



## MODEL 160L PLANETARY GEAR DRIVE SERVICE MANUAL



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

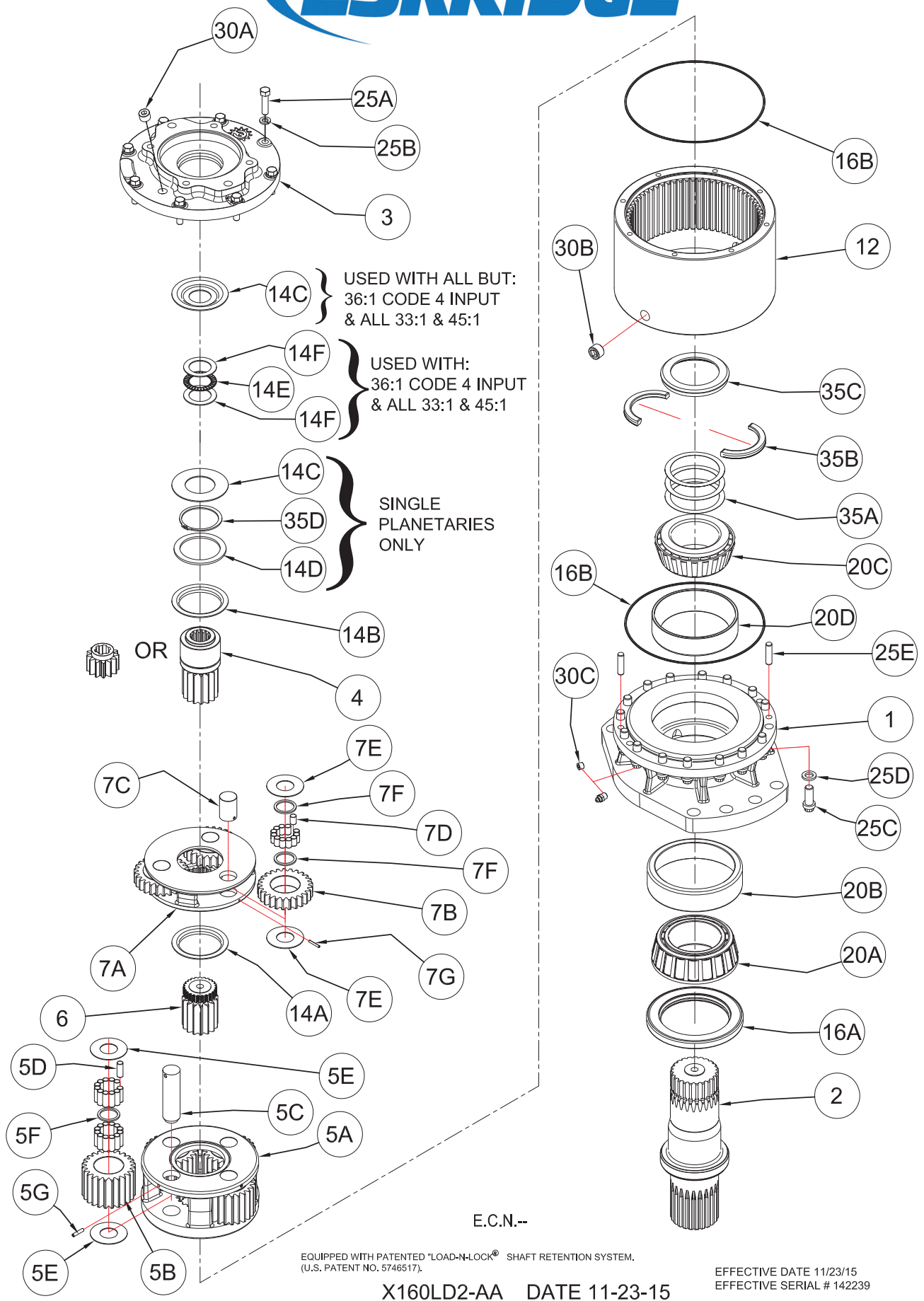
**THIS SERVICE MANUAL IS EFFECTIVE:**











**S/N: 130905 TO CURRENT**

**DATE: 12/17/14 TO CURRENT**

**VERSION: SM160L-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.

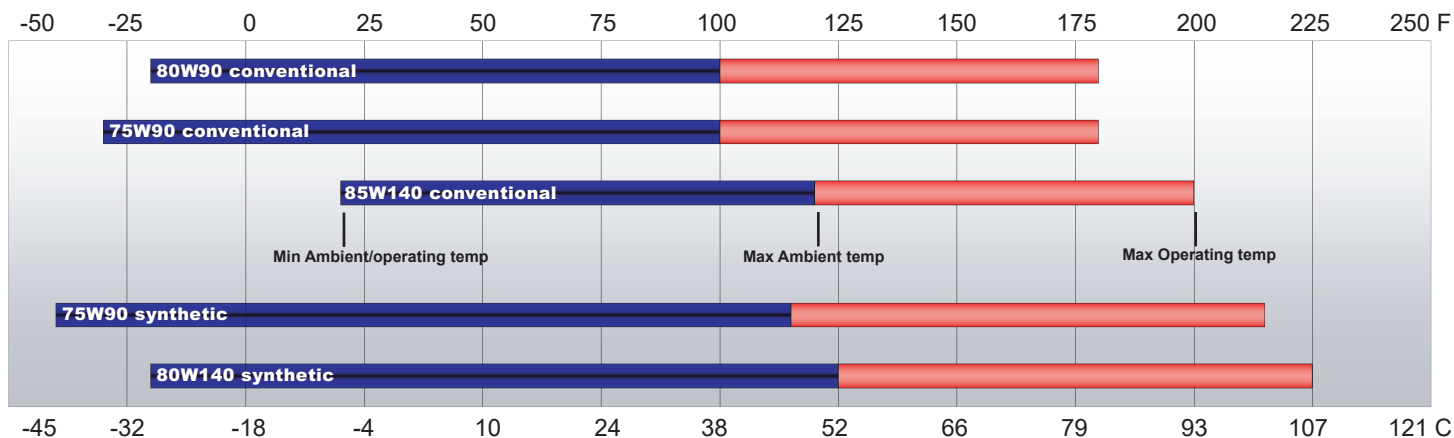


ITEM	QTY	DESCRIPTION	RATIOS		SINGLE PLANETARY		DOUBLE PLANETARY							
			4.42:1	5.33:1	4.42:1	5.33:1	19.54:1	23.58:1	26.53:1	26.53:1	32.00:1	32.00:1		
														
			4.42	5.33	4.42	5.33	19.54	23.58	26.53	26.53	32.00	32.00		
							W/CODE 4		W/O CODE 4		W/CODE 4		W/O CODE 4	
BASE	1	A - ROUND FLANGE											16-004-3007	
		A - ROUND FLANGE W/BOOT SEAT											16-004-3004	
		B - SQUARE FLANGE											16-004-3005	
		E - RECTANGULAR FLANGE											16-004-3001	
		F - FLANGELESS											16-004-3006	
		AQ - ECCENTRIC (ROUND)											16-004-3002	
		C1 - CUSTOM												
OUTPUT SHAFT	2	D1 23 T 8/16 DP SPL 2.25" LG											13-004-4352M	
		D2 3.000" DIA, 5/8" SQ KEY											13-004-4312M	
		D3 23 T 8/16 DP SPL 1.22" LG											13-004-4362M	
		D4 23 T 8/16 DP SPL 2.72" LG											13-004-4372M	
		D5 3.500" DIA, 7/8" SQ KEY											13-004-4382M	
		D6 20T 6/12 DP SPL 4.15" LG											13-004-4342M	
		S1 SPINDLE SHAFT											13-004-4202M	
C1 CUSTOM														
COVER	3	SAE 'A' 2 & MOD. 4 BOLT			13-004-1192	13-004-1192			13-004-1192			13-004-1192		
		SAE 'A' 2 & MOD. 4 BOLT W/ CODE 4	13-004-1252		13-004-1252	13-004-1252	13-004-1222		13-004-1222			13-004-1222		
		SAE 'B' 2 BOLT			13-004-1182	13-004-1182			13-004-1182			13-004-1182		
		SAE 'B' 4 BOLT			13-004-1831	13-004-1831			13-004-1831			13-004-1831		
		SAE 'B' 2 & 4 BOLT W/ CODE 4	13-004-1202		13-004-1202	13-004-1202	13-004-1232		13-004-1232			13-004-1232		
		SAE 'C' 2 BOLT & 4 BOLT	13-004-1212		13-004-1212	13-004-1212	13-004-1242		13-004-1242			13-004-1242		
		SAE 'D' 4 BOLT W/ CODE 9 **	13-004-1412											
INPUT GEAR	4	CODE 2 - INPUT 13 T 16/32 DP			13-004-1292	13-004-1292			13-004-1302			13-004-1302		
		CODE 3 - INPUT SAE 1"-6B			13-004-1322	13-004-1322			13-004-1332			13-004-1332		
		CODE 4 - INPUT 14 T 12/24 DP	13-004-1372	16-004-1001	13-004-1342	13-004-1342	13-004-1352		13-004-1352			13-004-1352		
		CODE 5 - INPUT 15 T 16/32 DP			13-004-1452	13-004-1452			13-004-1442			13-004-1442		
		CODE 9 - INPUT 13 T 8/16 DP **	13-004-1402	16-004-1002										
5	(1)	CARRIER ASSEMBLY-SECONDARY	13-005-2162	13-005-2161	13-005-2162	13-005-2161	13-005-2162	13-005-2162	13-005-2161	13-005-2161	13-005-2161			
5A	1	CARRIER (SEC)	13-004-1835	13-004-1836	13-004-1835	13-004-1836	13-004-1835	13-004-1835	13-004-1836	13-004-1836				
5B	4	PLANET GEAR (SEC)	13-004-1712	13-004-1837	13-004-1712	13-004-1837	13-004-1712	13-004-1712	13-004-1837	13-004-1837				
5C	4	PLANET SHAFT (SEC)										13-004-1562		
5D	96	BEARING - PLANET ROLLER										01-106-0010		
5E	8	THRUST WASHER - PLANET										13-004-1582		
5F	4	SPACER WASHER - PLANET										13-004-1592		
5G	4	ROLL PIN - SEC. PL. 3/16 X 7/8										01-153-0210		
6	1	SUN GEAR										13-004-1142		
7	(1)	CARRIER ASSEMBLY-PRIMARY										13-005-2121		
	7A	1	CARRIER (PRI)										13-004-1692	
	7B	3	PLANET GEAR (PRI)										13-004-1722	
	7C	3	PLANET SHAFT (PRI)										13-004-1572	
	7D	36	BEARING - PRI. PL. ROLLER .375 X.560										01-106-0020	
	7E	6	THRUST WASHER - PLANET										13-004-1582	
	7F	6	SPACER WASHER - PLANET										13-004-1592	
7G	3	ROLL PIN - PRI. PL. 1/8 X 7/8										01-153-0180		
12	1	RING GEAR										81-004-2362		
14	--	THRUST WASHERS & THRUST BRGS												
14A	1	CARRIER THRUST WASHER										81-004-2711		
14B	1	CARRIER THRUST WASHER	81-004-2711	CODE 4 ONLY			81-004-2711			81-004-2711				
14C	1	INPUT THRUST WASHER	81-004-2883	CODE 4 ONLY	81-004-2701	81-004-2701			81-004-2701			81-004-2701		
14D	1	THRUST WASHER SGL PL										01-112-0030		
14E	1	BEARING										01-112-0220		
14F	2	THRUST RACE										01-112-0230		
14G	1	THRUST RACE SINGLE-STAGE, CODE 9 INPUT										01-112-0030		
14H	1	THRUST RACE SINGLE-STAGE, CODE 9 INPUT										01-112-0400		
16	(1)	SEAL KIT	13-016-2051 Contains Items 16A, 16B and 16C: 13-016-2101 SEAL KIT contains only items 16A and 16B											
16A	1	SHAFT SEAL										01-405-0690		
16B	2	O-RING										01-402-0420		
16C	1	SEAL - RUBBER (DIRT BOOT)	01-406-0050 DIRT BOOT IS USED ON THE S1 SPINDLE SHAFT WITH A 16-004-3001 OR 16-004-3004 BASE.											
20	--	OUTPUT SHAFT BEARINGS												
20A	1	OUTER CONE										01-102-0260		
20B	1	OUTER CUP										01-103-0260		
20C	1	INNER CONE										01-102-0360		
20D	1	INNER CUP										01-103-0360		
25	--	HARDWARE												
25A	8	BOLTS - COVER - 3/8-16-1 1/2 GR8	01-150-1670 (FOR 13-004-1412 COVER, USE 01-150-1710 SHCS)											
25B	8	LOCKWASHERS - COVER - 3/8 MED	01-166-0010 (FOR 13-004-1412 COVER, DO NOT USE LOCKWASHERS)											
25C	16	BOLTS - RING	01-150-1460											
25D	16	HARD WASHERS - RING	01-166-0120											
25E	2	PIN - DOWEL, 3/8 X 1 1/2	01-152-0070											
30	--	PLUGS /GREASE ZERK												
30A	1	PLUG - COVER										01-207-0070		
30B	2	PLUG - RING - 1/2 PTF MAG 3/8 INT SQ. DR										01-207-0041		
30C	1	1/4 NPT (SOC. HD.)										01-207-0020		
		GREASE FITTING										01-215-0040		
35	--	MISCELLANEOUS												
35A	*	SHIMS	80-004-1151 ( * QUANTITY DETERMINED BY PRELOAD REQUIRED AND PART STACK-UP)											
35B	1	SPLIT RING										81-004-8101		
35C	1	LOCK RING										81-004-8111		
35D	1	RETAINING RING SINGLE-STAGE, CODE 4 INPUT	01-160-0040	CODE 4 ONLY										

# 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.

If your unit was specified “shaft up” or with a “-Z” option, a grease zerk was provided in the base housing. For shaft-up operation, the output bearing will not run in oil and must be grease lubricated. Use a lithium based or general purpose bearing grease sparingly every 50 operating hours or at regular maintenance intervals. Over-greasing the output bearing should be avoided as it tends to fill the housing with grease and thicken the oil

## ESKRIDGE MODEL 160L OIL CAPACITIES

Operating Position		Oil Capacity		Oil Level	
		Single stage	Double stage		
	Horizontal Shaft	1.5 qts / 1.4 l	1.5 qts / 1.4 l	To horizontal centerline of gear drive	
	Vertical Shaft (Pinion Up)	2.5 qts / 2.4 l	2.5 qts / 2.4 l	To side port on gear drive base	
	Vertical Shaft (Pinion Down)	2.5 qts / 2.4 l	2.5 qts / 2.4 l	To midway on upper/primary gear set	

## ESKRIDGE PART NUMBER INTERPRETATION

**Note:** All non custom 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 line across the outside of the unit from the cover (3) to the base (1) before disassembly to aid in the proper positioning of pieces during reassembly.
  - 2) Remove drain plugs (30A &/or 30B) and drain oil from unit. The oil will drain out more quickly and completely if warm.
  - 3) Remove the eight 3/8-16 capscrews (25A) and lockwashers (25B).
  - 4) Remove the cover (3), thrust washer(s)/bearing(s) (14C OR 14E & 14F OR 14G), and input gear (4). Inspect o-ring (16B); discard if damaged or deformed.
  - 5) Lift the planet carrier assembly (7) (if equipped) out of the unit and lift the secondary carrier (5) out of the unit.
  - 6) If the ring gear (12) needs to be replaced or serviced, remove the sixteen 1/2-13 12-point, flange-screws and hard-washers (25C, 25D). Then use the two jack-screw threaded holes (1/2-13) in the ring-gear flange of the base (1) to push the ring gear (12) off the dowel pins (25E) which prevent rotation of the ring gear against the base (1). If the ring gear (12) does not require service, it can be left in place for all other service. Inspect gear to base O-ring (16B); as before, replace if damaged or deformed.
  - 7) 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.
- b) Center planet shaft (7C pri/5C sec) in planet gear (7B pri/5B sec) bearing bore.
  - c) If used, place spacer washer (7F pri/ 5F sec) onto planet shaft (refer to exploded view to confirm spacer positions).
  - d) Begin placing rollers (7D pri/5D sec) around shaft (7C pri/5C sec). There should be clearance for last roller to slide in. Be sure to install 12 (pri) or 2 rows of 12 (sec) rollers in each planet gear (7B pri/5B sec) on loose roller applications.  
  
(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 (7F pri/ 5F sec) are appropriately placed.)
  - e) Place a washer (7E pri/5E sec) over gear (7B pri/5B sec) and onto shaft (7C pri/5C sec).
  - f) Carefully slide assembly off of table, holding planet washers (7E pri/5E sec) against planet gear (7B pri/5B sec).
  - g) Slide planet shaft (7C pri/5C sec) out of the assembly and slide assembly into carrier.
  - h) Align planet gear & bearing assembly inside carrier and install planet shaft through entire assembly. Use grease to hold the rollers if necessary.

## Carrier Assembly Teardown

Rotate planet gears (7B pri/5B sec) to check for abnormal noise or roughness in bearings (7D pri/5D sec). If further inspection or replacement is required, proceed as follows.

- 1) Drive roll pins (7G pri/5G sec) completely into the planet shafts (7C pri/5C sec).
  - 2) Slide planet shafts (7C pri/5C sec) out of carrier (7A pri/5A sec).
  - 3) Remove planet gears (7B pri/5B sec), washers (7E pri/5E sec), spacers (7F pri/5F sec) and bearings (7D pri/5D sec) from carrier (7A pri/5A sec).
  - 4) Inspect the planet gear (7B pri/5B sec), bearing bore and planet shaft (7C pri/5C sec) and bearing rollers (7D pri/5D sec). Check for spalling, bruising or other damage and replace components as necessary. *Note: When using loose (uncaged individual) rollers, all rollers in the planet gear must be replaced if any are found to be defective (and likely the planet shaft and planet gear as well).*
  - 5) Remove roll pins (7G pri/5G sec) from planet shafts (7C) using a 1/16 pri/ 3/16 sec inch pin punch.
- 2) Planet shafts (7C pri/5C sec) should be installed with chamfered end of 1/16 pri/ 3/16 sec inch roll pin hole towards outside diameter of carrier (7A pri/5A sec); this will ease alignment of holes while inserting roll pins (7G pri/5G sec).
  - 3) Drive roll pin (7G pri/5G sec) into the carrier hole and into planet shaft to retain parts. Repeat for remaining planet gears.

## Base Subassembly Teardown

- 1) Remove the 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 personal injury. Care should also be taken not to damage it while pressing through base.

- Note:** Removing the shaft from the base assembly damages the shaft seal (16A) and the seal will need to be replaced.
- 2) Place base (1) external side down, on a plate or table. Press output shaft (2) out bottom of base (1) by applying a load to internal end of shaft until it passes through inner shaft bearing cone (20C).
  - 3) 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. Remove the shaft

## Carrier Reassembly

- 1) Loose roller installation:
  - a) Set planet washer (7E pri/5E sec) on work table with

seal **(16A)** for inspection or replacement.

- 4) Lubricate inner lip of new shaft seal **(16A)** and slide it onto the shaft **(2)** until it fits snugly over the shaft seal diameter with the open side toward the inside of the gear drive.

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

- 5) Inspect inner and outer bearing cups **(20D & 20B)**. If cups are damaged, 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 any magnetic oil plugs located on base **(1)** or ring gear **(12)**.
- 2) Place base **(1)** 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 bearing **(20A)** into the base **(1)**.
- 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 **(2)** until it seats against inner bearing cup **(20D)**.
- 7) Prior to installation of the shaft seal **(16A)**, the pre-load may result in a rolling torque which varies between 100 to 400 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 **(35A)** to obtain this pre-load.

Install the Load-N-Lock™ segments **(35B)** over the shims **(35A)** and into the groove in the shaft **(2)**. Finally, install the lock ring **(35C)** over the segments **(35B)**.

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

## Unit Reassembly

- 1) Install the secondary carrier **(5)** assembly onto the output shaft **(2)**; align the splines of the carrier **(5A)** with the output shaft **(2)** splines and slide the carrier onto the shaft.
- 2) Lubricate o-ring(s) **(16B)** and install on the base **(1)** pilot and drive in the dowels **(25E)** into the base (if the ring gear **(12)** was removed during disassembly).

**Caution: Hold ring gear(s) by outside diameter or use lifting device to prevent injury.**

- 3) Align gear teeth of secondary ring gear **(12)** (if it was removed during disassembly) with the gear teeth of the planet gears **(5B)** and then align dowel pins with dowel pin holes (also use

the scribe-mark made during disassembly) and work the ring gear down onto the dowel pins **(25E)** by tightening the 12-point flange-screws **(25C)** a little at a time to bring the ring gear **(12)** down straight. Tighten the 16 1/2-13 12-point, flange-screws through the base into the ring gear to a torque of **110 ft-lb dry, 80 ft-lb if the fasteners are lubricated.**

- 4) Install the primary carrier assembly and sun gear into the secondary carrier.
- 5) Install the input gear **(4)**.
- 6) Install the thrust bearing set **(14C OR 14E & 14F OR 14G)** Refer to exploded view for details..
- 7) Noting the scribed line made during disassembly, (with lubricated o-ring **(16B)** in place) align and install the cover **(3)**.
- 8) Install and torque the 8 3/8-16 hex-head cap-screws **(25C)** with lockwashers **(25A)**. The torque for the cap-screws: **45 ft-lb dry, 35 ft-lb if the fasteners are lubricated.**
- 9) Using a splined shaft to drive the input gear **(4)** ensure that the unit spins freely.
- 10) 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 gearbox is now ready to use.**