirements of today's industrial applications

1. TRIPLE SEAL RING.
(See Figure 1) This radial labryinth seat is a very efficient non-contact type This seal rotates with the shalt and automatically locates itself relative lo the labryinth groove in the housing The triple seal rings are generally made of aluminum or low carbon steel

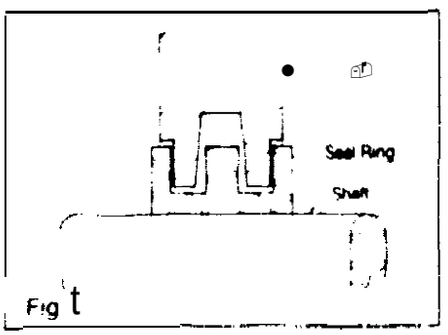


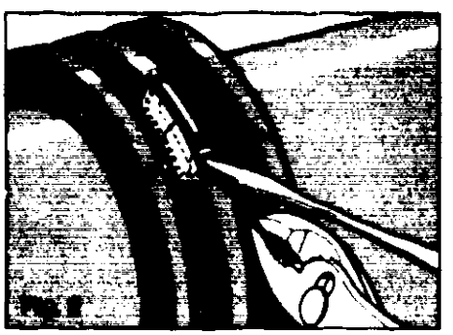
Fig t

TAME **D — SOLID AND** SPLIT TRIPLE **SEAL RING INTERCHANGE**

Shaft Diameter (Inches)	FAG Split Triple Seal Ring No.	FAG Solid Triple Seal Ring No.
2	LERS 37	LER 37
2	LERS 44	LER 44
2	LERS 53	LER 53
3	LERS 69	LER 69
3	LERS 102	LER 102
3	LERS 109	LER 109
4	LERS 110	LER 110
4	LERS 113	LER 113
4	LERS 117	LER 117
4	LERS 118	LER 118
4	LERS 122	LER 122
5	LERS 125	LER 125
5	LERS 130	LER 130
5	LERS 140	LER 140
6	LERS 141	LER 141
6	LERS 148	LER 148
6	LERS 149	LER 149
6	LERS 155	LER 155
	LERS 156	LER 156
7	LERS 159	LER 159
7	LERS 162	LER 162
7	LERS 162-1	LER 162-1 *
7	LERS 167	LER 167
8	LERS 168	LER 168
8	LERS 551	LER 551
9	LERS 513	LER 513
9	LERS 178	LER 178
10	ERS 705	ER 705
11	ERS 825	ER 825
11 Heavy Duty	TSRS 1100	TSR 1100
12	ERS 818	ER 818
12 Heavy Duty	TSRS 1200	TSR 1200
13	ERS 846	ER 846
13 Heavy Duty	TSRS 1300	TSR 1300
14	ERS 876	ER 876
14 Heavy Duty	TSRS 1400	TSR 1400

Special

2. SPLIT TRIPLE SEAL RING.
FAG offers a unique split triple seal ring for easy installation and replacement of worn out seals (See Table D) FAG also offers a complete range of split spherical roller bearings dimensionally interchangeable with 22200K. 23000K and 23100K bearing series and adapter sleeve assembly Consult FAG for more details



Mounting Instructions for Split Triple Seal Ring.
(See Figure 2) Position split seal into lower housing grooves Locate split at top of shaft Thread tie-strap down through large hole at one end o! seal and up through small hole on other halt With tie-head seated in the large hole draw tie across split, through tie head and pull tie (as shown) until seal fits snugly on the shaft with the two halves of the seal mating Cut excess tie I! possible rotate shah slowly and position seal so i: does riot rub against housing grooves

3. TACONITE SEAL.

This seal has been designed for the most demanding applications in highly contaminated environments such as taconite ore mining It fits into the standard triple seal ring groove in the SAF 22500 Series Pillow Blocks For all other SAF Series consult FAG Engineering

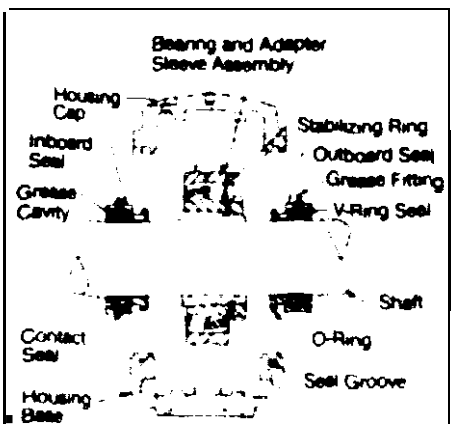


Fig 3

The seal consists of tour basic barriers (See Figure 3) A V-Ring **Seal** is mounted on the shaft and rotates with the shaft A **Grease Packed Cavity** is between the contact seal and the V ring seal The grease cavity may be purged periodically and replenished with fresh grease through a standard grease fitting A **Contact Seal** is spring loaded and has the lip facing in an outward direction forming an effective barrier lo prevent any contaminated grease in the cavity from entering the bearing during purging and regreasing of the cavity Tne inner case used with the contact seal provides for maximum strength rigidity and protection of the sealing lip and spring An **O-Ring** seals the seal cartridge to the pillow block housing

Mounting Instructions for Taconite Seal. SAF 22500 SERIES PILLOW BLOCKS.

(See Figure 3.) Check shaft for nicks. burrs and dimensional accuracy Apply a lght coating of oil lo the shaft install the V-Ring seal on the shaft with the lip towards the beanng and locale it beyond the final assembled position

Install the O-Ring on the seal cartridge Slide the Inboard seal cartridge on the shaft with the O-Ring toward the bearing and locale it beyond the final assembled position Be sure the grease fitting is in an accessible position Mount beanng on the shaft following the mounting instructions for FAG Adapter Mounted Spherical Roller Bearing Pillow Blocks (See page 1-3)

Slide the outboard seal cartridge on the shaft with the O-Ring toward the beanng Place shaft (with bearing and taconite seals) into the lower halt of housing while carefully guiding the O-Ring into the seal groove

If this is a fixed bearing, snake the stabilizing ring between the housing shoulder and the face of the bearing Make sure that seals and all other parts are in place on me shaft Place the lop halt (cap) of the housing onto the bottom half The two dowel pins will align the cap with the base Insert cap bolts and tighten to recommended torque valus (Table B page 3)

Move both V-Ring seals toward the beanng until the outer face of the V-Ring seal is flush with the seal cartridge While rotating the shaft fill the grease cavity by pumpng grease through the grease fitting provided in the seal cartridge When the grease appears at the V-Ring seal the cavity nas been filled

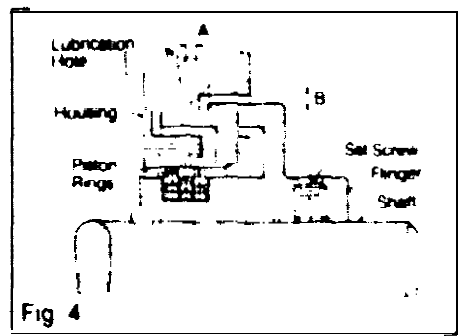


Fig 4

Mounting Instructions for Taconite Seal. SDD SERIES ADAPTER MOUNTED PILLOW BLOCKS.

(See Figure 4) Install the flinger with axial gap (A) equal to the radial gap (B) as shown above To obtain this axial gap value measure the radial gap (B) then push the seal toward the housing until it contacts the housing groove When sliding the flinger into the housing groove be sure piston rings are centered in the lead-in chamfer of the housing and that rings are not overlapping each other Put a mark on the O D of the flinger even with the housing wall, then pull the flinger away from the housing the same distance that you measured at B Tighten all flinger set screws securely

Note: A seal withdrawal allowance of 1" is required on each side of the housing for assembly and disassembly of the pillow block

In any bearing, the lubricating film is a load transmitting element. Its job is 10 prevent the detrimental metal-tc-metal contact between the bearing parts performing relative sliding or rolling motions

This general function of the lubricant also applies to bearings mounted in the Pillow Blocks. In some cases. the lubricant also functions as a sealing agent protecting the housing cavity from external contaminants The efficiency of such protection depends upon the selection of the proper seal design, which in turn affects the sealing contribution of the grease

FAG Pillow Blocks are designed lo be used with either grease or oil lubrication The selection of the proper type of lubricant and lubncatron system depends upon the operating conditions of the bearings such as temperature, speed. loads. environment, etc

Grease Lubrication

Most bearings mounted in pillow blocks are grease lubricated because of the simplicity involved The most important aspect of grease lubrication is periodic relubrication (bringing a definite amount of fresh grease between the rolling contact surfaces at specific Intervals while avoiding overlubrication) This should be done through the lubrication holes in the beanng outer ring For this purpose, lhc housing caps are equipped with a lapped hole in the center for mounting a grease fitting

In applications utilizing bearings without lubricating holes and grooves in the outer rings, the relubrication is done through the hole(s) on lhe housing cap.

When taconite seals are required, they have to be purged frequently with the same type of grease as used for the bearing

The quantity of the grease and the replenishment intervals depend upon the Operating conditions, and the extent to which the grease has been worked by bearing friction and speed Overlubrication must be avoided due to the extra heat generated which deteriorates the lubricity of the grease and can cause premature beanng failure

For normal operating conditions a No 2 grade general purpose lithium soap base grease such as Shell Alvania 2 is generally suitable For special conditions, re'ubrication Intervals and oil selection, consult FAG or ask for our fubrication manual

Oil Lubrication

Oil lubncatron is. in principle, a superior method of beanng lubrication than grease lubrication It offers the advantage of being suitable for higher temperatures, due to the higher temperature limits of oil and its inherent capability of heal dissipation

High loads and speeds which result in a prohibitive rise in beanng temperature may make oil lubrication mandatory In addition to the inlet holes, FAG Pillow Blocks feature dram holes and return holes from the labyrinth grooves. All housings have adequate oil sumps

Two types of lubrication can be used: oil bath or oil circulation. For oil bath lubncation. the oil level (with the shalt in horizontal position) should cover one half of the lowest roller with the beanng at standstill. An oil sightgage al the housing will help control the level For oil circulation, consult FAG Engineering

Selection of Oils

Rolling bearings should only be lubricated with fully refined oils because they possess a high resistance against deterioration

The most important criterion which defines the oil suitability is its viscosity Since the viscosity changes with temperature. the proper selection can only be undertaken if the bearing operating temperature is known

It is suggested that FAG Engineering be consulted in all cases when operating conditions are severe or special in some respect 7 his applies not only to the proper viscosity but alsc to the oil additives, whether they are deoxidants. corrosion inhibitors, defoamingagents or E.P additives

FAG BEARINGS CORPORATION
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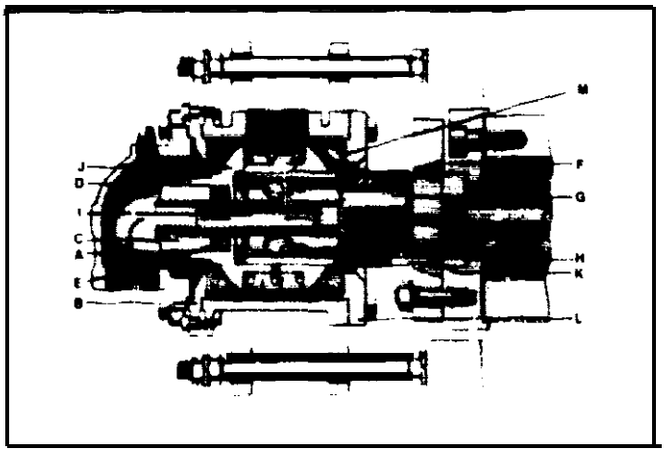
Stamford. CT 06904
(203) 327-1960

Installation instructions for type N Johnson joints

For rotating syphon or distribution pipe applications



Cross section of Type N Joint shown with "Q" nipple.

Step 1.

Check to make sure that all core sand, dirt, weld beads, pipe turnings, metal dust and other foreign matter has been removed from the piping, roll, dryer or cylinder before installing joint. This will help eliminate carbon seal ring scoring and damage to internal joint parts which could cause unnecessary downtime and maintenance.

Step 2.

Remove the head (A) from the joint, leaving the assembly plate (B) attached. Remove the packing gland (C), locknut (D) and packing (E).

Make sure the pipe is clean and smooth where it seals in the packing gland.

IMPORTANT: THE INNER PIPE MUST BE STRAIGHT, TRUE AND ATTACHED WITHIN THE ROLL SO IT ROTATES WITHOUT WOBBLING. THIS WILL PREVENT STRAINING INTERNAL JOINT PARTS WHICH COULD CAUSE LEAKAGE AND CARBON SEAL RING BREAKAGE

Step 3.

Slide the Quick Release Nipple Flange (F) onto the rotary joint nipple (G) with its taper facing outward.

Step 4.

Place a new copper gasket (H) into the recess of the journal

Step 5.

Slide the joint over the inner rotating syphon pipe, being careful when the pipe (I) passes through the opening in the thrust collar (J) not to damage either part The inner rotating pipe should extend slightly beyond me gland (when installed), but not enough lo touch the joint head when it is re-installed

Step 6.

Place the two split taper wedges into the recess of the nipple (K). Slide the Quick Release Nipple Flange over the wedges and secure to the journal flange studs with nuts provided Tighten evenly Note that the Quick Release Nipple Flange will not seat tightly against the face of the journal flange When tight, mm will be approximately 1/8 to 3/16" space between the flanges

Step 7.

Using the packing (E) furnished, repack the internal pipe in the thrust collar (J). Tighten the packing gland (C) just enough to seal (approximately 30 ft. lbs.), but not so tight as to lock on the pipe. Then tighten the locknut (D) against the thrust collar.

IMPORTANT: THE ROTARY JOINT MUST BE FREE TO MOVE OUTWARD ALONG THE PIPE TO COMPENSATE FOR CARBON SEAL RING WEAR.

Step 8.

Using a suitable support, mount the rotary joint to it. Make sure components are in alignment, and that the rotating nipple and thrust collar are aligned squarely with the wear plate and assembly plate. If necessary, loosen supports and re-align joint. Gauge the running clearance between the nipple tube (G) and renewable wear plate CL). See drawing A97-16-3-13 for gauge size.

Step 9.

Re-atach the head (A) to the joint

Step 10.

Connect piping to joint using Johnson bronze or stainless steel flexible metal hose. The hose(s) should be long enough so there is no binding or tension tending to move the joint off the journal centerline of the roll. The joint must be reasonably free to move outward to compensate for seal ring wear (Refer to Johnson flexible metal hose Bulletin FMH.) When flanged hose is used, spool pieces in place of the hose are recommended for fabrication purposes (see spec sheet A97-PS-1615-4-1).

IMPORTANT: CONNECT THE HOSE AS CLOSE TO THE JOINT AS POSSIBLE. MINIMIZE THE USE OF FITTINGS AND PIPE, AS THIS INCREASED WEIGHT CAN AFFECT THE PERFORMANCE OF THE JOINT. PROVIDE SUITABLE SUPPORT FOR THE WE AND FITTING BEYOND THE HOSE.

NEVER APPLY OIL OR GREASE TO JOHNSON JOINTS. THE SATURATED STEAM, CONDENSATE OR LIQUID PASSING THROUGH IS THE ONLY LUBRICATION REQUIRED FOR THE CARBON-GRAPHITE PARTS.

MINIMIZE RUNNING JOHNSON JOINTS DRY. EXCESSIVE CARBON SEAL WEAR MAY OCCUR.

CAUTION

Check the rotary joint regularly to determine carbon seal ring wear using a seal ring wear indicator Seal wear indicator tools am available from Johnson Refer to installation drawing for seal ring wear check procedure Should the seal ring (M) war away completely, the metal nipple can wear through into the joint body or marring plate. and eventually through it requiring extensive part replacement

JOHNSON

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ALIGNING JOHNSON JOINTS

Self-supported rotary joints such as Series W, S, SN, ELS, and ELSN are supported internally and do not require aligning during installation. However, bracket mounted and rod-supported rotary joints should be aligned to the centerline of the journal in order to realize maximum leak-free service.

After the joint is attached to the journal and loosely bolted to the support bracket you should check the alignment with a simple gauge made from common welding rod.

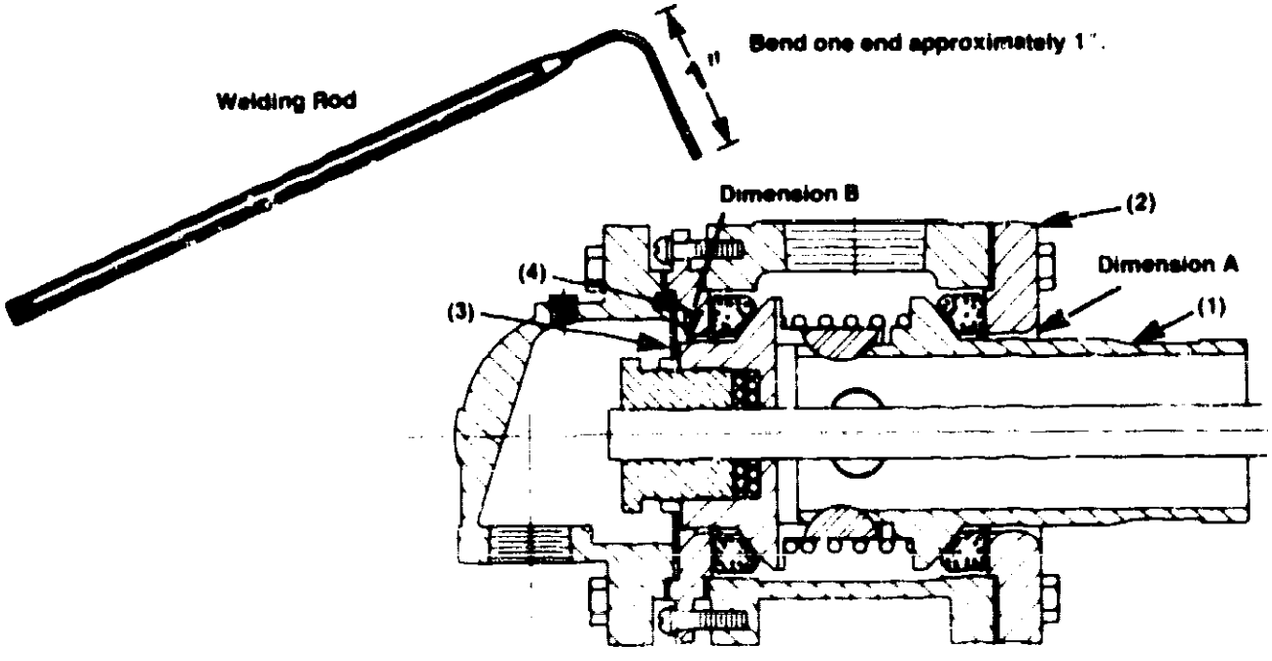
On Table 1, you will find the gauge diameter listed for each size rotary joint. As shown below, bend one end 90° approximately 1" from the end.

ROTARY **JOINT CLEARANCE RELATION CHART**
N-JOINTS

Size	A (Inboard) Nipple/Wear Plate	Gauge Size	B (Outboard) Thrust Collar/ Assembly Plate	Gauge Size
3/4"-2200	1/16	1/32	3/32	1/16
1"-2300	3/32	1/16	3/32	1/16
1 1/4"-2400	1/16	1/32	3/32	1/16
1 1/2"-2500	3/16	1/8	532	1/8
2"-2550	1/8	3/32	1/8	3/32
2 1/2"-2600	1/8	3/32	5/32	1/8
3"-2700	1/8	3/32	1/8	3/32
3 1/2"-2750	1/8	3/32	5/16	1/4
4"-2800	1/4	3/16	1/4	3/16
5"-950	1/2	3/8	1/16	3/8
6"-1000	1/4	3/16	1/4	3/16
7 1/2"-1075	1/8	3/32	1/2	7/16
8"-1100	1/4	3/16	1/4	3/16

Then using the appropriate size gauge check the clearance around the nipple tube (1) where it passes through the body opening (2) followed by a check where the thrust collar (3) protrudes through the assembly plate (4).

Since both parts (nipple tube and thrust collar) rotate, the body housing must be centered around the rotating components. To achieve this alignment may require shimming or readjustment of the rotary joint support mechanism.



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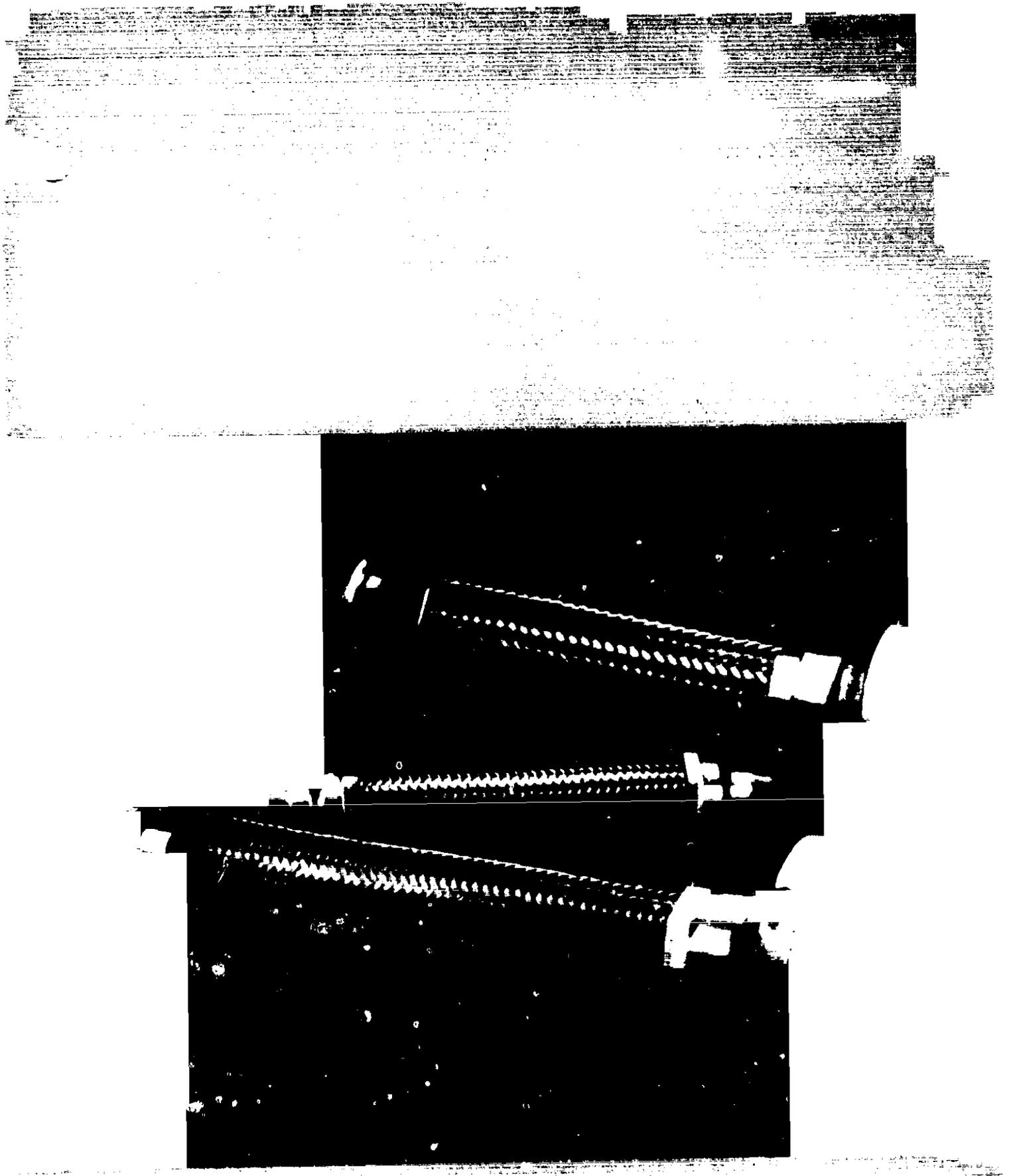


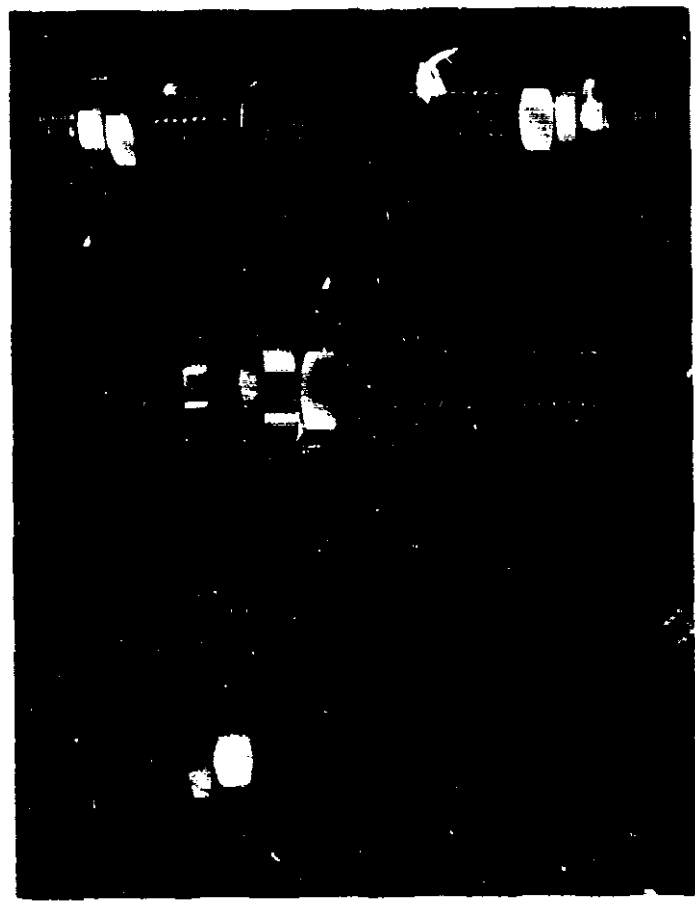
Flexible Metal Hose

For use with Johnson Rotary Pressure Joints...and for all types of piping systems

Johnson Flexible Metal Hose has been engineered especially for use as inlet and outlet connections to Johnson Rotary Pressure Joints. It keeps pipe strains from crowding the joint, and does not restrict the joint's built-in flexibility. It can serve also in many other types of piping systems, wherever misalignment or expansion presents a problem.

This flexible hose is all-metal construction, either bronze or 300 Series stainless steel. Stainless steel hose is recommended for use with hot heat transfer oils, Dowtherm. General Electric Silicone Fluids, Mobiltherm. Monsanto Therminol Fluids, Ucon and similar liquids and vapors Johnson Flexible Hose has a corrugated liner. fully armored with metal braid. Bronze hose has bronze sleeve and steel nipple: stainless steel hose has steel sleeve and steel nipple. Couplings are double brazed to hose to make this joint stronger than the hose itself. Each individual length is given a hydrostatic test at double the maximum operating pressure.

Johnson Flexible Hose is available in sizes from ¼ to 8 inches, with couplings threaded. flanged or in combination. Tables on these pages list the recommended minimum length for each size; other lengths can also be furnished on application. Flexible hose listed can be ordered simply by using the catalog numbers in the tables; they specify material, size. length. and type Of coupling. as explained below.



EXPLANATION OF CATALOG NUMBERS

The letters and numbers which make up the Catalog Numbers for Johnson Flexible Metal Hose Identify all details of size and construction. The example below will explain.

FH-B-150-18-FFLF-02

Product

Construction

Size

025	¼	200	2
038	⅜	250	2½
050	½	300	3
		400	4
100	1	500	5
125	1¼	600	6
150	1½	800	8

Length
(in inches)

Couplings

FF Threaded both ends

FL Threaded one end, Lap Flange one end

FFLF Fixed Flange one end, Lap Flange one end

Series
Indicates current production of this catalog number

Threaded Both Ends

NOTE ON BRONZE HOSE:
Hose, braid and hex collars are bronze. Fittings are carbon steel.

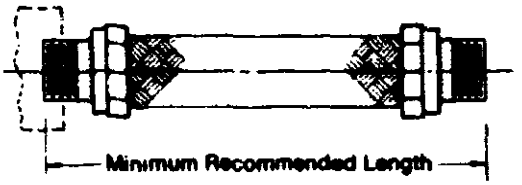


Figure 3

NOTE ON STAINLESS STEEL HOSE:
Hose and braid are stainless steel. Fittings are carbon steel.

BRONZE HOSE

Catalog Number	SIZE (Inches) Pipe Size and Recommended Minimum Length*
	1/4 x 12
	3/8 x 12
	1/2 x 12
	3/4 x 12
	1 x 15
	1 1/4 x 18
	1 1/2 x 18
	2 x 21
	2 1/2 x 22
	3 x 24
	4 x 28
	5 x 30
	6 x 33
	8 x 36

STAINLESS STEEL HOSE

Catalog Number	Maximum Pressure (psig) at: 400°F	500°F	600°F	650°F
FH-SS-025-12-TT-03	625	600	575	560
FH-SS-038-12-TT-03	550	525	505	490
FH-SS-050-12-TT-03	575	550	525	510
FH-SS-075-12-TT-03	495	465	440	430
FH-SS-100-15-TT-03	440	420	405	390
FH-SS-125-18-TT-03	370	350	330	320
FH-SS-150-18-TT-03	340	320	300	295
FH-SS-200-21-TT-03	335	325	310	300
FH-SS-250-22-TT-01	330	315	305	2%
FH-SS-300-24-TT-01	270	255	240	2%
FH-SS-400-28-TT-01	190	175	170	15.5
FH-SS-500-30-TT-01	220	205	195	1%
FH-SS-600-33-TT-01	195	185	175	170
FH-SS-800-36-TT-01	150	140	135	130

Note: All dimensions shown are approximate only. Certified prints available on request.
**These pressure ratings can be increased under special conditions; consult factory.

*Other lengths available.

Threaded One End
Lap Flange One End

NOTE ON BRONZE HOSE:
Hose, braid and hex collars are bronze. Fittings are carbon steel.

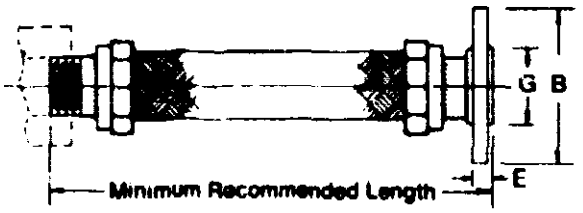


Figure 4

NOTE ON STAINLESS STEEL HOSE:
Hose and braid are stainless steel. Fittings are carbon steel.

BRONZE HOSE

SIZE (Inches) Pipe Size and Recommended Minimum Length*	Catalog Number	Steel Pipe Size	Flange Dimensions (Inches) B	E	G	Bolts No.	Size	Bolt Circle
			3 1/2	11/16	1 3/8	4	1/2	2 3/8
			3 7/8	3/4	1 11/16	4	1/2	2 3/4
			4 1/4	13/16	2	4	1/2	3 1/8
			4 5/8	7/8	2 1/2	4	1/2	3 1/2
			5	15/16	2 7/8	4	1/2	3 7/8
			6	1	3 3/8	4	5/8	4 3/4
			7	1 1/8	4 1/8	4	5/8	5 1/2
			7 1/2	1 3/16	5	4	5/8	6
			9	1 3/16	6 3/16	8	5/8	7 1/2
			10	1 1/4	7 5/16	8	3/4	8 1/2
			11	1 5/16	8 1/2			
			13 1/2	1 1/2	10 5/8	8	3/4	11 1/2

STAINLESS STEEL HOSE

SIZE (Inches) Pipe Size and Recommended Minimum Length*	Catalog Number	Maximum Pressure (psig) at: 400°F	500°F	600°F	650°F
1/2 x 12	FH-SS-050-12-TLF-03	1%	1%	1%	150
3/4 x 12	FH-SS-100-15-TLF-03	150	1150	150	150
1 x 15				150	150
1 1/4 x 18	FH-SS-125-18-TLF-03	1%	150	150	150
1 1/2 x 18	FH-SS-150-18-TLF-03	150	150	150	150
2 x 21	FH-SS-200-21-TLF-03	150	150	150	150
2 1/2 x 22	FH-SS-250-22-TLF-01	150	150	150	150
3 x 24	FH-SS-300-24-TLF-01	150	150	150	1%
4 x 28	FH-SS-400-28-TLF-01	150	150	150	150
5 x 30	FH-SS-500-30-TLF-01	150	150	150	150
6 x 33 x 36	FH-SS-800-36-TLF-01	150	150 140	150 135	130

Note: All dimensions shown are approximate only. Certified prints available on request.

*Other lengths available.

Flexible Metal Hose

Fixed Flange One End
Lap Flange One End

NOTE ON BRONZE HOSE:
Hose, braid and hex collars are bronze. Fittings are carbon steel.

Figure 5

NOTE ON STAINLESS STEEL HOSE:
Hose and braid are stainless steel. Fittings are carbon steel.

BRONZE HOSE

SIZE (Inches) Pipe Size and Recommended Minimum Length*	Catalog Number	Flange Dimensions (Inches) B	E	G	Bolts No.	Bolts Size	Bolts Bolt Circle
½ x 12	[illegible]	3½	11/16	1⅜	4	½	2⅜
¾ x 12	[illegible]	3⅞	¾	1 11/16	4	½	2⅝
1 x 15	[illegible]	4¼	13/16	2	4	½	3⅛
1¼ x 18	[illegible]	4⅝	⅞	2½	4	½	3½
1½ x 18	[illegible]	5	15/16	2⅞	4	½	3⅞
2 x 21	[illegible]	6	1	3⅝	4	⅝	4⅝
2½ x 22	[illegible]	7	1⅛	4⅛	4	⅝	5½
3 x 24	[illegible]	7½	13/16	5	4	⅝	6
4 x 28	[illegible]	9	13/16	6 3/16	8	⅝	7½
5 x 30	[illegible]	10	1¼	7 5/16	8	¾	8½
6 x 33	[illegible]	11	15/16	8½	8	¾	9½
8 x 36	[illegible]	13½	1½	10⅝	8	¾	11¾

STAINLESS STEEL HOSE

SIZE (Inches) Pipe Size and Recommended Minimum Length*	Catalog Number	Maximum Pressure (psig) at: 400°F	500°F	600°F	650°F
½ x 12	FH-SS-050-12-FFLF-03	150	150	1%	150
¾ x 12	FH-SS-075-12-FFLF-03	150	150	150	150
1 x 15	FH-SS-100-15-FFLF-03	150	150	150	150
1¼ x 18	FH-SS-125-18-FFLF-03	150	150	1%	1%
1½ x 18	FH-SS-150-18-FFLF-03	150	150	150	1%
2 x 21	FH-SS-200-21-FFLF-03	150	150	1%	150
2½ x 22	FH-SS-250-22-FFLF-01	150	150	150	150
3 x 24	FH-SS-300-24-FFLF-01	150	150	150	150
4 x 28	FH-SS-400-28-FFLF-01	150	150	150	150
5 x 30	FH-SS-500-30-FFLF-01	150	150	150	150
6 x 33	FH-SS-600-33-FFLF-01	150	150	150	150
8 x 36	FH-SS-800-36-FFLF-01	150	140	135	130

Note: All dimensions shown are approximate only. Certified prints available on request. ○◆ lengths available.

HOW TO USE FLEXIBLE **METAL HOSE with JOHNSON JOINTS**

Flexible hose should be of recommended minimum length (or longer) installed in a neutral position, in a straight plane without being in compression or tension. Hose should be connected directly to joint, but the weight of pipe and fittings should be suitably supported beyond the hose.

Figure 6—Recommended use of flexible hose with rod-supported Johnson Joints, where body lugs are installed vertically

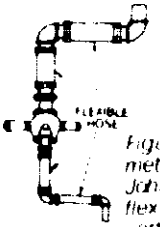


Figure 7—Basic method of installing Johnson Joints with flexible hose in each vertical and horizontal legs

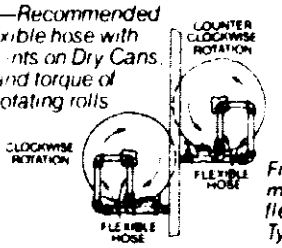


Figure 8—Recommended use of flexible hose with Type S Joints on Dry Cans to withstand torque of counter-rotating rolls

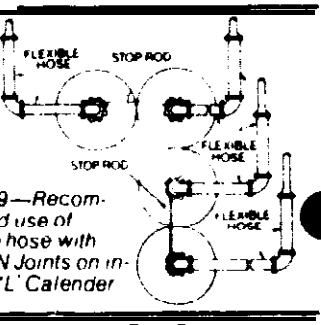


Figure 9—Recommended use of flexible hose with Type SN Joints on inverted 'L' Calender

Wrong Way to Use Hose

In both cases Show" below, expansion and contraction 01 the flexible hose and the piping can put a tension on the joint and crowd it toward the roll Joint must be free to move out away from roll to compensate for seal ring wear.

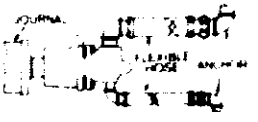


Figure 10—Type S Joint showing incorrect use of hose

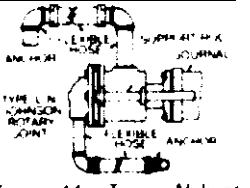


Figure 11—Type L-N Joint showing incorrect use of hose

THE JOHNSON WARRANTY

Johnson products are built to a high standard of quality II performance is what you desire, that is what we provide. The Johnson Corporation warrants to the original buyer that the product will be free from defects in materials and workmanship for a period of one year from date of shipment It is expressly understood and agreed hat the limit of Johnson's liability shall, at Johnson's sole option, be the repair or resupply of a like quantity of nondefective product

REPRESENTATIVES IN ALL **PRINCIPAL CITIES**

Because the selection of proper equipment is so important, there is a factory-trained Johnson District Representative nearby who will gladly discuss your installation without any obligation. With Johnson Offices in more than forty cities you are assured of prompt and intelligent service whenever required.

Johnson Joints are also manufactured in England, Holland, Francs, Argentina, Mexico, Japan and Spain Representatives in principal cities throughout the world.

JOHNSON

THE JOHNSON CORPORATION • 805 Wood St., Three Rivers, MI 49093 • Phone (616) 278-1715 • Cable: JOCO • Telex 0224457
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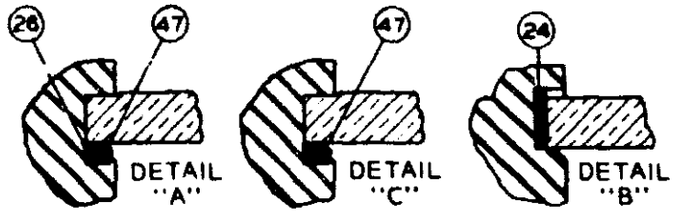
Litho in U.S.A. 4M-3/90

Parker Hannifin Corporation
Cylinder Division
501 South Wolf Road
Des Plaines, IL 60016

Service Bulletin 0995-M1
Piston Seal Kits
Issued: September 1983
Supersedes: March 1977

Piston Seal Kits

(Piston & Cylinder Body Seals) For Series A, 1A, and 2A Air Cylinders

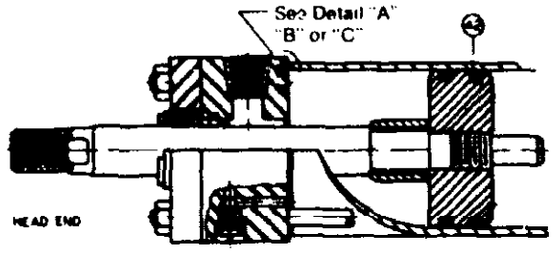


Early Design Series 1A or 2A July 1961 To Oct. 1966

Current Design Series 2A

Old Style Series A June 1961 and before

Piston Seal Kit



Piston Seal Kit

PK kits for Series 1A and 2A cylinders contain 2 each of the following:
- symbol 42, Lipseal, piston
- O-ring, cylinder body to head and cap seal

PK kits for Series A (old style) cylinders contain 1 each of the following:
- symbol 24, cylinder body to head and cap gasket
- symbol 42, Lipseal, piston

NOTE: Detail "A" Backup washers, symbol 26, for all bore sizes of current-design Series "2A" air cylinders, are no longer required When making repairs to existing Series 1A or 2A air cylinders, install only the O-ring seal, symbol 47, at each end of the cylinder body

Service kits of expendable parts for fluid power cylinders are stocked in principal industrial locations across the U.S.A. and other countries. For prompt delivery and complete information, contact your nearest distributor or Parker Hannifin office.

Service kits of expendable parts for fluid power cylinders are available for either Class 1, or Class 5 fluid service

Standard Seals — Class 1 Service Kits are standard, and contain Buna-N seals for standard fluid service These seals are suitable for use when air, or hydraulic oil, water-glycol fluid or water-in-oil emulsions are the operating medium

The recommended operating temperature range for Class 1 seals is -10°F (-23°C) to +165°F (+74°C)

Viton▲ Seals — Class 5 Service Kits contain viton seals and are especially suited for elevated temperature service or for some fire resistant fluids (for specific fluids not listed in Catalogue 1100H or 0900P consult factory) Viton seals (Class 5) should be used for high temperature service within a temperature range of -10°F (-23°C) to 250°F (+121°C) Viton seals may be operated to +400°F (+204°C) with limited service life For temperatures above +250°F (+120°C) the cylinder must be manufactured with a non-studded piston rod end thread and a pinned piston to rod connection

Caution — The piston rod stud and the piston rod to piston threaded connections are secured with an anaerobic adhesive which is temperature sensitive Cylinders specified with vita seals are assembled with anaerobic adhesive having a maximum operating temperature rating of +250°F (121°C) Cylinders specified with all other seal compounds are assembled with anaerobic adhesive having a maximum operating temperature rating of +165°F, +74°C) These temperature limitations are necessary to prevent the possible loosening of the threaded connections Cylinders originally manufactured with Class 1 seals (Buna-N) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service Contact the factory immediately and arrange for the piston to rod and the stud to piston rod connections to be properly re-assembled to withstand the higher temperature service

▲Registered tradename of E I duPont de Nemours & co, Inc

BORE SIZE	PK* PISTON SEAL KIT NOS. FOR SERIES 1A - 2A CYLS.	PK PISTON SEAL KIT NOS. FOR SERIES A CYLS. OLD STYLE	ROD DIA.	GLAND CARTRIDGE WRENCHES PART NO.	SPANNER WRENCHES PART NO.
1"	PK1002 A001	—	1/2"	089680 0000	011676 0000
1½"	PK1502 A001	PK1500 A001	5/8"	089680 0000	011676 0000
2"	PK2002 A001	PK2000 A001	1"	089681 0000	011676 0000
2½"	PK2502 A001	PK2500 A001	1-3/8"	[illegible]	011703 0000
3¼"	PK3202 A001	PK3200 A001	1-3/4"	089683 0000	011677 0000
4"	PK4002 A001	PK4000 A001	2"	089684 0000	011677 0000
5"	PK5002 A001	PK5000 A001	2-1/2"	089685 0000	011677 0000
6"	PK6002 A001	PK6000 A001	3"	089685 0000	011677 0000
7"	PK7002 A001	—	3-1/2"	089687 0000	011677 0000
8"	PK8002 A001	PK8000 A001	4"	089688 0000	011677 0000
10"	PK9002 A001	PK9000 A001	4-1/2"	089677 0000	011678 0000
12"	PK9202 A001	PK9200 A001	5"	089689 0000	011678 0000
14"	PK9402 A001	PK9400 A001	5-1/2"	089690 0000	011678 0000

● numbers listed above identify Class 1 kits, substitute "1" in place of "1" . . last digit of kit number.

Parker Lube-A-Cyl . . .

is recommended for use in air cylinders during normal operation, and particularly when servicing and re-assembling cylinders. It is a multi-purpose lubricant in grease form that provides lubrication without deteriorating effects on synthetic seals. Particularly recommended for use in low pressure air cylinders because of its special ability to adhere to metal surfaces. It produces a thin film which will not blow out with exhaust air. It provides piston, rod and seal lubrication and has excellent resistance to water and mechanical breakdown with temperature range of -10°F (-23°C) to +350°F (177°C). Lube-A-Cyl is packaged in 4-oz "be, a sufficient quantity for average size air cylinder. One application should last for a period of from 6 to 18 months, depending upon service. Lube-A-Cyl is available in 4 ounce tubes. Order by pa" no. 76163.

Servicing The Piston Seals

Piston Seal Kits for old-style Series A cylinders, produced prior to June 1961, contain piston Lipseals and flat gaskets. Old-style cylinders can be identified by observing the cylinder body-to-head joint. See details "A", "B" and "C" on reverse side. On old-style Series A cylinders, shown in detail "B", the O.D. of the cylinder body was not turned down for a pilot into the head. Early design cylinders, Series 1A and 2A, produced prior to October, 1966, are made like detail "A" and have the cylinder body O.D. turned down to provide a pilot fit to head or cap. Current design Series 2A cylinders are made like detail "C", and only the O-ring seal, symbol 47, is required at each end of the cylinder body. PK piston seal kits for Series 1A and 2A contain piston Lipseals and cylinder body O-ring seals.

Disassemble the cylinder completely, remove the old seals and clean all of the parts. The cylinder bore and the piston should then be examined for evidence of scoring. (The light scratch marks usually present on both cylinder bore and piston will generally cause no difficulty.)

Apply Parker "Lube-A-Cyl" to O.D. of piston and to both grooves. Install one piston seal in the groove nearest the rod. The two "lips" of this Lipseal should face toward the rod end of the piston. Coat the inside of the cylinder body with Parker "Lube-A-Cyl" and insert the piston, cap end first, into the cylinder body as shown in (1) below.

Next, turn the cylinder body on its side and push the piston through the barrel just far enough to expose the groove for the second seal. (See 2 below.) Be careful not to move the piston too far so as to expose the first seal. If this is done, the "lip" of this Lipseal may slip past the cylinder body and be damaged when the piston is pulled back into the cylinder body. If the piston should move too far, pass the piston and rod completely through the cylinder body and again start the piston from the original end. Now install the second Lipseal in the exposed groove with the two "lips" facing away from the rod and pull piston into the cylinder body.

The piston is sealed and securely locked to the piston rod with anaerobic adhesive. This threaded connection should only be disassembled or reassembled by factory trained personnel.

Assemble both cap and head, complete with cylinder body seals, to each end of the cylinder body. If the bore diameter is less than 8", thread the gland through the gland retainer, then slip gland and retainer over the end of the rod and pilot gland into the head. Do NOT seat gland against the head until tie rod nuts are tightened to the proper torque (see table below). After nuts are torqued, firmly seat the gland against the head using a gland wrench. If the cylinder bore diameter is 8" or greater, tighten the tie rod nuts to the torques specified in table below and then install the gland retainer plate and gland. Seat the gland against the head using a gland wrench.

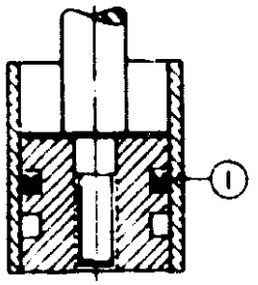
In the case of a "UD" — center trunnion mounted — cylinder, care must be taken to prevent binding the cylinder body when repositioning the trunnion collar. The proper method of assembling this type of cylinder is as follows:

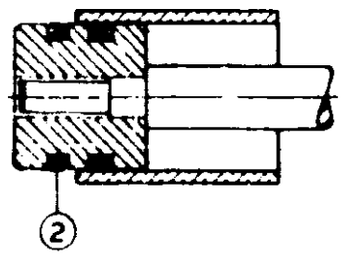
After the piston seals have been inserted, the piston is in the cylinder body to its approximate position. Fit the cap with its seal onto the body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Bring up the four tie rod nuts at the cap. Distances from the inner face of the cap to the finished face of the trunnion collar should then be made equal at all four tie rods when all four tie rod nuts are in contact with the cap.

Finally, when the assembly is ready for final tightening, it may be necessary to adjust the tie rod nuts at the cap when torquing the tie rod nuts at the head in order to position the trunnion collar in its final position.

As a Check to be certain the mount will not interfere with cylinder operation, move the piston by hand to determine whether there is any tendency to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.

NOTE: An extreme pressure lubricant (such as molybdenum disulphate) should be used on the tie rod threads and nut bearing faces to reduce friction and tie rod twist. Tie rod twist can be eliminated by chalking a straight line on each tie rod before torquing and backing off the nut after torquing so this line is straight again. This is particularly important on long-stroke cylinders.





TIE ROD NUT TORQUE - FOOT POUNDS
Series A, 1A, 2A Cyls.

Cyl. Bore	1	1½	2 2½	3¼ 4	5 6	7	8	10	12	14
Brass Body	1	3	6	18	45	80	80	115	150	230
Steel Body	2	5	11	25	60	110	110	150		
Fibre Glass	-	·	·	·	·	—	·	80	80	120

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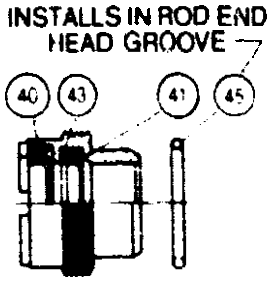
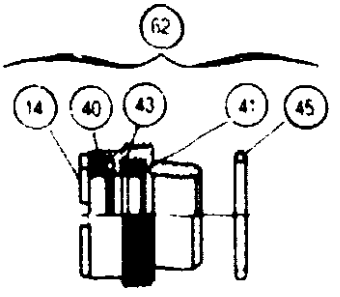
Service Bulletin 0995-M3A
Gland Seal Kits
Issued: October 1990
Supersedes: 0995-M3 of Sept. 1983

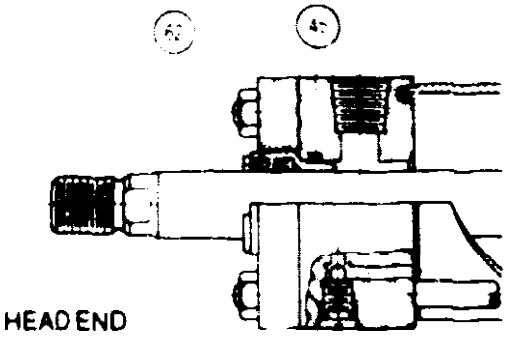
Gland Seal Kits

(Gland Cartridges & Rod Seals)
For Series A, 2A, H, 2H, VH, L, 2L & 3L Air & Hydraulic Cylinders





ROD SEAL KIT
RK kit contains 1 each of the following
symbol 40, rod Wiperseal
symbol 41, rod Lipseal
symbol 43, backup washer for rod Lipseal
symbol 45, O-ring, gland to head seal



GLAND CARTRIDGE KIT
RG (symbol 62) contains 1 each of the following:
symbol 14, gland, threaded cartridge type
symbol 40, rod Wiperseal
symbol 41, rod Lipseal
symbol 45, O-ring gland to MM seal

Service kits of expendable parts for air and hydraulic cylinders are stocked in principal industrial locations across the U.S.A. and other countries. For prompt delivery and complete information, contact your nearest Parker Hannifin distributor Or office.

Standard Seals — Class 1 Service Kits are standard, and contain Buna-N seals for standard air and hydraulic service. These seals are suitable for use when air or hydraulic (mineral-type) oil is the operating medium. The recommended operating temperature range for Class 1 seals is -10 F (-23 C) to +165 F (+74 C)

Class 1 Service Only

	Gland Cartridge Kits (Sym. c62)	Rod Seal Kits
	Class 1 (Std.)	Class 1 (Std.)
Rod Dia.	Buna-N (Nitrile)	Buna-N (Nitrile)
	RG2AHL0051	RK2AHL0051
	RG2AH...0081	RK2AHL0081
1"	RG2AHL0101	RK2AHL0101
1¼"	RG2AHL0131	RK2AHL0131
1½"	RG2AHL0171	RK2AHL0171
2"	RG2AHL0201	RK2AHL0201
2½"	RG2AHL0251	RK2AHL0251
3"	RG2AHL0301	RK2AHL0301
3½"	RG2AHL0351	RK2AHL0351
4"	RG2AHL0401	RK2AHL0401
4½"	RG2AHL0451	RG2AHL0451
5"	RG2AHL0501	RK2AHL0501
5½"	RG2AHL0551	RK2AHL0551

NOTE: The kits listed above do not fit 10" & 12" bore Series H & 2H Hydraulic Cylinders. See Bulletin #0995-M4

How To Replace **Cylinder** Gland Packing

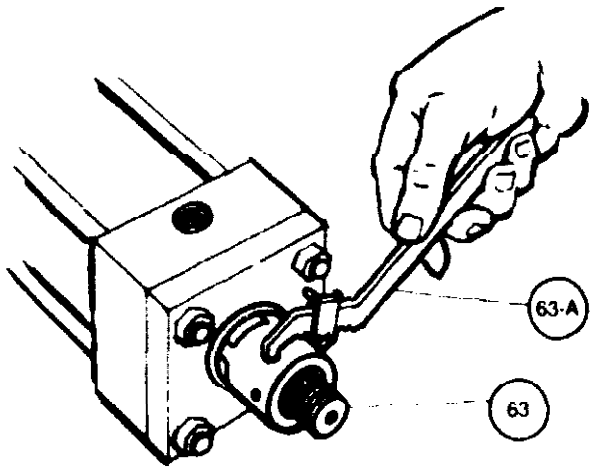
Fluid leakage around piston rod at the gland area will normally indicate a need to replace gland seals. First, remove cylinder from machine to which it is mounted or, if this is not feasible, disconnect the piston rod from rod clevis, knuckle or machine member to which it is fastened.

The Parker Hannifin "Jewel" gland is a unique cartridge design consisting of a bronze gland, primary lipseal and double lip wiperseal. It is threaded into the gland retainer plate, and all sizes are removable without disturbing the tie rod torque.

To remove the gland

a) Inspect the piston rod to make sure it is free of burrs or other displaced metal which would prevent sliding the gland off the rod.

b) For most cylinders, unscrew the gland (right hand thread) from the gland retainer plate. On 7" and 8" bore series 3H, all JJ mounting styles and 8" bore low pressure hydraulic cylinders remove the socket head cap screws securing the round or square retainer plate. The gland protrudes from the face of the retainer and can be removed with vice grip pliers. Or use a Parker Hannifin gland and spanner wrench shown in the table below.



c) Slide the gland off of the piston rod and remove the seals. Thoroughly clean the gland and seal grooves. Inspect gland bore for wear. If bore is worn, replace — using gland cartridge (RG) kit complete with seals (See opposite side.)

d) If gland is not worn, replace seals only using rod seal (RK) kit (See opposite side.) Lubricate gland seal grooves and all new seals. Install wiperseal Sym. #40 in groove closest to end of gland. Slightly collapse back-up washer, Sym #43, and install in seal groove, make sure it is flat against wall of groove. Install lipseal, Sym. #41, in seal groove. **Lips of seal should point toward the long bearing side of the gland.**

e) An O-ring Sym #45 is supplied with each gland cartridge kit. It served as a seal between the gland and the head. This O-ring is a static seal and does not normally require replacement. The original O-ring may be left in place, unless it is known to be leaking (fluid flow around gland thread).

Retainer Bolt Torque

For Cylinders with Round or Small Square Gland Retainer

Bolt Dia.	Torque
3.16"	15 In. Lbs.
1/4"	60 In. Lbs.
5/16"	10 Ft. Lbs.
3/8"	20 Ft. Lbs.
7/16"	35 Ft. Lbs.

Gland Cartridge Wrenches

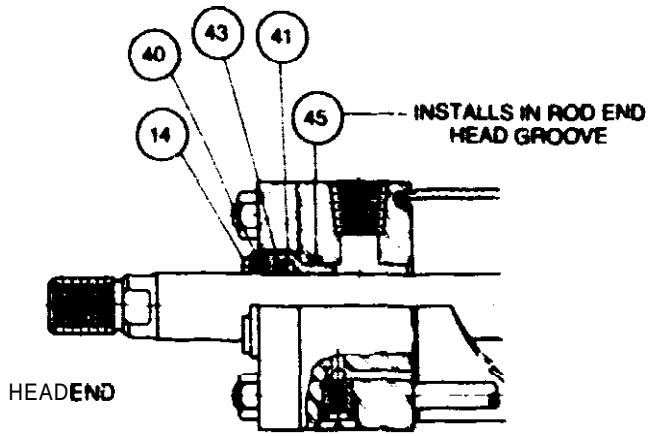
Rod Dia.	Gland Wrench (Symbol 63)	Spanner Wrench (Symbol 63-A)	Rod Dia.	Gland Wrench (Symbol 63)	Spanner Wrench (Symbol 63-A)
5/8"	069590 0000	011676 0000	2 1/2"	069595 0000	011677 0000
1"	069590 0000		3"	069596 0000	
1 1/8"	069591 0000		3 1/2"	069597 0000	
1 3/8"	069592 0000	011703 0000	4"	069598 0000	011678 0000
1 3/4"	069593 0000	011677 0000	5"	069599 0000	
2"	069594 0000	011677 0000	5 1/2"	069600 0000	

Installation

Before installing a new gland, inspect the surface of the piston rod for scratches, burrs, dents or other damage. A damaged piston rod surface will result in premature rod seal failure.

Lubricate the bore of the gland and the seals, and slide the gland over the end of the piston rod. Thread the gland into the retainer until it is seated firmly against the head. The gland-to-head O-ring, Sym. #45, serves as a torque prevailing lock.

THE SEALS ARE PRESSURE ACTUATED, SO NO FURTHER ADJUSTMENTS ARE NECESSARY.



When replacing a gland on a rod which is threaded to the full diameter or so shaped that it could damage the seals, a slight rotary motion of the gland will help prevent damage. In addition, because full-diameter threads are usually supplied with the crest of the threads slightly truncated, a piece of shim stock or other thin, tough material can be wrapped around the threads to help protect the gland seals when they are being passed over the threads.

Cyl. Bore Size	Tie Rod Torque (Ft. Lbs.)				
	Series A-1A & 2A Cyl. Cylinder Body Material			Series L 2L & 3L Cyl.	Series H-2H VH Cyl.
	Brass	Steel	Fiber-Glass		
1"	1	2	—	2	—
1 1/2"	3	5	—	5	18
2"	6	11	—	11	45
2 1/2"	6	11	—	11	45
3 1/4"	18	25	—	25	120
4"	18	25	—	25	130
5"	45	60	—	60	310
6"	45	60	—	L-2L=244 3L=60	525
7"	—	—	—	—	790
8"	80	110	—	L-2L=513 3L=110	1160
10"	115	150	80	—	—
12"	150	175	80	—	—
14"	230	—	120	—	—

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