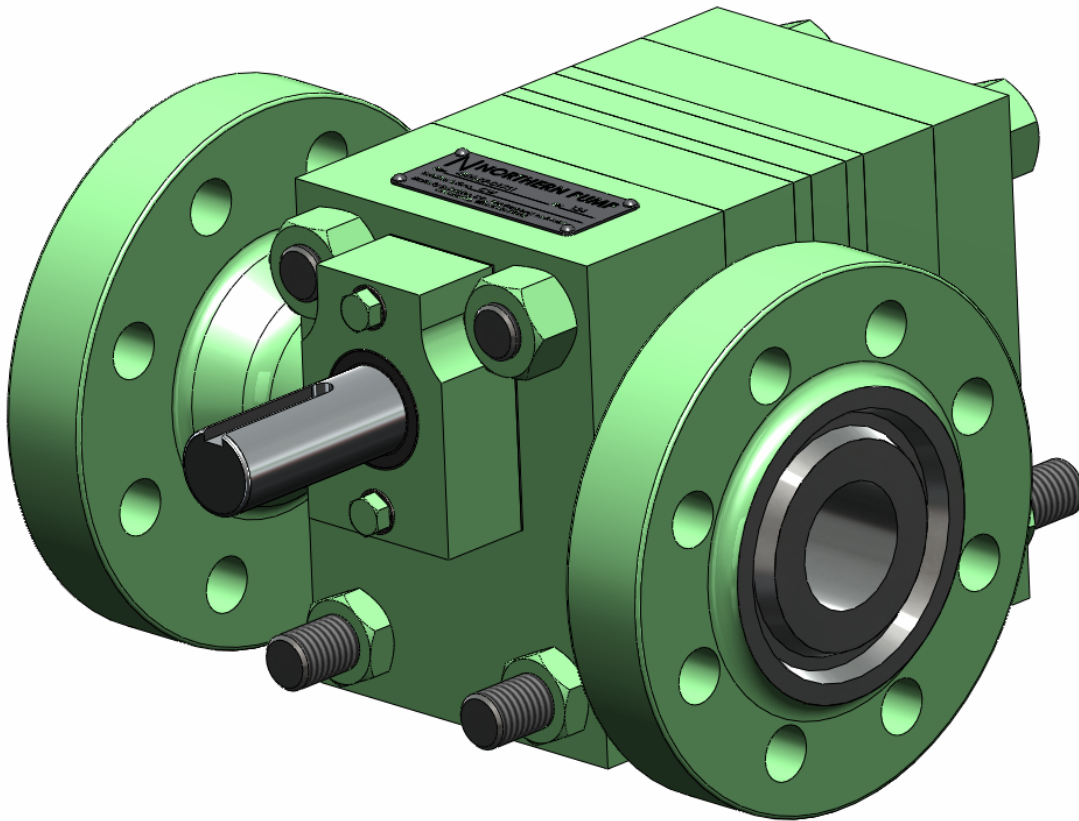




Special Field Maintenance Manual

Northern® Pump Model 4800-07-D1761

REVISION 2.0



Northern® Pump

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Cautionary Statements

Failure to heed these cautionary statements may result in personal injury and/or damage to equipment.

1. Disable and lock-out the drive system before any work is done to install, maintain, or remove the pump.
2. Fully depressurize the entire system.
3. Close the valves closest to the pump in both the suction and discharge pipe.
4. Wear protective eyewear, fire retardant clothing, gloves and any other required face and head protection.
5. When handling corrosive, caustic, toxic, or hazardous liquids, wear appropriate protective clothing to prevent contact with skin.
6. Wear protective footwear such as safety shoes.
7. When handling liquids with toxic vapors, wear a properly rated breathing mask.
8. Work area must always be properly ventilated.
9. Work area must be properly grounded.
10. Do not work alone.
11. Clean up any spilled liquid immediately.
12. Consult your company safety policy or program to ensure compliance with all requirements for work permits, risk assessments, and any additional safety requirements.



Required Tools and Equipment

1. Inventory all pump related items. You will need the following to complete the installation –
 - Calibrated Torque Wrench capable of measuring 240 foot pounds with a 1.437” deep well and shallow socket.
 - Calibrated 0-1” Micrometer, capable of reading increments of .0001”
 - Grease gun filled with all purpose grease. The recommended grease for use during assembly and lubricating the mechanical seal support bearing on Northern® Heavy Duty Gear Pumps is Mobilgrease 28, or comparable synthetic grease that meets a similar standard.
 - Snap Ring Pliers with range suitable for 1.375” nominal shaft diameter external snap ring.
 - Tool kit containing basic hand tools, wrenches and pliers.
 - 1.437” open end or combination wrench
 - 1.437” box end or combination wrench
 - Rubber mallet or soft faced dead blow hammer
 - .500 to .625” diameter brass drive rod measuring at least 12” in length.
 - Shop towels or rags.
 - Clean and suitable work surface or bench.
 - Spill and fire protection equipment.
 - Genuine factory spare parts kit provided by Northern® Pump
 - Northern® Bulletin 130- Special Field Maintenance Manual for Northern® Pump Model 4800-07-D1761
 - Allen Wrench Set with range of ANSI inch and metric sizes



PRE-Assembly Instructions

Use of Shall, Will, Should, and May.

Shall- Establishes a mandatory requirement to complete this task

Will – Establishes a mandatory requirement to complete this task

Should – Establishes a recommendation that unless otherwise unattainable, complete task

May- Establishes an optional condition to be completed at the discretion of the assembler

Use of terms “Tapping”, “Applying Force”, and “Press or Pressing”

Tapping- Refers to threading only! Does not mean using a hammer or any other item to assemble

Applying Force – Establishes the use of discretion by the assembler to apply necessary force required to install, insert, or otherwise assemble components. DOES NOT include the use of a press

Press or Pressing – Allows for the use of a mechanical or Hydraulic Press to insert, install or otherwise assemble components.

Use of the term “Secure”

Secure- Refers to placing parts in protective packaging, on a cart, table or other stable surface until they are required to reassemble.

Separation of “Unique” Parts and Assemblies

The gears and cylinder shall be considered a “Unique” assembly. This means that once they are determined to have a dimension that is suitable for the specified side clearance of the pump, they are to remain with that specific assembly. These parts MUST remain separated from other like parts to avoid repeating of steps to re-verify, or even remanufacture parts because of inadvertent mixing. A tagging system should be used by the assemblers to avoid inadvertent mixing of parts.

Use of the term “Contamination”

Contamination- Refers to debris, chips, oil, grease, or any other foreign material that may inadvertently introduced to the Pump Assembly during processing and operations.

Great care and judgment will be used to ensure that the cleanliness of the assembly is maintained. This includes covering all parts and the bores of the housing at the close of business for all parts and assemblies

Use of the term “Break Loose” and Tighten

Break Loose- Refers to technique of initially loosening bolts of nuts in order to easily remove fastener at a later disassembly step.

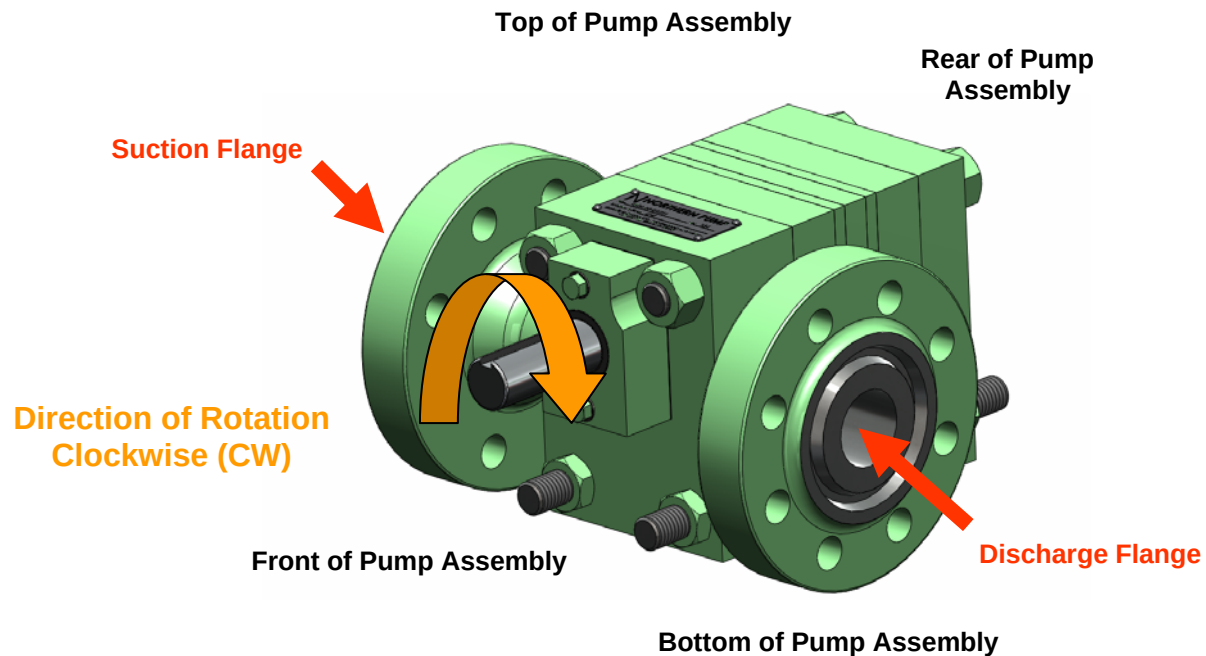
Tighten- Refers to a tightening a fastener that does not have a listed torque specification. This leaves the discretion up to the assembler to use a reasonable and non-excessive amount of force. For all critical fasteners, a torque specification will be listed.

PRE-Assembly Instructions Cont.....

Use of the terms to describe locations on Pump Assembly

Pump Unit Assembly – See Appendix A for list of parts. Generally it describes the Pump with Mounting Base, Motor, Coupling, and fasteners.

Pump Assembly – See Appendix B for list of parts. Generally it describes the Gear Pump and it's internal components.



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Removal of Pump Assembly from Installation

1. Turn off and lock out the drive mechanism.
2. Fully depressurize both the suction and discharge lines to the pump.
3. Close the valve in the suction and discharge lines closest to the pump.
4. Place a pan or other liquid collecting device under the pump to collect the liquid that may drain from the pump or the suction and base plate when assembly is disconnected.
5. Remove and secure all suction and discharge piping flange bolts.
6. Proceed to **Pump Removal and Disassembly Steps**.

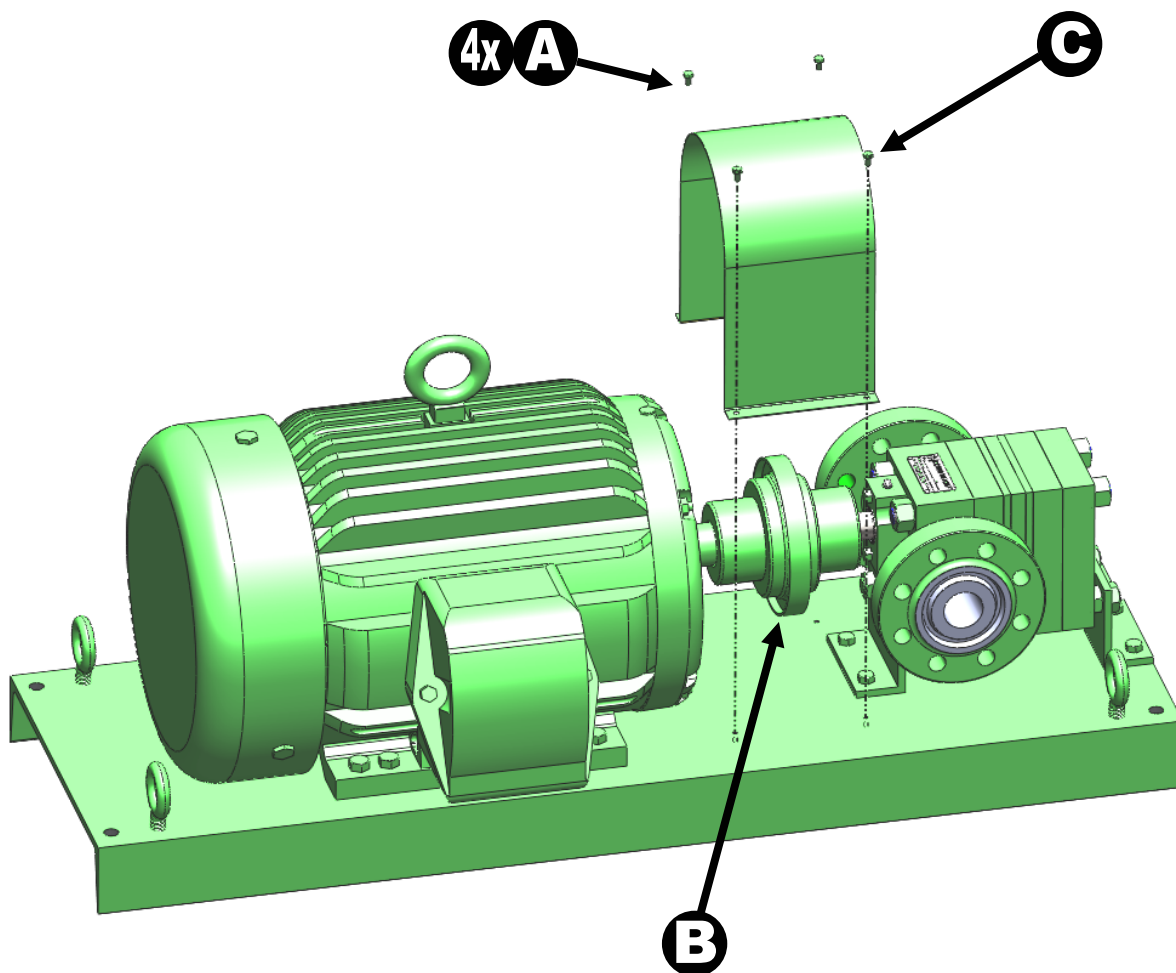
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Pump Removal and Disassembly Steps

Step

1

Remove Coupling Guard (C) from pump unit assembly by removing 4x (A) socket headed cap screws.



Step

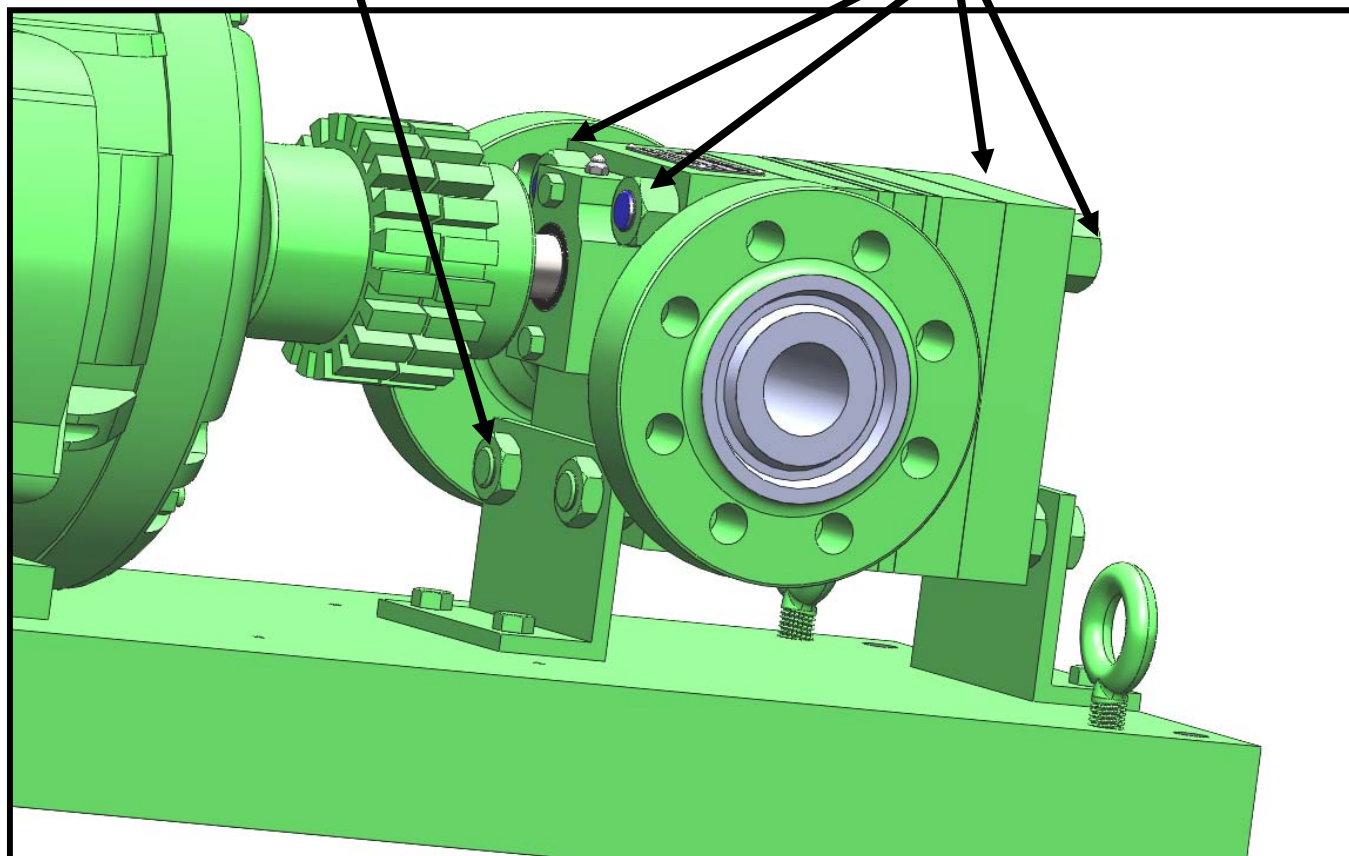
2

Remove Coupling Cover and Grid Assembly (B) by removing socket headed cap screws. (Not Shown in Detail) (See Appendix D) This will allow the pump coupling hub to separate from the motor coupling hub after the mounting brackets are loosened. Secure components and protect grease coated parts from contamination.

Step

3

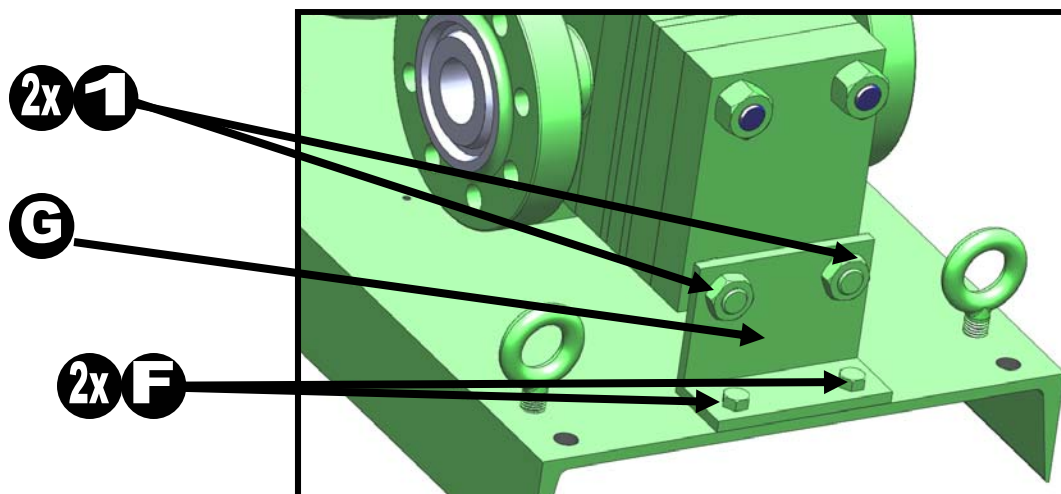
Break loose but do not remove 2x Outer Jam Nuts (1) and 4x Whole Nuts (2).



Step

4

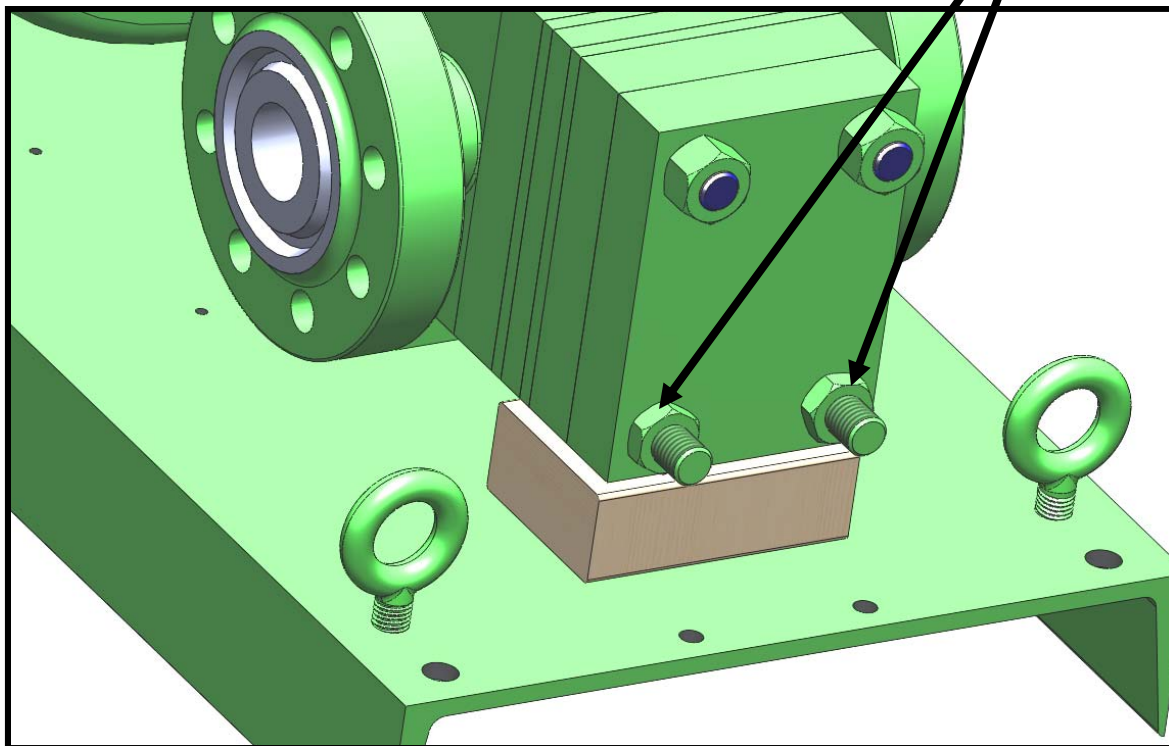
Break loose and remove 2x Outer Jam Nuts (1), 2x Mounting Bracket Cap Screws (F), and Rear Mounting Bracket (G). Note – Support the pump weight with a block of wood or suitable substitute.



Step

5

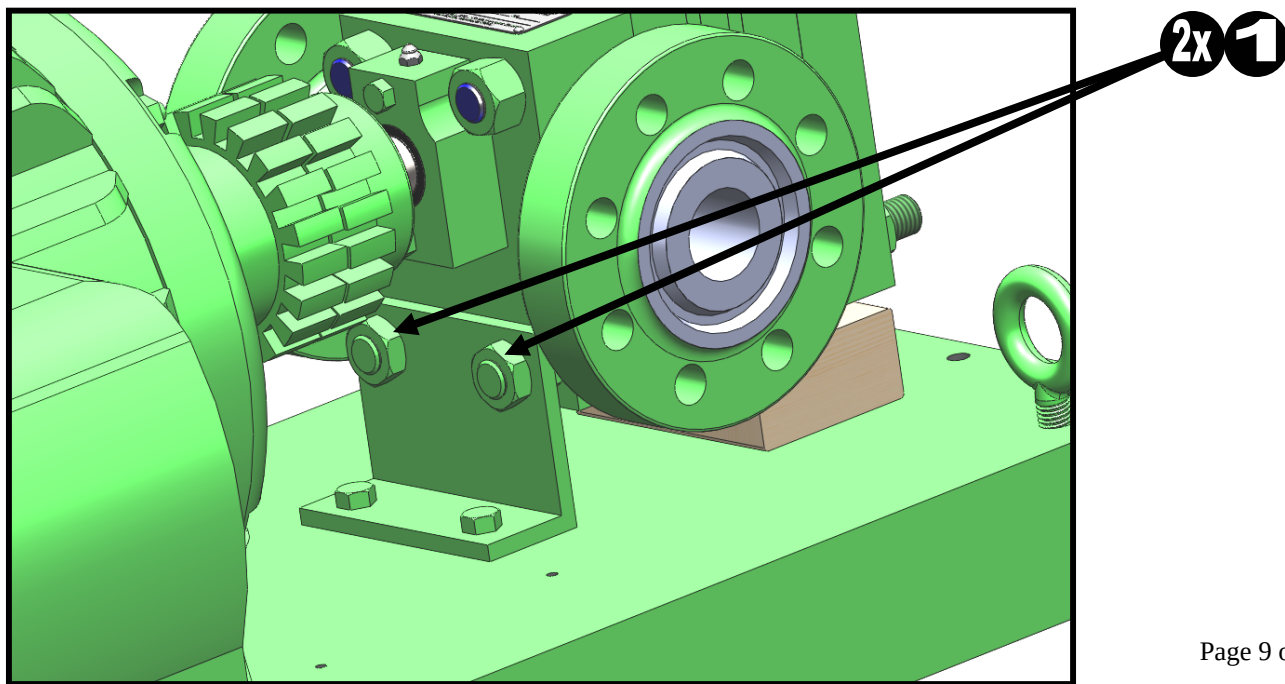
Break loose but do not remove 2x Inner Jam Nuts (1).



Step

6

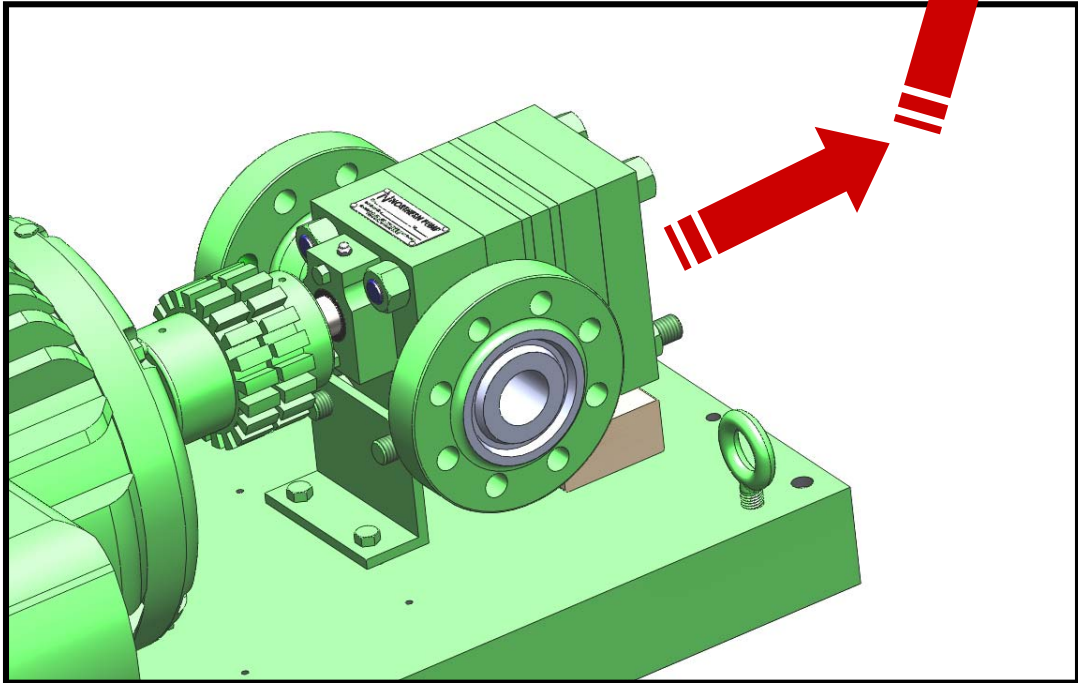
Remove the 2x Outer Jam Nuts (1). The Pump Assembly is now free from the pump unit base.



Step

7

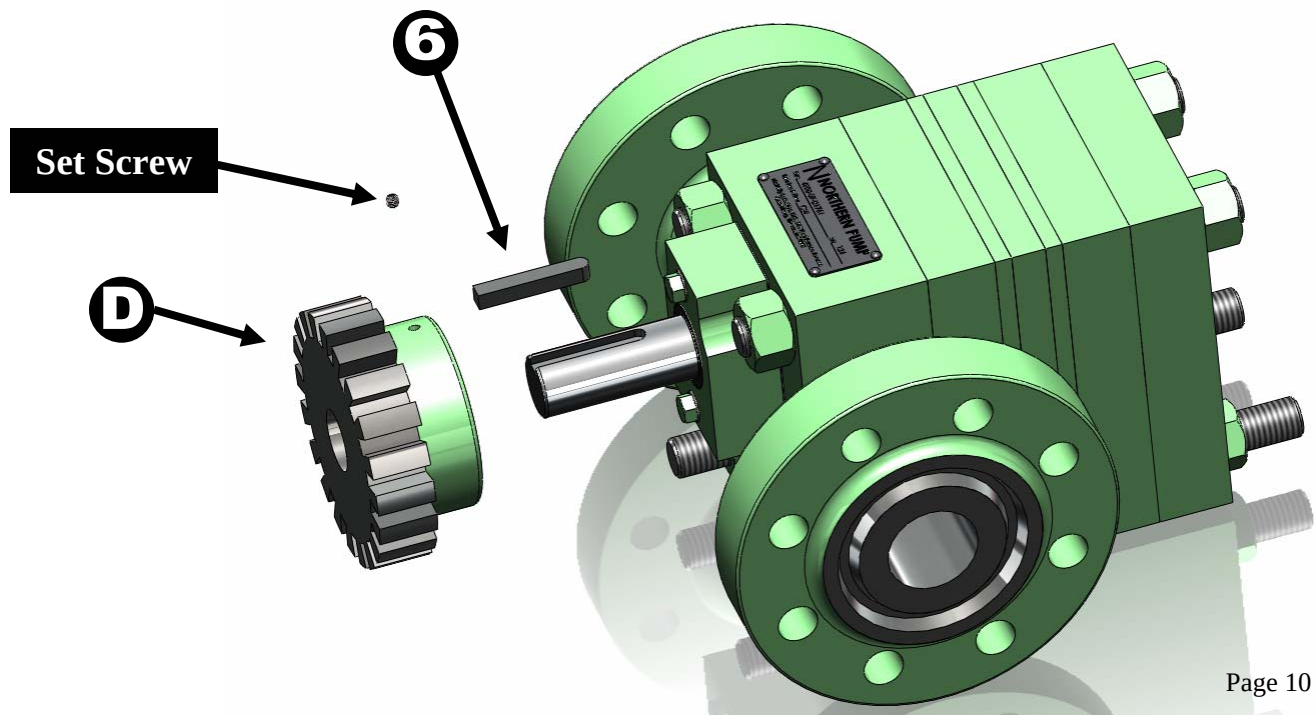
Slide the pump assembly out and off of the front mounting bracket (G) and up away from the motor and unit base. Secure pump assembly on a suitable surface. Use caution as pump assembly is awkward and heavy.



Step

8

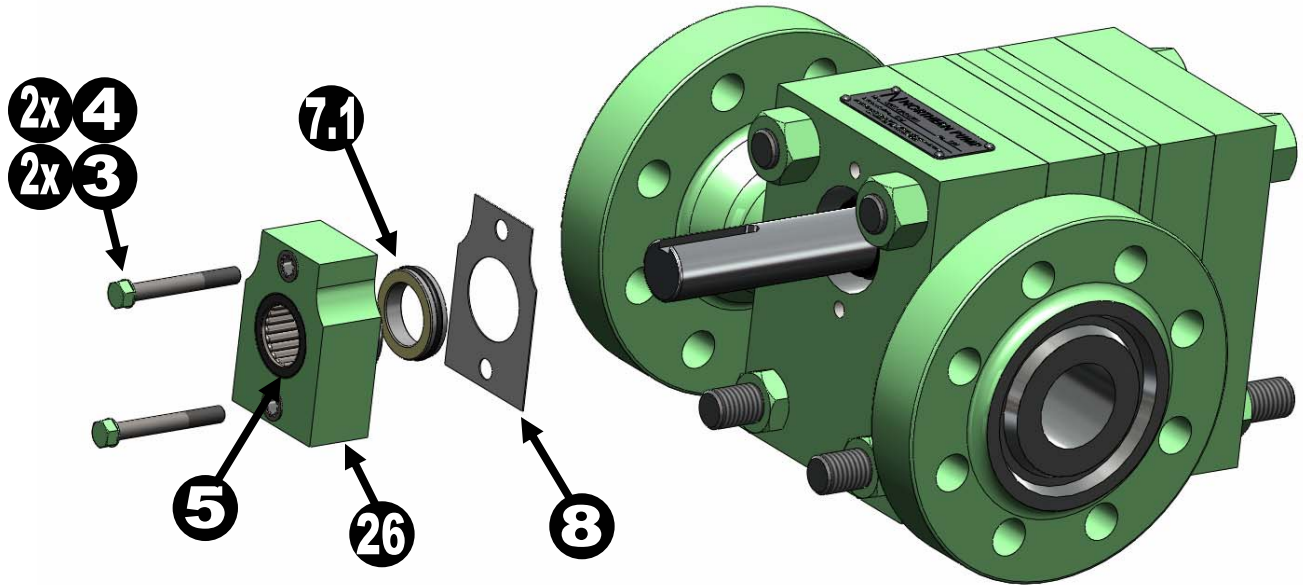
Remove the Coupling Hub (D) from the pump assembly by loosening the set screw and pulling the Coupling Hub (D) off of shaft. Secure Drive Key (6)



Step

9

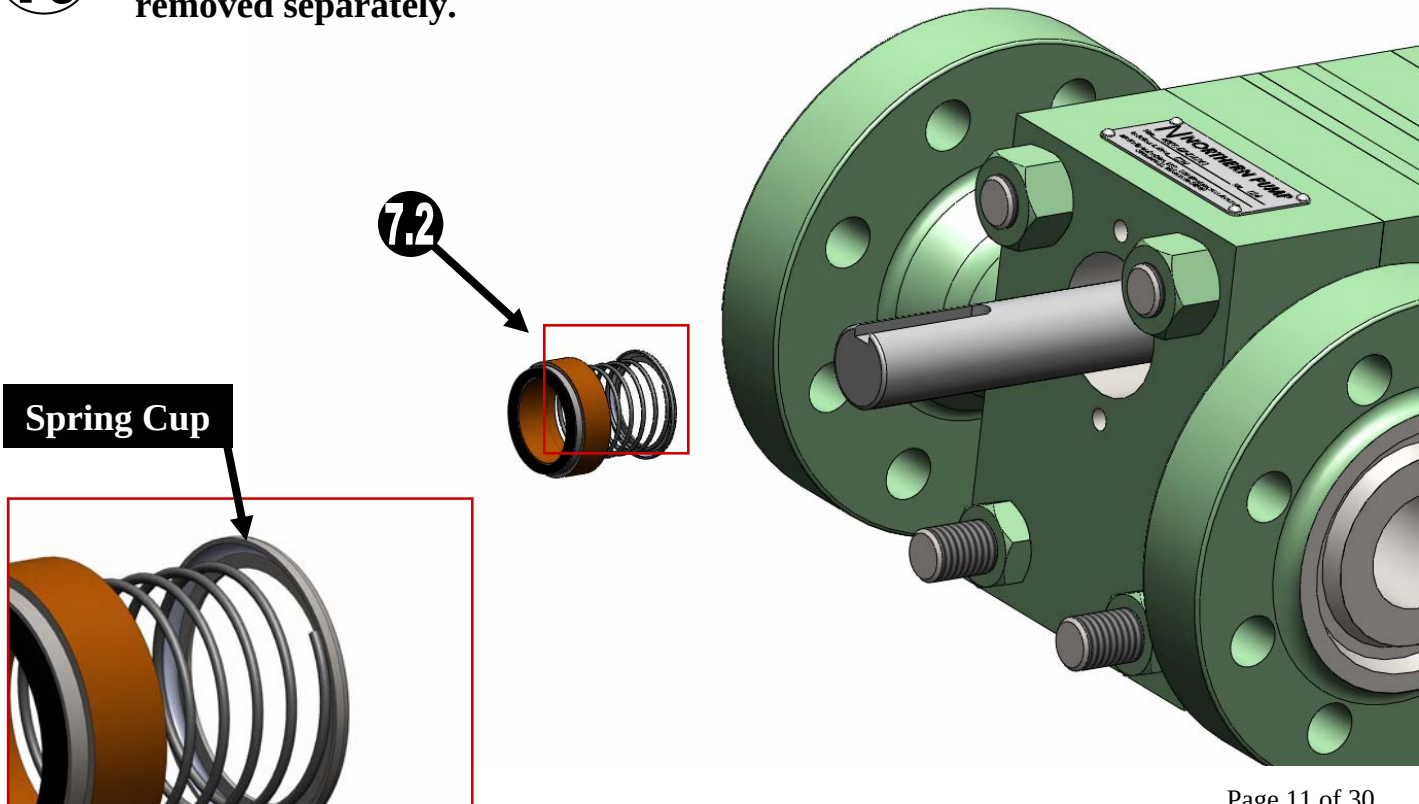
Remove 2x Socket Head Cap Screws (3) and 2x Lock Washers (4) from the assembly. Then remove the Bearing & Seat Housing (26) and Gasket (8). The Seal Support Roller Bearing (5) and Mating Ring (7.1) will remain in the Bearing & Seat Housing. Secure as a unique Assembly.



Step

10

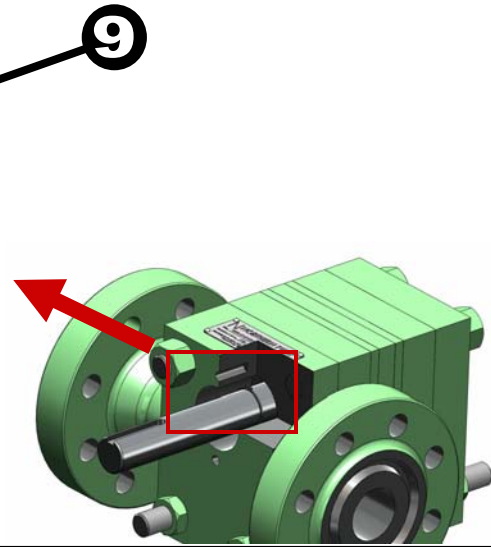
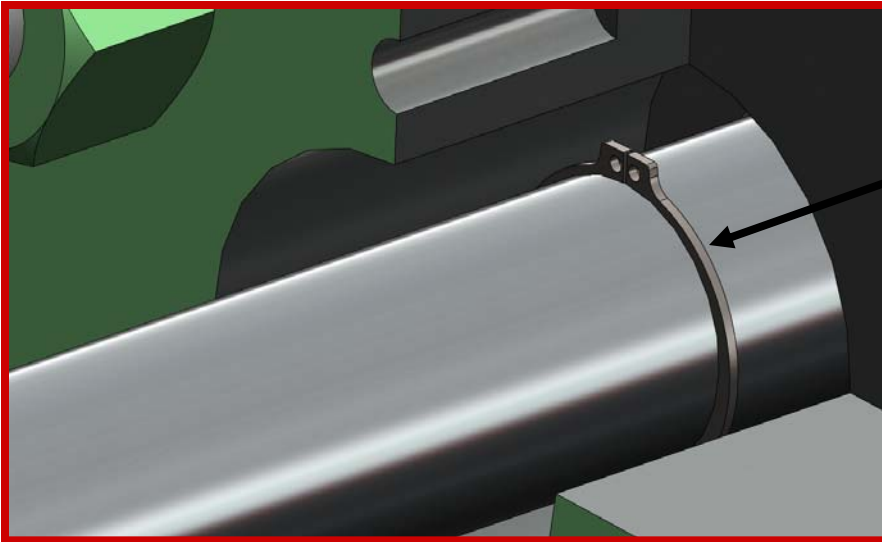
Remove the Mechanical Seal (7.2) (Uncompressed) and the spring cup. The Spring Cup will remain resting against the retaining ring and will need to be removed separately.



Step

11

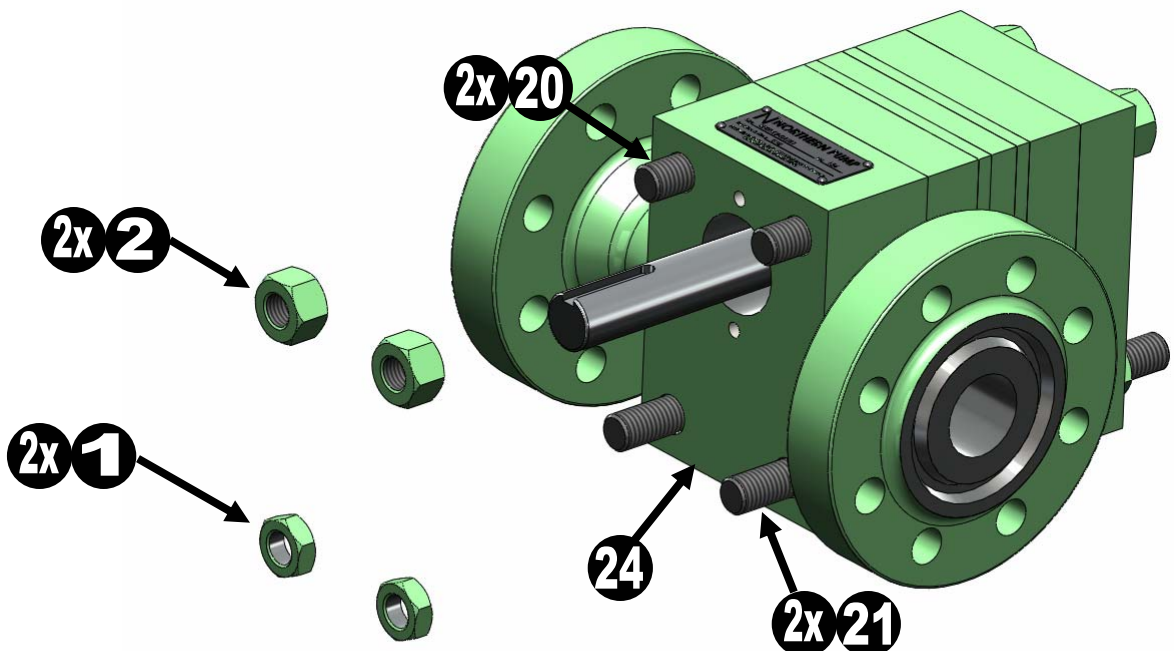
Reach in through the Packing Plate and remove Retaining Ring from shaft groove with appropriate retaining ring pliers or other suitable tool.



Step

12

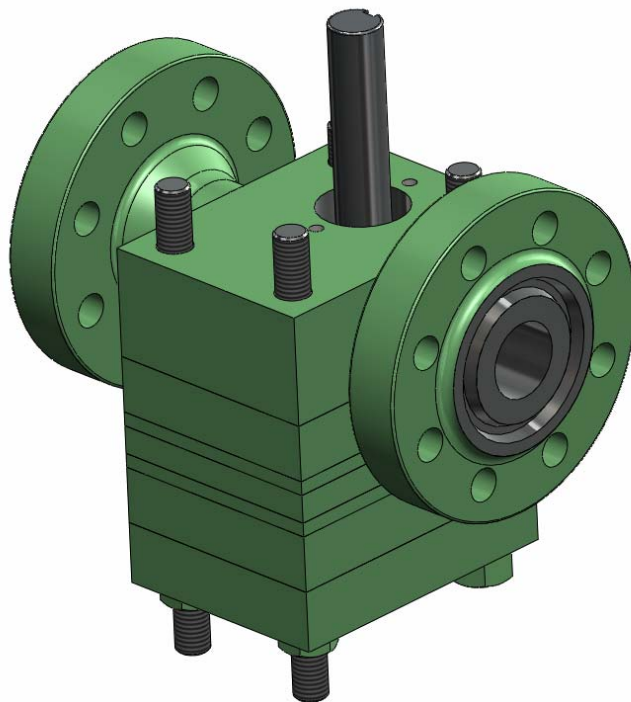
Remove the front 2x Whole Nuts (2) and the front 2x Jam Nuts (1). Do not remove the studs (20) & (21) from the assembly at this time. If required, apply force to the studs with mallet to push them back flush with the front surface of the Packing Plate (24)



Step

13

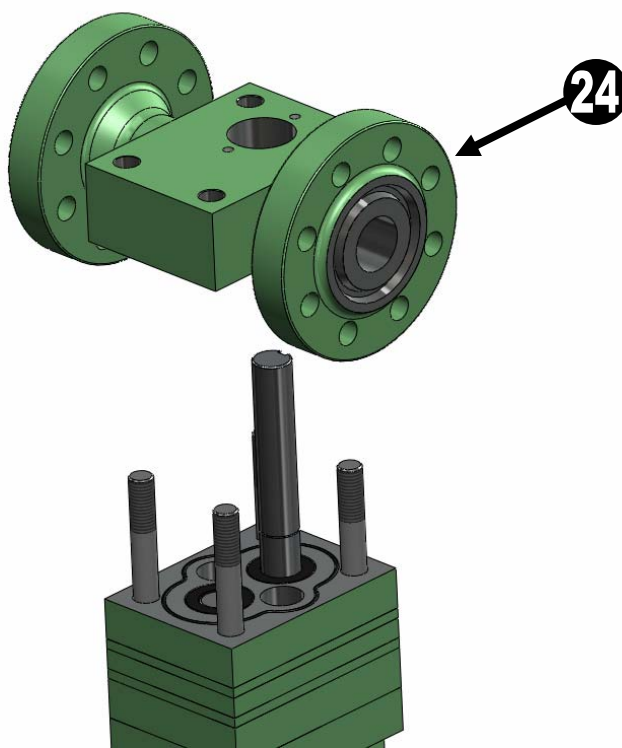
Secure Pump Assembly on a suitable surface or in a vise in an upright position as shown below.



Step

14

Lift the packing Plate (24) up and off of the assembly. Secure plate ensuring that the mating surfaces are properly protected.



Step

15

Remove the Bearing Plate (12) and 2x O-Ring (23). 2x Bearing Washer (11.3) and the 2x Bearing Sleeve (11.2) will remain installed in the Bearing Plate (12). They should not need to be replaced. The Rollers (11.1) may fall out of the bearing Plate (12). This is normal.

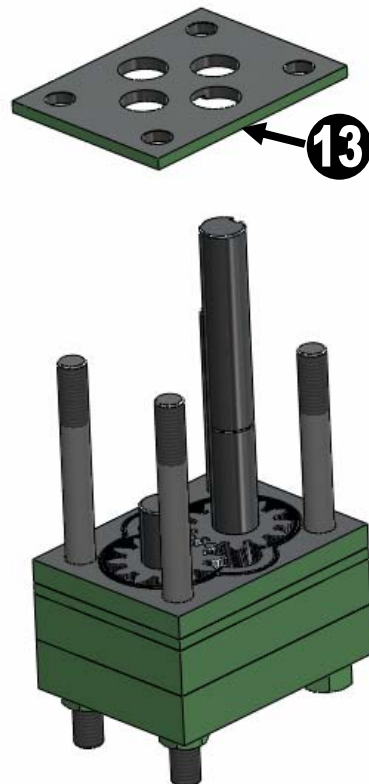
Note- Although Bearing Washers (11.3) and Bearing Sleeves have been included in the spare parts provided, they should not need to be replaced. If there are signs of damage, please contact the Northern® Factory for instructions for how to replace bearing sleeves and washers.



Step

16

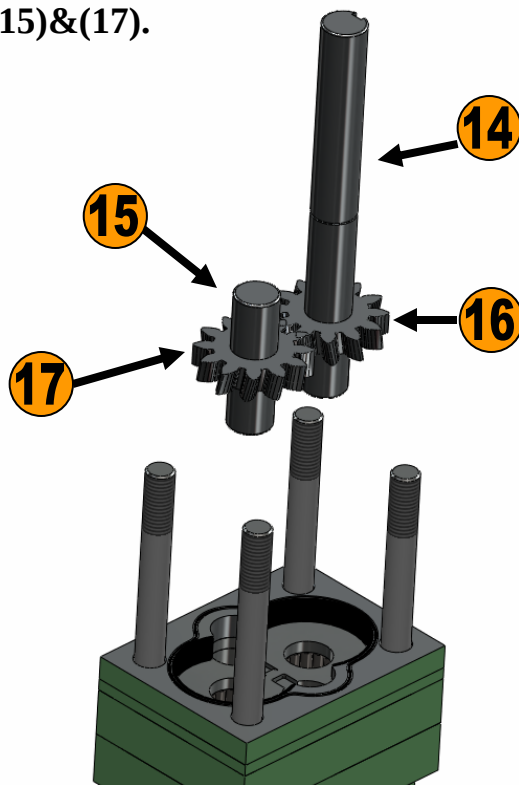
Remove the Front Liner Plate (13). Also remove any O-Rings (23) that were not retained in the Bearing Plate. (12)



Step

17

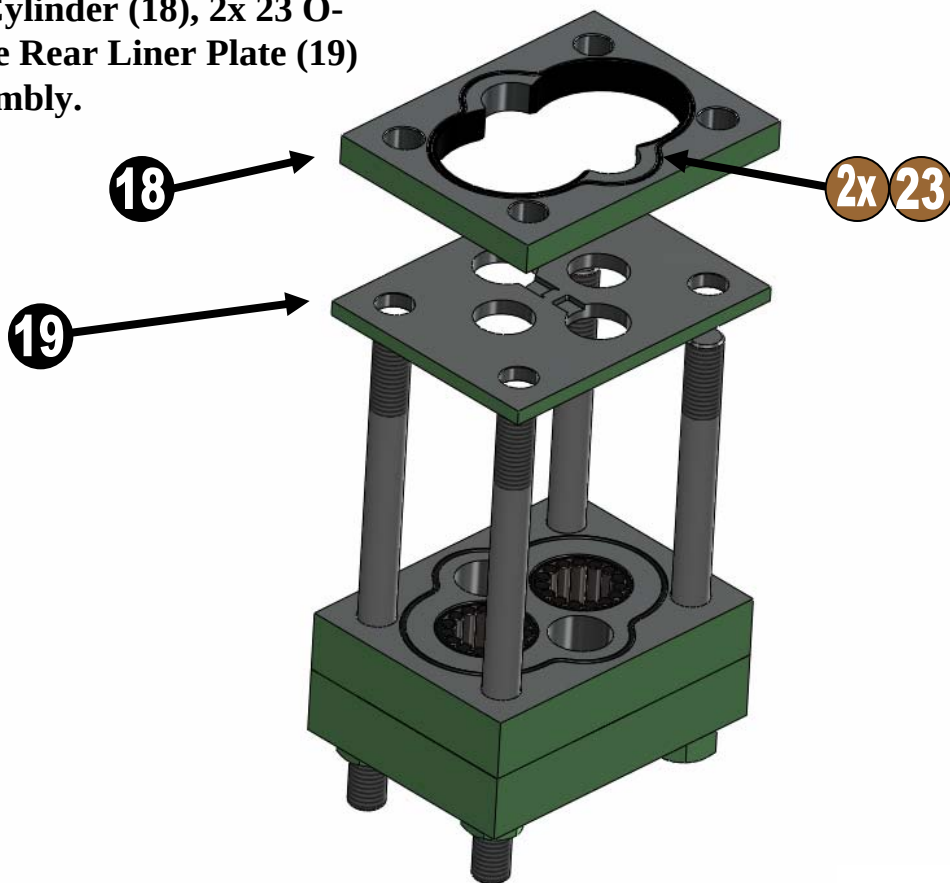
Remove the Drive Gear and Shaft (14)&(16)
and the Driven Gear and Shaft (15)&(17).



Step

18

Remove the Cylinder (18), 2x 23 O-Rings, and the Rear Liner Plate (19)
from the assembly.



Step

19

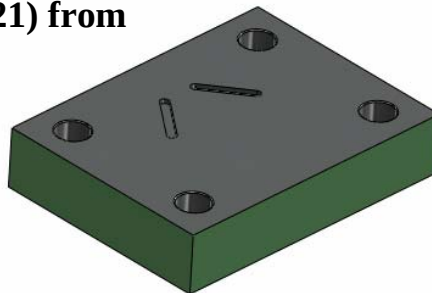
Remove the Rollers (11.1) and then the Bearing Plate (12) with 2x O-Ring (23). The 2x Bearing Washer (11.3) and the 2x Bearing Sleeve (11.2) will remain installed in the Bearing Plate (12). They should not need to be replaced.



Step

20

Remove the End Plate (22) from and separate the studs 2x (20) & (21) from the 2x Nuts (1) & (2).





Inspection

1. Visually inspect all parts for obvious problems- scratches on surfaces that mate with seals, cracks, upset metal that will affect how parts mate together, burrs, or other serious wear. Correct problem or replace part as necessary.
2. Inspect the cylinder for wear:
 - 5.1 Visually inspect the end surfaces of the cylinder. No nicks, burrs, or scratches are allowed on the ends of the cylinder.
 - 5.2 Visually inspect the gear bores for any sign that the gear has contacted the surface of the gear bore. No major nicks, scratches, grooves, or galling is allowed on the gear bore surface. If any of these conditions exist, check the gear outer diameter, shaft bearing diameter, and bearing bore diameter for wear and replace as necessary.
3. Inspect the Packing Plate:
 - 6.1 Visually inspect the seal adapter plate for nicks, scratches, or burrs on the mating surfaces. No nicks, scratches, or burrs that will affect the mate-up of the parts at assembly or that will affect the ability of the O-ring to properly seal are allowed.
7. Inspect the Bearing & Seat Housing
 - 7.1 Inspect the bearing (5) and bore. No scoring or other abnormal wear patterns are allowed. If necessary, the bearing may be pressed out of the Bearing & Seat Housing and replaced by pressing in a new one.

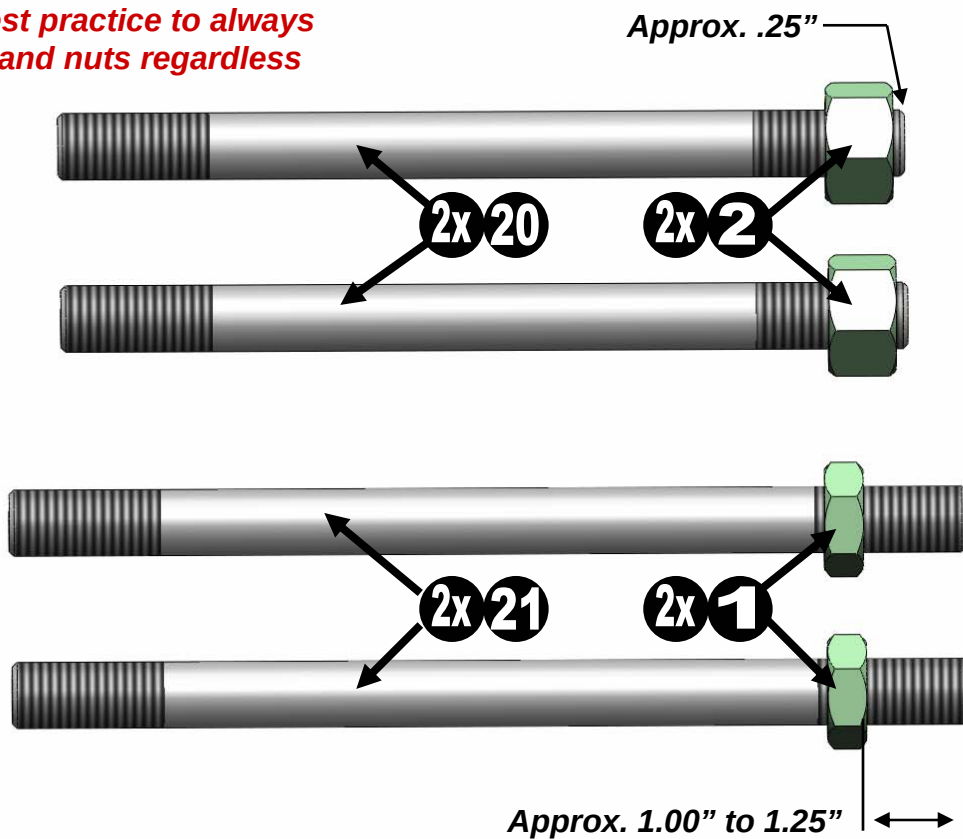
Pump Assembly

1. Visually inspect all parts for obvious problems- scratches on surfaces that mate with seals, cracks, upset metal that will affect how parts mate together, burrs, or other serious wear. Correct problem or replace part as necessary.
2. Proceed to Pump Assembly Steps. Note- Drive shaft & gear should turn freely after completion of assembly.

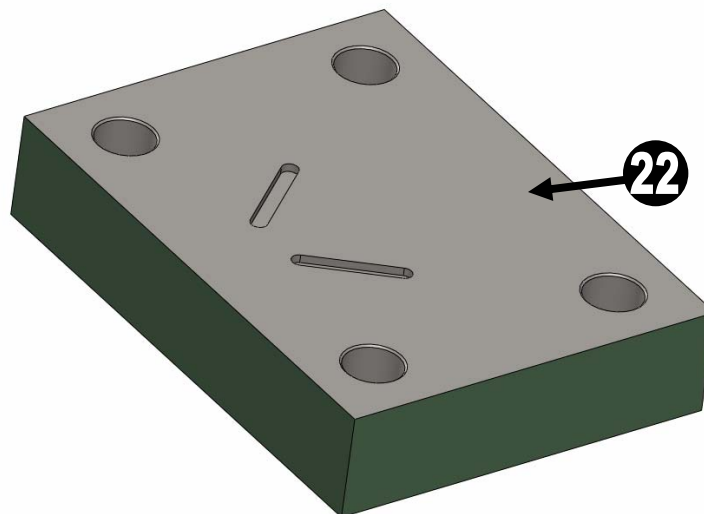
Pump Assembly Steps

Step 1 Thread 2x Jam Nuts (1) on to 2x Studs (21) and 2x Whole Nut (2) on to 2x Studs (20) as shown below. Set parts aside and secure.

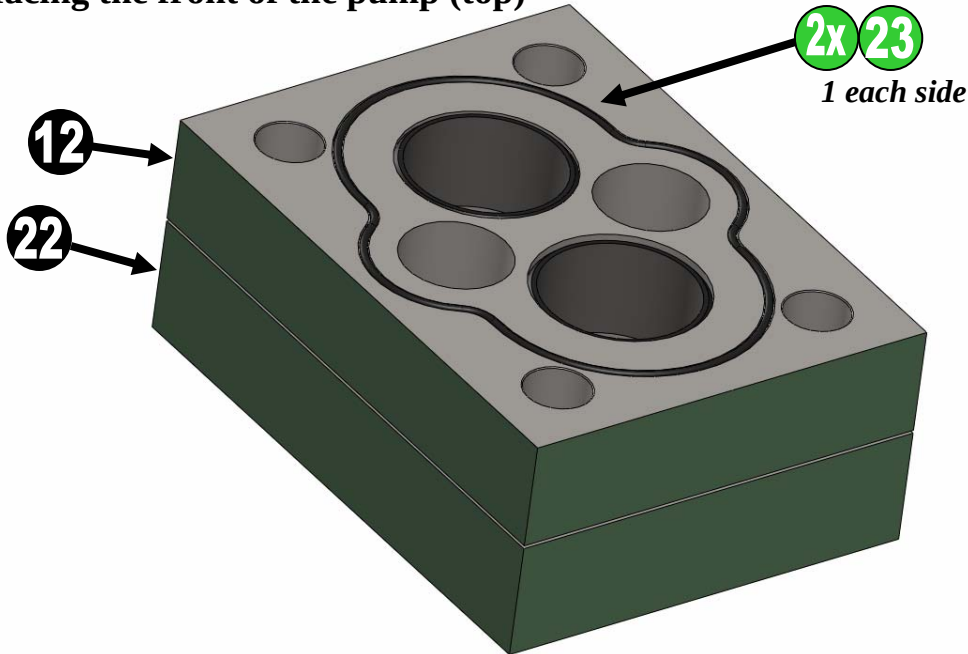
Note- It is a best practice to always replace studs and nuts regardless of condition.



Step 2 Place End Plate (22) on a suitable and solid surface as shown below.



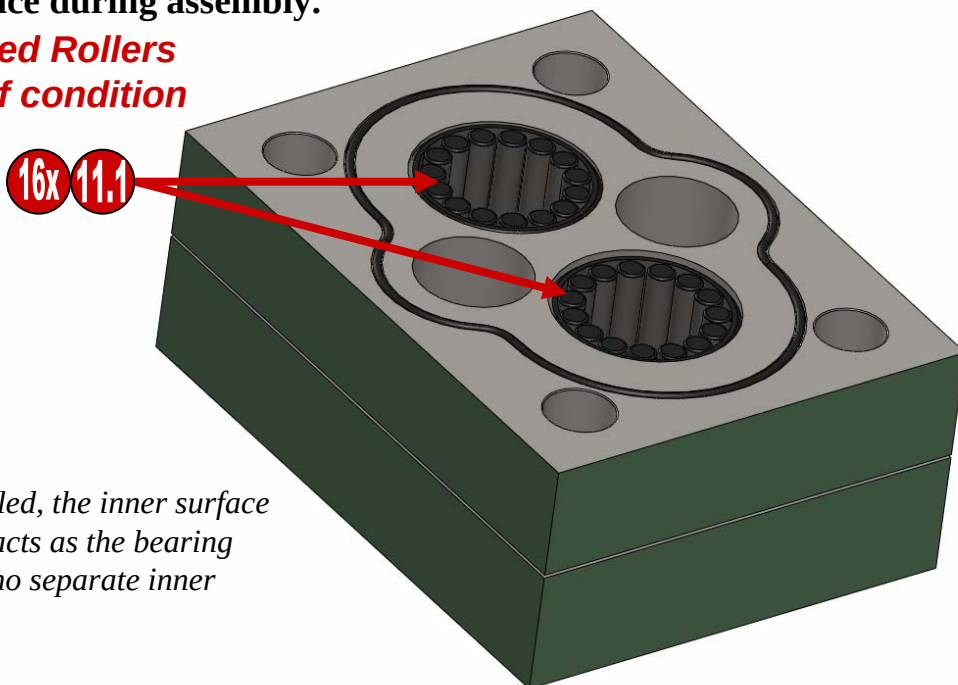
- Step 3** Coat 2x O-Rings (23) with grease. Place 1 O-Ring (23) in groove on the side of the Bearing Plate (12) that will end up facing the rear of the pump (Down). In one smooth motion, place Bearing Plate (12) on top of End Plate (22), ensuring that the O-Ring (23) stays in the groove. Once Bearing Plate (12) is resting on top of the End Plate (22), place second O-Ring (23) in the groove facing the front of the pump (top)



- Step 4** Place 16x Rollers (11.1) in each of the bearing Sleeves (11.2) Coat bearings and sleeves with a generous amount of grease to lubricate for start up and to hold in place during assembly.

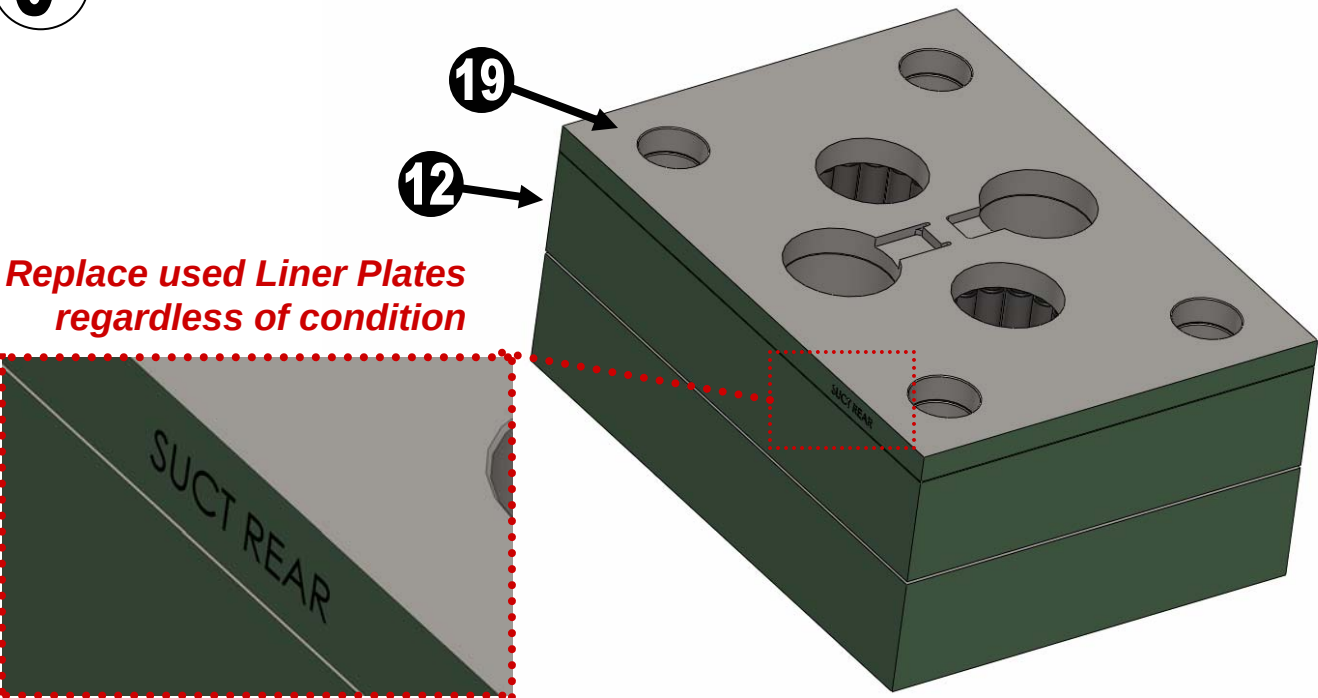
Replace all Used Rollers regardless of condition

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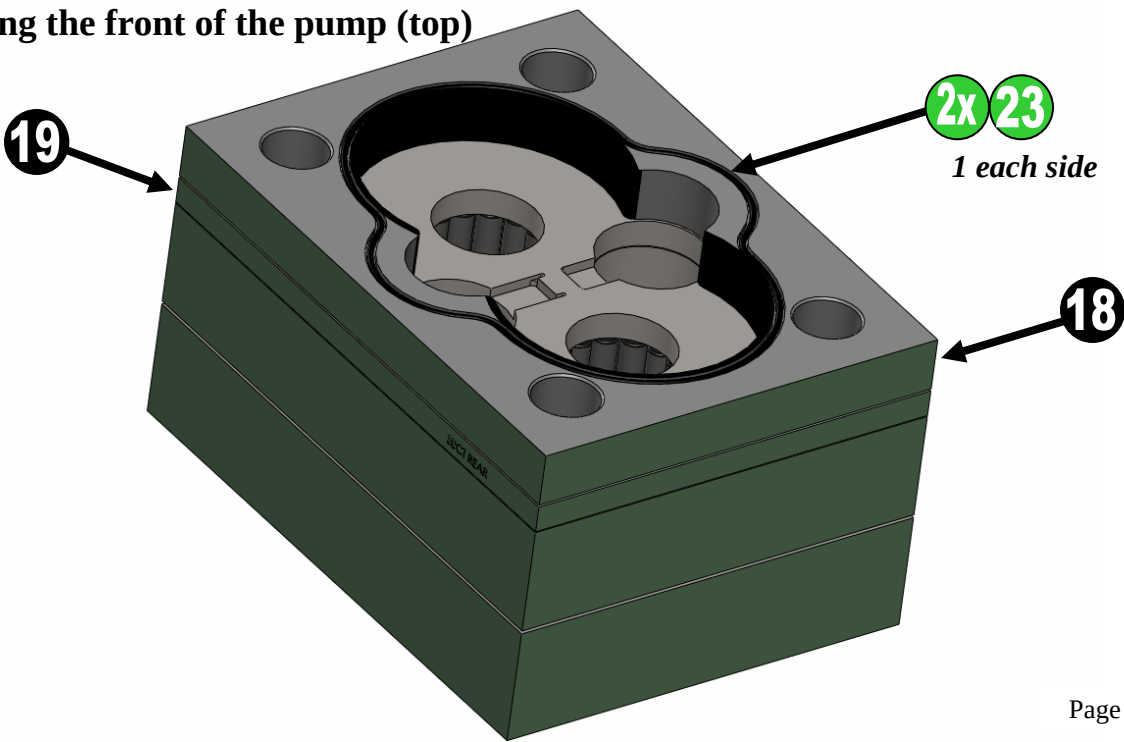


Note- Once Installed, the inner surface of the liner plate acts as the bearing washer. There is no separate inner Bearing Washer.

Step 5 Place the Liner Plate Rear (19) on top of the Bearing Plate (12). Verify the orientation of the Liner Plate Rear by the Engraved Text “SUCTION REAR”.

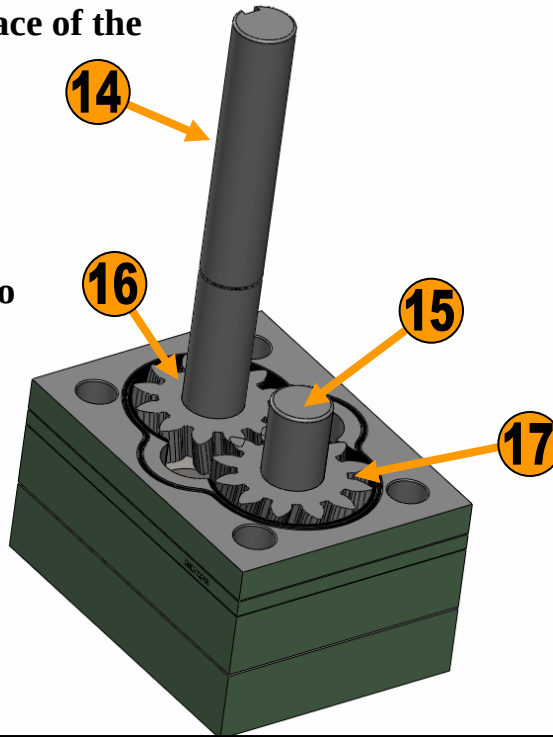


Step 6 Coat 2x O-Rings (23) with grease. Place 1 O-Ring (23) in groove on the side of the Cylinder (18) that will end up facing the rear of the pump (Down). In one smooth motion, place Cylinder (18) on top of Rear Liner Plate (19), ensuring that the O-Ring (23) stays in the groove. Once Cylinder (18) is resting on top of the Liner Plate (19), place second O-Ring (23) in the groove facing the front of the pump (top)



Step
7

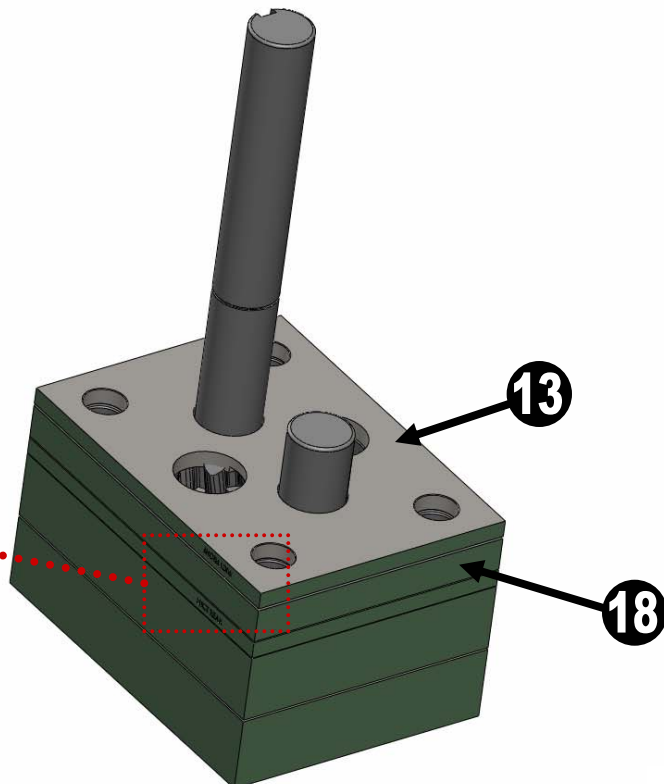
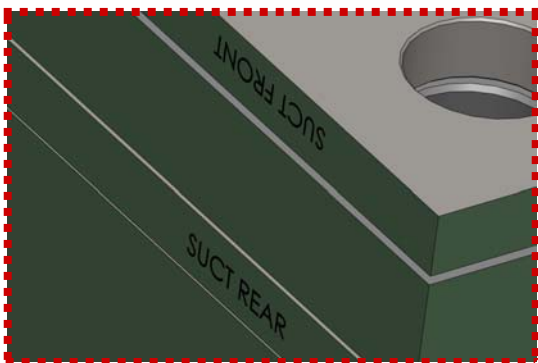
Place the Drive Shaft & Gear (14)(16) and the Driven Gear & Shaft (15)(17) into the cylinder (18) as shown. Note the orientation. Use grease or clean lube oil to coat the surface of the Liner Plates and all 4 Gear Faces in the areas that they will be riding on both the Front and Rear Liner Plates. Otherwise, grease is also suitable.



Step
8

Place the Liner Plate Front (13) on top of the Cylinder (18). Verify the orientation of the Liner Plate Rear by the Engraved Text “SUCTION FRONT”.

*Replace used Liner Plates
regardless of condition*



Step

9

On the remaining Bearing Plate (12), place 16x Rollers (11.1) in each of the bearing Sleeves (11.2). Coat bearings and sleeves with a generous amount of grease to lubricate for start up and to hold in place during assembly. Coat an O-Ring (23) with grease. Place O-Ring (23) in groove on this side of the Bearing Plate (12).

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16x 11.1

23

12

*Replace all Used Rollers
regardless of condition*

Step

10

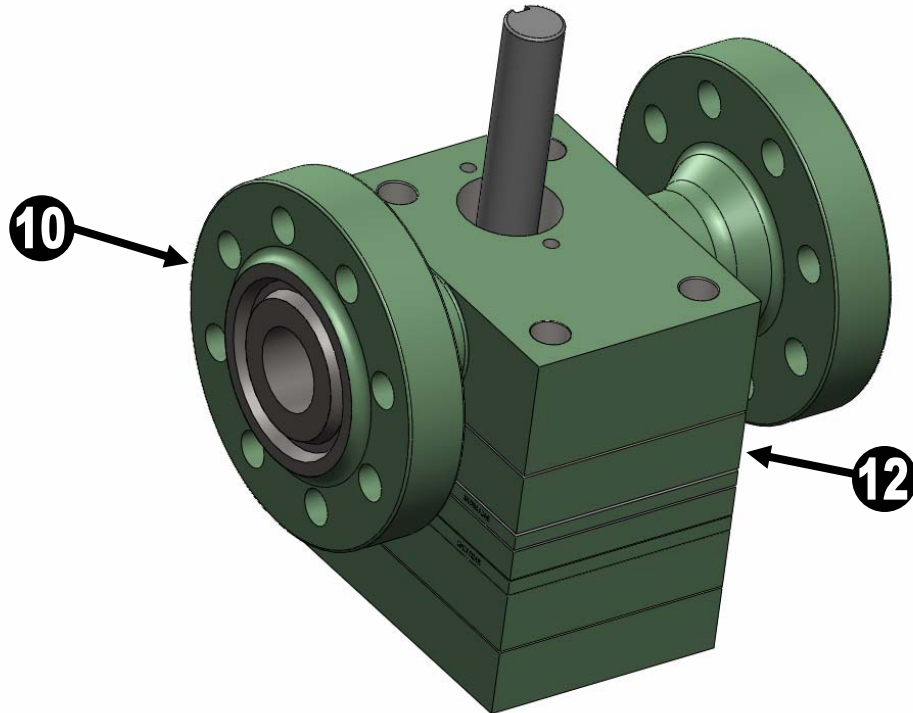
In one smooth motion, place Bearing Plate (12) on top of Front Liner Plate (13), ensuring that the O-Ring (23) stays in the groove, and the rollers stay in the sleeves. Once Bearing Plate (12) is resting on top of the Liner Plate(13), place second O-Ring (23) in the groove facing the front of the pump (top)

*Note- Bearing Washers
(11.3) are facing up
after assembly.*

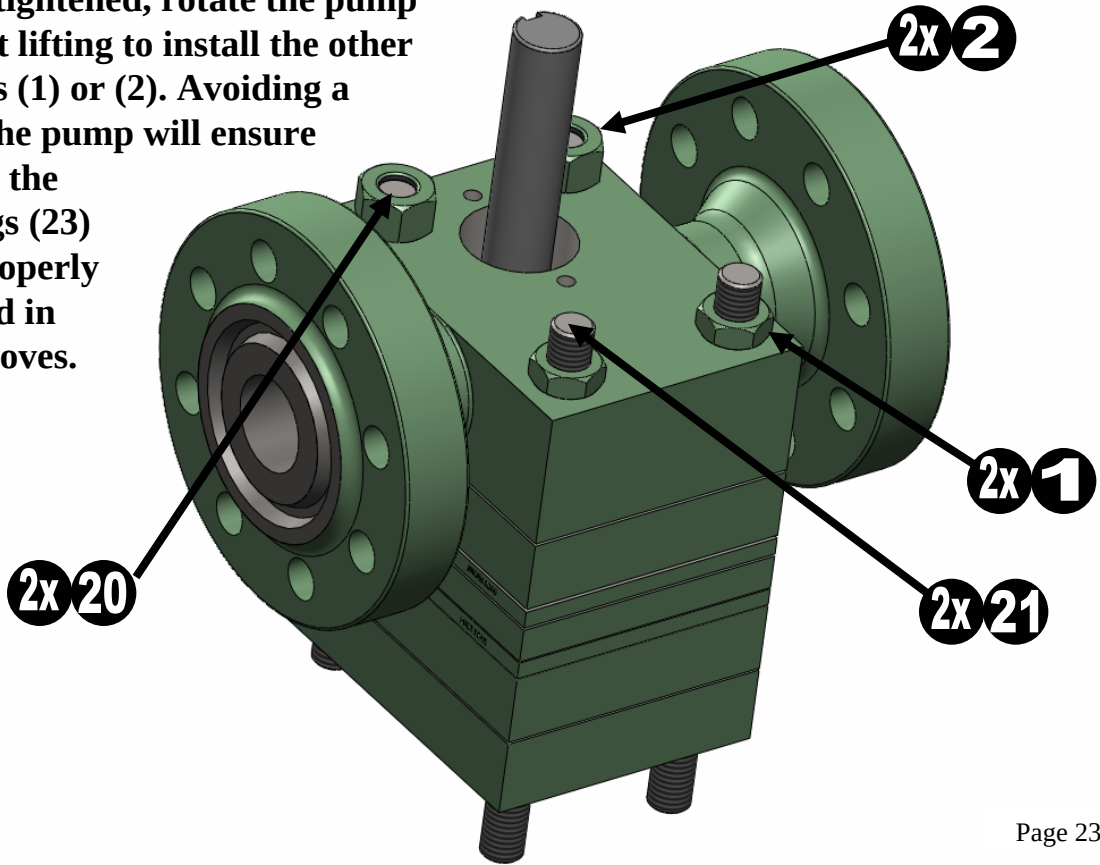
12

Step Place the Packing Plate(24) on top of the Bearing Plate(12).

11



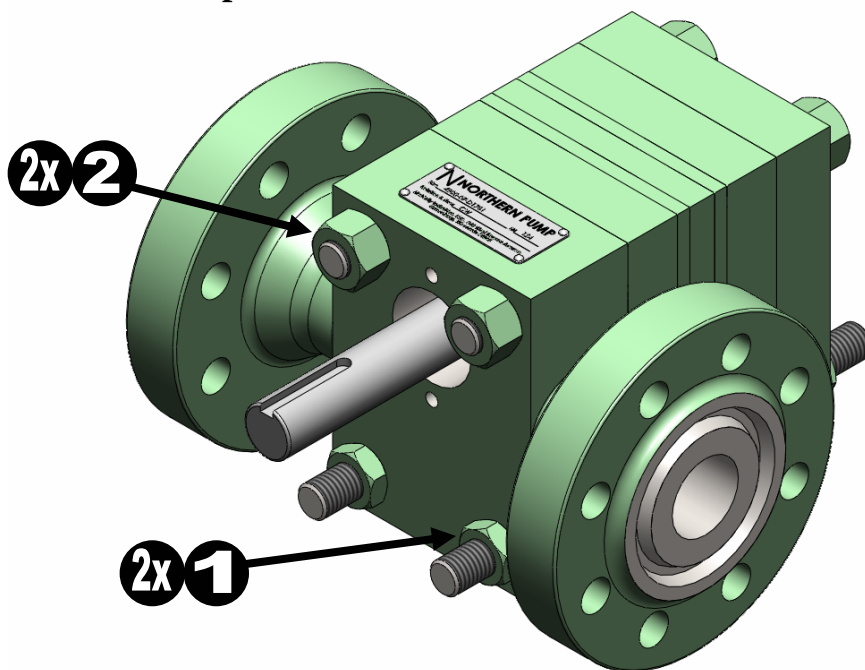
Step Insert the pre-assembled Studs (20)(21) and Nuts (1)(2) by pushing through the dowel holes. Gently Slide the pump to the edge of the surface to install the first two Nuts (1) or (2) on the back of the pump. Once the nuts are gently tightened, rotate the pump without lifting to install the other 2x Nuts (1) or (2). Avoiding a lift of the pump will ensure that all the O-Rings (23) stay properly inserted in the grooves.



Step

13

Evenly tighten all both the Whole Nuts (2) and the Jam Nuts (1) until snug. Then evenly Torque to 240 foot pounds.

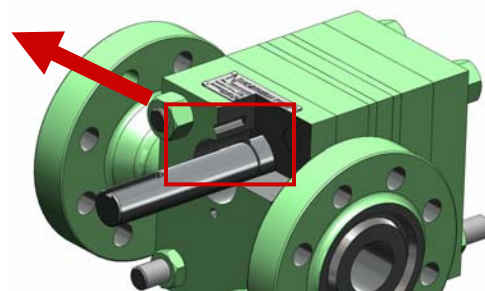
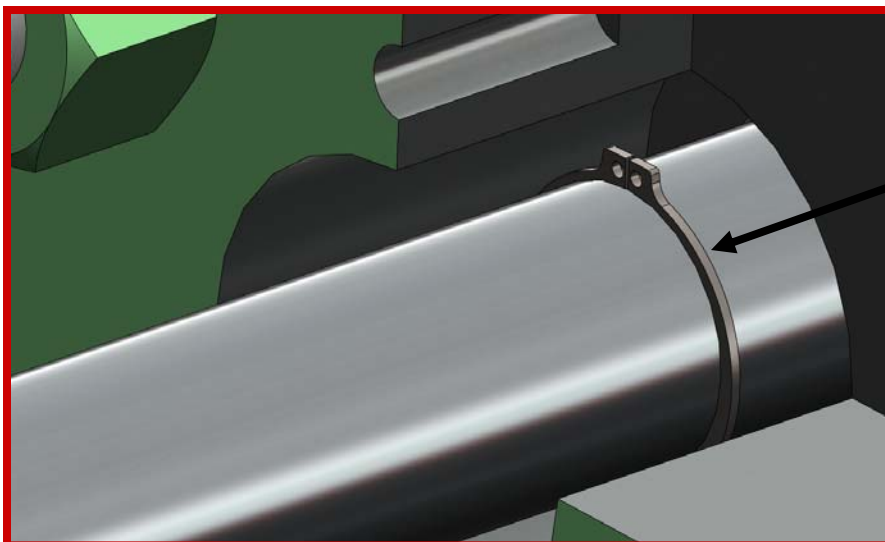


Step

14

Install the Retaining Ring (9) into the groove on the shaft.

Replace used Retaining Ring regardless of condition

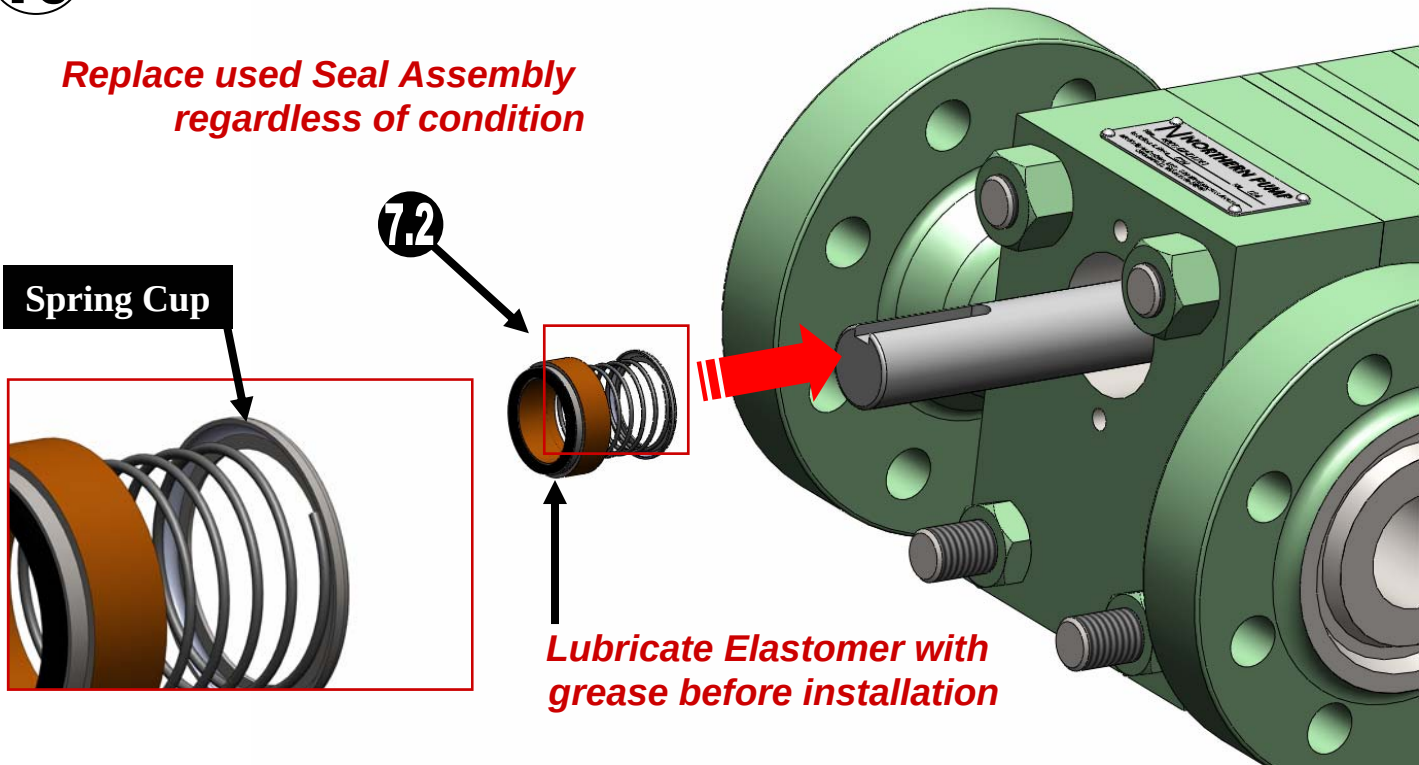


Step

15

Insert the Spring Cup over the shaft until it is resting up against the Retaining Ring (9). Next, insert the Seal Assembly.

Replace used Seal Assembly regardless of condition

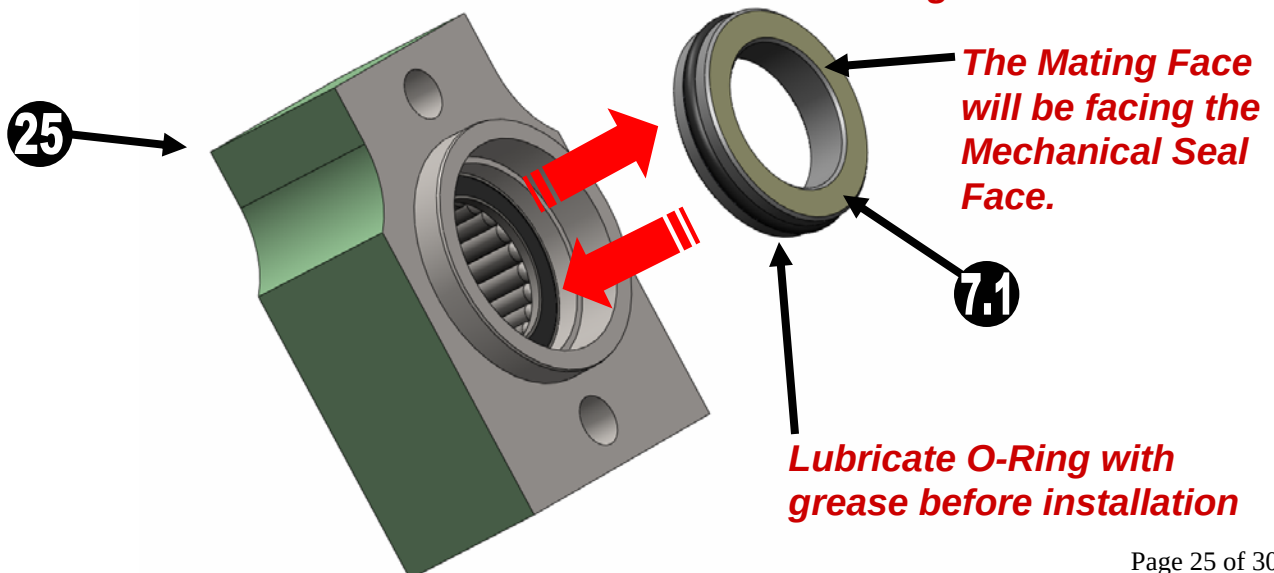


Step

16

Using the Brass Drive Pin or other suitable tool, replace the mating ring by pushing it out of the Bearing and Seat Housing (25). Then Gently replace the Mating Ring by pushing it in with clean fingers. Note- The non-lapped surface will typically have a marker on it to signify it is the *NON MATING FACE*.

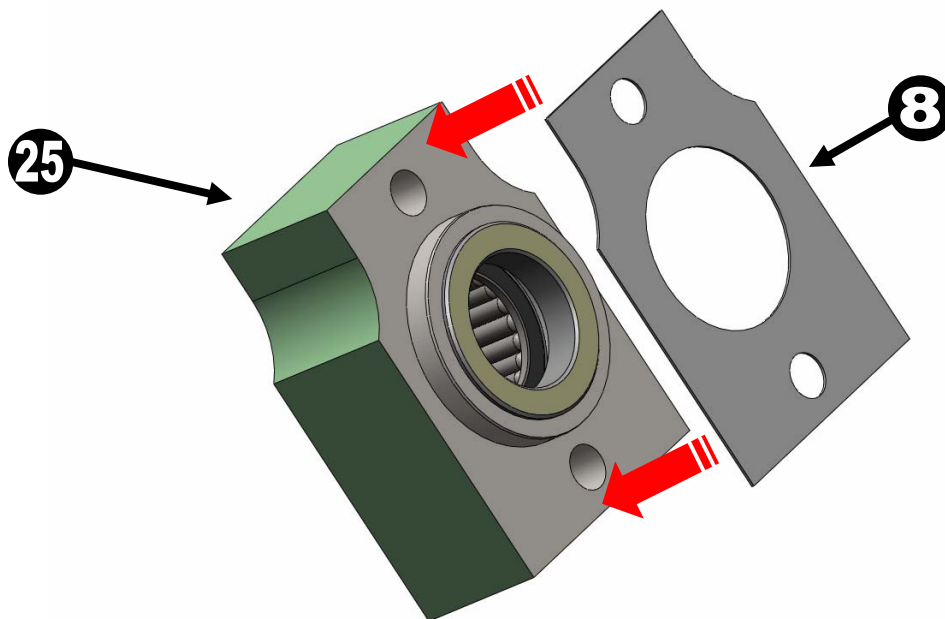
Replace used Mating Ring regardless of condition



Step

17

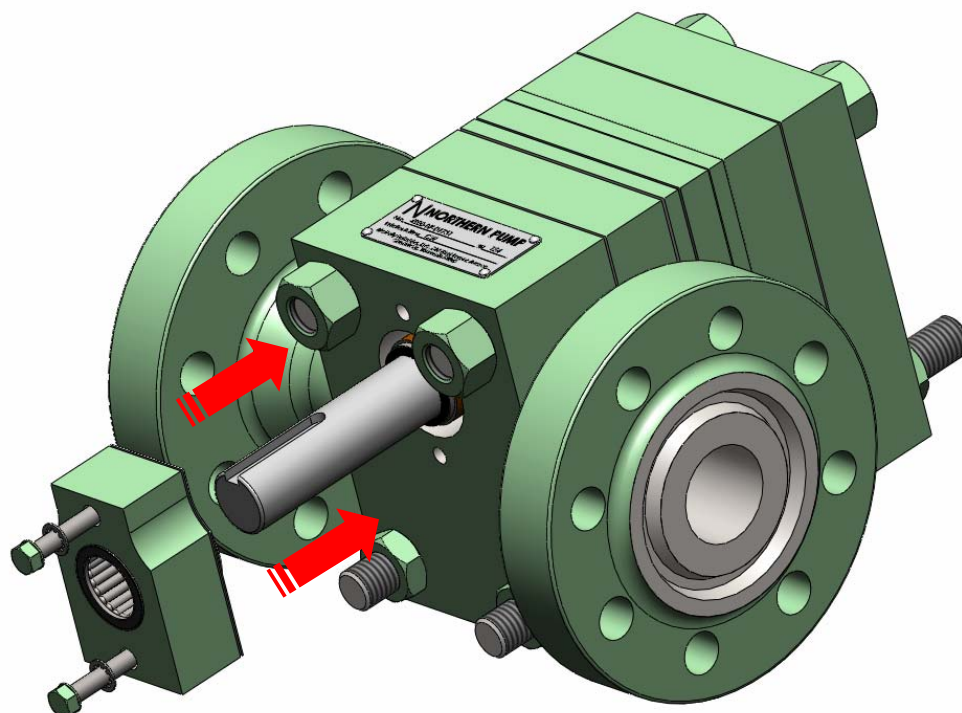
Place the Gasket (8) over the bore on the Bearing & Seat Housing (25).



Step

18

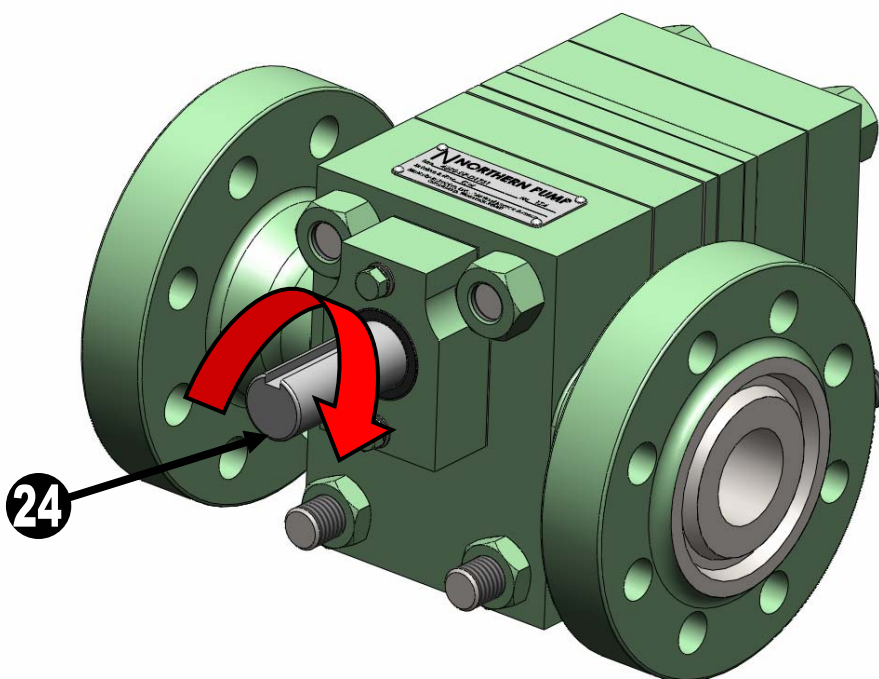
Install the Bearing & Seat Housing (25) and Gasket (8) and fasten with 2x Hex Head Cap Screw (3) and 2x Lock Washer (4). There is no torque specific



Step

19

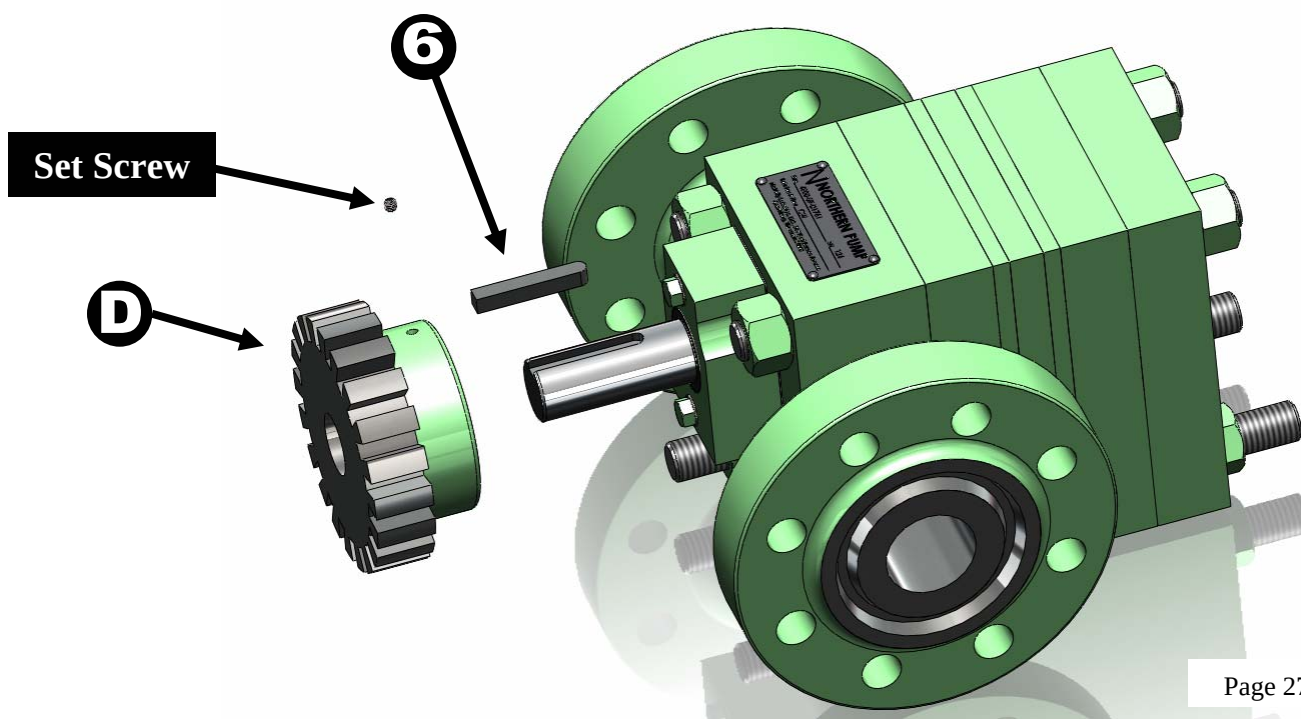
Turn Drive Shaft (14) and verify Free Rotation of the Pump.



Step

20

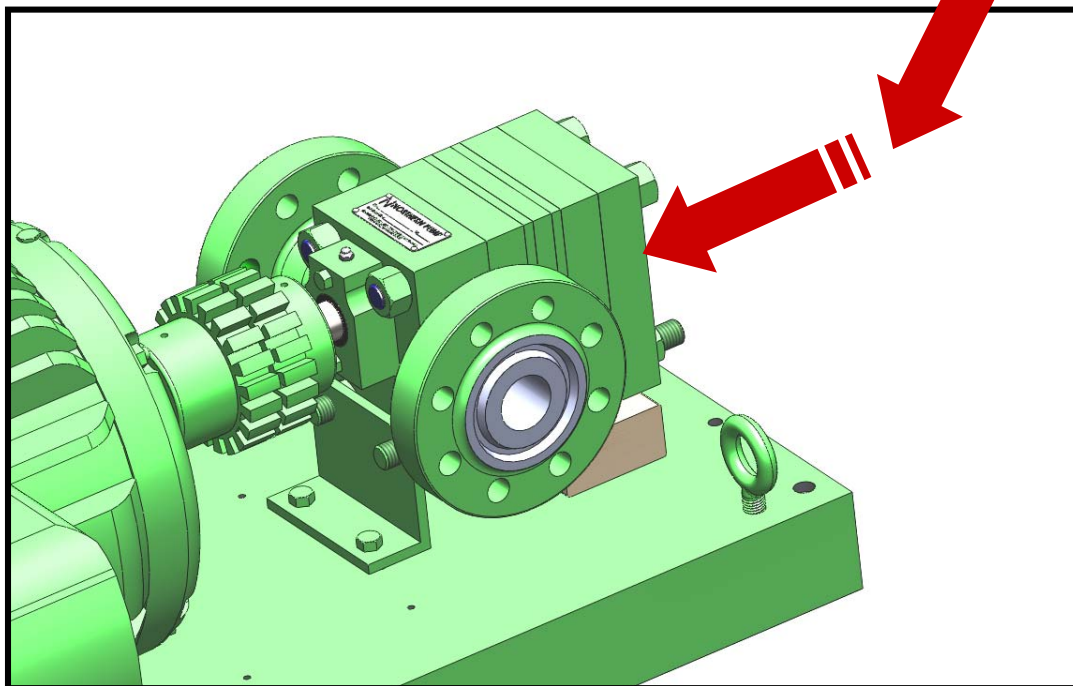
Install the Coupling Hub (D) and Key (6). Tighten Set Screw.



Step

21

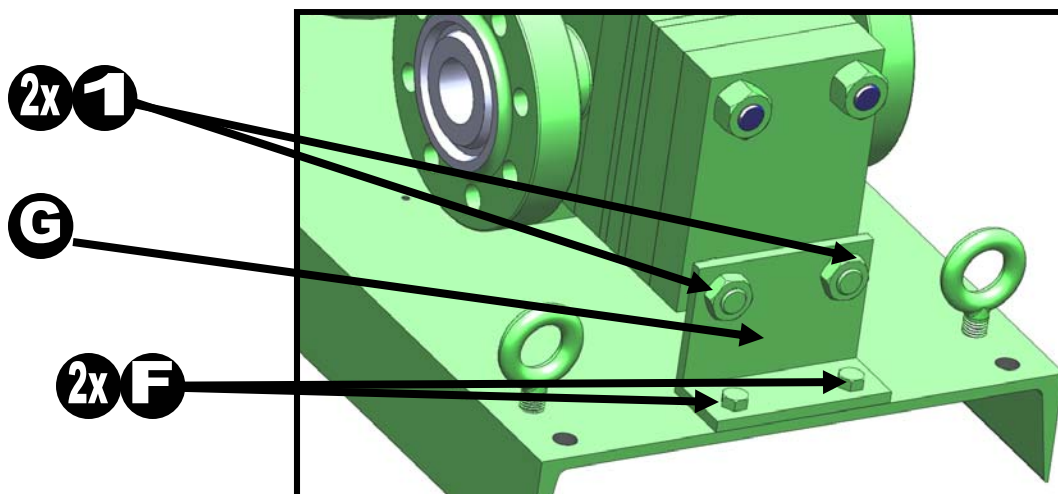
Slide the pump assembly into the holes on the Front Mounting Bracket (4). Insert a block of wood or suitable support for the rear of the pump. Use caution as pump assembly is awkward and heavy.



Step

22

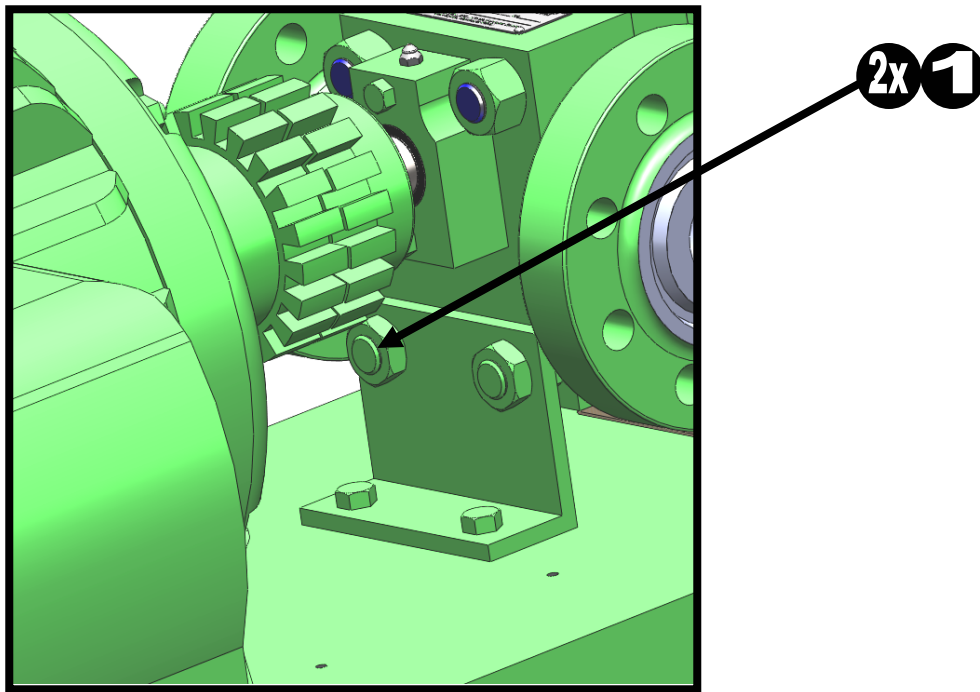
Insert the Rear Mounting Bracket (G) and secure with 2x Hex Head Cap Screws (F). Install and Tighten 2x (1) Jam Nuts.



Step

23

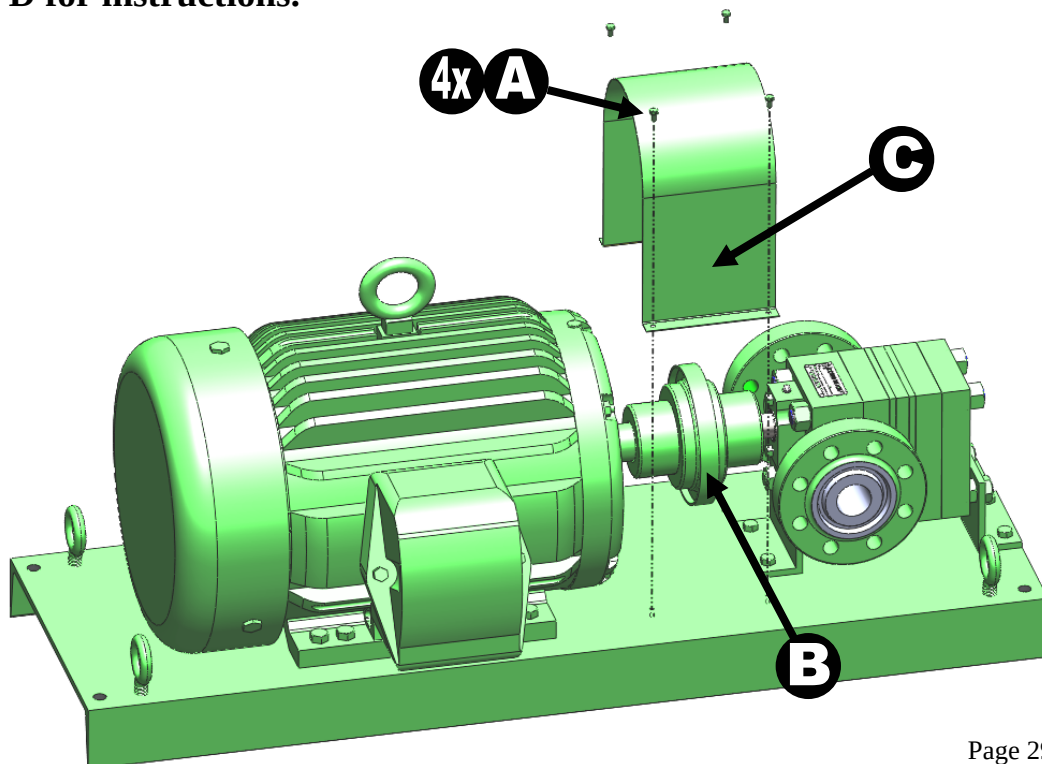
Install and Tighten the 2x Outer Jam Nuts (1). The Pump Assembly is now Secure to the unit base.



Step

24

Install the Cover & Grid Assembly (B) and the Coupling Guard (C). See Appendix D for instructions.





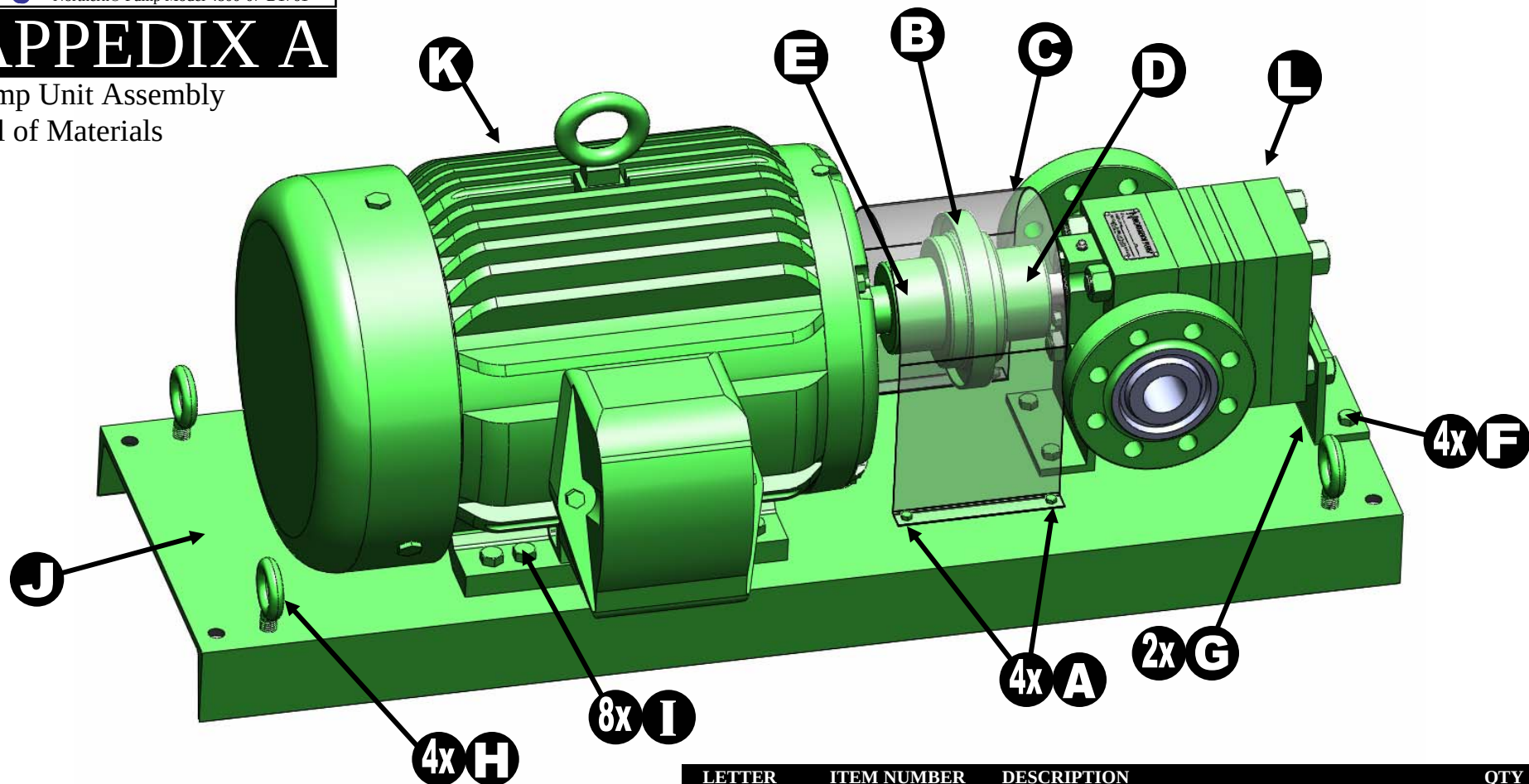
Clean-up

1. Clean all parts of the pump in accordance with your specified cleaning procedures. Take all appropriate precautions to prevent damage to the parts of the pump during the cleaning process.
2. All pump parts should accept a wide variety of acceptable cleaning methods and chemicals.

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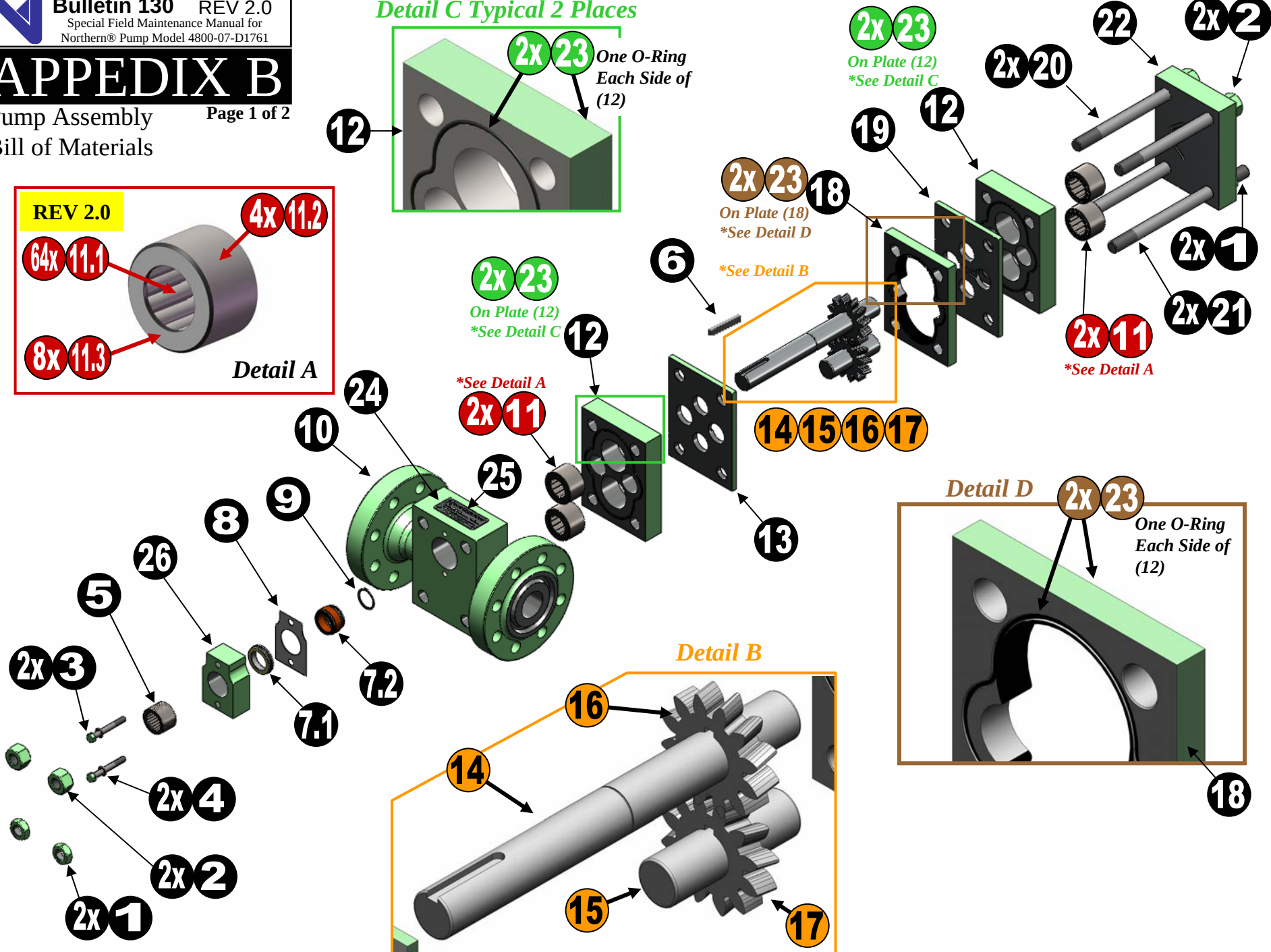
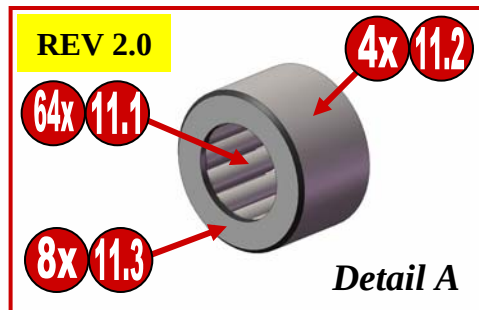
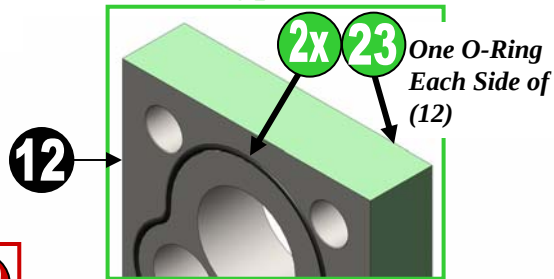
APPEDIX A

Pump Unit Assembly Bill of Materials

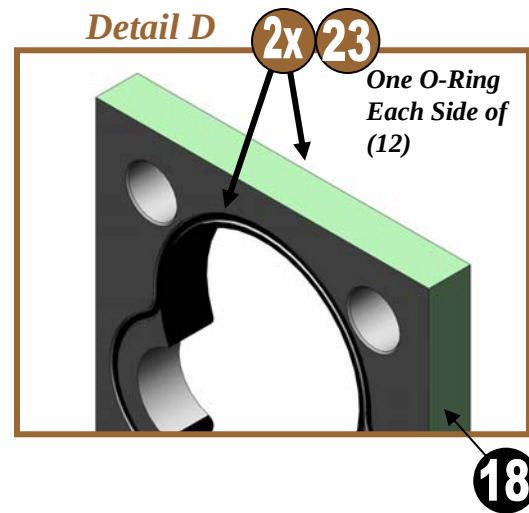


LETTER	ITEM NUMBER	DESCRIPTION	QTY
A	13430004-08	CAP SCREW, HEX HEAD	4
B	20820000	COUPLING COVER & GRID ASSEMBLY	1
C	7793-4000	GUARD, COUPLING	1
D	20821371-06	COUPLING HUB, FALK 80T20 (PUMP)	1
E	20822125-08	COUPLING HUB, FALK 80T20 (MOTOR)	1
F	13430008-16	CAP SCREW, HEX HEAD	4
G	7062-4800	BRACKET, MOUNTING	2
H	19210012-32	EYEBOLT, DROP FORGED,	4
I	13430010-24	CAP SCREW, HEX HEAD	8
J	G-1600-13-GA244	BASE, UNIT	1
K	M7062T	MOTOR, ELECTRIC, 40HP	1
L	480007D1761	PUMP ASSEMBLY	1

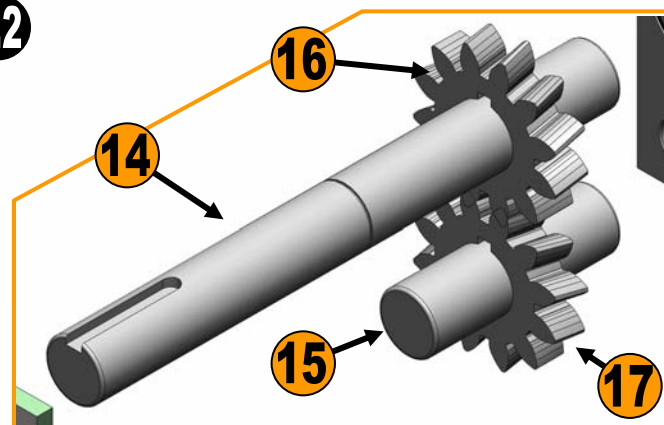
Detail C Typical 2 Places



Detail D



Detail B





APPENDIX B

Pump Assembly Page 2 of 2
Bill of Materials

LETTER	ITEM NUMBER	DESCRIPTION	QTY
1	15420014	HEAVY HEX JAM NUT	8
2	15410014	HEAVY HEX WHOLE NUT	4
3	13430007-36	CAP SCREW, HEX HEAD	2
4	11490007	WASHER, LOCK	2
5	80848	BEARING, ROLLER	1
6	17500006-40	END KEY	1
7	6914-4800	ASSEMBLY, MECHANICAL SEAL &	1
7.1	N/A	MATING RING	1
7.2	N/A	MECHANICAL SEAL & SPRING SEA	1
8	1282-4800	GASKET	1
9	61902	RETAINING RING	1
10	2209-4800	PLATE, PACKING	1
11	5700-4800-02	ASSEMBLY, ROLLER BEARING	4
11.1	N/A	ROLLER, BEARING	64
11.2	N/A	SLEEVE, BEARING	4
11.3	N/A	BEARING WSHER, OUTER	8
12	31342-4800	PLATE, BEARING	2
13	81386-4800-07	LINER PLATE (FRONT)	1
14	4009-4800-07	SHAFT, DRIVE	1
15	4081-4800-07	SHAFT, DRIVEN	1
16	4689-4800-07	PUMP GEAR, HELICAL, L.H.	1
17	4669-4800-07	PUMP GEAR, HELICAL, R.H.	1
18	1171-4800-07	CYLINDER, PUMP	1
19	81387-4800-07	LINER PLATE (REAR)	1
20	28002-11	STUD, PUMP	2
21	28002-12	STUD, PUMP	2
22	3001-4800	PLATE, END	1
23	19120163-40	O-RING, ROUND SECTIONAL	6
24	2209-4800	PACKING PLATE	1
25	57455	NAMEPLATE AND PINS (4)	1
26	1519-4800	HOUSING, BEARING & SEAT	1
NS	56732	GREASE FITTING, STRT,S.S.,	1
NS	70000-03	WOODRUFF KEY	1

APPENDIX C

REVISIONS			
LTR	DESCRIPTION	DATE	APVD



- 1.0 HYDROSTATIC PRESSURE TEST PUMP HOUSING AT 2653 + 10 PSI FOR 4 HOURS MINIMUM WITH NO EXTERNAL LEAKAGE
 - 1.1 THE TESTED HOUSING SHALL INCLUDE ASSEMBLY OF THE FOLLOWING: PUMP CYLINDER, BEARING PLATE(2), LINER PLATE(2), END PLATE, PACKING PLATE, STUDS(4), WHOLE NUT(4) JAM NUTS (8)
 - 1.2 TEST FLUID— POWER TRANSMISSION FLUID EQUIV. TO MIL-DTL-17111
 - 1.3 REMOVE ALL RESIDUAL FLUID FROM UNIT UPON COMPLETION OF HYDROSTATIC TEST.
- 2.0 PAINT ENTIRE UNIT WITH ONE COAT OF SHERWIN WILLIAMS ZINC CLAD II LV INORGANIC ZINC PRIMER OR ZINC CLAD IV ZINC RICH EPOXY PRIMER IN PREPARATION OF THE CUSTOMER APPLICATION OF SYSTEM A OR C, IN ACCORDANCE WITH EXXON MOBIL GLOBAL PRACTICE 29-02-02 (PAINTING GENERAL REQUIREMENTS-OFFSHORE)

MAKE: BALDOR
MODEL NUMBER: M7062T
HORSEPOWER: 40.0
RPM: 1750
FRAME: 324T
POWER SUPPLY: 3 PHASE, 60Hz, 230/460 V
ENCLOSURE: XPFC

MAKE: FALK
MODEL: 80T20 GRID STYLE W/ VERTICAL SPLIT COVER
MAX RPM RATING: 4750 RPM
MATERIAL: STEEL WITH STEEL COVER



Northern® Pump

PUMP DUTY DATA

<u>Technical Information</u>		<u>Materials of Construction</u>	
<u>Pump Model</u>		Gears:	HARDENED ALLOY STEEL
Liquid:	CRUDE OILS	Shafts:	HARDENED ALLOY STEEL
Pump Flow:	20–24 GPM	Bearings:	STEEL ROLLER BEARINGS
Pump Speed:	1750 RPM	Cylinder:	STEEL W/ IRON INSERT
Inlet Condition:	FLOODED	Bearing / Wear Plates:	STEEL W/ D2 WEAR PLATES
Temperature:	40°F – 100°F	End & Seal Plate:	ATSM A108 STEEL – SPECIAL FLANGED PACKING PLATE
Discharge Pressure:	1850 PSI	Shaft Seal:	TYPE 21 MECHANICAL SEAL WITH CARBON FACE AND VITON ELASTOMER SST CAGE O-RING SEAT
Viscosity:	17–37 cP	Suction & Discharge Ports:	900LB. RTJ FLANGES
BHP Required:	32 HP (40 HP MOTOR SUPPLIED)	Dowel Studs:	STEEL
Drive Equipment:	MOTOR, BASE, COUPLING, GUARD,	Mounting Brackets:	STEEL

NORTHERN PUMP SALE ORDER # 494143	DWN R. ANTONICH 10/30/09	M McNALLY McNALLY INDUSTRIES, LLC. 340 WEST BENSON AVE, GRANTSBURG, WI 54840 (715)463-8300	PUMP UNIT ASSEMBLY			
	CHK J. HOFFLAND 11/01/09					
	MET					
	STD					
	APVD					
CUSTOMER PURCHASE ORDER # L16783						
THIS DATA IS THE PROPERTY OF NORTHERN PUMP DIVISION OF McNALLY INDUSTRIES, LLC. AND SHALL NOT BE USED, DUPLICATED, OR DISCLOSED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF NORTHERN PUMP DIVISION OF McNALLY INDUSTRIES, LLC.		CAGE CODE	NORTHERN DWG.	SIZE	FILE NO	
		96953	4800-07	D	1761	
		SCALE: 1:4	UNIT WT.	SHEET 1 OF 1		

DRAWING CERTIFIED FOR GCI ROTATING EQUIPMENT – P.O. BOX 83657 – BATON ROUGE, LA 70884

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McNALLY
McNALLY INDUSTRIES, LLC.
340 WEST BENSON AVE, GRANTSBURG, WI 54840 (715)463-8300



Appendix D

Installation & Maintenance Manual

Falk™ Steelflex® T20 Grid Style Coupling

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How To Use This Manual

This manual provides detailed instructions on maintenance, lubrication, installation, and parts identification. Use the table of contents below to locate required information.

Table of Contents

Introduction	Page 1
Lube Fittings	Page 1
Limited End Float	Page 1
Lubrication	Pages 1-2
Installation & Alignment Instructions.	Pages 2-4
Annual Maintenance, Relube & Disassembly.	Page 4
Installation & Alignment Data	Page 5
Parts Identification & Parts Interchangeability	Page 6

CAREFULLY FOLLOW THE INSTRUCTIONS IN THIS MANUAL FOR OPTIMUM PERFORMANCE AND TROUBLE FREE SERVICE.

Introduction

This manual applies to Sizes 1020T thru 1170T and 20T thru 170T20 Falk Steelflex Tapered Grid Couplings. Unless otherwise stated, information for Sizes 1020T thru 1170T applies to Sizes 20T thru 170T respectively, e.g. 1020T = 20T, 1100T = 100T, etc. These couplings are designed to operate in either the horizontal or vertical position without modification.

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 vertical couplings to prevent leakage.

WARNING: Lockout starting switch of prime mover and remove all external loads from drive before installing or servicing couplings.

Lube Fittings

Depending on coupling size, cover halves have $\frac{1}{8}$ or $\frac{3}{8}$ NPT lube holes. Use a standard grease gun and lube fitting as instructed on Page 4.

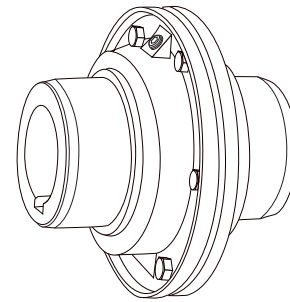
Limited End Float

When electric motors, generators, engines, compressors, and other machines are fitted with sleeve or straight roller bearings, limited axial end float kits are recommended for protecting the bearings. Falk Steelflex couplings are easily modified to limit end float; refer to Manual 428-820 for instructions.

Lubrication

Adequate lubrication is essential for satisfactory operation. Page 2 provides a list of typical lubricants and specifications for general purpose and long term greases. Because of its superior lubricating characteristics and low centrifuge properties, Falk Long Term Grease (LTG) is highly

TYPE T20 STEELFLEX COUPLING



recommended. Sizes 1020T to 1090T20 are furnished with a pre-measured amount of grease for each coupling. The grease can be ordered for larger size couplings.

The use of general purpose grease requires re-lubrication of the coupling at least annually.

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 grid-groove area of Steelflex couplings resulting in premature hub or grid failure unless periodic lubrication cycles are maintained.

Falk Long Term Grease (LTG) was developed specifically for couplings. It resists separation of the oil and thickener. The consistency of Falk LTG changes with operating conditions. As manufactured it is an NLGI #1/2 grade. Working of the lubricant under actual service conditions causes it to become semifluid while the grease near the seals will set to a heavier grade, helping to prevent leakage.

LTG is highly resistant to separation, easily out performing all other lubricants tested. The resistance to separation allows the lubricant to be used for relatively long periods of time.

Steelflex couplings initially lubricated with LTG will not require re-lubrication until the connected equipment is stopped for servicing. If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture, or experiences frequent reversals, more frequent lubrication may be required.

Although LTG grease is compatible with most other coupling greases, the mixing of greases may dilute the benefits of LTG.

USDA Approval

LTG has the United States Department of Agriculture Food Safety & Inspection Service approval for applications where there is no possibility of contact with edible products. (H-2 ratings).

CAUTION: Do not use LTG in bearings.

Specifications — Falk LTG

The values shown are typical and slight variations are permissible.

AMBIENT TEMPERATURE RANGE — -20°F (-29°C) to 250°F (121°C). Min. Pump = 20° F (-7° C).

MINIMUM BASE OIL VISCOSITY — 3300SSU (715cST) @ 100°F (38°C).

THICKENER — Lithium & soap/polymer.

CENTRIFUGE SEPARATION CHARACTERISTICS — ASTM #D4425 (Centrifuge Test) — K36 = 2/24 max., very high resistance to centrifuging.

NLGI GRADE (ASTM D-217) — 1/2

CONSISTENCY (ASTM D-217) — 60 stroke worked penetration value in the range of 315 to 360 measured at 77°F (25°C)

MINIMUM DROPPING POINT — 350°F (177°C) minimum

MINIMUM TIMKEN O.K. LOAD — 40 lbs.

ADDITIVES — Rust and oxidation inhibitors that do not corrode steel or swell or deteriorate synthetic seals.

Packaging

14 oz (0,4 kg) CARTRIDGES — Individual or case lots of 10 or 30.

35 lb (16 kg)PAIL, 120 lb (54 kg) KEG & 400 lb (181 kg) DRUMS.

General Purpose Grease

Annual Lubrication — The following specifications and lubricants for general purpose grease apply to Falk Steelflex couplings that are lubricated annually and operate within ambient temperatures of 0°F to 150°F (-18°C to 66°C). For temperatures beyond this range (see Table 1), refer to Falk.

If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture, or experiences frequent reversals, more frequent lubrication may be required.

Specifications — General Purpose Coupling Lubricants

The values shown are typical and slight variations are permissible.

DROPPING POINT — 300°F (149°C) or higher.

CONSISTENCY — NLGI No. 2 with 60 stroke worked penetration value in the range of 250 to 300.

SEPARATION AND RESISTANCE — Low oil separation rate and high resistance to separation from centrifuging.

LIQUID CONSTITUENT — Possess good lubricating properties equivalent to a high quality, well refined petroleum oil.

INACTIVE — Must not corrode steel or cause swelling or deterioration of synthetic seals.

CLEAN — Free from foreign inclusions.

General Purpose Greases Meeting Falk Specifications

Lubricants listed below are typical products only and should not be construed as exclusive recommendations.

TABLE 1 — General Purpose Greases ★

Ambient Temperature Range	0°F to 150°F (-18°C to 66°C)	-30°F to 100°F (-34°C to 38°C)
Manufacturer	Lubricant †	Lubricant †
Amoco Oil Co.	Amolith Grease #2	Amolith Grease #2
BP Oil Co.	Energrease LS-EP2	Energrease LS-EP1
Chevron U.S.A. Inc.	Dura-Lith EP2	Dura-Lith EP1
Citgo Petroleum Corp.	Premium Lithium Grease EP2	Premium Lithium Grease EP1
Conoco Inc.	EP Conolith Grease #2	EP Conolith Grease #2
Exxon Company, USA	Unirex EP2	Unirex EP2
E.F. Houghton & Co.	Cosmolube 2	Cosmolube 1
Imperial Oil Ltd.	Unirex EP2	Unirex EP2
Kendall Refining Co.	Lithium Grease L421	Lithium Grease L421
Keystone Div. (Pennwalt)	81 EP-2	81 EP-1
Lyondell Petrochemical (ARCO)	Litholine H EP 2 Grease	Litholine H EP 2 Grease
Mobil Oil Corp.	Mobilux EP111	Mobilith AW1
Petro-Canada Products	Multipurpose EP2	Multipurpose EP1
Phillips 66 Co.	Philube Blue EP	Philube Blue EP
Shell Oil Co.	Alvania Grease 2	Alvania Grease 2
Shell Canada Ltd.	Alvania Grease 2	Alvania Grease 2
Sun Oil Co.	Ultra Prestige 2EP	Ultra Prestige 2EP
Texaco Lubricants	Starplex HD2	Multifak EP2
Unocal 76 (East & West)	Unoba EP2	Unoba EP2
Valvoline Oil Co.	Multilube Lithium EP Grease	...

★ Grease application or re-lubrication should be done at temperatures above 20°F (-7°C). If grease must be applied below 20°F (-7°C), consult the Factory.

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

Installation Of Type T20 Steelflex Tapered Grid Couplings

Installation

Only standard mechanics tools, wrenches, a straight edge, and feeler gauges are required to install Falk Steelflex couplings. Clean all parts using a non-flammable solvent. Check hubs, shafts and keyways for burrs. Coupling Sizes 1020T thru 1090T are generally furnished for CLEARANCE FIT with setscrew over the keyway. Sizes 1100T and larger are furnished for an INTERFERENCE FIT without a setscrew.

CLEARANCE FIT HUBS — Clean all parts using a non-flammable solvent. Check hubs, shafts, and keyways for burrs. Do not heat clearance fit hubs. Install keys, mount hubs with flange face flush with shaft ends or as otherwise specified and tighten setscrews.

INTERFERENCE FIT HUBS — Furnished without setscrews. Heat hubs to a maximum of 275°F (135°C) using an oven, torch, induction heater, or an oil bath. To prevent seal damage, DO NOT heat hubs beyond a maximum temperature of 400°F (205°C).

When an oxy-acetylene or blow torch is used, use an excess acetylene mixture. Mark hubs near the center of their length in several places on hub body with a temperature sensitive crayon, 275°F (135°C) melt temperature. Direct flame towards hub bore using constant motion to avoid overheating an area.

WARNING: If an oil bath is used, the oil must have a flash point of 350°F (177°C) or higher. Do not rest hubs on the bottom of the container. Do not use an open flame in a combustible atmosphere or near combustible materials.

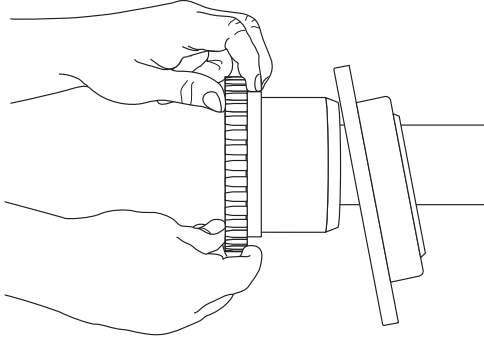
Heat hubs as instructed above. Mount hubs as quickly as possible with hub face flush with shaft end. Allow hubs to cool before proceeding. Insert setscrews (if required) and tighten.

Maximize Performance And Life

The performance and life of couplings depend largely upon how you install and maintain them. Before installing couplings, make certain that foundations of equipment to be connected meet manufacturers' requirements. Check for soft foot. The use of stainless steel shims is recommended. Measuring misalignment and positioning equipment within alignment tolerances is simplified with an alignment computer. These calculations can also be done graphically or mathematically.

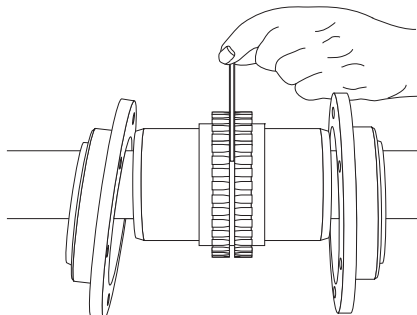
Alignment is shown using spacer bar and straight edge. This practice has proven to be adequate for many industrial applications. However, for superior final alignment, the use of dial indicators (see Manual 458-834 for instructions), lasers, alignment computers, or graphical analysis is recommended.

1— Mount Covers, Seals & Hubs



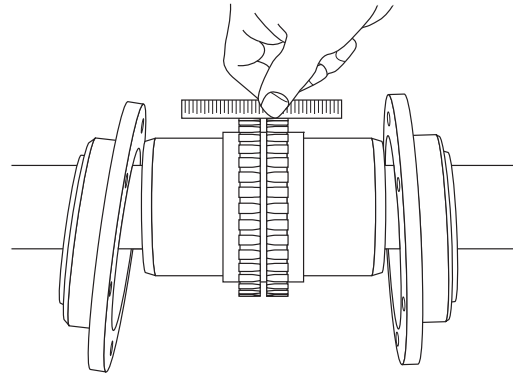
Lock out starting switch of prime mover. Clean all metal parts using a non-flammable solvent. Place seals into each cover half and lightly coat seals with grease. Place covers on shafts BEFORE mounting hubs. Heat interference fit hubs as previously instructed. Seal keyways to prevent leakage. Mount hubs on their respective shafts so the hub face is flush with the end of its shaft unless otherwise indicated. Tighten setscrews when furnished.

2 — Gap & Angular Alignment



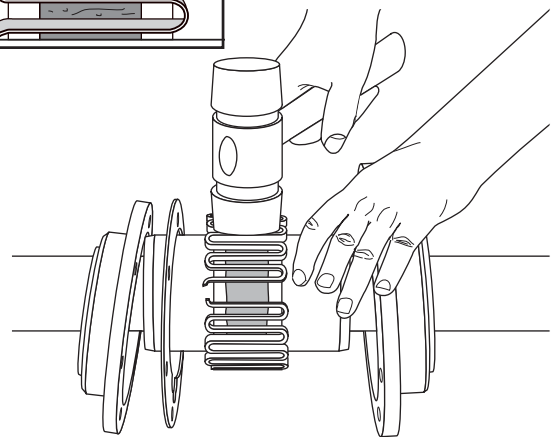
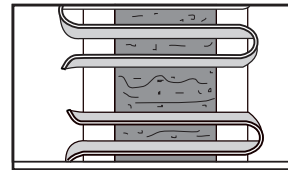
Use a spacer bar equal in thickness to the gap specified in Table 2, Page 5. Insert bar as shown below left, to same depth at 90° intervals and measure clearance between bar and hub face with feelers. The difference in minimum and maximum measurements must not exceed the ANGULAR installation limits specified in Table 2.

3 — Offset Alignment



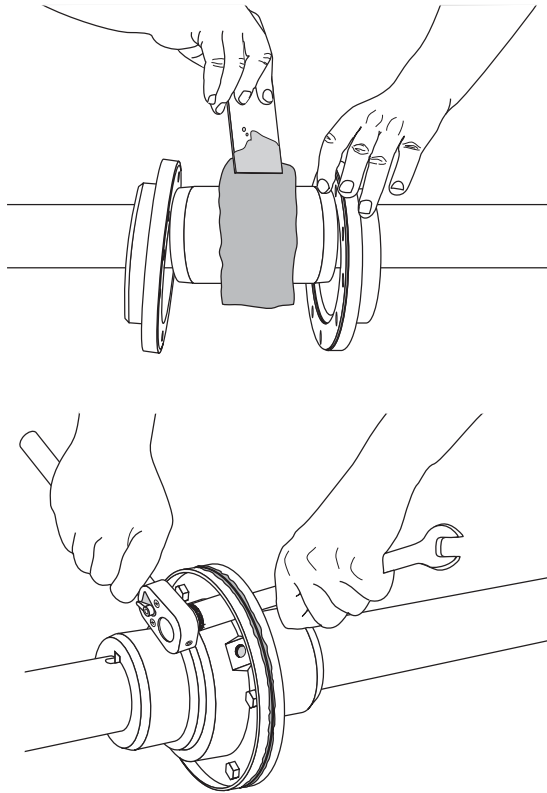
Align so that a straight edge rests squarely (or within the limits specified in Table 2) on both hubs as shown above and also at 90° intervals. Check with feelers. The clearance must not exceed the PARALLEL OFFSET installation limits specified in Table 2. Tighten all foundation bolts and repeat Steps 2 and 3. Realign coupling if necessary.

4 — Insert Grid



Insert gasket thru the gap and hang it on either hub. Pack gap and grooves with specified lubricant before inserting grid. When grids are furnished in two or more segments, install them so that all cut ends extend in the same direction (as detailed in the exploded view picture above); this will assure correct grid contact with non-rotating pin in cover halves. Spread the grid slightly to pass over the coupling teeth and seat with a soft mallet.

5 — Pack With Grease & Assemble Covers



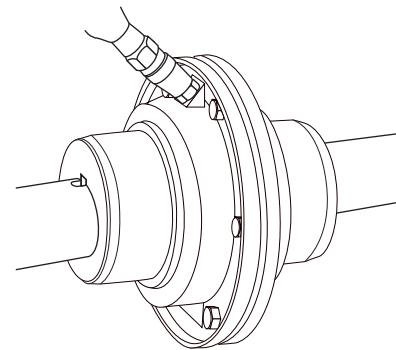
Pack the spaces between and around the grid with as much lubricant as possible and wipe off excess flush with top of grid. Make certain lube plugs are removed to ease in cover assembly. Slide cover halves with seals onto hubs and position with lube holes 180° apart (90° apart for Sizes 1150 thru 1170). Line up cover and gasket bolt holes and secure with fasteners; tighten to torque specified in Table 2. **CAUTION:** Make certain lube plugs are installed before operating.

Annual Maintenance

For extreme or unusual operating conditions, check coupling more frequently.

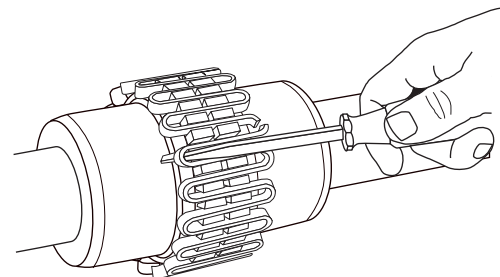
1. Check alignment per steps on Page 3. If the maximum operating misalignment limits are exceeded, realign the coupling to the recommended installation limits. See Table 2 for installation and operating alignment limits.
2. Check tightening torques of all fasteners.
3. Inspect seal ring and gasket to determine if replacement is required. If leaking grease, replace.
4. When connected equipment is serviced, disassemble the coupling and inspect for wear. Replace worn parts. Clean grease from coupling and repack with new grease. Install coupling using new gasket as instructed in this manual.

Periodic Lubrication



The required frequency of lubrication is directly related to the type of lubricant chosen, and the operating conditions. Steelflex couplings lubricated with common industrial lubricants, such as those shown in Table 1, should be relubed annually. The use of Falk Long Term Grease (LTG) will allow relube intervals to be extended to beyond five years. When relubing, remove both lube plugs and insert lube fitting. Fill with recommended lubricant until an excess appears at the opposite hole. **CAUTION:** Make certain all plugs have been inserted after lubricating.

Coupling Disassembly & Grid Removal



Whenever it is necessary to disconnect the coupling, remove the cover halves and grid. A round rod or screwdriver that will conveniently fit into the open loop ends of the grid is required. Begin at the open end of the grid section and insert the rod or screwdriver into the loop ends. Use the teeth adjacent to each loop as a fulcrum and pry the grid out radially in even, gradual stages, proceeding alternately from side to side.

Type T Coupling Installation & Alignment Data

Maximum life and minimum maintenance for the coupling and connected machinery will result if couplings are accurately aligned. Coupling life expectancy between initial alignment and maximum operating limits is a function of load, speed and lubrication. Maximum operating values listed in Table 2 are based on cataloged allowable rpm.

Values listed are based upon the use of the gaps listed, standard coupling components, standard assemblies, and cataloged allowable speeds.

Values may be combined for an installation or operating condition.

Example: 1060T max. operating misalignment is .016" parallel plus .018" angular.

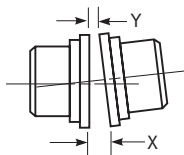
NOTE: For applications requiring greater misalignment, refer application details to the Factory.

Angular misalignment is dimension X minus Y as illustrated below.

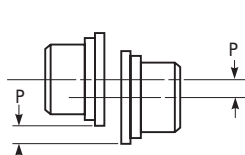
Parallel misalignment is distance P between the hub center lines as illustrated below.

End float (with zero angular and parallel misalignment) is the axial movement of the hubs(s) within the cover(s) measured from "O" gap.

ANGULAR MISALIGNMENT



PARALLEL OFFSET MISALIGNMENT



END FLOAT

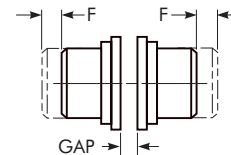


TABLE 2 — Misalignment & End Float

SIZE	Installation Limits						Operating Limits						Cover Fastener Tightening Torque Values		Allow Speed (rpm)	Lube Wt	
	Parallel Offset-P		Angular (x-y)		Hub Gap ± 10%		Parallel Offset-P		Angular (x-y)		End Float Physical Limit (Min) 2 x F						
	Max Inch	Max mm	Max Inch	Max mm	Inch	mm	Max Inch	Max mm	Max Inch	Max mm	Inch	mm	(lb-in)	(Nm)	lb	kg	
1020T	.006	0,15	.003	0,08	.125	3	.012	0,30	.010	0,25	.186	4,72	100	11,3	6000	.06	0,03
1030T	.006	0,15	.003	0,08	.125	3	.012	0,30	.012	0,30	.186	4,72	100	11,3	6000	.09	0,04
1040T	.006	0,15	.003	0,08	.125	3	.012	0,30	.013	0,33	.186	4,72	100	11,3	6000	.12	0,05
1050T	.008	0,20	.004	0,10	.125	3	.016	0,41	.016	0,41	.186	4,72	200	23,6	6000	.15	0,07
1060T	.008	0,20	.005	0,13	.125	3	.016	0,41	.018	0,46	.220	5,59	200	22,6	6000	.19	0,09
1070T	.008	0,20	.005	0,13	.125	3	.016	0,41	.020	0,51	.220	5,59	200	22,6	5500	.25	0,11
1080T	.008	0,20	.006	0,15	.125	3	.016	0,41	.024	0,61	.282	7,16	200	22,6	4750	.38	0,17
1090T	.008	0,20	.007	0,18	.125	3	.016	0,41	.028	0,71	.282	7,16	200	22,6	4000	.56	0,25
1100T	.010	0,25	.008	0,20	.188	5	.020	0,51	.033	0,84	.408	10,36	260	29,4	3250	.94	0,43
1110T	.010	0,25	.009	0,23	.188	5	.020	0,51	.036	0,91	.408	10,36	260	29,4	3000	1.1	0,51
1120T	.011	0,28	.010	0,25	.250	6	.022	0,56	.040	1,02	.546	13,87	260	29,4	2700	1.6	0,74
1130T	.011	0,28	.012	0,30	.250	6	.022	0,56	.047	1,19	.548	13,92	650	73,4	2400	2.0	0,91
1140T	.011	0,28	.013	0,33	.250	6	.022	0,56	.053	1,35	.568	14,43	650	73,4	2200	2.5	1,14
1150T	.012	0,30	.016	0,41	.250	6	.024	0,61	.062	1,57	.620	15,75	650	146	2000	4.2	1,91
1160T	.012	0,30	.018	0,46	.250	6	.024	0,61	.070	1,78	.630	16,00	1300	146	1750	6.2	2,81
1170T	.012	0,30	.020	0,51	.250	6	.024	0,61	.079	2,01	.630	16,00	1300	146	1600	7.7	3,49

Parts Identification

All coupling parts have identifying part numbers as shown below. Parts 3 and 4 (Hubs and Grids), are the same for both Type T10 and T20 couplings. All other coupling parts are unique to Type T20. When ordering parts, always SPECIFY SIZE and TYPE shown on the COVER.

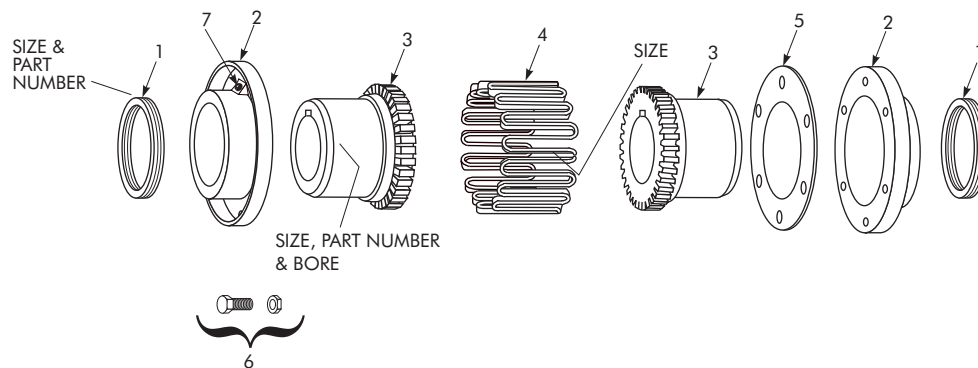
Parts Interchangeability

Parts are interchangeable between Sizes 20T and 1020T, 30T and 1030T, etc. except as noted.

GRIDS — Size 1020T thru 1140T Steelflex couplings use blue grids or non-painted grids. Older models, 20T thru 140T, use orange grids.

CAUTION: Blue grids may be used in all applications, but DO NOT substitute orange grids for blue.

PART NUMBER LOCATION



PART DESCRIPTION

1. Seal (T20)
2. Cover (T20)
3. Hub (Specify bore and keyway)
4. Grid
5. Gasket (T20)
6. Fasteners (T20) — Coupling may be supplied with one set each of inch series fasteners and metric fasteners.
7. Lube Plug

ORDER INFORMATION

1. Identify part(s) required by name above.
2. Furnish the following information.

EXAMPLE:

Coupling Size: 1030
Coupling Type: T20
Model: B
Bore: 1.375
Keyway: .375 x .187

3. Price parts from appropriate price list and discount sheet.



Appendix E

Trouble Shooting Guide (Standard for all 4000 series pumps)

Problem	Solution
Key will not fit into keyway in drive shaft	Check for burrs and nicks in the keyway and on the key. Remove as required. Measure width of key and keyway, if an interference fit is found, reduce the width of the key.
Motor shaft turns but pump shaft does not	Verify that the coupling has been properly installed with the correct key in each hub. Verify that the set screws are properly tightened in each coupling hub.
Pump will not prime	Check for air leaks in the suction line. Check for correct rotation of the pump shaft -- CW when facing the shaft end of the pump. “Wet” the internals of the pump with the liquid to be pumped to provide a liquid hydraulic seal in the pumping chamber. Make sure that all suction and discharge line valves are open. Make sure that the suction and discharge lines are free of obstructions.



Problem	Solution
Pump requires too much torque	Make sure that the viscosity of the liquid being pumped is not abnormally high. Check alignment of pump.
Pumped liquid has entrained air	Check for air leaks in suction line.
Flow rate is too low	Make sure that the viscosity of the liquid being pumped is not abnormally low. Make sure that the discharge pressure is not abnormally high. Make sure that there are no air leaks in the suction line. Verify that the rotational speed is correct. Disassemble pump and verify that the internal clearances are within specification.