



MODEL 600 PLANETARY GEAR DRIVE SERVICE MANUAL



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

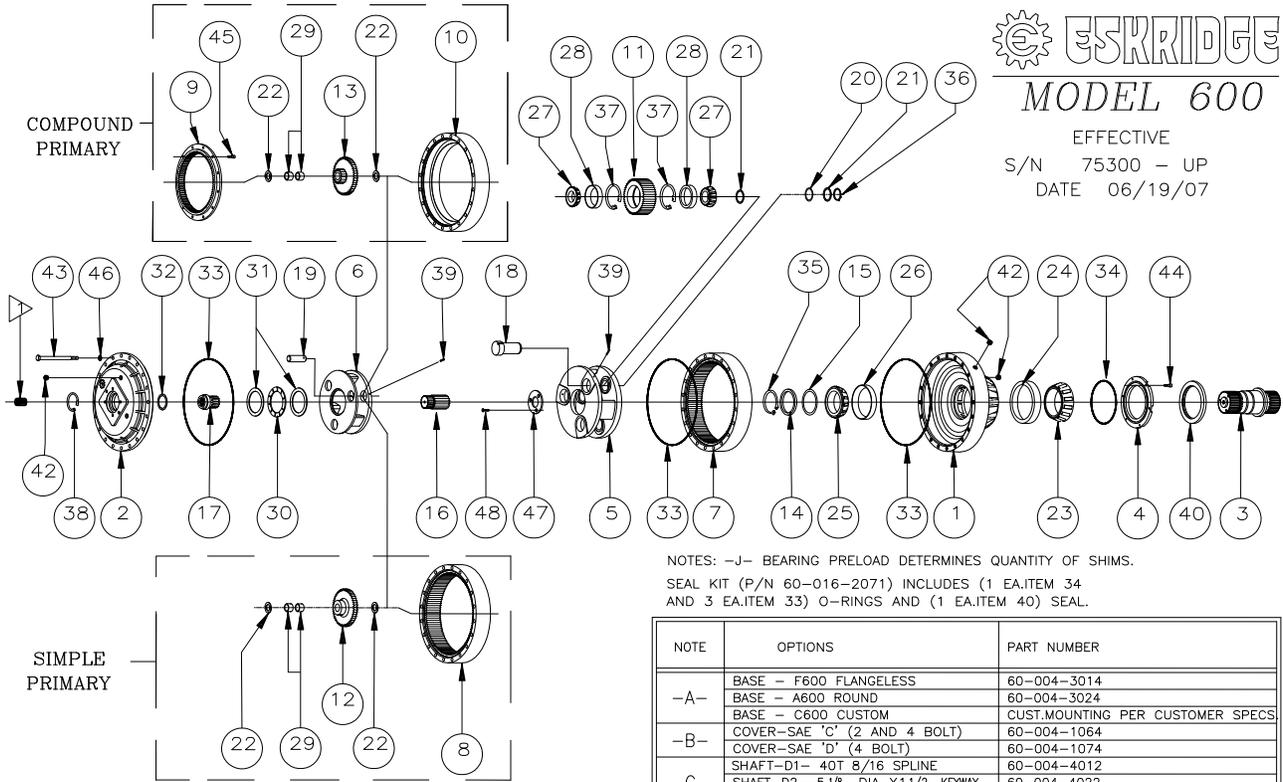
THIS SERVICE MANUAL IS EFFECTIVE:
S/N: 25000# TO CURRENT
DATE: 02/01/1996 TO PRESENT
VERSION: SM600KD2-AD

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.



MODEL 600

EFFECTIVE
S/N 75300 - UP
DATE 06/19/07



NOTES: -J- BEARING PRELOAD DETERMINES QUANTITY OF SHIMS.
SEAL KIT (P/N 60-016-2071) INCLUDES (1 EA.ITEM 34 AND 3 EA.ITEM 33) O-RINGS AND (1 EA.ITEM 40) SEAL.

NOTE	OPTIONS	PART NUMBER
-A-	BASE - F600 FLANGELESS	60-004-3014
	BASE - A600 ROUND	60-004-3024
	BASE - C600 CUSTOM	CUST.MOUNTING PER CUSTOMER SPECS
-B-	COVER-SAE 'C' (2 AND 4 BOLT)	60-004-1064
	COVER-SAE 'D' (4 BOLT)	60-004-1074
-C-	SHAFT-D1- 40T 8/16 SPLINE	60-004-4012
	SHAFT-D2- 5 1/8" DIA X11/2" KEYWAY	60-004-4022
	SHAFT-C1 CUSTOM	CUSTOM SHAFT PER CUSTOMER SPECS.

SIMPLE PLANETARY

24.66:1 RATIO	38.56:1 RATIO	60.29:1 RATIO		
PART NUMBER	PART NUMBER	PART NUMBER	QTY	ITEM
-A-	-A-	-A-	1	1
-B-	-B-	-B-	1	2
-C-	-C-	-C-	1	3
60-004-1044	60-004-1333	60-004-1054	1	4
60-004-1044	60-004-1014	60-004-1024	1	5
60-004-1044	60-004-1193	60-004-1193	1	6
60-004-1044	60-004-1193	60-004-1193	1	7
60-004-1044	60-004-1193	60-004-1193	1	8
60-004-1044	60-004-1193	60-004-1193	1	9
60-004-1092	60-004-1112	60-004-1112	3	10
60-004-1092	60-004-1132	60-004-1152	3	11
60-004-1082	60-004-1281	60-004-1281	1	12
60-004-1082	60-004-1311	60-004-1102	1	13
60-004-1082	60-004-1102	60-004-1102	1	14
60-004-1082	60-004-1122	60-004-1142	1	15
60-004-1082	60-004-1402	60-004-1492	1	16
60-004-1082	60-004-1262	60-004-1272	3	17
60-004-1082	60-004-1272	60-004-1272	3	18
60-004-1082	60-004-1321	60-004-1291	1	19
60-004-1082	60-004-1291	60-004-1291	6	20
60-004-1082	60-004-1881	60-004-1881	6	21
60-004-1082	01-102-0190	01-102-0190	6	22
60-004-1082	01-103-0190	01-103-0190	1	23
60-004-1082	01-102-0220	01-102-0220	1	24
60-004-1082	01-103-0220	01-103-0220	1	25
60-004-1082	01-102-0210	01-102-0210	6	26
60-004-1082	01-103-0210	01-103-0210	6	27
60-004-1082	01-105-0510	01-105-0510	6	28
60-004-1082	01-112-0340	01-112-0340	1	29
60-004-1082	01-112-0350	01-112-0350	2	30
60-004-1082	01-112-0060	01-112-0060	1	31
60-004-1082	01-402-0660	01-402-0660	3	32
60-004-1082	01-402-0670	01-402-0670	1	33
60-004-1082	01-160-0480	01-160-0480	1	34
60-004-1082	01-160-0490	01-160-0490	3	35
60-004-1082	01-160-0500	01-160-0500	6	36
60-004-1082	01-160-0510	01-160-0510	1	37
60-004-1082	01-153-0150	01-153-0150	6	38
60-004-1082	01-405-0630	01-207-0100	1	39
60-004-1082	01-207-0100	01-150-1580	6	40
60-004-1082	01-150-1580	01-150-1110	20	41
60-004-1082	01-150-1110	01-150-1110	6	42
60-004-1082	01-150-0570	01-166-0350	45	43
60-004-1082	01-166-0350	60-004-1352	20	44
60-004-1082	60-004-1352	01-150-1590	1	45
60-004-1082	01-150-1590		3	46

MODEL 600	
DESCRIPTION	
1	BASE
2	COVER
3	OUTPUT SHAFT
4	SEAL CARRIER
5	CARRIER-SECONDARY
6	CARRIER-PRIMARY
7	RING GEAR - SECONDARY
8	RING GEAR - SIMPLE PRIMARY
9	RING GEAR - COMPOUND PRIMARY
10	RING SPACER - PRIMARY
11	PLANET GEAR-SECONDARY
12	PLANET GEAR-PRIMARY
13	CLUSTER GEAR
14	SUPPORT RING - SHAFT BEARING
15	SHIM(S) - SHAFT
16	SUN GEAR
17	INPUT GEAR (13T 8/16 SPLINE)
18	INPUT GEAR (16T 8/16 SPLINE)
19	PLANET SHAFT-SECONDARY
20	PLANET SHAFT-PRIMARY
21	SHIM(S) - SECONDARY PLANET
22	WASHER - SECONDARY PLANET
23	WASHER - PRIMARY PLANET
24	BEARING CONE - SHAFT OUTER
25	BEARING CUP - SHAFT OUTER
26	BEARING CONE - SHAFT INNER
27	BEARING CUP - SHAFT INNER
28	CONE - SEC.PLANET
29	CUP - SEC.PLANET
30	BRG-PRIMARY PLANET
31	BRG-PRI. CARR. THRUST
32	RACE-PRI. CARR. THRUST
33	RACE -INPUT THRUST
34	O-RING - RING GEAR
35	O-RING - SEAL CARRIER
36	RETAINING RING - SHAFT
37	RETAINING RING -SEC. PIN
38	RETAINING RING-SEC. PLANET
39	RETAINING RING - INPUT
40	ROLL PIN - 1/4 X 1 3/8
41	SEAL-SHAFT
42	PIPE PLUG 3/4 NPT MAGNETIC
43	H.H.C.S 3/4-10 X 10.5 GRD 8
44	S.H.C.S 3/8-16 X 1 GRD 8
45	S.H.C.S 1/2-13 X 1.5 GRD 8
46	HARDWASHER - 3/4
47	RING-SEC. CARR. RETAINER
48	FLAT HD SOC C.S. 3/8-24 X 1 GR8

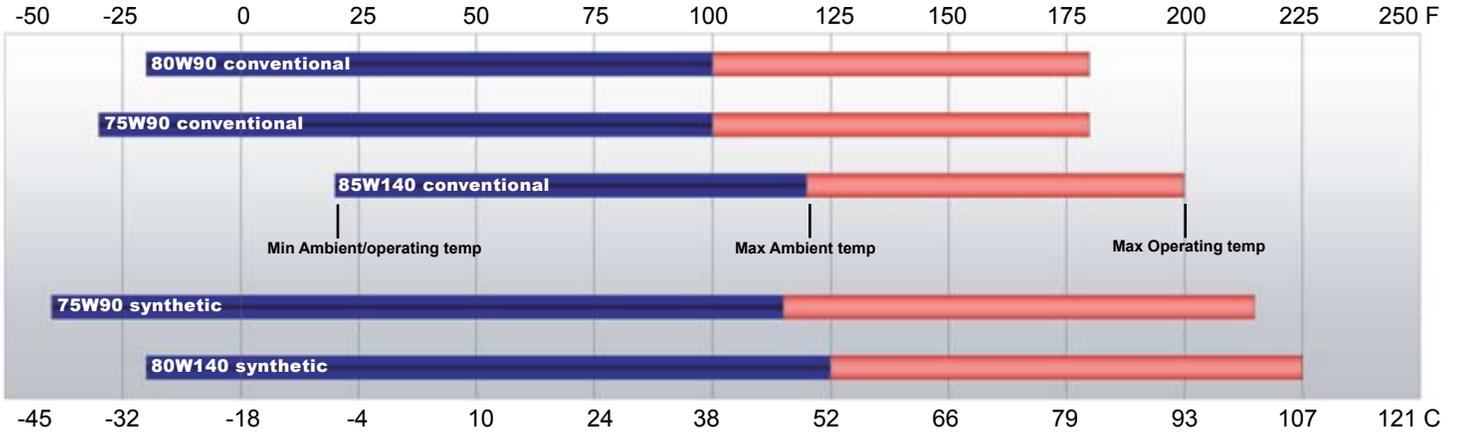
COMPOUND PLANETARY		70.39:1 RATIO	89.38:1 RATIO	110.08:1 RATIO	139.77:1 RATIO
ITEM	QTY	PART NUMBER	PART NUMBER	PART NUMBER	PART NUMBER
1	1	-A-	-A-	-A-	-A-
2	1	-B-	-B-	-B-	-B-
3	1	-C-	-C-	-C-	-C-
4	1	60-004-1333			
5	1	60-004-1044		60-004-1054	
6	1	60-004-1024			
7	1	60-004-1193			
8	-				
9	1	60-004-1213			
10	1	60-004-1253			
11	3	60-004-1092		60-004-1112	
12	-				
13	3	60-004-1162	60-004-1182	60-004-1162	60-004-1182
14	1	60-004-1281			
15	-J-	60-004-1311			
16	1	60-004-1082		60-004-1102	
17	1	60-004-1142	60-004-1172	60-004-1142	60-004-1172
18	3	60-004-1492	60-004-1452	60-004-1492	60-004-1452
19	3	60-004-1262			
20	3	60-004-1272			
21	-J-	60-004-1321			
22	6	60-004-1291			
23	6	60-004-1881			
24	1	01-102-0190			
25	1	01-103-0190			
26	1	01-102-0220			
27	1	01-103-0220			
28	6	01-102-0210			
29	6	01-103-0210			
30	6	01-105-0510			
31	1	01-112-0340			
32	2	01-112-0350			
33	1	01-112-0060			
34	3	01-402-0660			
35	1	01-402-0670			
36	1	01-160-0480			
37	3	01-160-0490			
38	6	01-160-0500			
39	1	01-160-0510			
40	6	01-153-0150			
41	1	01-405-0630			
42	6	01-207-0100			
43	20	01-150-1580			
44	6	01-150-1110			
45	12	01-150-0570			
46	20	01-166-0350			
47	1	60-004-1352			
48	3	01-150-1590			

E.C.N 2681
X600KD2-AD DATE 06-13-07

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 600 OIL CAPACITIES

Operating Position	Oil Capacity			Oil Level
	Single stage	Double stage	Triple stage	
 Horizontal Shaft	-	20 qts	-	To horizontal centerline of gear drive 
 Vertical Shaft (Pinion Up)	-	38 qts	-	To side port on gear drive base 
 Vertical Shaft (Pinion Down)		38 qts		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 diagonal line across the outside of the unit from the cover (2) to the base (1) before disassembly to aid in the proper positioning of pieces during reassembly.
- 2) Remove drain plugs (42) and drain oil from unit. The oil will drain out more quickly and completely if warm.
- 3) Remove the 20 3/4-10 capscrews (43) and lockwashers (46) retaining the cover (2).
- 4) Remove the cover (2), thrust washer(s)/bearing(s) (30,31,32), and input gear (17). Inspect o-ring (33); discard if damaged or deformed.
- 5) Lift the planet carrier assembly out of the unit .
- 6) Remove ring gear(s)/spacer (8/10pri, 7sec) and subsequent carrier assemblies. Inspect gear to gear and gear to base O-ring(s) (33); as before, discard if damaged or deformed.
- 7) The unit is now disassembled into groups of parts. The area(s) requiring service should be identified by thorough inspection of the individual components after they have been cleaned and dried.

Carrier Assembly Teardown

Rotate planet gears (12/13 pri;11 sec) to check for abnormal noise or roughness in bearings. If further inspection or replacement is required, proceed as follows.

- 1) *Primary:* Drive roll pins (39) completely into the planet shafts (19). *Secondary:* Remove planet shaft retaining rings (36), spacers (21) and preload shims (20)
- 2) Slide planet shafts (19 pri/18 sec) out of carrier.
- 3) Remove planet gears (12/13 pri; 11 sec), washers (22 pri/21 sec) and bearings (29 pri;27/28 sec) from carrier (6).
- 4) Inspect the planet gear (12/13 pri; 11 sec), bearing bore and planet shaft (19 pri/18 sec) and bearings (29 pri; 27/28 sec). Check for spalling, bruising or other damage and replace components as necessary.
- 5) *Primary only:* Remove roll pins (39) from planet shafts (19) using a 1/4 inch pin punch.

Carrier Reassembly

- 1) *Primary:* Planet shafts(19) should be installed with chamfered end of 1/4 inch roll pin hole towards outside diameter of carrier (6); this will ease alignment of holes while inserting roll pins (39). *Secondary:* Planet shafts must be installed aligning the slot in the large end of the shaft with the roll pin protruding into the shaft bore.
- 2) *Primary:* Drive roll pin (39) into the carrier hole and into planet shaft to retain parts. *Secondary:* Install the first planet washer (21) to the small end of the planet shaft, the appropriate number of preload shims (20) and then the second planet washer (21) and retaining ring (36) Repeat for remaining planet gears.

Base Subassembly Teardown

- 1) Remove output shaft retaining ring (35), spacer (14) and shims (15)

- 2) Remove the six 3/8-16 x 1 (44) hex head capscrews from the seal carrier and remove seal carrier (4) and sealing o-ring (34) from unit. Inspect the shaft seal (40) for wear or damage and replace as necessary.

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/drop the shaft while pressing through base.

- 3) Place assembly external side down, supported by base (1). Press output shaft from base by applying a load to internal end of shaft until it passes through the inner shaft bearing cone (25).
- 4) A gear puller may be used to remove the outer bearing cone (23) from the shaft if replacement is necessary. If reusing old bearing cone, do not pull on or damage roller cage. Lubricate inner lip of shaft seal (40) and slide seal carrier assembly (34, 4, 40) onto the shaft (3). **Note: Press bearing cone onto output shaft by pressing on inner race only. DO NOT press on roller cage, as doing so will damage the bearing.**
- 6) Inspect inner and outer bearing cups (26 & 24). If cups are damaged they must be replaced, they may be driven out using a brass drift and utilizing the bearing knock-out notches in the base (1)

Base Reassembly

- 1) Clean all foreign material from the magnetic oil plugs located on the base (1).
- 2) Place the base with 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 (24).
- 4) If previously removed, press outer bearing cone (23) onto the shaft until it seats against the shoulder.
- 5) Place the shaft (3) with the bearing (23) into the base (1) then install seal carrier (4) using the six 3/8-16 (grade 8) hex head capscrews (44) and torque to 45 ft-lbs (dry) or 35 ft-lbs (wet)
- 6) Flip shaft/base assembly, and apply lithium or general purpose bearing grease to roller contact surface of the inner cup (26), then press inner bearing cone (25) onto shaft (3) until it seats against inner bearing cup (26).
- 7) Neglecting the friction which results from the installation of the shaft seal (40), bearing pre-load should result in a rolling torque which varies between 200 to 300 in-lb. Preload should be tailored to your application; a low-speed application may warrant a high pre-load, while high-speed applications usually benefit from low pre-load. Adding shims (15) will increase the pre-load on the bearing set. Determine your pre-load requirement and install shims to obtain the desired bearing pre-load.
- 8) Place shaft spacer washer (14) over shims (15), then install shaft retaining ring (35)

All subassembly service or repairs should be complete at

this time. Continue to Unit Assembly to complete buildup..

Unit Reassembly

- 1) Install the secondary carrier assembly onto the output shaft; aligning the splines of the carrier (5) with the output shaft (3) splines and centering the three threaded holes in the output shaft between the planet gears. Once aligned slide the carrier onto the shaft.
- 2) Install carrier retaining plate (47) & secure using provided 3/8-24 Flathead capscrews (48). If using thread locking compound to assist in screw retention, apply only a small amount to internal threads. Use of excess thread lock may cause screws to be irremovable once compound has cured.
- 3) Lubricate o-ring (33) and install on the ring gear (7) pilot.

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

- 4) Align gear teeth of secondary ring gear (7) with the gear teeth of the planet gears (11) and place ring gear on base aligning mounting holes of ring gear with holes in base. Use the scribed line made during disassembly for reference. With carrier in place, install secondary sun gear.

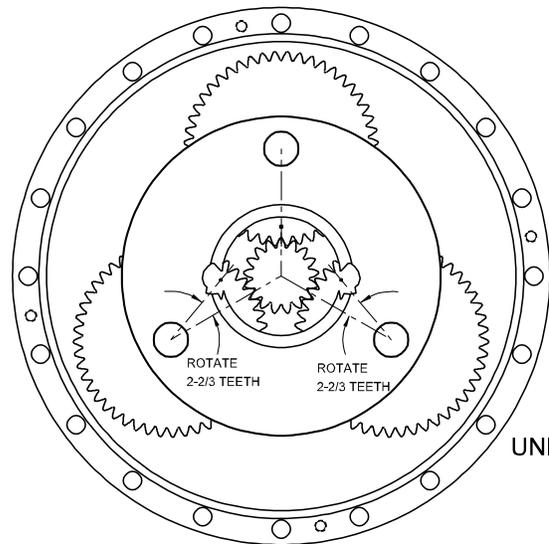
Simple Planetary Primary, for compound primary skip to step 5C

- 5S) Install primary ring gear (with lubricated o-ring in place), aligning mounting holes of ring gear with holes in base, using the scribed line made during disassembly for reference. Install the primary carrier assembly aligning gear teeth of ring gear with those of the planet gears and place on base. Install the input gear.

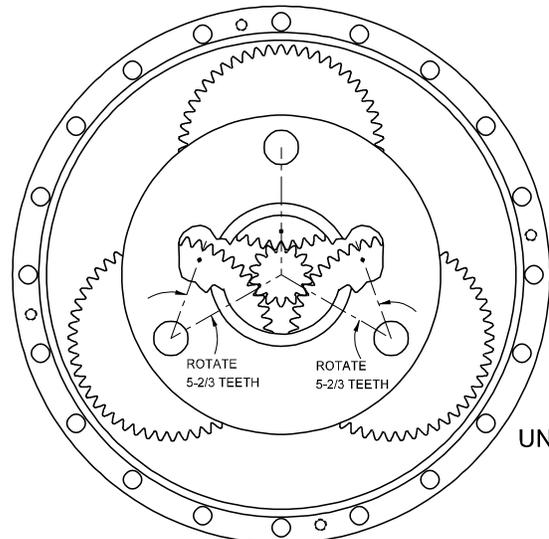
Compound primary (76:1 ratio and up):

- 5C) a) The planet gears will now need to be timed. Refer to the diagram appropriate for your unit's gear ratio (above, right). The planet gears each have a timing mark, usually a round punch mark stamped into the surface which is shown as a circle on the diagram.
 - b) As seen from above, start with the top planet gear with its timing mark pointing straight down. Next, rotate the lower left planet gear counterclockwise as indicated in the timing diagram. Then rotate the lower right planet gear clockwise as indicated.
 - c) Set the input gear (17) and the input thrust race (32) into the center of the primary planet carrier assembly.
 - d) If compound primary ring gear (9) was not removed during disassembly, then skip to step 7. Otherwise, bolt to the inside of the cover (2) with twelve bolts (45). Use a removable thread locking compound on the threads of the bolts (45). Tighten to 110 ft.-lbs. dry or 80 ft.-lbs. lubricated.
 - e) Install primary ring spacer (10) w/ O-ring (33) in place.
- 6) Install the input to cover thrust washer (32) and carrier to cover thrust washers (31, 2ea; 30, 1ea) Refer to exploded view for details.
- 7) Noting the scribed line made during disassembly, (with lubricated o-ring in place) align and install the cover (2).
- 8) Install and torque the 20 3/4-10 hex-head cap-screws

PRIMARY CARRIER TIMING DIAGRAMS



UNIT RATIO
76:1



UNIT RATIO
96:1

(43) with lockwashers (46). The torque for the cap-screws: 380 ft-lb dry, 280 ft-lb if the fasteners are lubricated.

- 9) Using a splined shaft to drive the input gear (17) 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.