



SERVICE MANUAL DH200 SERIES DIGGER MODELS



Example Part Number

200	224	6	4	F	170	BP	-
Model	Ratio	Shaft	Bail Boss	Motor Supplier	Motor Number	Back Spin Protection	-

THIS SERVICE MANUAL IS EFFECTIVE:
S/N: 203527 TO CURRENT
DATE: 1-2020 TO CURRENT
VERSION: SMD200224-64FXXXBP_AA

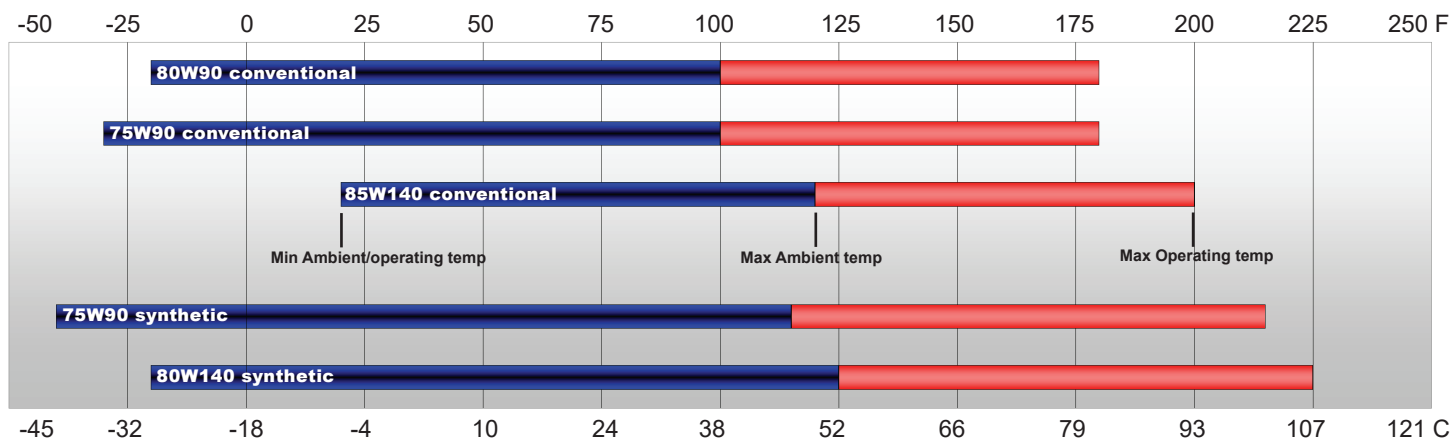
NOTE: Individual customer specifications (spindle mounting, sprocket pilot, brake assembly, etc.) may vary from exploded drawing and standard part numbers shown. If applicable, refer to customer drawing for details.

LUBRICATION & MAINTENANCE

GEARBOX OIL REQUIREMENTS

Use the chart below to determine an appropriate lubricant viscosity. Use only EP (extreme pressure) or API GL-5 designated lubricants. The lubricants pour point needs to be 10F below the minimum ambient temperature. Change the lubricant after the first 50 hours of operation and at 500 hour intervals thereafter. The 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



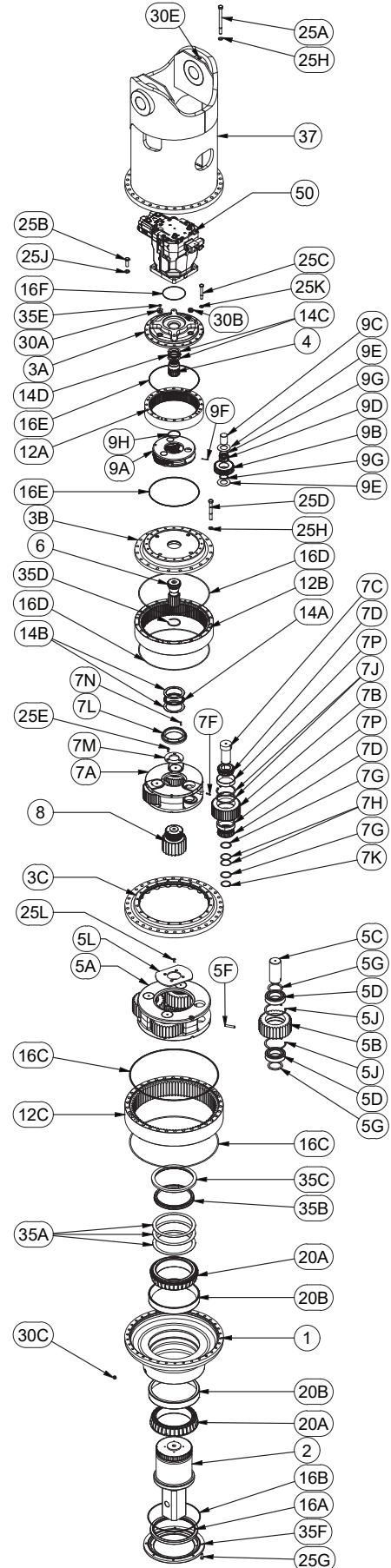
Note: Ambient temperature is the air temperature measured in the immediate vicinity of the gearbox. A gearbox exposed to the direct rays of the sun or other radiant heat sources will operate at higher temperatures and therefore must be given special consideration. The max operating temp must not be exceeded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

<u>Operating Position</u>	<u>Oil Capacity</u>	<u>Oil Level</u>
Vertical Shaft (Shaft Down)	14.75 gal	To midway on upper/primary gear set

HYDRAULIC MOTOR OIL REQUIREMENTS

The maximum motor service life is obtained by using a fluid that meets or exceeds ISO cleanliness specifications code 18/13 (ISO 4406). A recommended motor filtration of 10um (absolute) is recommended. Hydraulic main circuit oil temperatures should not exceed 176°F/80°C and drain fluid should not exceed 212°F/100°C. Hydraulic fluid type HLP (DIN 51524), automatic transmission fluids type A, or API CD engine oils can be used. When hydraulic system has reached full operating temperature the minimum oil viscosity from the motor drain should be above 8 mm²/s (cSt). At motor startup the hydraulic fluid viscosity should not exceed 1500 mm²/s (cSt). The ideal operating range for the hydraulic fluid viscosity is 15 to 30 mm²/s (cSt).

PARTS LIST				
GROUP	ITEM	QTY	PART NUMBER	DESCRIPTION
	1	1	18-004-3001	BASE
	2	1	18-004-4003	SHAFT-LNL 5.90IN SQUARE DIGGER
3	-	-	-	COVERS
3A	1	42-004-2032	COVER-SAE 'E' 440	
3B	1	60-004-1962	COVER	
3C	1	18-004-2003	COVER APAPTOR (1800-600)	
4	1	42-004-1532	INPUT GEAR - 5.87:1, 15T	
5	-	(1)	18-005-2002	SECONDARY CARRIER ASSY
5A	1	18-004-1010	CARRIER - 1800 - 4.91:1	
5B	4	18-004-1003	PLANET GEAR	
5C	4	18-004-1004	PLANET SHAFT	
5D	8	01-110-0131	BEARING	
5F	4	01-153-0242	ROLL PIN	
5G	8	45-004-1008	THRUST WASHER	
5J	8	01-160-0829	RETAINING RING	
5L	1	18-004-1005	SECONDARY CARRIER RETAINER - (1800)	
6	1	60-004-1963	SUN GEAR	
7	-	(1)	60-005-2213	CARRIER ASSEMBLY
7A	1	60-004-1964	CARRIER SEC	
7B	3	60-004-1112	PLANET GEAR SEC	
7C	3	60-004-1262	PLANET SHAFT - SEC. 600/1400	
7D	6	01-102-0210	TAPERED BEARING CONE	
7F	3	01-153-0150	ROLL PIN 1/4" X 1-3/8"	
7G	6	60-004-1291	WASHER - SEC. PLANET 600 1000 1400	
7H	6	60-004-1321	SHIM-SECONDARY PLANET	
7J	6	01-160-0500	RETAINING RING	
7K	3	01-160-0490	RETAINING RING; EXTERNAL; 5100-262	
7L	1	18-004-1015	THRUST PLATE	
7M	1	60-004-1352	SECONDARY CARRIER RETAINER	
7N	6	01-150-1100	SHCS	
7P	6	01-103-0210	TAPERED BEARING CUP	
8	1	18-004-1002	SUN GEAR	
9	-	(1)	42-005-0111	PRI CARRIER ASSY
9A	1	42-004-1072	PRI CARRIER	
9B	3	42-004-1112	PLANET GEAR - PRI	
9C	3	42-004-1342	PLANET SHAFT - PRI (440)	
9D	60	01-106-0040	PLANET ROLLER	
9E	6	42-004-1362	THRUST WASHER	
9F	3	01-153-0220	ROLL PIN (3/16X1-3/4)	
9G	6	42-004-1352	SPACER - LOOSE ROLLER 440	
9H	1	01-160-0690	RETAINING RING	
12	-	-	-	RING GEARS
12A	1	42-004-1042	RING GEAR - PRI (440)	
12B	1	60-004-1193	RING GEAR - SEC- 600; PRI 600/1000 SIMPLE	
12C	1	18-004-1001	RING GEAR	
14	-	-	-	THRUST WASHERS & BEARINGS
14A	1	01-112-0340	THRUST BRG AXK120155	
14B	2	01-112-0350	THRUST RACE AS120155	
14C	2	01-112-0400	THRUST WASHER	
14D	1	01-112-0410	THRUST BEARING	
16	-	-	-	SEALS & O-RINGS
16A	1	01-405-0840	SEAL	
16B	1	01-402-1018	O-RING	
16C	2	01-402-1017	O-RING 34.5 ID	
16D	2	01-402-0660	O-RING	
16E	2	01-402-0840	O-RING (PARKER #280)	
16F	1	01-402-1039	O-RING 154 X 3-4000-70	
20	-	-	-	SHAFT BEARINGS
20A	2	01-102-0350	BEARING CONE	
20B	2	01-103-0350	BEARING CUP	
25	-	-	-	HARDWARE
25A	34	01-150-2075	HEX HEAD CAP SCREW	
25B	4	01-150-2112	HHCS (3/4-10 UNC 1.75" GR5)	
25C	20	01-150-0870	HEX HEAD CAP SCREW	
25D	20	01-150-2076	HEX HEAD CAP SCREW	
25E	3	01-150-1590	FLAT HD SOC C.S.;GR8 3/8-24X1	
25G	8	01-150-0030	SHCS-1/2-13 X 1-1/4 GR. 8	
25H	54	01-166-0350	HARDWASHER - 3/4; 1.25 O.D.	
25J	4	01-166-0360	LOCKWASHER 3/4" MED.	
25K	20	01-166-0040	LOCKWASHER - 5/8 ZINC PLATED	
25L	4	01-150-2042	FLAT HEAD HEX SOCKET CAPSCREW 3/8-16 X 3/4" UNF GR8	
30	-	-	-	PLUGS AND FITTINGS
30A	1	01-201-0520	ADAPTOR SAE-12-1/8 NPT	
30B	1	01-208-0030	HOLLOW HEX PLUG (05HP-12)	
30C	2	01-208-0060	HOLLOW HEX PLUG	
30E	2	01-215-0050	GREASE FITTING	
35	-	-	-	MISCELLANEOUS
35A	*	18-004-1007	SHIM - (1800)	
35B	1	18-004-1012	SPLIT RING - (1800)	
35C	1	18-004-1011	LOCK RING - (1800)	
35D	1	01-160-0826	RETAINING RING	
35E	1	01-216-0020	RELIEF VALVE	
35F	1	18-004-1000	SEAL CARRIER - (1800)	
37	1	18-005-2030	BAIL	
50	1	01-304-1700	MOTOR	



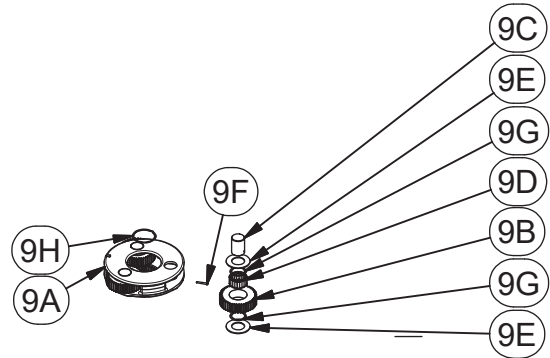
*QUANTITY DEPENDANT UPON DESIRED BEARING PRELOAD
X200224-64F170E5 ECN: - REV: A 10-28-19 HWP

Unit Disassembly Procedure

- 1) Scribe a diagonal line across the outside of the unit from the bail (37) to the base (1) before disassembly to aid in the proper positioning of pieces during reassembly.
- 2) Remove magnetic drain plugs (30C) and drain oil from unit. The oil will drain out faster and more completely if warm.
- 3) Remove the thirty four hex-head capscrews (25A) and flat washers (25H).
- 4) Separate bail (37) from gearbox and remove from digger assembly.
- 5) Install two hex-head capscrews (25A) into cover (3C) to retain gearbox assembly together while disassembling motor, Stage I and Stage II assemblies.
- 6) Remove motor (50) from cover (3A) by removing four hex-head fasteners (25B) and flat washers (25J).
- 7) Remove 20 5/8-11 capscrews (25C) and flat washers (25K). Remove cover (3A), thrust bearings (14D & 14C), and input gear (4). Inspect o-ring (16E); discard if damaged or deformed.
- 8) Take off retaining ring (9H). Lift Stage I planetary carrier assembly (9) out of the unit. Remove ring gear (12A) and inspect o-ring (16E); discard if damaged or deformed.
- 9) Remove 20 3/4-10 capscrews (25D) and washer (25H). Lift off cover (3B). Inspect o-ring (16D); discard if damaged or deformed.
- 10) Take out Stage II sun gear (6) from secondary carrier assembly (7). Remove three 3/8-24 flat head capscrews (25E) securing the carrier retaining plate (7M) to the Stage III sun gear (8).
- 11) Remove Stage II ring gear (12B) and Stage II carrier assembly (7). Inspect o-ring (16D), discard and replace any damaged or deformed o-rings.
- 12) Remove two hex-head capscrews (25A) from cover (3C). Lift cover from gearbox. Inspect o-ring (16C), discard and replace any damaged or deformed o-rings.
- 13) Remove Stage III sun gear (8) from Stage III carrier assembly.
- 14) Remove the four 3/8-16 flat head capscrews (25L) securing the carrier retaining plate (5L) from output shaft (2).
- 15) Remove Stage III ring gear (12C) and Stage III carrier assembly (5). Inspect o-ring (16C), discard and replace any damaged or deformed o-rings.
- 16) The unit is now separated into subassemblies. The area(s) requiring repair should be identified by thorough inspection of the individual components after they have been cleaned and dried.

Stage I Carrier Subassembly

(Items 9A, 9B, 9C, 9D, 9E, 9F, 9G, & 9H)



Disassembly

- 1) Rotate planet gears (9B) to check for abnormal noise or roughness in bearings (9D) or planet shafts (9C). If further inspection or replacement is required, proceed as follows.
- 2) Drive roll pins (9F) completely into the planet shafts (9C).
- 3) Press or drive planet shafts (9C) out of carrier (9A).
- 4) Remove planet gears (9B) and thrust washers (9E & 9G) and bearings (9D) from the carrier (9A).
- 5) Inspect the planet gear (9B) bearing bore, planet shaft ((C) and rollers (9D). Check for spalling, bruising or other damage. Replace components as necessary; rollers should be replaced as a set of 20. Replace any parts where abnormal wear is found.
- 6) Use 3/16 inch pin punch to remove roll pins (9F) from planet shafts (9C).

NOTE: If either the rollers or the planet shafts (pins) are damaged, both components should be replaced.

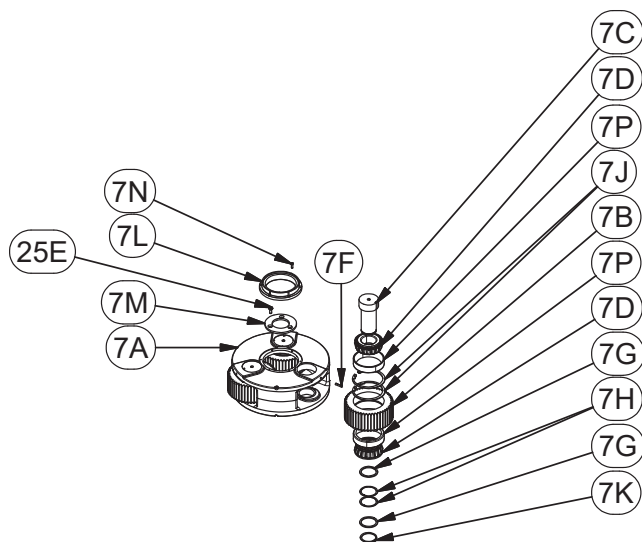
Reassembly

- 1) Rebuild Stage I planet carrier assembly in reverse order using any needed new parts.
- 2) Install rollers in gear as follows:
 - a) Set planet washer (9E) on work table with planet gear (9B) positioned on top of washer. Center the planet washer to the planet gear as closely as possible.
 - b) Center the planet shaft (9C) in the planet gear (9B) bearing bore. Install roller spacer (9G) onto planet shaft.
 - c) Begin placing rollers (9D) around the shaft (9C). There should be clearance for the last roller to slide in. Be sure to install 20 rollers in each planet gear.
 - d) Place spacer (9G) and washer (9E) on gear (9B) and shaft (9C).
 - e) Carefully slide the assembly off the table, holding the lower planet washer (9E) and planet gear (9B).
 - f) Slide the planet shaft (9C) out of the assembly and slide the assembly into the carrier.

- g) Align the planet gear/bearing assembly inside the carrier and install the planet shaft through the entire assembly.
- 3) Planet shaft (9C) should be installed with the chamfered end of the 3/16 inch hole towards the outside diameter of the carrier (9A); this will aid in alignment of holes while inserting roll pins (9F).
- 4) Drive roll pin (9F) into the carrier hole and into the planet shaft to retain the parts. Repeat for remaining planet gears.

Stage II Carrier Subassembly

(Items 7A, 7B, 7C, 7D, 7F, 7G, 7H, 7J 7K, 7L, 7M, 7N, 7L, 7P & 25E)



Disassembly

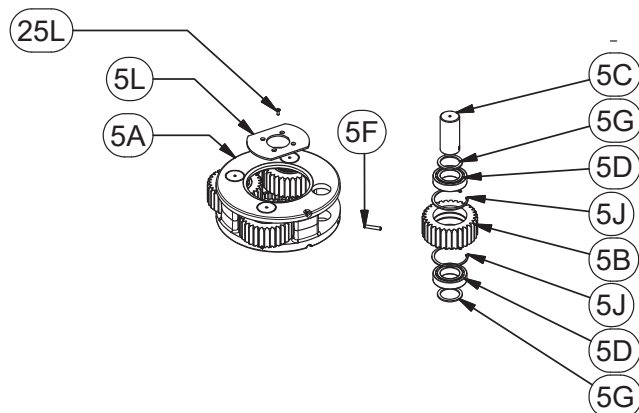
- 1) Rotate planet gears (7B) to check for abnormal noise or roughness in bearings (7D & 7P). If further inspection or replacement is required, proceed as follows.
- 2) Removing retaining ring (7K), washer (7G) and shims (7H) from planet shaft (7C).
- 3) Press planet shafts (7C) out of carrier (7A).
- 4) Remove planet gears (7B) and washer (7G) from carrier.
- 5) Inspect the planet gear (7B), bearing cone (7D), bearing cup (7P) and planet shaft (7C). Check for spalling, bruising or other damage. Replace components as necessary; bearing need to be replaced as a cup and cone set.
- 6) Replace any parts where abnormal wear is found.

Reassembly

- 1) Rebuild Stage II planet carrier assembly in reverse order using any needed new parts.
- 2) Install bearing cones (7D) into planet gear bearing cups (7P). Place washer (7G) onto interior carrier spot faced surface.
- 3) Place carrier retainer (7M) into carrier (7A). Insert planet gear assembly into carrier (7A). Slide planet shaft (7C) into carrier and align planet pin notch with roll pin in carrier.
- 4) Place shims and washer (7G) onto planet shaft. Install retaining ring (7K). Rotate planet gears by hand to test bearing preload. Correct bearing preload on the planet gears requires 50-75 in-lbs rotating torque. If gear doesn't rotate remove a shim and test again until a smooth loaded rotation is developed. Repeat for remaining planet gears.

Stage III Carrier Subassembly

(Items 5A, 5B, 5C, 5D, 5F, 5G, 5J & 5L)



Disassembly

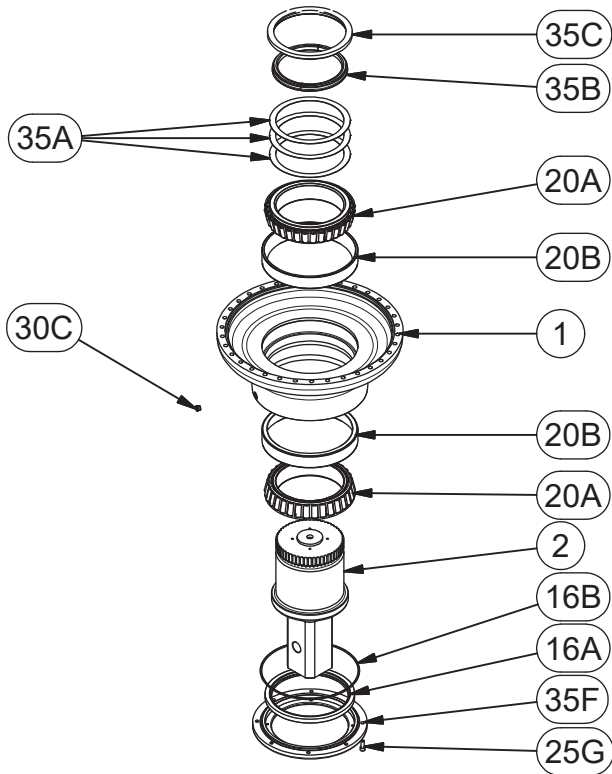
- 1) Rotate planet gears (5B) to check for abnormal noise or roughness in bearings (5D). If further inspection or replacement is required, proceed as follows.
- 2) Drive roll pins (5F) completely into the planet shafts (5C).
- 3) Press or drive planet shafts (5C) out of carrier (5A).
- 4) Remove planet gears (5B) and spacers (5G) from the carrier (5A).
- 5) Inspect the planet gear (5B) and planet bearings (5D) for spalling, bruising or other damage.
- 6) Replace any parts where abnormal wear is found.
- 7) Use 1/4 inch pin punch to remove roll pins (5F) from planet shafts (5C).

Reassembly

- 1) Install carrier retainer (5L) into carrier (5A). Place planet spacers (5G) onto planet bearings (5D) and install assembly into carrier (5A).
- 2) Planet shafts (5C) should be installed with chamfered end of 1/4 inch hole toward outside diameter of the carrier (5A). This will aid in alignment of holes while inserting roll pins (5F).
- 3) Drive a roll pin (5F) through the carrier hole and into the planet shaft to retain the parts. Repeat for other planet gears.

Base Subassembly

(Items 1, 2, 16A, 16B, 20A, 20B, 25G, 30C, 35A, 35B, 35C & 35F)



Disassembly

- 1) Remove the seal carrier retaining screws (25G) and seal carrier (35F) from unit. Inspect seal (16A) and o-ring (16B) for signs of wear or damage and replace as necessary.
- 2) 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 (20A). Remove the split ring segments (35B) and shims (35A).

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

- 3) Base (1) should be set with output shaft side down, as shown, on a plate or table. Press output shaft through the bottom of base by applying a load to top end (internal end) of shaft until it passes through inner shaft bearing cone (20A).

- 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.
- 5) Inspect inner and outer bearing cups (20B). If cups are damaged, drive them out using a brass drift

Reassembly

- 1) Place base (1) (output side up, opposite shown) on the table.
- 2) Apply a layer of lithium or general purpose bearing grease to the roller contact surface of outer bearing cup (20B).
- 3) Press outer bearing cone (20A) (large end down as shown) onto the shaft until it seats against the shoulder.

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

- 4) Place the shaft (2) with the bearing (20A) into the base (1).
- 5) Install o-ring (16B) onto seal carrier (35F). Lubricate inner lip of shaft seal (16A) and slide seal carrier assembly onto the shaft (2). Install seal carrier fasteners (25D) and torque to 110 ft-lbs dry and 80 ft-lbs lubed. Flip this assembly, resting the base (1) on the end of the output shaft (2).
- 6) Apply a layer of lithium or general purpose bearing grease to the roller contact surface of the inner cup (20B). Press the inner bearing cone (20A) (large end up as shown) onto the shaft (2) until it is seated against inner bearing cup (20B).
- 7) The shaft bearing preload needs to result in a rolling torque between 300 to 400 in-lb. Adding shims (35A) will increase the pre-load on the bearing set. Install the Load-N-Lock™ segments (35B) over the shims (35A) and into the groove in the shaft (2). When the load and lock assembly is installed properly it will not rotate because it is firmly engaged with the shims. 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 Assembly

- 1) When all subassemblies are complete, the unit is ready to be assembled.
- 2) Install the Stage III carrier assembly onto the output shaft; align the splines of the carrier (**5A**) with the splines of the shaft (**2**) and slide the carrier onto the shaft.
- 3) Place removable thread locking compound onto the 3/8-16 flathead capscrews (**25L**). Install capscrews into carrier retaining plate (**5L**) and **torque to 35ft-lbs**.
- 4) Install Stage III sun gear (**8**) into Stage III carrier assembly.
- 5) Lubricate o-ring (**16C**) and install on the pilot of the Stage III ring gear (**12C**). Align gear teeth of ring gear (**12C**) with the gear teeth of the planet gears (**5B**) and place on base. Align mounting holes of ring gear with holes in base. Using the scribed line made during disassembly for reference.
- 6) Lubricate o-ring (**16C**) and install on the pilot of the cover (**3C**). Install cover onto Stage III ring gear (**12C**) and align mounting holes. Install two fasteners (**25A**) to hold assembly together. Install Stage III sun gear (**8**).
- 7) Install Stage II carrier assembly onto the Stage III sun gear (**8**) splines. The carrier retaining plate (**7M**) holes need to be positioned so that all fasteners can be installed. Place removable thread locking compound onto the 3/8-24 flathead capscrews (**25E**). Install capscrews into carrier retaining plate (**7M**) and **torque to 35ft-lbs**.
- 8) Lubricate o-ring (**16D**) and install on the pilot of the Stage II ring gear (**12B**). Align gear teeth of ring gear (**12B**) with the gear teeth of the planet gears (**7B**) and place on cover (**3C**). Align mounting holes of ring gear with cover.
- 9) Install Stage II sun gear (**6**) into Stage II carrier assembly (**7**). Place thrust washer (**14B**) thrust bearing (**14A**) and thrust washer (**14B**) onto thrust plate (**7L**).
- 10) Lubricate o-ring (**16D**) and install on the pilot of the cover (**3B**). Place cover on Stage II ring gear. Install 20 3/4-10 hex head capscrews (**25D**) with flat washers (**25H**). **Torque the capscrews to 380 ft-lbs dry, 280 ft-lbs lubricated.**
- 11) Install Stage I carrier assembly (**9**) onto Stage II sun gear (**6**). Install retaining ring (**9H**).
- 12) Lubricate o-ring (**16E**) and install on the pilot of the Stage II ring gear (**12A**). Align gear teeth of ring gear (**12A**) with the gear teeth of the planet gears (**9B**) and place on cover (**3B**). Align mounting holes of ring gear with holes in cover.
- 13) Install input gear (**4**), thrust washers (**14C**) and bearing (**14D**).
- 14) Lubricate o-ring (**16E**) and install on the pilot of the cover (**3A**). Place cover on Stage I ring gear. Install 20 5/8-11 hex head capscrews (**25C**) with flat washers (**25K**). **Torque the capscrews to 70 ft-lbs dry, 55 ft-lbs lubricated.**
- 15) Ensure the unit spins freely by using a splined shaft to drive the input gear (**4**).
- 16) Install motor (**50**) onto cover (**3A**). Install 4 3/4-10 fasteners (**25B**) and washers (**25J**). **Torque fasteners to 380 ft-lb dry 280 ft-lbs when lubricated.**
- 17) Remove temporarily fasteners installed in cover (**3C**). Place bail (**37**) onto assembly and aligning holes in bail and cover using scribed line made during disassembly as a reference. Install 34 3/4-10 hex head capscrews (**25A**) with flat washers (**25H**). **Torque the capscrews to 380 ft-lbs dry, 280 ft-lbs lubricated.**
- 18) Fill the unit to the proper level, as specified, with GL5 EP oil.

The digger is now ready to use.