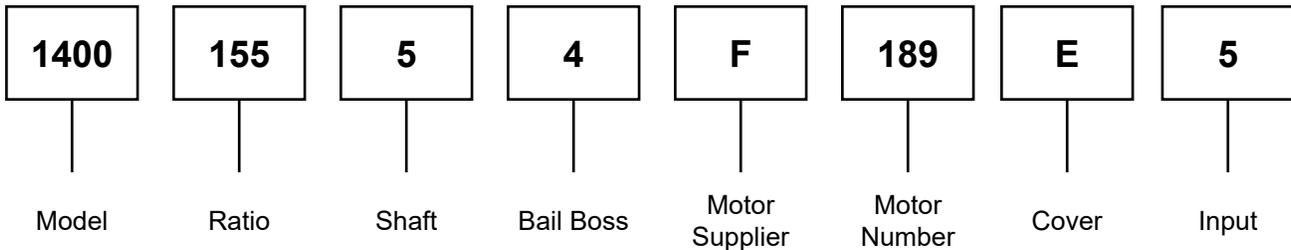




## SERVICE MANUAL 1400 SERIES DIGGER MODELS



### Example Part Number



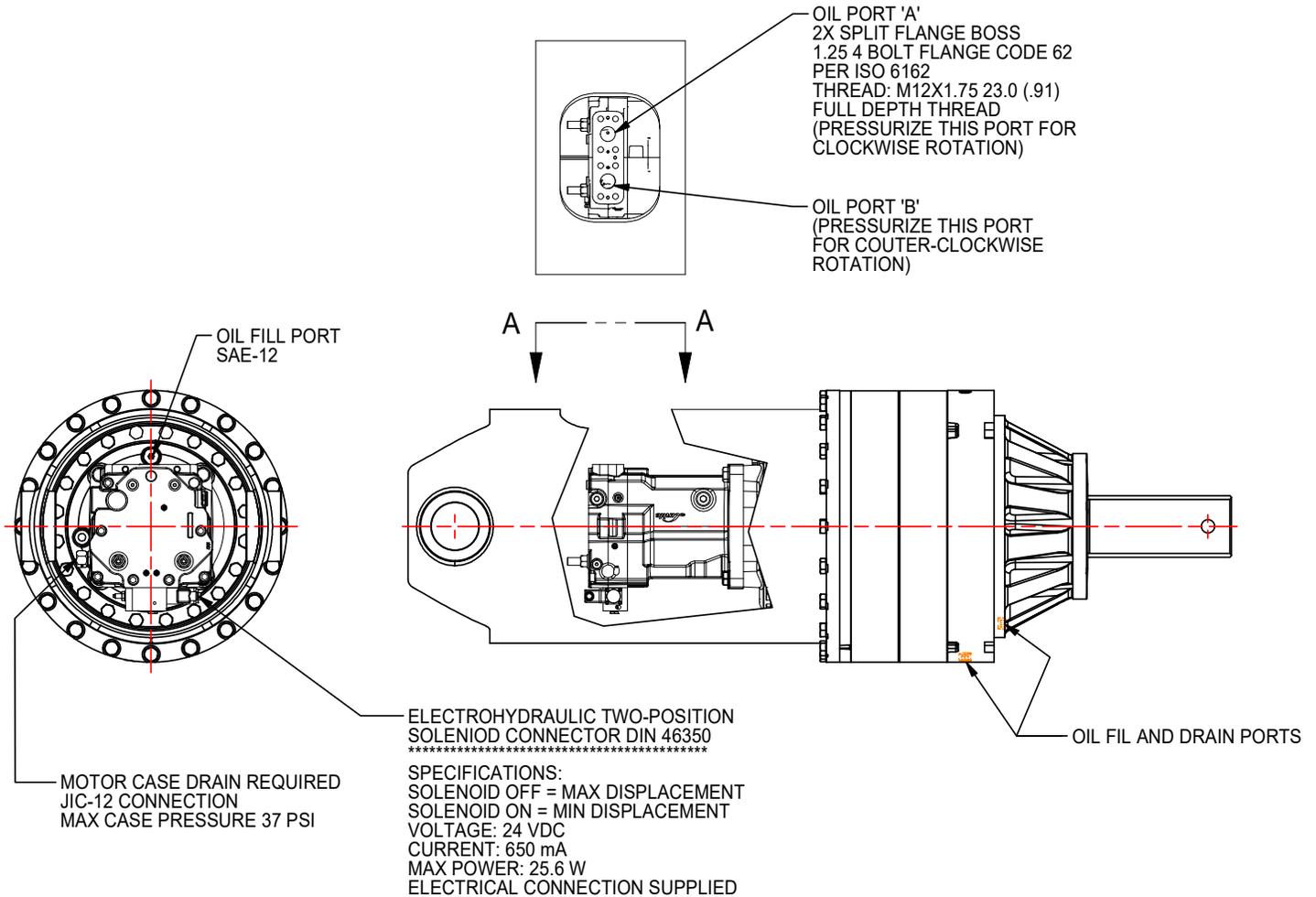
**THIS SERVICE MANUAL IS EFFECTIVE:**  
S/N: 237505 TO CURRENT  
DATE: 1-2022 TO CURRENT  
VERSION: SMD1400155-54F189E5\_AC

**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.

# INSTALLATION INFORMATION

The D1400 drive head is designed for anchor setting and digger applications. This drive head uses a high efficiency, solenoid actuated, two speed axial piston motor of optimum performance. These drives require a customer supplied mounting apparatus for connection to the customers mechanized equipment.

The maximum allowable motor pressure is 5000 psi and the maximum flow is 100 GPM. The motor requires a case drain and the maximum allowable case drain return line pressure is 37 PSI. Fill motor with hydraulic oil to the bottom of the case drain port before startup. For two speed operation the electrohydraulic switch requires a 24V excitation voltage. The voltage shifts the motor from 210cc maximum displacement to 115cc minimum displacement. The motor is fixed at maximum displacement if an electrical signal is not applied. Refer to drawing below for electrical and hydraulic information and locations.

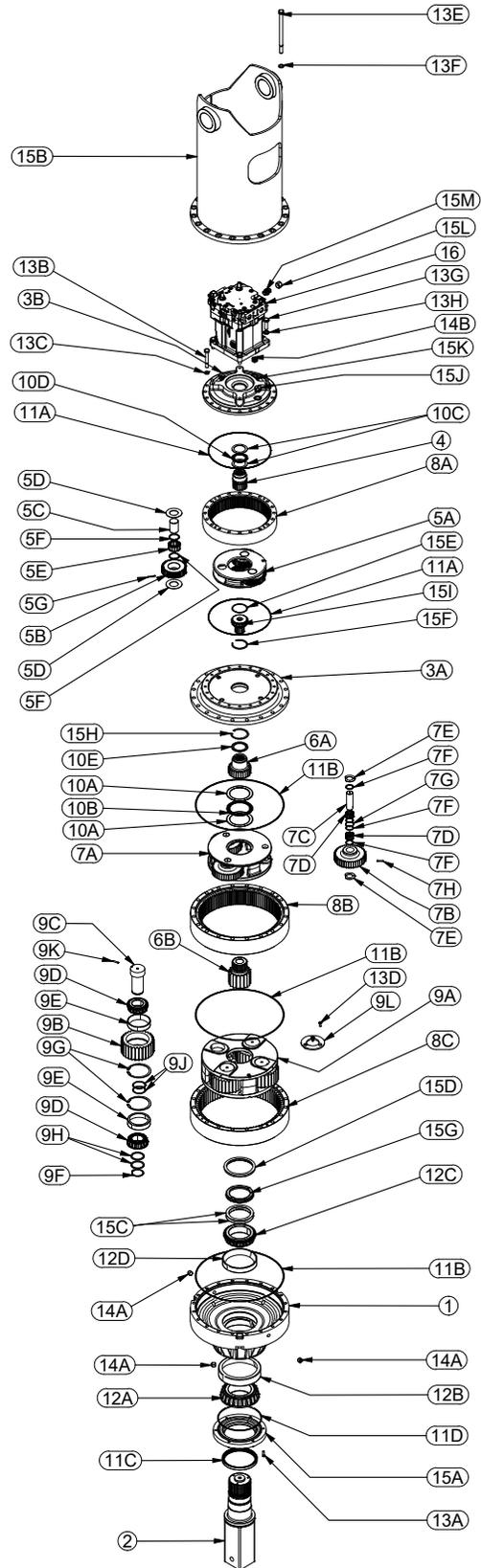




X1400155-54F189E5 EFFECTIVE FROM SN: 237505 FROM 1-1-2022 TO PRESENT 11-12-2021 EG

MODEL 1400155-54F189E5 DIGGER				
GROUP	ITEM	QTY	PART NUMBER	DESCRIPTION
	1	1	60-004-3014	BASE-FLANGELESS-F600/F1000
	2	1	60-004-4222L	SHAFT
	3A	1	60-004-1934	COVER
	3B	1	42-004-2032	COVER-SAE 'E' 440
	4	1	42-004-1532	INPUT GEAR - 5.87:1, 15T
5		(1)	42-005-0111	CARRIER ASSEMBLY - PRIMARY
	5A	1	42-004-1072	PRI CARRIER
	5B	3	42-004-1112	PLANET GEAR
	5C	3	42-004-1342	PLANET SHAFT
	5D	6	42-004-1362	THRUST WASHER
	5E	60	01-106-0040	PLANET ROLLER
	5F	6	42-004-1352	SPACER
	5G	3	01-153-0220	ROLL PIN
6		-	-	SUN GEARS
	6A	1	60-004-1402	INPUT GEAR
	6B	1	60-004-1792	SUN GEAR
7		(1)	60-005-2113	CARRIER ASSY - PRIMARY
	7A	1	60-004-6106	CARRIER-PRI(5:1) WHL DRIVE MOD
	7B	3	60-004-1862	PLANET GEAR-PRI
	7C	3	60-004-1272	PLANET SHAFT - PRI
	7D	168	01-106-0050	ROLLER BEARING
	7E	6	60-004-6110	WASHER - THRUST- PRI
	7F	12	60-004-1891	SPACER
	7G	3	01-160-0750	RETAINING RING; INTERNAL
	7H	3	01-153-0150	ROLL PIN
	8A	1	42-004-1042	RING GEAR - PRI
	8B	1	60-004-1193	RING GEAR - SEC- 600
	8C	1	60-004-1243	RING GEAR - SEC
9		(1)	60-005-2133	CARRIER ASSEMBLY, SEC
	9A	1	60-004-1774	CARRIER - SEC
	9B	4	60-004-1232	PLANET GEAR SEC
	9C	4	60-004-1262	PLANET SHAFT - SEC.
	9D	8	01-102-0210	TAPERED BEARING CONE
	9E	8	01-103-0210	TAPERED BEARING CUP
	9F	4	01-160-0490	RETAINING RING; EXTERNAL
	9G	8	01-160-0500	RETAINING RING
	9H	8	60-004-1291	WASHER - SEC. PLANET
	9J	8	60-004-1321	SHIM-SECONDARY PLANET
	9K	4	01-153-0150	ROLL PIN
	9L	1	60-004-1352	SECONDARY CARRIER RETAINER
10		-	-	THRUST WASHERS & BEARINGS
	10A	2	01-112-0350	THRUST RACE
	10B	1	01-112-0340	THRUST BRG
	10C	2	01-112-0400	THRUST WASHER
	10D	1	01-112-0410	BRG THRUST
	10E	1	01-112-0060	THRUST WASHER
11		-	-	SEALS & O-RINGS
	11A	2	01-402-0840	O-RING
	11B	3	01-402-0660	O-RING
	11C	1	01-405-0810	SEAL
	11D	1	01-402-0670	O-RING
12		-	-	OUTPUT SHAFT BEARINGS
	12A	1	01-102-0190	BEARING CONE
	12B	1	01-103-0190	BEARING CUP
	12C	1	01-102-0220	BRG CONE
	12D	1	01-103-0220	BEARING CUP
13		-	-	HARDWARE
	13A	6	01-150-1110	HEX SOCKET HEAD CAP SCREW
	13B	20	01-150-0870	HEX HEAD CAP SCREW
	13C	20	01-166-0040	LOCKWASHER - 5/8 ZINC PLATED
	13D	3	01-150-1590	FLAT HEAD HEX SOCKET CAPSCREW
	13E	20	01-150-1720	HHCS (3/4-10 x 11.5 GRD 8)
	13F	20	01-166-0350	HARDWASHER - 3/4; 1.25 O.D.
	13G	4	01-150-2112	HHCS (3/4-10 UNC 1.75" GR5)
	13H	4	01-166-0360	LOCKWASHER 3/4" MED.
14		-	-	PLUGS
	14A	4	01-207-0100	PIPE PLUG 3/4 NPT MAGNETIC
	14B	1	01-208-0030	HOLLOW HEX PLUG
15		-	-	MISCELLANEOUS
	15A	1	60-004-1922	SEAL CARRIER
	15B	1	60-005-2153	BAIL ASSY - 3-STAGE 1400 DIGGER
	15C	*	60-004-1311	SHIM - SHAFT
	15D	1	60-004-1472	LOCKING RING
	15E	1	01-160-0690	RETAINING RING
	15F	1	01-160-0826	RETAINING RING
	15G	1	60-004-1482	SPLIT RING
	15H	1	01-160-0510	RETAINING RING; INTERNAL
	15I	1	60-004-1902	ADAPTOR
	15J	1	01-201-0520	ADAPTOR SAE-12-1/8 NPT
	15K	1	01-216-0020	RELIEF VALVE
	15L	1	01-201-0821	CAP- #12 JIC
	15M	1	01-201-0820	ADAPTER-STR M27X 2/12 JIC
	16	1	01-304-1890	MOTOR

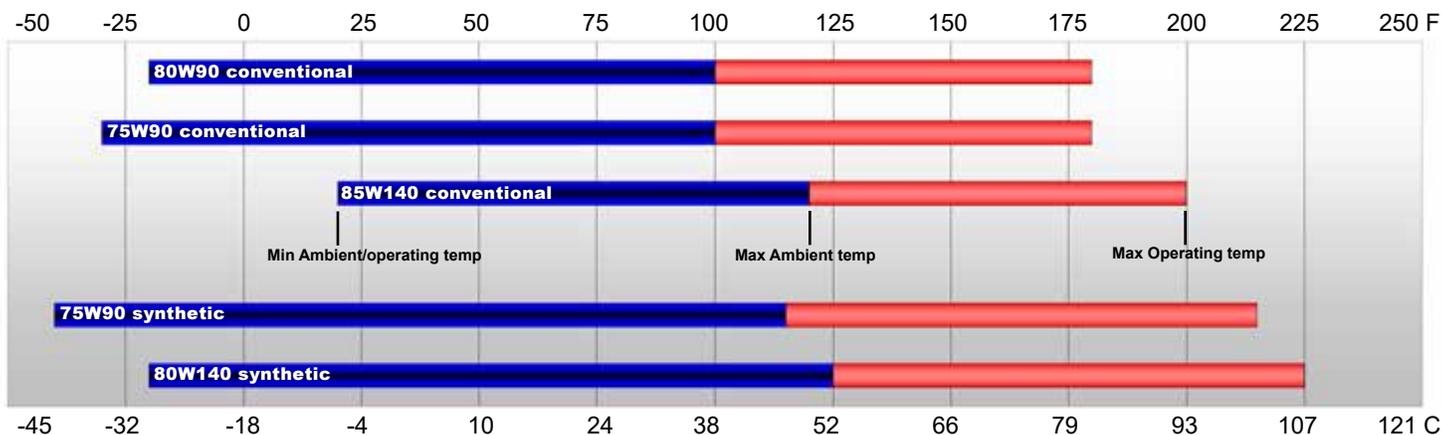
\*NUMBER OF SHIMS DEPENDANT UPON DESIRED BEARING PRELOAD



# 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 auger 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)	10.25 gal	To midway on upper gear set

## HYDRAULIC MOTOR OIL REQUIREMENTS

The maximum motor service life is obtained by using a fluid that meets or exceeds ISO 4406 cleanliness specifications code 18/16/13. 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. When hydraulic system has reached full operating temperature the minimum oil viscosity from the motor drain should be above 8 mm<sup>2</sup>/s (cSt). At motor startup the hydraulic fluid viscosity should not exceed 1000 mm<sup>2</sup>/s (cSt). The ideal operating range for the hydraulic fluid viscosity is 15 to 30 mm<sup>2</sup>/s (cSt). For working temperatures approximately between 140°F/60°C and 176°F/80°C a viscosity class oil of 46 or 68 should be used.



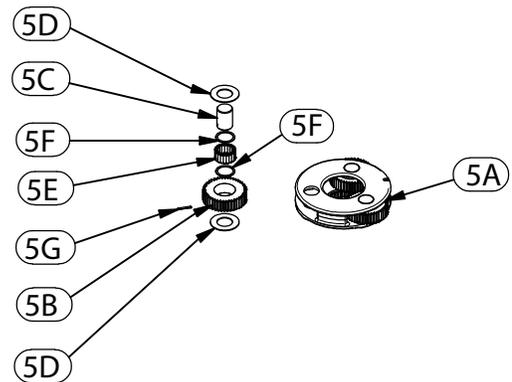
**WARNING:** While working on this equipment, use safe lifting procedures, wear adequate clothing and wear hearing, eye and respiratory protection.

# Unit Disassembly Procedure

- 1) Scribe a diagonal line across the outside of the unit from the bail (15B) to the base (1) before disassembly to aid in the proper positioning of pieces during reassembly.
- 2) Remove magnetic drain plugs (14A) and drain oil from unit. The oil will drain out faster and more completely if warm.
- 3) Remove the twenty hex-head capscrews (13E) and lockwashers (13F).
- 4) Separate bail (15B) from ring gear adapter (3A) and remove from digger assembly.
- 5) Install two hex-head capscrews (13E) into ring gear adaptor (3A) to retain gearbox assembly together.
- 6) Remove motor (16) from cover (3B).
- 7) Remove the twenty hex-head capscrews (13B) and lockwashers (13C).
- 8) Remove cover (3B), thrust bearings (10C & 10D), remove input gear (4). Inspect o-ring (11A); discard if damaged or deformed.
- 9) Remove retaining ring (15E) from adaptor (15I) and lift Stage I planet carrier assembly (5) out of the unit. Remove ring gear (8A) and inspect o-ring (11A); discard if damaged or deformed.
- 10) Remove two hex-head capscrews (13E) and ring gear adapter (3A). Inspect o-ring (11B) as before; discard if damaged.
- 11) Remove thrust washers and bearings (10A, 10B & 10E).
- 12) Remove adaptor (15I), sun gear (6A) and carrier assembly (7). Remove the Stage II ring gear (8B). Inspect o-ring (11B); as before, discard if damaged.
- 13) Remove Stage III sun gear (6B) from Stage III carrier assembly (9).
- 14) Remove the three 3/8-24 flat head capscrews (13D) securing the carrier retaining plate (9L) to the output shaft (2).
- 15) Remove remaining ring gear (8C) and Stage III carrier assembly (9). Inspect gear to gear and gear to base o-ring(s) (11B), 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 5A, 5B, 5C, 5D, 5E, 5F & 5G)



## Disassembly

- 1) Rotate planet gears (5B) to check for abnormal noise or roughness in bearings (5E) or planet shafts (5C). If further inspection or replacement is required, proceed as follows.

**NOTE: Support only the carrier (5A) while pressing out planet shafts.**

- 2) Drive roll pins (5G) completely into the planet shafts (5C).
- 3) Press or drive planet shafts (5C) out of carrier (5A).
- 4) Remove planet gears (5B) and thrust washers (5D) from the carrier (5A).
- 5) Inspect the planet gear (5B), bearing bore, planet shaft (5C) and rollers (5E). Check for spalling, bruising or other damage. Replace components as necessary; rollers should be replaced only as a set of 20.
- 6) Check primary planet shafts (5C) for any abnormal wear, especially ones where bearings needed to be replaced. If any abnormal wear is found, replace planet shafts.
- 7) Use 3/16 inch pin punch to remove roll pins (5G) from planet shafts (5C).

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

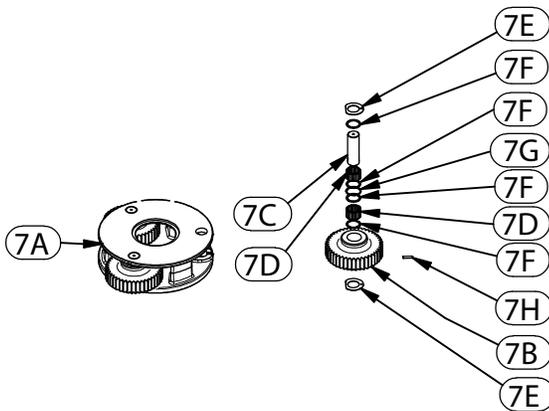
## Reassembly

- 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 (5D) on work table with planet gear (5B) positioned on top of washer. Center the planet washer to the planet gear as closely as possible.
  - b) Center the planet shaft (5C) in the planet gear (5B) bearing bore. Install roller spacer (5F) onto planet shaft.
  - c) Begin placing rollers (5E) around the shaft (5C). There should be clearance for the last roller to slide in. Be sure to install 20 rollers in each planet gear.
  - d) Install roller spacer (5F) and washer (5D) over the gear (5B).

- e) Carefully slide the assembly off the table, holding the lower planet washer (5D) and planet gear (5B).
  - f) Slide the planet shaft (5C) 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 shafts (5C) should be installed with the chamfered end of the 3/16 inch hole towards the outside diameter of the carrier (5A); this will aid in alignment of holes while inserting roll pins (5G).
  - 4) Drive roll pin (5G) 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, 7E, 7F, 7G, & 7H)



### Disassembly

- 1) Rotate planet gears (7B) to check for abnormal noise or roughness in bearings (7D). If further inspection or replacement is required, proceed as follows.
- 2) Drive roll pins (7H) completely into the planet shafts (7C).
- 3) Slide planet shafts (7C) out of carrier (7A).
- 4) Remove planet gears (7B), washers (7E) and rollers (7D) from carrier (7A).
- 5) Inspect the planet gear (7B), bearing bore, planet shaft (7C) and rollers (7D). Check for spalling, bruising or other damage. Replace components as necessary; rollers should be replaced only as a set of 56.
- 6) Remove roll pins (7H) from primary planet shafts (7C) using a 3/16 inch pin punch.

### Reassembly

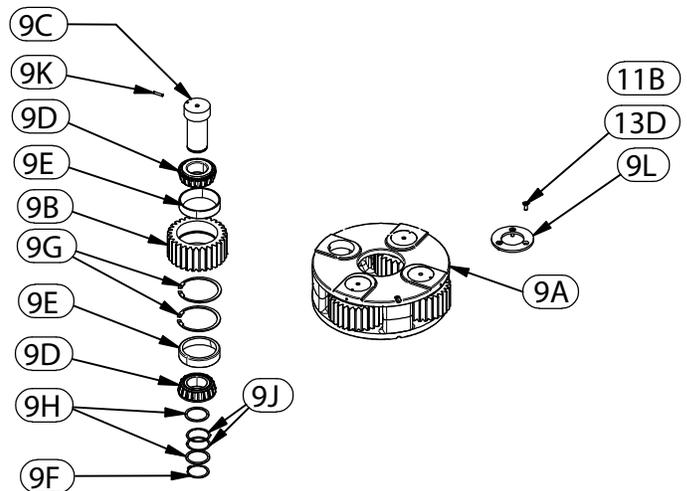
- 1) Rebuild primary planet carrier assembly in reverse order using any needed new parts. The carrier retainer plate (7L) needs to be installed in the carrier before planet gears are replaced.
- 2) Install rollers in gear as follows:
  - a) Set planet gear (7B) onto table. Install one roller spacer

(7F) into planet gear bore and seat on internal retaining ring (7G).

- b) Center the planet shaft (7C) in the planet gear (7B) bearing bore.
  - c) Begin placing rollers (7D) around the shaft (7C). There should be clearance for the last roller to slide in. Be sure to install 28 rollers in each planet gear.
  - d) Place spacer washer (7F) onto planet rollers.
  - e) Place thrust washer (7E) onto planet gear (7B) remove planet shaft.
  - f) Carefully slide the assembly off the table and rotate 180 degrees placing thrust washer onto table. Repeat steps 1 (a-f).
  - g) Remove planet shaft (7C) then slide the gear into carrier (7A). (Oriented as shown. Position tabs on washers towards outside of carrier.)
- 3) Planet shafts (7C) should be installed with the chamfered end of the 3/16 inch hole towards the outside diameter of the carrier (7A); this will aid in alignment of holes while inserting roll pins (7G).
  - 4) Drive roll pin (7G) into the carrier hole and into the planet shaft to retain the parts. Repeat for remaining planet gears.

## Stage III Carrier Subassembly

(Items 9A, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9J, 9K, 9L, 11B & 13D)



### Disassembly

- 1) Rotate planet gears (9B) to check for abnormal noise or roughness in bearings (9D, 9E). If further inspection or replacement is required, proceed as follows.
- 2) Removing retaining ring (9F), washer (9H) and shims (9J) from planet shaft (9C).
- 3) Press planet shafts (9C) out of carrier (9A).
- 4) Remove planet gears (9B) and washer (9H) from carrier.

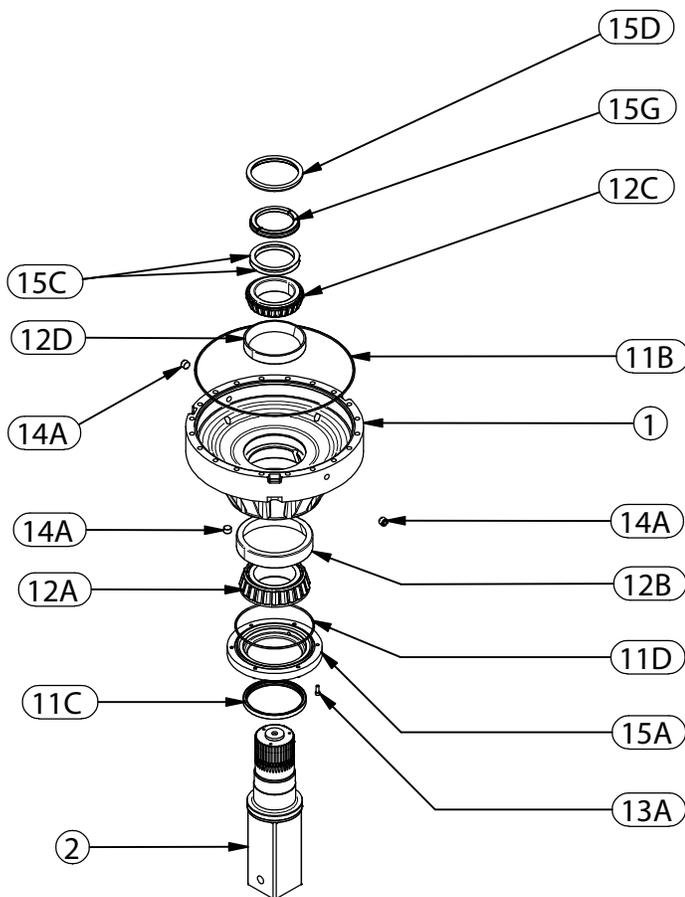
- 5) Inspect the planet gear (9B), bearing cone (9E), bearing cup (9D) and planet shaft (9C). Check for spalling, bruising or other damage. Replace components as necessary; bearing need to be replaced as a cup and cone set.
- 6) Replace any parts where abnormal wear is found.

### Reassembly

- 1) Rebuild Stage III planet carrier assembly in reverse order using any needed new parts.
- 2) Install bearing cones (9D) into planet gear bearing cups (9E). Place washer (9H) onto interior carrier spot faced surface.
- 3) Insert planet gear assembly into carrier (9A). Slide planet shaft (9C) into carrier planet assembly and align planet pin notch with roll pin in carrier.
- 4) Place shims (9J) and washer (9H) onto planet shaft. Install retaining ring (9F). 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.

## Base Subassembly

(Items 1, 2, 11B, 11C, 11D, 12A, 12B, 12C, 12D, 13A, 14A, 15A, 15C, 15D, & 15G)



### Disassembly

- 1) Remove the seal carrier retaining screws (13A) and seal carrier (15A) from unit. Inspect seal (11C) and o-ring (11D) for signs of wear or damage and replace as necessary.

- 2) Remove the lock ring (15D) 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 (12C). Remove the split ring segments (15G) and shims (15C).

**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 it when it is pressed through base.**

- 3) Base (1) should be set pinion 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 (12C).
- 4) A gear puller may be used to remove the outer bearing cone (12A) from the shaft (2). If reusing old bearing cone, do not pull on or damage roller cage.
- 5) Inspect inner and outer bearing cups (12A, 12B, 12C & 12D). If cups are damaged, drive them out using a brass drift and utilizing the bearing knock-out notches in the base (1)

### Reassembly

- 1) Clean all foreign material from magnetic oil plug (14A) located on the side of the base (1).
- 2) Place base (1) (output side up, opposite shown) on the table.
- 3) Apply a layer of lithium or general purpose bearing grease to the roller contact surface of outer bearing cup (12B).
- 4) Press outer bearing cone (12A) (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.**

- 5) Place the shaft (2) with the bearing (12A) into the base (1).
- 6) Flip this assembly, resting the base (1) on the end of the output shaft (2).
- 7) Apply a layer of lithium or general purpose bearing grease to the roller contact surface of the inner cup (12D). Press the inner bearing cone (12C) (large end up as shown) onto the shaft (2) until it is seated against inner bearing cup (12D).
- 8) Without the shaft seal (11C) installed, the preload may result in a rolling torque that varies between 50 to 300 in-lb. The bearing preload should be tailored to your application; a low-speed application may require a high pre-load, high-speed applications usually benefit from low pre-load. Adding shims (15C) will increase the pre-load on the bearing set. Determine your pre-load requirement and install shims to obtain this pre-load. Install the Load-N-Lock® segments (15G) over the shims (15C) and into the groove in the shaft (2). Finally, install the lock ring (15D) over the segments (15G).
- 9) Install o-ring (11D) onto seal carrier (15A). Lubricate inner lip of new shaft seal (11C) and slide seal carrier assembly onto the shaft (2). Install seal carrier fasteners (13A) and torque to 30 ft-lbs.

**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. During assembly a bead of Loctite 635 needs to be placed in between the mating surfaces of the base, ring gears, cover, and bail.
- 2) Install the Stage III carrier assembly onto the output shaft; align the splines of the carrier (9A) with the splines of the shaft (2) and slide the carrier onto the shaft. The holes in the top of the shaft (2) need to be orientated between the planet gears when the carrier is installed.
- 3) Install carrier retaining plate (9L) & secure using 3/8-24 Flat-head capscrews (13D). **Torque fasteners to 30 ft-lbs.**
- 4) Lubricate o-ring (11B) and install on the pilot of the Stage III ring gear (8C).
- 5) Install Stage III sun gear (6B) into Stage III carrier assembly.
- 6) Align gear teeth of ring gear (8C) with the gear teeth of the planet gears (9B) and place on base. Align mounting holes of ring gear with holes in base. Using the scribed line made during disassembly for reference.
- 7) Slide Stage II carrier (7A) onto Stage III sun gear (6B) and install Stage II sun gear (6A).
- 8) Lubricate o-ring (11B) and install on the pilot of the Stage II ring gear (8B). Align gear teeth of ring gear (8B) with those of the planet gears and place on Stage II ring gear. Align mounting holes of ring gear with holes in base. Use the scribed line made during disassembly for reference.
- 9) Install thrust bearing (10A, 10B & 10E). Lubricate o-ring (11B) and install on the pilot of the Stage I ring gear adaptor (3A).
- 10) Noting the scribed line made during disassembly, install the Stage I gear adapter (3A) and temporarily install two fasteners (13E) to hold assembly together.
- 11) Install the Stage I adaptor (15I) into Stage II input gear. Place retaining ring (15F) onto lower adaptor groove and install Stage I carrier assembly (5) onto adaptor. Install upper retaining ring (15E) onto adaptor.
- 12) Install o-ring (11A) onto ring gear (8A). Align gear teeth of ring gear (8A) with the gear teeth of the planet gears (5B) and place on ring adaptor. Align mounting holes of ring gear with holes in base. Using the scribed line made during disassembly for reference.
- 13) Install the input gear (4) then thrust bearings in the following order onto the input gear: one thrust washer (10C), thrust bearing (10D), and one thrust washer (10C).
- 14) Lubricate o-ring (11A) and install on the pilot of the cover (3B).
- 15) Noting the scribed line made during disassembly, install the cover (3).
- 16) Install and torque the 20 5/8-11 hex-head cap-screws (13B) with lockwashers (13C). **The torque for the cap-screws to 55 ft-lb dry.**
- 17) Ensure the unit spins freely by using a splined shaft to drive the input gear (4).
- 18) Install motor (16) onto cover (3B) Install motor fasteners (13G) and washers (13H). **Torque to 380 ft-lbs dry, 280 ft-lbs if fasteners are lubricated.**
- 19) Remove two temporarily fasteners installed in step 10. Place bail (15B) onto assembly and aligning holes in bail and cover using scribed line made during disassembly as a reference. Install and torque the 20 3/4-10 hex head cap-screws (13E) with lockwashers (13F). **Torque to 380 ft-lbs dry, 280 ft-lbs if fasteners are lubricated.**
- 20) Fill the unit to the proper level, as specified.

**The digger is now ready to use.**

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