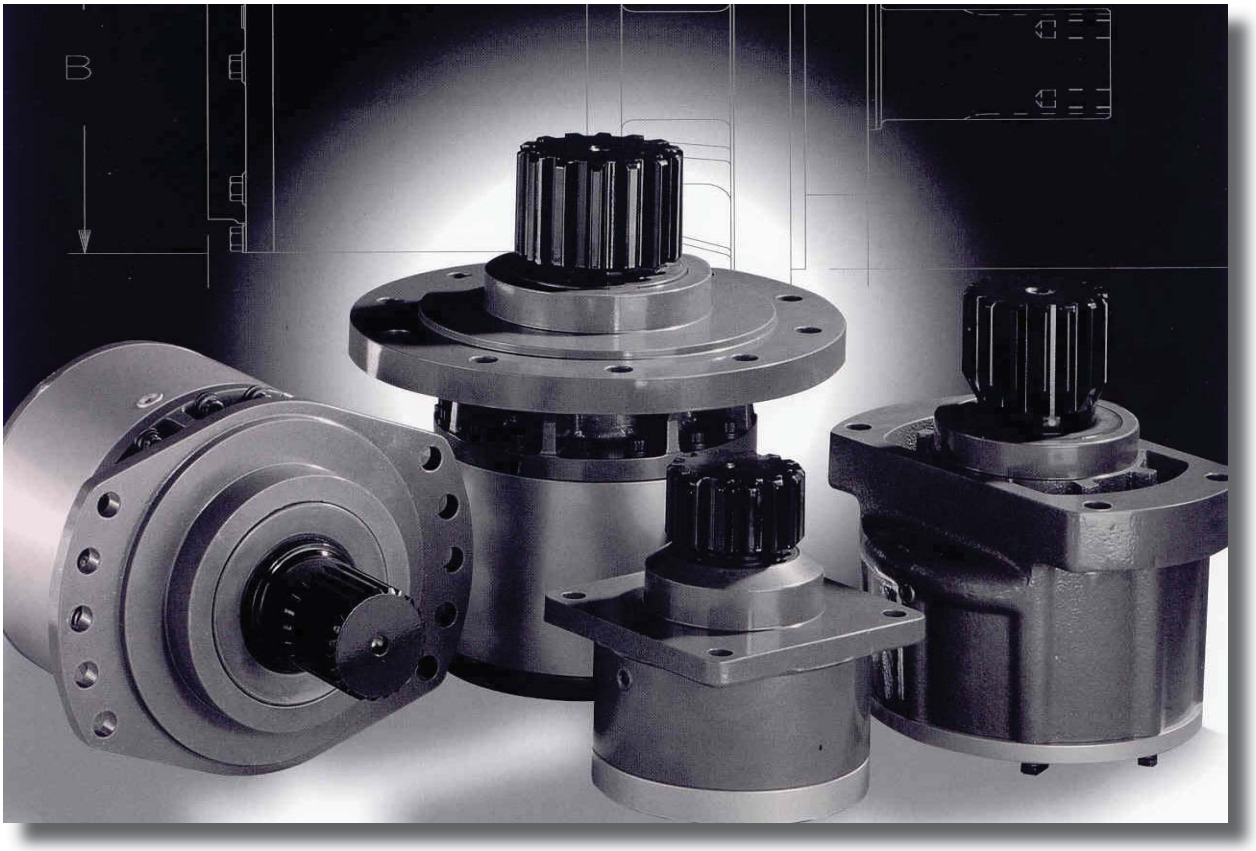
ESKRIDGE

MODEL 1400 TRIPLE PLANETARY SHAFT DRIVE SERVICE MANUAL



WARNING: While working on this equipment, use safe lifting procedures, wear adequate clothing and wear hearing, eye and respiratory protection.

THIS SERVICE MANUAL IS EFFECTIVE:
S/N: 74362 TO CURRENT
DATE: 10/01/2007 TO CURRENT
VERSION: SM1400KD3-AA

NOTE: Individual customer specifications (mounting case, output shaft, brake assembly, etc.) may vary from exploded drawing and standard part numbers shown. If applicable, refer to customer drawing for details.

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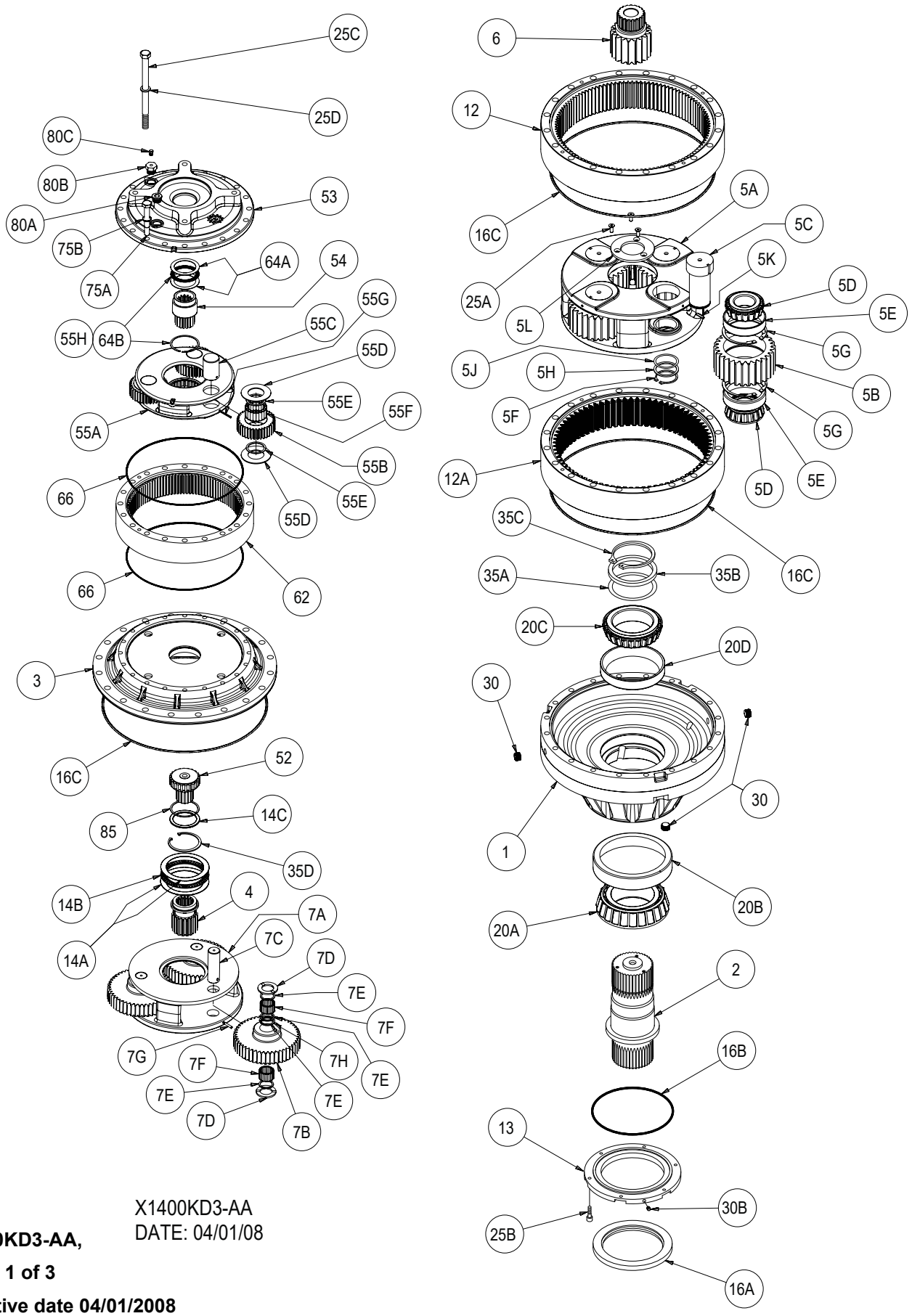

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DATE: 04/01/08

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Model 1400 Shaft/Spindle Drive Ratio breakdown				
Unit	104	155	201	163	243	314
Stg I	3.95	5.87	7.59	3.95	5.87	7.59
Stg II	4.96	4.96	4.96	7.76	7.76	7.76
Stg III	5.33	5.33	5.33	5.33	5.33	5.33

CORE UNIT:				1400-26	1400-41	2-STAGE+3rd-STAGE CORE
MODEL 1400 SHAFT DRIVE				26.48:1 4.96:1 5.33:1	41.41:1 7.76:1 5.33:1	EITHER RATIO + 3RD STAGE
Item #	**QTY.**	**Description**		**Part Number**	**Part Number**	**Part Number**
1	1	BASE	CODE A - FLANGED	60-004-3024		
			CODE A - FLANGED W/ BRG GREASE ZERK	60-004-3024Z		
			CODE F - FLANGELESS	60-004-3137		
			CODE F - FLANGELESS W/ BRG GREASE ZERK	60-004-3137Z		
			CODE CA or CF - CUSTOM	(CUSTOM P/N)		
2	1	OUTPUT SHAFT	CODE D1 - 4" LONG, 40T 8/16 SPLINE	60-004-4012		
			CODE D3 - 5" LONG, 40T 8/16 SPLINE	60-004-4082		
			CODE C1 - CUSTOM	(CUSTOM P/N)		
3	1	COVER #1	CODE D - SAE 'D' (4 BOLT)	60-004-1074		**60-004-1934**
			CODE E - SAE 'E' (4 BOLT)	60-004-1564		
4	1	INPUT GEAR #1	CODE 9 (13T, 8/16 SPLINE)	60-004-1122	60-004-1142	---
			CODE 5 (15T, 8/16 SPLINE)	PNNYA	60-004-1552	---
			CODE 8 (16T, 8/16 SPLINE) REQ'D f/RATIOS ≥ 50:1	60-004-1402	60-004-1492	*SEE 2-STAGE*
5	**1**	**SEC CARR ASSY-5.33:1(1400)**		**60-005-2133**		
5A	1	CARRIER SEC; 4-PLANET		60-004-1774		
5B	4	PLANET GEAR; SEC		60-004-1232		
5C	4	PLANET SHAFT; SEC		60-004-1262		
5D	8	CONE; SEC. PLNT				
5E	8	CUP; SEC.PLNT				
5F	4	RETAINING RING; PLANET SHAFT		01-160-0490		
5G	8	RETAINING RING; PLANET BORE		01-160-0500		
5H	8	WASHER; SEC		60-004-1291		
5J	8	SHIM; SEC. PLNT		60-004-1321		
5K	4	ROLL PIN; 1/4 x 1 3/8		01-153-0150		
5L	1	PLATE; SEC CARRIER RETAINER		60-004-1352		
6	1	SUN GEAR -SECONDARY		60-004-1792		
7	**1**	**PRIMARY CARRIER ASSY-1400**		**60-005-2113**	**60-005-2123**	*SEE 2-STAGE*
7A	1	CARRIER; PRIMARY		60-004-1372	60-004-1722	*SEE 2-STAGE*
7B	3	PLANET GEAR; PRIMARY		60-004-1862	60-004-1872	*SEE 2-STAGE*
7C	3	PLANET SHAFT; PRIMARY		60-004-1272		
7D	6	THRUST WASHER; PRIMARY PLANET		60-004-1881		
7E	12	SPACER WASHER; PRI ROLLER; 4 PER SHAFT		60-004-1891		
7F	168	LOOSE ROLLER; 2 X 28 PER SHAFT 3/16 X 1.12		01-106-0050		
7G	3	ROLL PIN; 1/4 x 1 3/8		01-153-0150		
7H	3	RETAINING RING; PLANET BORE		01-160-0750		
12A	1	RING GEAR; SEC.		60-004-1243		
12B	1	RING GEAR; SIMPLE PRI		60-004-1193		
13	1	SEAL CARRIER		60-004-1333		
14A	2	THRUST RACE; PRI CARR		01-112-0350		
14B	1	THRUST BRG; PRI CARR		01-112-0340		
14C	1	THRUST RACE; INPUT GEAR		01-112-0060		
16A	1	SEAL; OUTPUT SHAFT		01-405-0630		
16B	1	O-RING; SEAL CARRIER		01-402-0670		
16C	3	O-RING; RING GEAR		01-402-0660		
20A	1	BRG CONE; OUTER		01-102-0190		
20B	1	BRG CUP; OUTER		01-103-0190		
20C	1	BRG CONE; INNER		01-102-0220		
20D	1	BRG CUP; INNER		01-103-0220		
25A	3	FLAT HD SOC C.S.; SEC CARR RET. (3/8-24X1 GR-8)		01-150-1590		

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Model 1400 Shaft/Spindle Drive Ratio breakdown				
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Stg II	4.96	4.96	4.96	7.76	7.76	7.76
Stg III	5.33	5.33	5.33	5.33	5.33	5.33

25B	6	SHCS; 3/8-16 X 1 GR 8; SEAL CARRIER	01-150-1110
25C	20	HHCS (3/4-10 x 10.5 GRD 8)	01-150-1580
25D	20	HARDWASHER; 3/4; 1.25 O.D.	01-166-0350
30A	4	PIPE PLUG (3/4 NPT MAGNETIC)	01-207-0100
30B	(2)	PIPE PLUG; 1/8 NPT (QTY OF 1 WITH 'Z' OPTION)	01-207-0030
30C	(1)	GR. FIT; STR.1/8 NPT ('Z' OPTION) SEAL CARRIER O.D.	01-215-0010
35A	2	SHIM; OUTPUT SHAFT	60-004-1311
35B	1	SUPPORT RING; SHAFT BRG	60-004-1281
35C	1	RETAINING RING; OUTPUT SHAFT	01-160-0480
35D	1	RETAINING RING; INPUT	01-160-0510

MODEL 440 THIRD STAGE (RATIOS > 50:1)		**CORE UNIT:**		**1400-440-4**	**1400-440-5**	**1400-440-7**
			3RD-STAGE RATIO:	**3.95**	**5.87**	**7.59**
52	1	SPLINED ADAPTER SHAFT		60-004-1902		
53	1	COVER #2	SAE 'C' 2 BOLT AND 4 BOLT	42-004-2012		
			SAE 'D' 4 BOLT	42-004-2022		
			SAE 'E' 4 BOLT	42-004-2032		
54A	1	INPUT GEAR	INPUT GEAR 13 TOOTH, 8/16	42-004-1152	42-004-1162	42-004-1172
54B	(1)		FOR 14 TOOTH, 12/24, USE ADAPTER	98-005-1141		
55	**1**	**CARRIER ASSY - THIRD STAGE**		**42-005-0101**	**42-005-0111**	**42-005-0121**
55A	1	CARRIER - 3RD STAGE		42-004-1062	42-004-1072	42-004-12102
55B	3	PLANET GEAR - 3RD STAGE		42-004-1102	42-004-1112	42-004-1272
55C	3	PLANET SHAFT - 3RD STAGE		42-004-1342		
55D	6	THRUST WASHER - 3RD STAGE PLANET		42-004-1362		
55E	6	SPACER WASHER - 3RD STAGE ROLLER		42-004-1352		
55F	60	LOOSE ROLLER; 20 PER SHAFT		01-106-0040		
55G	3	ROLL PIN; 3/16 X 1-3/4		01-153-0220		
55H	1	RETAINING RING - ADAPTER SHAFT		01-160-0690		
62	1	RING GEAR - PRIMARY		42-004-1042		
64A	2	THRUST WASHER		01-112-0400		
64B	1	THRUST BEARING		01-112-0410		
66	2	O-RING - RING GEAR		01-402-0840		
75A	20	HEX HEAD CAPSCREW 5/8-11 X 4.5 GR 8		01-150-0870		
75B	20	LOCKWASHER 5/8		01-166-0040		
80	2	PLUG - COVER #2		01-208-0030		
85	1	RETAINING RING - ADAPTER SHAFT		01-160-0690		

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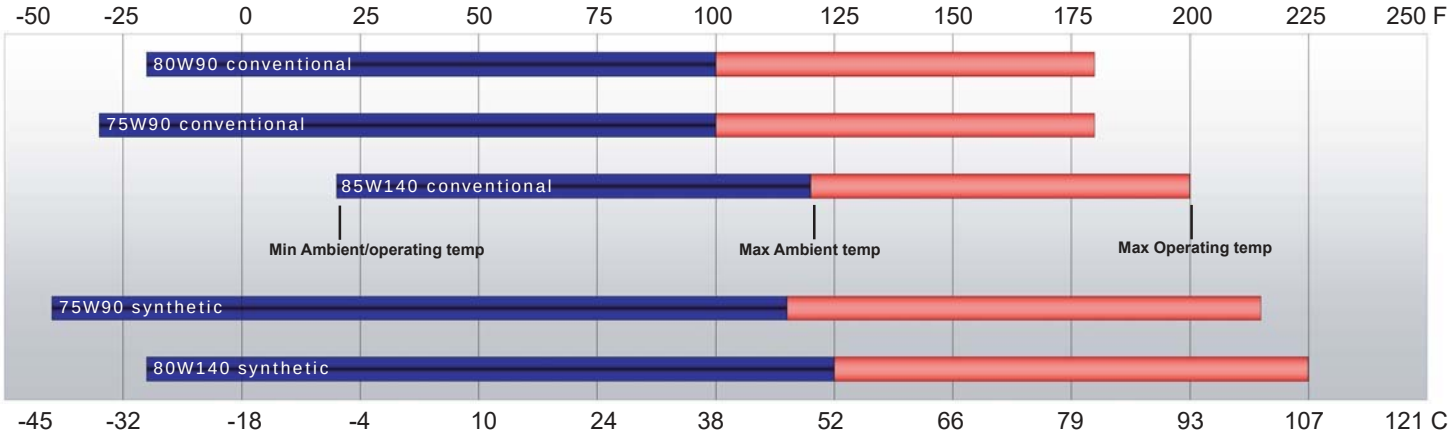
LUBRICATION & MAINTENANCE

Using the chart below, determine an appropriate lubricant viscosity. Use only EP (extreme pressure) or API GL-5 designated lubricants. Change the lubricant after the first 50 hours of operation and at 500 hour intervals thereafter. The gear drive should be partially disassembled to inspect gears and bearings at 1000 hour intervals.

Recommended ambient and operating temperatures for conventional and synthetic gear lubricants



Note: Ambient temperature is the air temperature measured in the immediate vicinity of the gearbox. A Gearbox exposed to the direct rays of the sun or other radiant heat sources will operate at higher temperatures and therefore must be given special consideration. The max operating temp must not be exceeded under any circumstances, regardless of ambient temperature.

ESKRIDGE MODEL 1400 OIL CAPACITIES

Operating Position	Oil Capacity			Oil Level
	Single stage	Double stage	Triple stage	
Horizontal Shaft	-	-	18 qts / 17 Liters	To horizontal centerline of gear drive
Vertical Shaft (Pinion Up)	-	-	27 qts / 25 Liters	To side port on gear drive base
Vertical Shaft (Pinion Down)		-	31 qts / 29 Liters	To midway on upper/ primary gear set

ESKRIDGE PART NUMBER INTERPRETATION

Note: All standard Eskridge Geardrives are issued a descriptive part number which includes information regarding the Model, means of shaft retention, base style, shaft style, input mounting, input shaft size, overall ratio and various available options. For a detailed breakdown of this information, please refer to Eskridge product specification sheets found at: http://www.eskridgeinc.com/geardrives/gearprodspecs.html

Unit Teardown

1) Scribe a diagonal line across the outside of the unit from the top cover **(53)** to the adapter cover **(3)**, and to the base **(1)** before disassembly to aid in the proper positioning of pieces during reassembly.

2) Remove drain plugs **(30A)** and drain oil from unit. The oil will drain out more quickly and completely if warm.

3) Remove the twenty 5/8-11 capscrews **(75B)** securing the top cover **(53)** to the unit.

4) Remove the top cover **(53)**, input thrust washer(s) , bearing(s) **(64A, 64B)**, and Stage I input gear **(54)**. Inspect cover o-ring **(66)**; discard if damaged or deformed.

5) Lift the stage I planet carrier assembly **(55)** including shaft adapter **(52)** from the unit .

6) Remove Stage I ring gear **(62)**, inspect o-ring **(66)** and replace if damaged or deformed.

7) Remove the twenty 3/4-10 capscrews **(25C)** and lockwashers **(25D)** securing the ring adapter cover **(3)**.

8) Remove the ring adapter cover **(3)**, thrust race **(14C)**, Stage II sun gear **(54)** and thrust washers **(14A, 14B)** from unit. Inspect cover o-ring **(16C)**; discard if damaged or deformed

9) Lift the stage II planet carrier assembly **(7)** from the unit .

10) Remove the Stage III sun gear **(6)**.

11) Remove the three 3/8-24 flat head capscrews **(25A)** securing the carrier retaining plate **(5L)** to the output shaft **(2)**.

12) Remove remaining ring gears **(12B, 12A)** and Stage III carrier assembly **(5)**. Inspect gear to gear and gear to base O-ring(s) **(16C)**, discard and replace any damaged or deformed O-rings.

13) The unit is now disassembled into groups of parts. The area(s) requiring repair should be identified by thorough inspection of the individual components after they have been cleaned and dried.

Carrier Assembly Teardown

Rotate planet gears (55B Stg I,7B Stg II, 5B, Stg III) to check for abnormal noise or roughness in bearings. If further inspection or replacement is required, proceed as follows.

1) Drive roll pins **(55G Stg I, 7C Stg II)** completely into the planet shafts or remove planet shaft retaining rings **(5F Stg III)**

2) Slide planet shafts **(55C Stg I, 7C Stg II, 5C Stg III**) out of carrier **(55A Stg I, 7A Stg II, 5A Stg III)**.

3) Remove planet gears, washers **(55D Stg I, 7D Stg II)** and bearings **(55E Stg I, 7F Stg II, 5D & 5E Stg III)** from carrier.

4) Inspect the planet gear**,** bearing bore and planet shaft **(55C Stg I, 7C Stg II, 5C Stg III)** and bearings. Check for spalling, bruising or other damage and replace components as necessary. *Note: When using loose (uncaged) roller bearings, all rollers in the corresponding planet gear should be replaced if any in the set are found to be defective*

5) Remove roll pins **(55C Stg I, 7C Stg II)** from planet shafts **(55C Stg I, 7C Stg II)** using a 3/16” (Stg I) or 1/4” (Stg II, Stg III) pin punch.

Carrier Reassembly

1) Loose roller installation; if using bearing assemblies, replace bearings as needed and proceed to step 2:

   a) Set planet washer **(55D Stg I, 7D Stg II)** on work table with planet gear **(55B Stg I, 7B Stg II)** on top of it. Center planet washer to planet gear as closely as possible.

   b) Center planet shaft **(55C Stg I, 7C Stg II)** in planet gear bearing bore.

   c) If used, place spacer washer **(55E Stg I, 7E Stg II)** onto planet shaft (refer to exploded view to confirm spacer positions).

   d) Begin placing rollers **(55F Stg I, 7F Stg II)** around shaft **(5C Stg I, 7C Stg II)**. There should be clearance for last roller to slide in. Be sure to install sixteen (Stg I) or twenty (Stg II) rollers in each bearing row.

   (If using multiple rows of rollers, repeat steps C and D as necessary. Once complete, refer to exploded view to confirm that any spacer washers **(55E Stg I, 7E Stg II)** are appropriately positioned.)

   e) Place a washer **(55D Stg I, 7D Stg II)** over gear and onto shaft.

   f) Carefully slide assembly off of table, holding planet washers against planet gear.

   g) Slide planet shaft out of the assembly and slip assembly into carrier.

   h) Align planet gear & bearing assembly inside carrier and install planet shaft through entire assembly.

2) Planet shafts **(55C Stg I, 7C Stg II, 5C Stg III)** should be installed with chamfered end of roll pin hole (Stg I, II) or slot (Stg III) towards outside diameter of carrier.

3) Drive roll pin into the carrier hole (Stg I & II) and into planet shaft or replace planet shaft retaining rings (Stg III) to retain parts. Repeat for remaining planet gears.

Base Subassembly Teardown

1) Remove the seal carrier retaining screws **(25B)** and seal carrier **(13)** from unit. Inspect seal **(16A)** for signs of wear or damage and replace as necessary.

2) Remove the output shaft lock ring **(35C)** using a heel bar or puller; if using a heel bar, be sure not to pry against the cage of the inner output shaft bearing **(20C)**. Remove the split ring segments **(35B)** and shims **(35A)**.

Caution: Since the shaft is no longer positively retained, care should be taken to avoid injury. Care should also be taken not to damage it while pressing through base.

3) Place base **(1)** exterior side down, on a plate or table. Press output shaft out bottom of base by applying a load to internal end of shaft until it passes through inner shaft bearing cone **(20C)**.

4) A gear puller may be used to remove the outer bearing cone **(20A)** from the shaft **(2)**. If reusing old bearing cone, do not pull on or damage roller cage.

Note: Press bearing cone onto output shaft by pressing on inner race only. DO NOT press on roller cage, as it may damage the bearing assembly.

5) Inspect inner and outer bearing cups **(20D & 20B)**. If cups are damaged they must be replaced, drive them out using a brass drift and utilizing the bearing knock-out notches in the base **(1)**

Base Reassembly

1) Clean all foreign material from magnetic oil plugs located In base **(1)**.

2) Place base exterior side up on work table.

3) Apply a layer of lithium or general purpose bearing grease to the roller contact surface of outer bearing cup **(20B)**.

4) Press outer bearing cone **(20A)** onto the shaft until it seats against the shoulder.

5) Place the shaft **(2)** with the outer bearing cone into the base.

6) Flip shaft/base assembly, and apply lithium or general purpose bearing grease to roller contact surface of the inner cup **(20D)**, then press inner bearing cone **(20C)** onto shaft until it seats against inner bearing cup.

7) Prior to installation of the shaft seal the preload may result in a rolling torque which varies between 200 to 300 in-lb. The bearing preload should be tailored to your application; a low-speed application may require a high pre-load, while high-speed applications usually benefit from low pre-load. Adding shims **(35A)** will increase the pre-load on the bearing set. Determine your pre-load requirement and install shims to obtain this pre-load.

   Install the support ring **(35B)** over the shims. Next, install the retaining ring **(35C)** into the shaft groove.

8) Lubricate shaft seal and reinstall seal carrier.

All subassembly service or repairs should be complete at this time. Continue to Unit Assembly to complete buildup of unit.

Unit Reassembly

1) Install the Stage III carrier assembly onto the output shaft; align the splines of the carrier **(5A)** with the output shaft splines and slide the carrier onto the output shaft **(2)**.

2) Install carrier retaining plate **(5L)** & secure using provided 3/8-24 Flathead capscrews **(25A).** If using retaining compound to assist in screw retention, apply only a small amount to internal threads. Use of excess thread retaining compound may cause screws to be irremovable once the compound has cured.

3) Lubricate o-rings **(16C)** and install on the ring gear **(12B Stg II/, 12A Stg III)** pilots.

Caution: Use lifting device to prevent injury when handling ring gears and other heavy components.

4) Align gear teeth of Stage III ring gear **(12A)** with planet gears **(5B)** and place on base, then align mounting holes of ring gear with holes in base. Use the scribed line made during disassembly for reference.

5) Install Stage II ring gear **(12B)** with lubricated o-ring in place. Align mounting holes of ring gear with holes in base, using the scribed line made during disassembly for reference.

6) Install Stage III sun gear **(6),** then Stage II carrier assembly **(7)** ,aligning gear teeth of ring gear with those of the planet gears and carrier splines aligned with those on the Stage III sun gear **(6)**.

7) Install Stage II sun gear **(4)**, and stage II carrier thrust-washers **(14A, 14B)**.

8) Install o-ring (**16C**) to ring adapter cover **(3)** and install adapter cover to Stage II ring gear, aligning mounting holes of cover with those in ring gears. Use the scribed line made during disassembly for reference.

9) Install, and torque the twenty 3/4-10 capscrews **(25C)** to retain adapter cover.

10) Install o-ring on Stage I ring gear **(62)** and install ring gear to adapter cover, aligning mounting holes of ring with those in the adapter cover. Use the scribed line made during disassembly for reference.

11) Install the Stage I carrier assembly with adapter shaft **(52)** into the Stage I ring gear **(62)**.

12) Install the input gear **(54)**.and thrust bearing set **(64A, 64B)** Refer to exploded view for details..

13) Noting the scribed line made during disassembly, (with lubricated o-ring in place) align and install the top cover **(53)**.

14) Install and torque the twenty 5/8-11 hex-head cap-screws **(75B)** with lockwashers, retaining the top cover. The torque for the cap-screws: 220 ft-lb dry, 170 ft-lb if the fasteners are lubricated.

15) Install and torque the twenty 3/4-10 capscrews **(25C)** w/ lockwashers **(26D)**. The torque for the capscrews is 380 ft.-lbs. dry or 280 ft.-lbs. lubricated

16) Using a splined shaft to drive the input gear **(54)** ensure that the unit spins freely.

17) Fill the unit to the proper level, as specified, with recommended gear oil (refer to chart, page 3) after unit is sealed with brake and/or motor.

The gear drive is now ready to use.