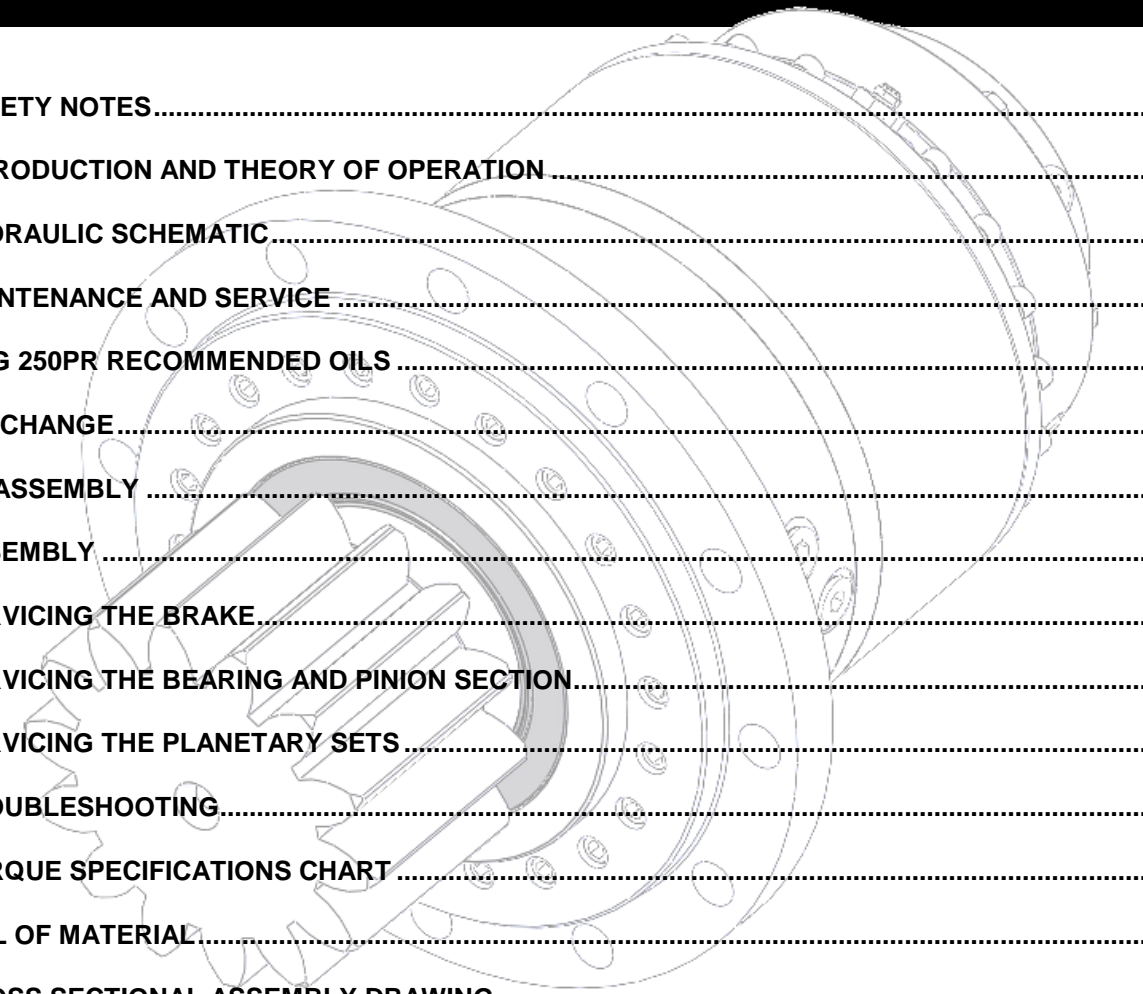




POWER to Move the World™

Model 250PR Service/Repair Manual

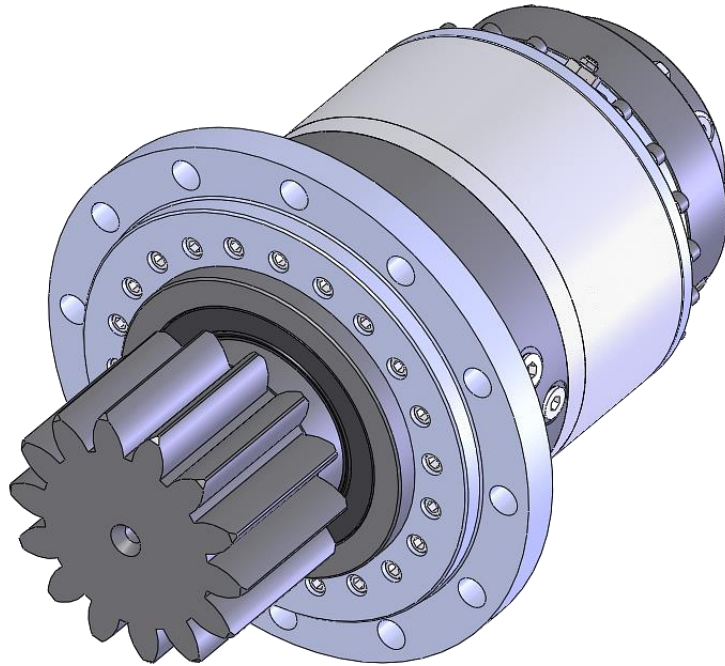
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SAFETY NOTES



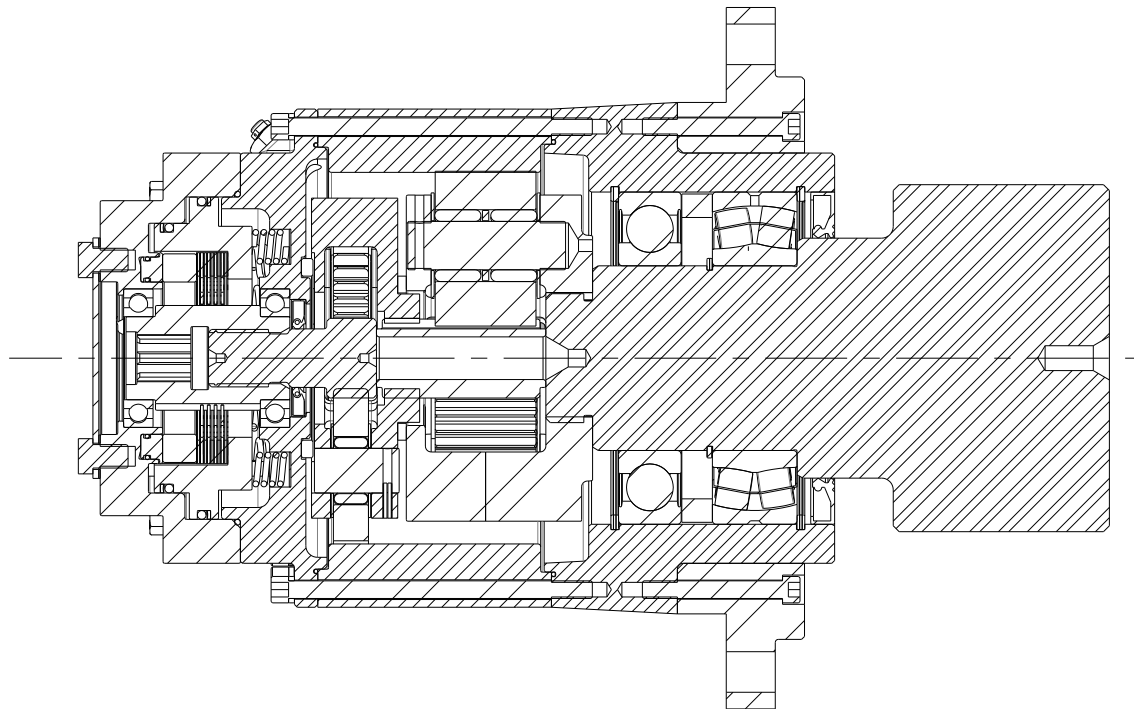
WARNING

FAILURE TO HEED THE FOLLOWING WARNINGS MAY RESULT IN SERIOUS INJURY OR DEATH!

- Operators/Technicians must be trained in the proper, safe operation of the swing-drive gearbox.
- All shields and guards must be in place during operation of swing-drive gearbox.
- Be aware of and stay clear of all pinch points during operation of swing-drive gearbox.
- Boom must be stowed and properly secured while removing swing-drive gearbox.
- Avoid shock loads. This type of load could impose a torque many times the actual torque rating of the swing-drive gearbox.
- Make sure that all equipment, including the swing-drive gearbox is maintained properly.
- Counterbalance valves are pre-set from the factory and must not be adjusted.



INTRODUCTION AND THEORY OF OPERATION



The TWG 250PR planetary gearbox is a hydraulically driven 2-stage planetary gearbox designed to use a motor with SAE "A" 2-BOLT mount and 1.00" 6B spline shaft. This gearbox has a total ratio of 38:1.

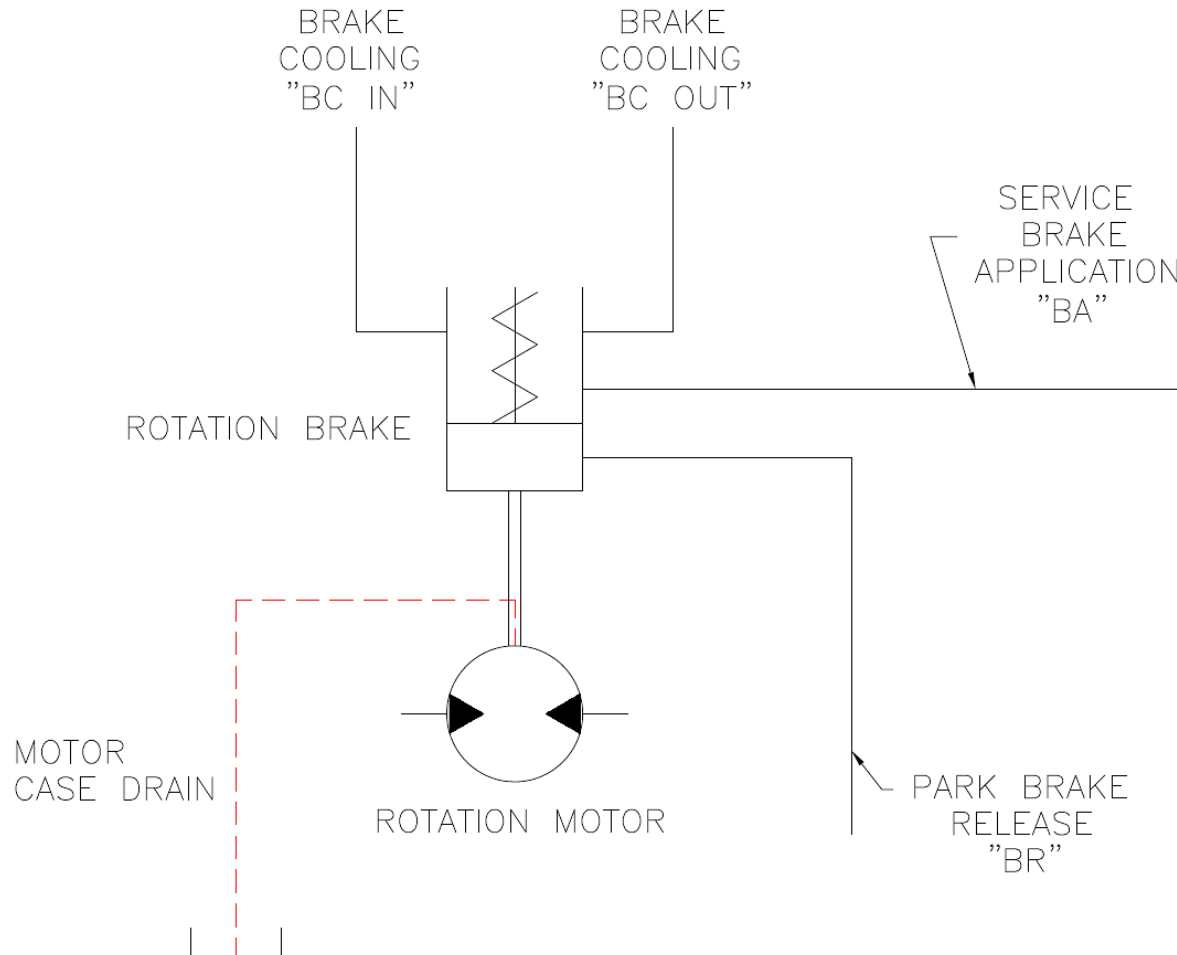
The gearbox is designed to utilize a hydraulic motor, driving through a multiple-disc static oil brake, into a pair of planetary gear sets to the output pinion.

The multiple-disc oil bath static park brake is spring applied and hydraulically released through a port in the brake housing. The multiple-disc "service brake" is hydraulically applied through a port in the brake housing.

During operation, dual counterbalance valves are used for dynamic braking to prevent the gearbox from moving faster than desired. These counterbalance/brake valves partially block the main line from the motor back to the directional control valve, allowing only a limited amount of hydraulic fluid through the motor. The counterbalance valves are generally internally modulated by sensing pressure on the supply line. Additionally, any time there is sufficient pressure to modulate the counterbalance valves; this same pressure releases the static friction/stator style park brake.

HYDRAULIC SCHEMATIC

The TWG 250PR is equipped with a spring applied hydraulically released static "park brake" and an optional integral hydraulically applied dynamic "service brake". The park brake on this unit should full release by pressurizing the "BR" port to 300 psi. The maximum pressure allowed into the park brake is 3,000 psi. The service brake is applied by pressurizing the "BA" port while pressurizing the "BR" port. The maximum pressure allowed into the service brake port is 1,000 psi. The service brake can be cooled using a flow-thru cooling method by plumbing hydraulic oil into "BC IN" port and plumbing "BC OUT" port back to tank. The maximum pressure allowed in the brake cavity (flow thru cooling circuit) is 25 psi. Excessive pressure in the flow thru cooling circuit could damage the oil seal separating the brake oil from the gearbox oil.



MAINTENANCE AND SERVICE



Authorized Distributor:
Pacific Marine & Industrial
www.pacificmarine.net
info@pacificmarine.net

For safe and consistent operation of TWG hoists, gearboxes, and winches, a regular program of preventive maintenance is strongly recommended. Regular oil changes with the correct oil and frequency for the application and an annual inspection of the wear components will help ensure a long life for your planetary geared products.

Maintenance Scheduling

Manufacturer recommends changing oil after first 50 hours of operation. All gearboxes require the proper EP gear oil for lubrication. Some units may be equipped with a grease fitting for lubrication of the output shaft bearings (pinion up applications). The shaft bearings should be greased sparingly at every 50 operating hours with an EP lithium or GP bearing lube. For pinion down applications, gearbox oil will lubricate shaft bearings

Oil Level Maintenance

Tulsa Winch recommends that the oil be checked and adjusted as part of the pre-use inspection. If the oil level drops frequently or oil leakage is detected during an inspection, maintenance should be performed to correct any problems.

Oil Change Interval

The oil in the gearbox and brake sections (if applicable) should be changed every **1000 hrs** or **6 months** of usage.

TWG 250PR RECOMMENDED OILS

Choose the proper gearbox and brake oil from lists below.

FOR STANDARD TEMP APPLICATIONS -10°F THRU 180°F (-23°C THRU 82°C) oil temp.

*Gearbox oil (GL-5): API 80W/90 GL-5 (Or equivalent)
Super MP 75W-90 GL-5 (Original oil in unit from factory)
Century Unigear Semi-Synthetic 80W-90
Texaco Multigear SS 80W-90 GL-5
Chevron DELO 80W-90 GL-5

**Brake oil: *Not applicable for this gearbox*

FOR LOW TEMP APPLICATIONS -40°F THRU 180°F (-40°C THRU 82°C) oil temp.

*Gearbox oil (GL-5): Mobil Delvac Synthetic 75W90 (Or equivalent)
Mobil Mobilube 1 SHC 75W90
CITGO, Syntetic Gear Lube 75W-90
Eaton, Roadranger EP75W-90
Mobil, Mobilube SHC 75W-90
Shell, Spirax® S 75W-90
Sunoco®, Duragear EP75W-90
Petro-Canada, Traxon E Synthetic 75W-90

**Brake oil: *Not Applicable for this gearbox*

**All gearbox oils must meet MIL-PRF2105 and GL-5 specifications.*

*** Brake oil is not applicable to units equipped with the "Flow Thru Brake Cooling" option. Hydraulic oil is plumbed thru the brake on "Flow Thru Brake Cooling" option.*

GEARBOX OIL CAPACITY	
PINION UP	N/A
PINION DOWN	3.50 QTS

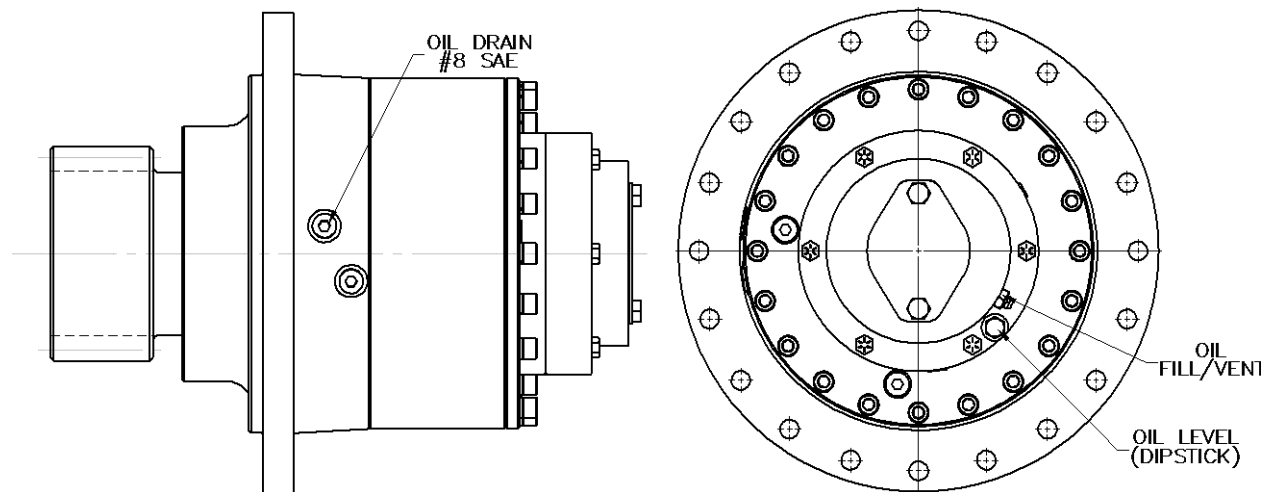
The hydraulic system should use only high quality hydraulic fluid from reputable suppliers. These oils should contain additives to prevent foaming and oxidation in the system. The hydraulic system should be equipped with a return line filter capable of filtering 10 micron particles from the system.

OIL CHANGE

Gearbox oil is drained by removing the drain plug and vent. Examine the used oil for signs of significant metal deposits and then dispose of it in a proper manner.

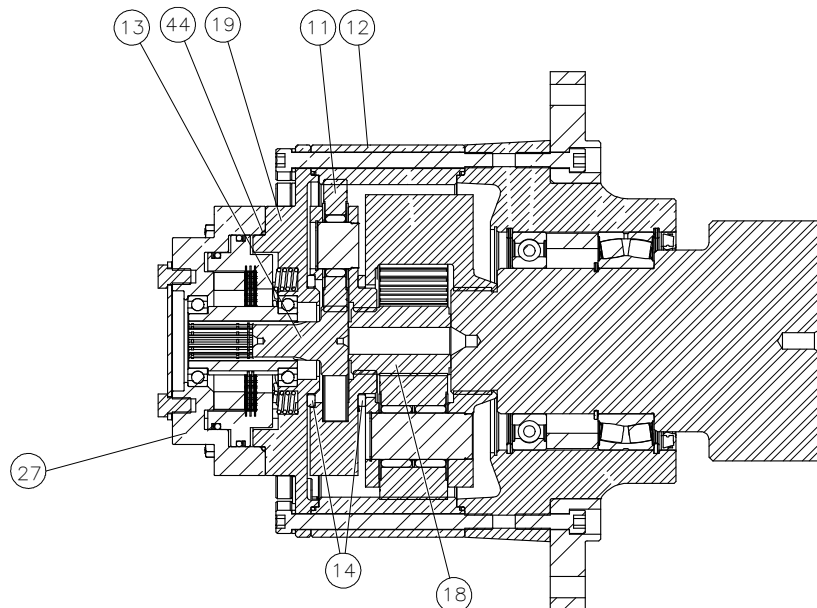
Replace the drain plug. Fill the swing drive with the appropriate amount and type of oil and then replace plug and vent. *See page 6 of this manual for the recommended oil type, amount and grade for your application.*

Gearbox oil level inspection is achieved by removing the dipstick and visually inspecting the oil level.



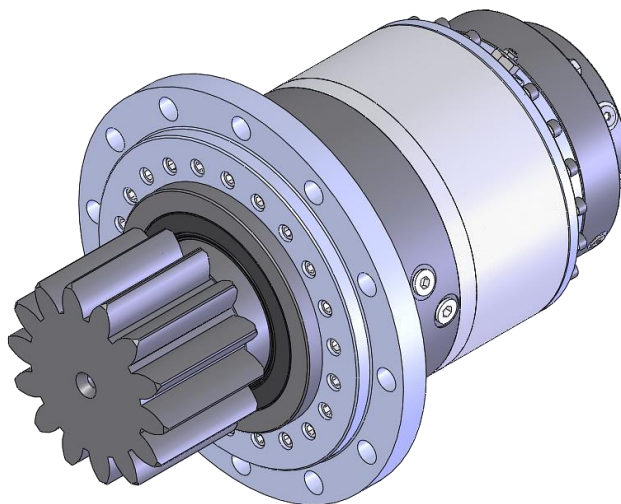
DISASSEMBLY

1. Remove the gearbox from the crane by securing the boom, removing the 20 mounting bolts and any hydraulic hoses connecting the crane to the gearbox assembly.
2. Orient the gearbox vertical and drain the gear oil from the gearbox. See page 7 of this manual.
3. Label and disconnect all hoses still attached to the gearbox.
4. Remove the hydraulic motor by removing the 2 bolts in the motor flange.
5. Remove the brake assembly from the gearbox by removing 20 bolts and washers (Item 16, 15). NOTE: Notice the orientation of the ports in relation to the drain and fill holes for reassembly. See Serviceing The Brake section on page 10 for brake service or repair.
6. Inspect the O-ring (Item 44) for damage and replace if necessary.
7. Remove the nylon thrust washer (Item 14) and sun gear (Item 13) from the input planetary set (Item 11). Inspect for wear or damage and replace if needed.
8. Remove input planet gear assembly by pulling straight up and out of the ring gear (Item 12). See Serviceing The Planetary Set section on page 13 for disassembly and repair.
9. Remove the nylon thrust washer (Item 14) and sun gear (Item 18) from the output planetary gear set (Item 10). Inspect for wear or damage and replace if needed.
10. Remove output planet gear assembly by pulling straight up and out of the ring gear (Item 12). See Serviceing The Planetary Set section on page 13 for disassembly and repair.
11. To service the pinion gear or pinion bearings see Serviceing The Pinion Gear/Bearings section on Page 12 of this manual for disassembly and repair.



ASSEMBLY

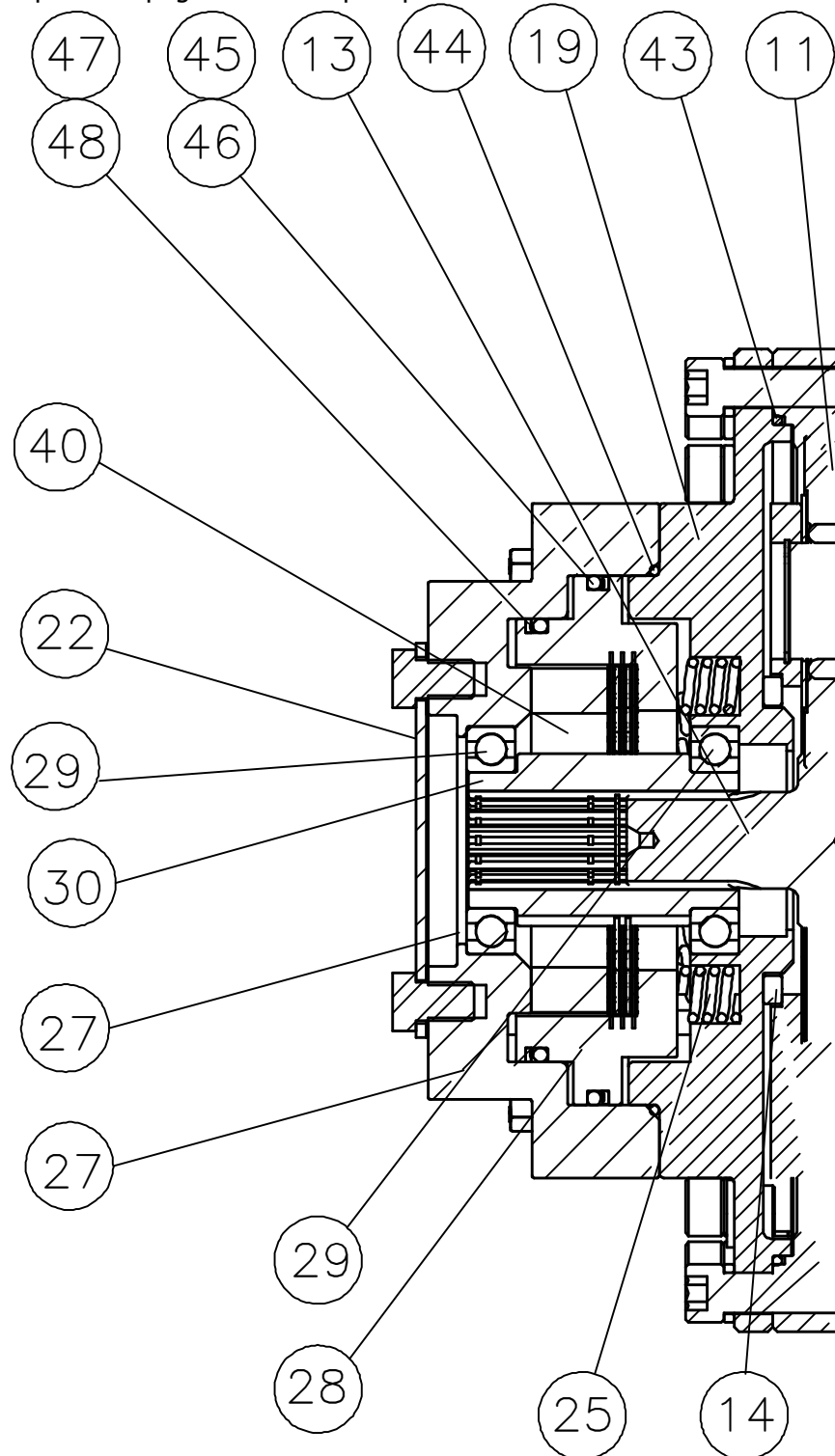
1. After servicing, inspecting and or repairing the Brake, Pinion Bearing and or the Planetary Gear sub-assemblies start reassembly by positioning the Bearing/Pinion section in a pinion down orientation.
2. Install new O-ring (Item 43) onto ring gear pilot on top of bearing housing (Item 1).
3. Next install the ring gear (Item 12) onto the bearing housing making sure to align dowel pins with the appropriate dowel pin hole. Using a dead blow hammer tap ring gear into position.
4. Insert the output planetary gearset (Item 10) into the ring gear making sure that it fully engages the splines on the output pinion shaft (Item 2).
5. Install output sun gear (item 18) into output planet set (Item 10).
6. Place and center nylon thrust washer (Item 14) on top of output planet set (Item 10).
7. With nylon washer in place install the input planet set (Item 11) into the ring gear making sure it fully engages the teeth on the output sun gear (Item 18).
8. Insert the input sun gear (Item 13) into the input gear set (Item 11). Turn sun gear by hand to ensure the gearing rotates and is not bound up.
9. Place and center nylon thrust washer (Item 14) onto input planet set (Item 11).
10. Lubricate and install a new O-ring (Item 43) onto brake housing (Item 27).
11. While considering proper port orientation install the brake section sub-assembly onto ring gear (Item 12) and input sun gear (Item 13).
12. Install the 20 ring gear bolts and washers (Items 15 and 16). Tighten to spec. See page 15 for Torque Specifications Chart.



SERVICING THE BRAKE

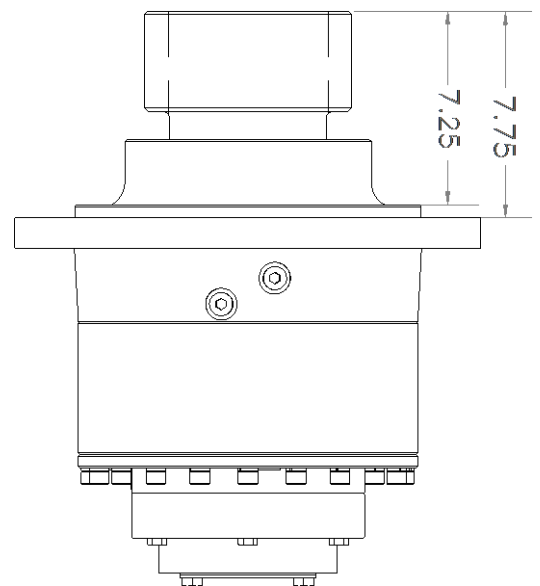
1. Evenly remove the six bolts (Item 26) attaching the brake housing (Item 27) to the brake adapter (Item 19). Spring pressure will raise the brake housing as the bolts are loosened. Remove the brake housing from the brake adapter.
2. Remove the piston (Item 28) from the brake housing (Item 27) by applying shop air to the "BR" port.
3. Remove the brake shaft (Item 30), friction disc's (Item 31), stator plates (Item 32) and bearings (Item 29) from brake housing (Item 27).
4. Using a bearing puller remove the bearings (Item 29) from the brake shaft (Item 30).
5. Remove the friction disc's (Item 31) and stator plates (Item 32) from brake shaft (Item 30) and check them for excessive wear, then replace if necessary. Friction discs should measure at least 0.075 inches thick and stator plates should at least than 0.045 inches thick.
6. Remove the spacer (Item 40).
7. If equipped with a "Service Brake", remove the service brake piston by applying shop air to the "BA" port.
8. Remove and inspect all brake springs (Item 25) for damage. Replace if necessary.
9. Remove the O-rings (Item 44) out of brake adapter (Item 19).
10. Remove the O-rings and backup rings (Items 45, 46, 47, 48) from the piston brake (Item 28).
11. Install a new bearing (Item 29) into the brake adapter (Item 19).
12. Install the brake springs (Item 25) into the spring pockets in brake adapter (Item 19).
13. Tap or press the brake shaft (Item 30) into the bearing in the brake adapter (Item 19).
Note: The 6 tooth spline should be oriented to engage with the hydraulic motor.
14. Install the O-ring (Item 44) onto the brake adapter (Item 19).
15. Install the O-ring and backup rings (Items 45, 46, 47 and 48) onto the O.D. and I.D. of the piston brake. Note, the rectangular backup rings should be located on the outsides of the O-rings as shown in the cross sectional drawing on the Pg. 11 of this manual. Lubricate the O-ring and backup rings and place the piston onto the springs centering the piston in the brake adapter.
16. Install the friction discs (Item 31) and stator plates (Item 32) into the piston over the brake shaft (Item 30). Note, you will start with a friction disc and end with a friction disc.
17. Place the spacer (Item 40) into the piston on top of the friction/stator pack.

18. Carefully place brake housing assembly onto the piston ensuring to orient the motor mount bolts and all ports properly. Ensure the dowel pin (Item 34) is installed through the brake housing, brake piston and brake adapter. Tap brake housing down until it makes contact with the springs.
19. Install the six bolts (Item 26) thru the brake housing into the brake adapter (Item 19) and evenly tighten the bolts to draw the brake housing down onto the springs to prevent damaging the O-ring and backup rings on the brake piston.
20. Tighten to spec. See page 15 for Torque Specifications Chart.



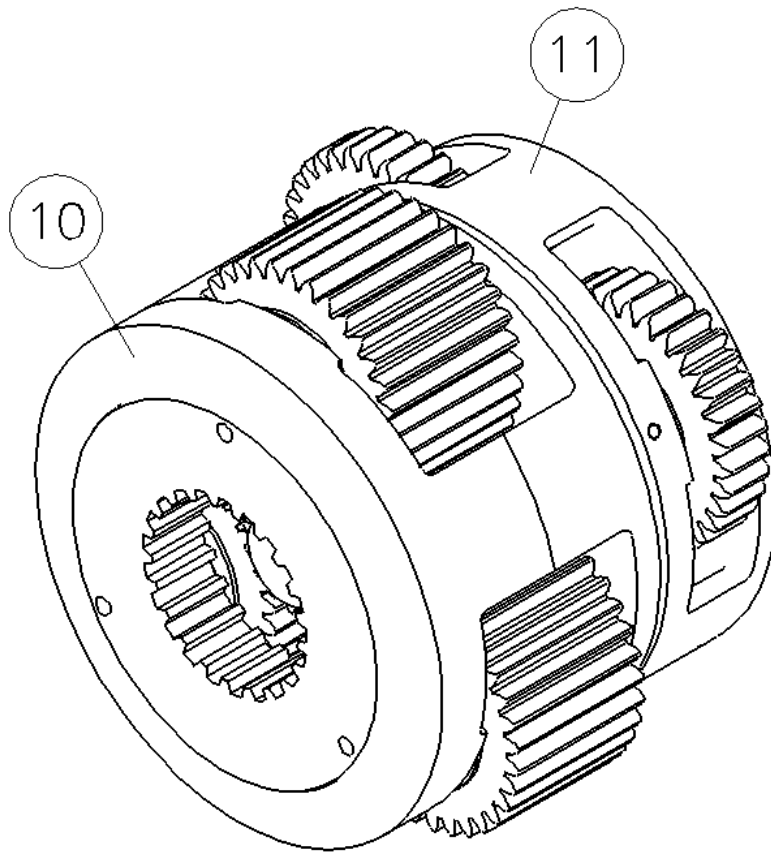
SERVICING THE BEARING AND PINION SECTION

1. Remove the gearbox from the vehicle by removing the bolts in the mounting flange (Item 9).
2. Remove the brake sub-assembly, gear sets (Items 10 and 11), and ring gear (Item 12) from unit by removing the twenty ring gear bolts and washers (Items 15 and 53). Note or mark the orientation of the brake housing in relation to the gearbox oil drain port located in the bearing housing (Item 1) for re-assembly.
3. Pry the oil seal (Item 42) out of the bearing housing (item 1) and using tin snips cut the seal and remove it from the output pinion gear (Item 2).
4. Remove the retaining ring (Item 7) from the bearing housing (Item 1).
5. Next secure the bearing housing assembly and press the pinion gear (Item 2), spherical bearing (Item 4), retaining ring (Item 8) and spacer (Item 6) out of the bearing housing (Item 1).
6. Remove the retaining ring (Item 7) from bearing housing.
7. Tap or press the ball bearing (Item 5) out of the bearing housing.
8. Clean and inspect all parts and hardware for damage or wear and replace if necessary.
9. For re-assembly of the bearing and pinion section the distance of the mounting flange to the end of the pinion must be maintained while pressing the new bearings into the housing. For this unit this dimension is 7.750". See Image below for reference.
10. Install outboard retaining ring (Item 7) into bearing housing.
11. Install new oil seal (Item 42) into bearing housing (item 1).
12. Carefully place bearing housing ass'y onto pinion shaft making sure to have the appropriate spacers in place to achieve the 7.750" dim. shown in this illustration.
13. Using appropriate press tooling install and press the spherical roller bearing (Item 4) into the housing.
14. Install retaining ring (Item 8) onto pinion shaft making sure it is seated properly in groove.
15. Next insert bearing spacer (Item 6) into housing.
16. Using proper press tooling press the ball bearing (Item 5) into the housing.
17. Install inboard retaining ring (Item 7) into the housing.
18. Check sub-assembly to ensure the pinion rotates freely.



SERVICING THE PLANETARY SETS

The TWG 250PR planetary gear sets (Items 10 and 11) are not serviceable in the field. Replace as a unit. Inspect for any damage or wear and replace if necessary.



TROUBLESHOOTING

GEARBOX BRAKE WON'T HOLD

Possible Solutions:

1. The brake discs and or stator plates are worn. Friction discs should measure no less than 0.075 inches thick and the stator plates should measure at least 0.045 inches thick and replace as necessary
2. Broken dowel pins in brake piston (*Item 34*). Check and replace if necessary
3. Mechanical failure. Evaluate all parts that transmit torque to ensure structural integrity and replace any parts that show signs of damage or excessive wear
4. Weak or damaged brake springs. Free length of springs should be 1.000"

GEARBOX UNABLE TO ROTATE

Possible Solutions:

1. Motor failure. Remove motor and rotate both directions verifying pressure rotating in both directions is appropriate.
2. Gearing Failure. See page 13 for servicing the planetary gear sets
3. One of the counterbalance valve cartridges may have a plugged metering hole. Remove the counterbalance cartridge valves and inspect/clean metering holes

OIL LEAKS FROM VENT

Possible Solutions:

1. The brake piston O-rings may have failed. Service the brake section and replace any worn or damaged parts and O-rings found
2. Hydraulic motor shaft seal failure. Return to an authorized dealer for service
3. Gearbox is overfilled with oil. Maintain proper oil amount
4. Brake oil seal failure. Inspect and replace oil seal

TORQUE SPECIFICATIONS CHART

Nominal	Size	Dry	Plated	Lubricated	Dry	Plated	Lubricated
		SAE Grade 5 Torque *(Ft-Lbs)	SAE Grade 5 Torque *(Ft-Lbs)	SAE Grade 5 Torque *(Ft-Lbs)	SAE Grade 8 Torque *(Ft-Lbs)	SAE Grade 8 Torque *(Ft-Lbs)	SAE Grade 8 Torque *(Ft-Lbs)
1/4	20	8	6	5	12	9	7
1/4	28	10	7	6	14	10	8
5/16	18	17	13	10	25	18	15
5/16	24	19	14	11	27	20	16
3/8	16	31	23	19	44	33	26
3/8	24	35	26	21	49	37	30
7/16	14	49	37	30	70	53	42
7/16	20	55	41	33	78	58	47
1/2	13	76	57	45	106	80	64
1/2	20	85	64	51	120	90	72
9/16	12	109	82	65	153	115	92
9/16	18	122	91	73	172	129	103
5/8	11	150	113	90	212	159	127
5/8	18	170	128	102	240	180	144
3/4	10	266	200	160	376	282	226
3/4	16	297	223	178	420	315	252
7/8	9	430	322	258	606	454	364
7/8	14	474	355	284	668	501	401
1	8	644	483	386	909	682	545
1	14	721	541	433	1019	764	611
1-1/8	7	794	596	475	1288	966	772
1-1/8	12	890	668	534	1444	1083	866
1-1/4	7	1120	840	672	1817	1363	1090
1-1/4	12	1241	930	745	2012	1509	1207

T = BOLT TORQUE (LB. FT.)

$$T = (KWD) / 12$$

K = TORQUE COEFFICIENT (K = 0.20 DRY K = 0.15 PLATED K = 0.12 LUBRICATED)

W = PRELOAD TENSION

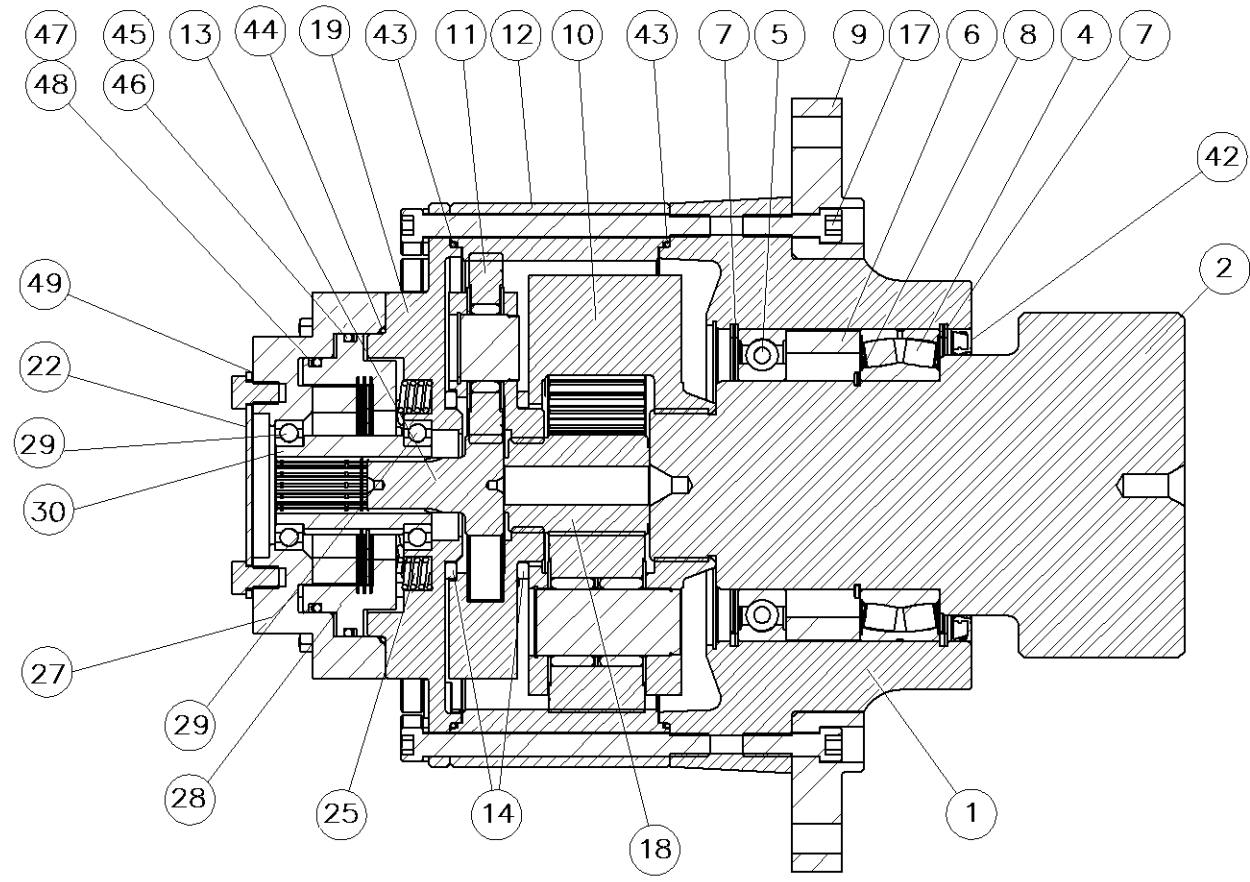
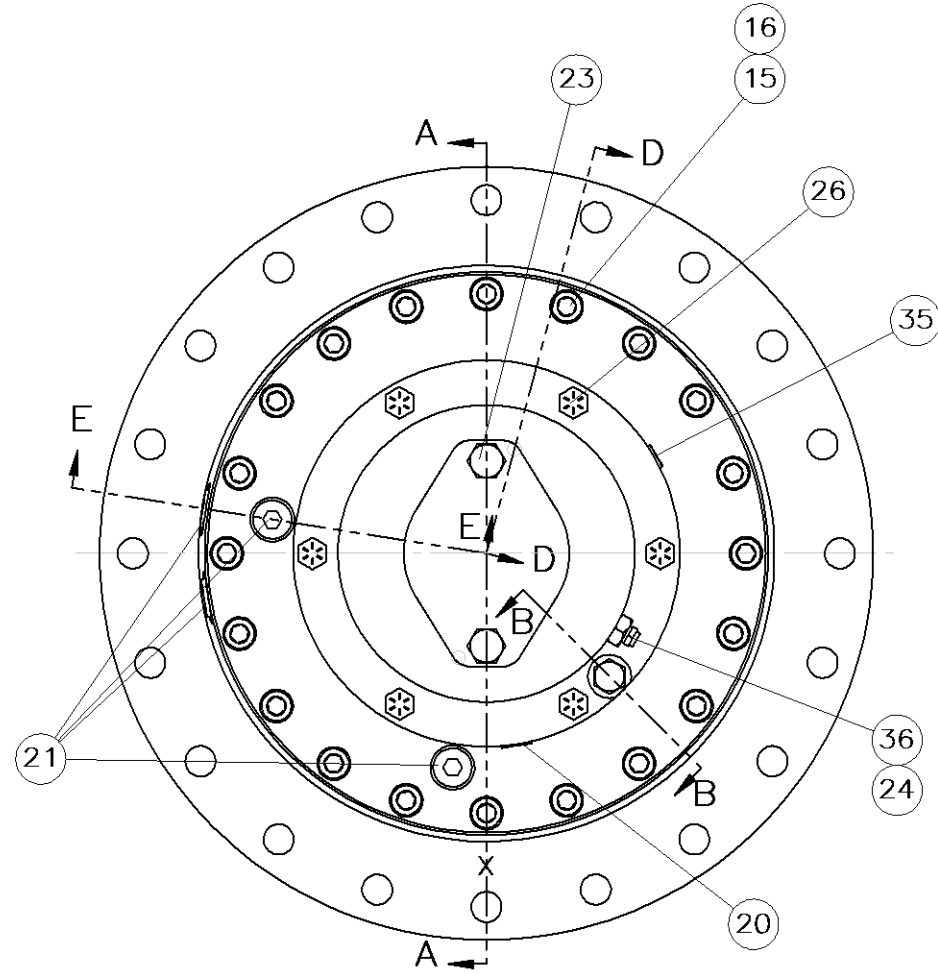
D = NOMINAL BOLT SIZE (IN.)

*** ALL TORQUE VALUE TOLERANCES ARE ± 5%**

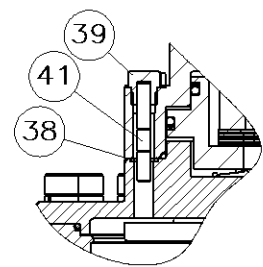
BILL OF MATERIAL

Item	Part Number	Description	Qty./Parent
10	45558	HOUSING, BEARING, 250PR	1
20	45554	SHAFT, OUTPUT, PINION, 250PR	1
40	45571	BEARING, SPHERICAL	1
50	29967	BEARING, BALL	1
60	45559	SPACER, BEARING, 250PR	1
70	45572	RING, RETAINING	2
80	45573	RING, RETAINING	1
90	45553	FLANGE, MOUNTING, PLR250	1
100	4610	GEARSET, OUTPUT, 250PR	1
110	4611	GEARSET, INPUT, 38:1, 250PR	1
120	45646	GEAR, RING, 250PR	1
130	45568	GEAR, SUN, INPUT, 31:1 & 38:1, 250PR	1
140	13929	WASHER-THRUST-NYLON-4 1/4 OD X 1/4T>	2
150	41000	LOCKWASHER, HI-COLLAR	20
160	45551	CAPSCREW-SH-1/2-13UNC X 6 1/2	20
170	41024	CAPSCREW-SH-1/2-13UNC X 1 3/4	20
180	45648	GEAR, SUN, OUTPUT, 250PR	1
190	45651	ADAPTER, BRAKE, 250PR	1
200	42392	PLUG, SOCKET HEAD, ORING, 9/16-18	1
210	41719	PLUG, O-RING	4
220	33561	PROTECTOR	1
230	23543	CAPSCREW-HH-1/2-13UNC X 3/4-GR 5	2
240	13050-TW	BREATHER	1
250	2319	SPRING-COMP-3/4D*1#HP BRAKE	12
260	1376	CAPSCREW-HH-7/16-14UNC X 2 1/2-GR 8	6
270	45580	HOUSING, BRAKE, 250PR	1
280	12377	PISTON-BRAKE-NONBAL-DP	1
290	81434	BEARING-BALL-1 3/4 ID-FAFNIR-9109K	2
300	11688	SHAFT-BRAKE	1
310	46245	DISC, FRICTION	3
320	3159	PLATE-DRIVE-BRAKE-MICO-C-P/N 32-230-045	2
330	29043	RING, RETAINING	1
340	3263	PIN-DOWEL-5/16 X 3 1/2	2
350	41307	PLUG, SOCKET HEAD, ORING, 7/16-20	1
360	42752	FITTING, ADAPTER SHORT BODY	1
370	545-10052-1	PIN, DOWELL 1/2X1	3
380	29931	O-RING, -906	1
390	939487	PLUG, O-RING	1
400	45549	SPACER, BRAKE, 250PR	1
410	45700	DIPSTICK, 180PR	1
420	45574	SEAL, OIL	1
430	9736	ORING-9 3/4ID*1/8W-#273-BUNA N-70D	2
440	9844	ORING-6 3/4 ID X 7 OD X 1/8 W-#2-261	1
450	9853	ORING-6 1/2ID X 3/16W-#2-363-BUNA N-70D	1
460	9854	RING-BACKUP-6 1/4 ID X .183W-#8-362	1
470	9851	ORING-5 3/8 ID X 3/16 W 2-356 BUNA 70	1
480	9852	RING-BACKUP-5.278 ID X .076-#8-355	1
490	40147	GASKET, 2B A	1

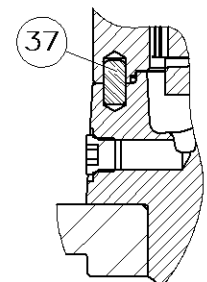
CROSS SECTIONAL ASSEMBLY DRAWING



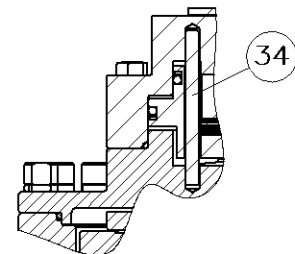
SECTION A-A



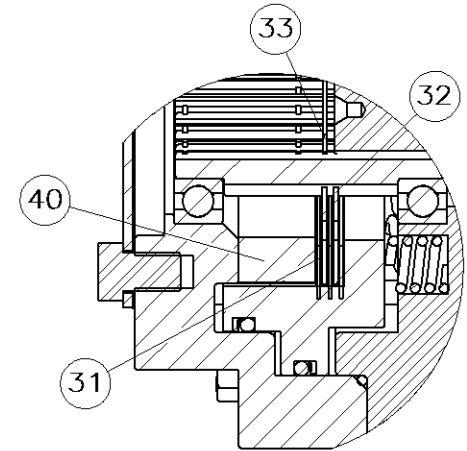
SECTION B-B



SECTION E-E

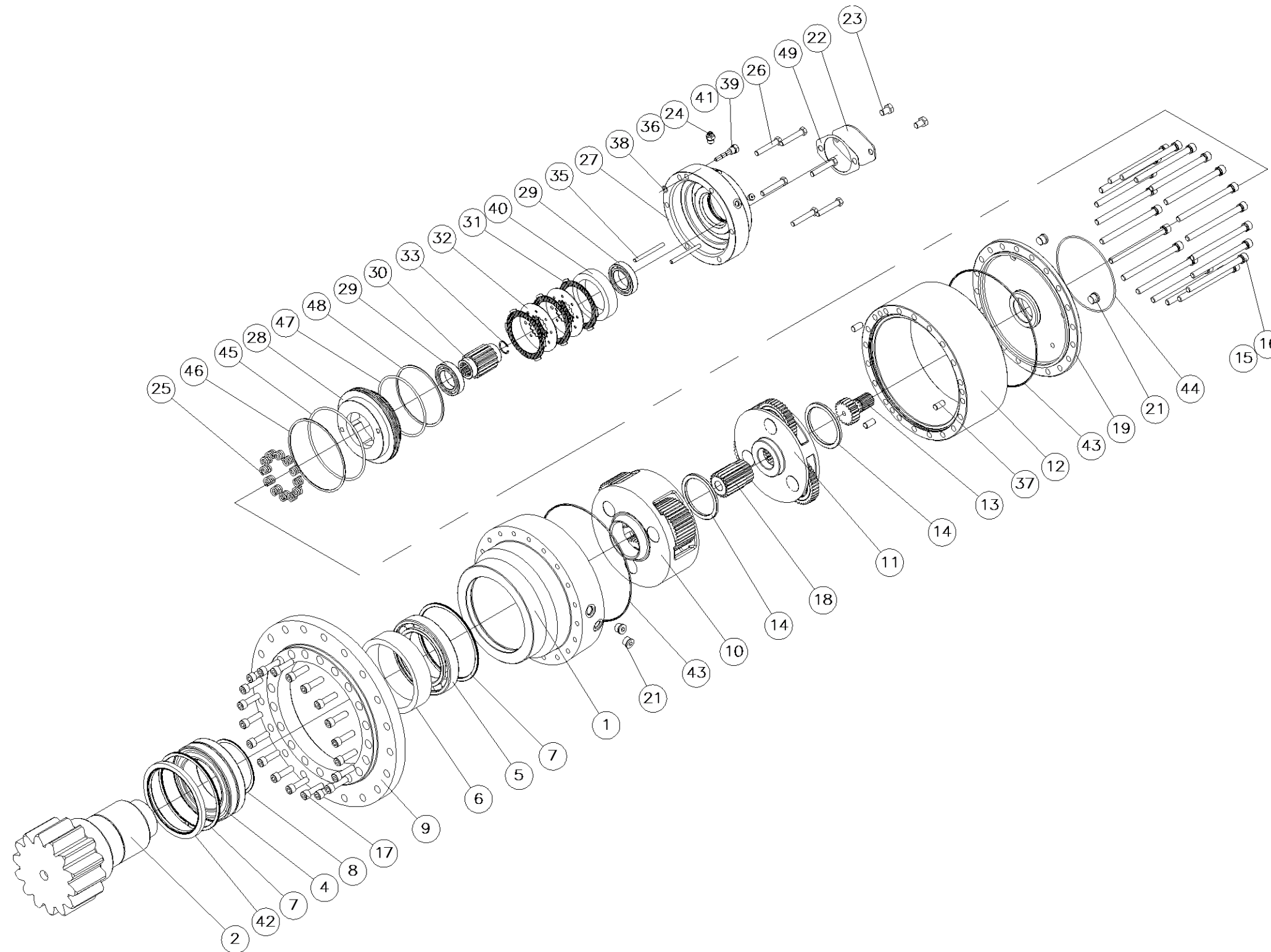


SECTION D-D

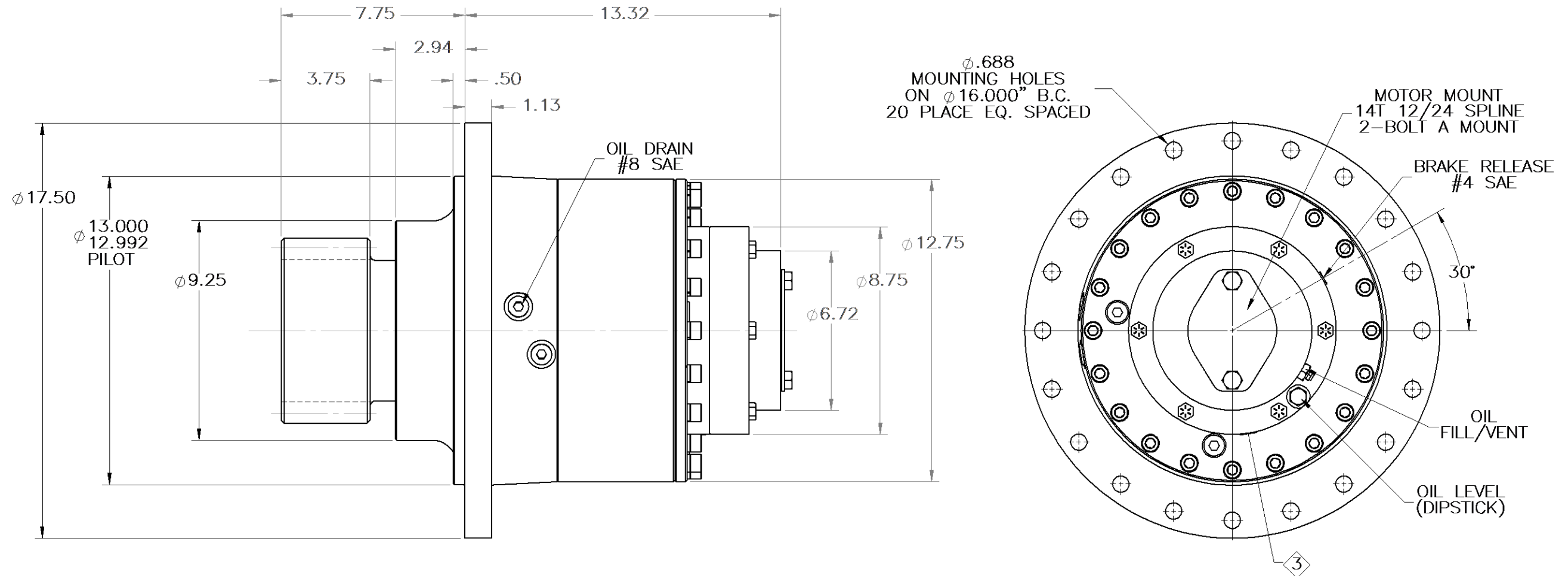


DETAIL C
SCALE 1 : 2

EXPLODED ASSEMBLY DRAWING



INSTALLATION DRAWING



SPUR GEAR DATA

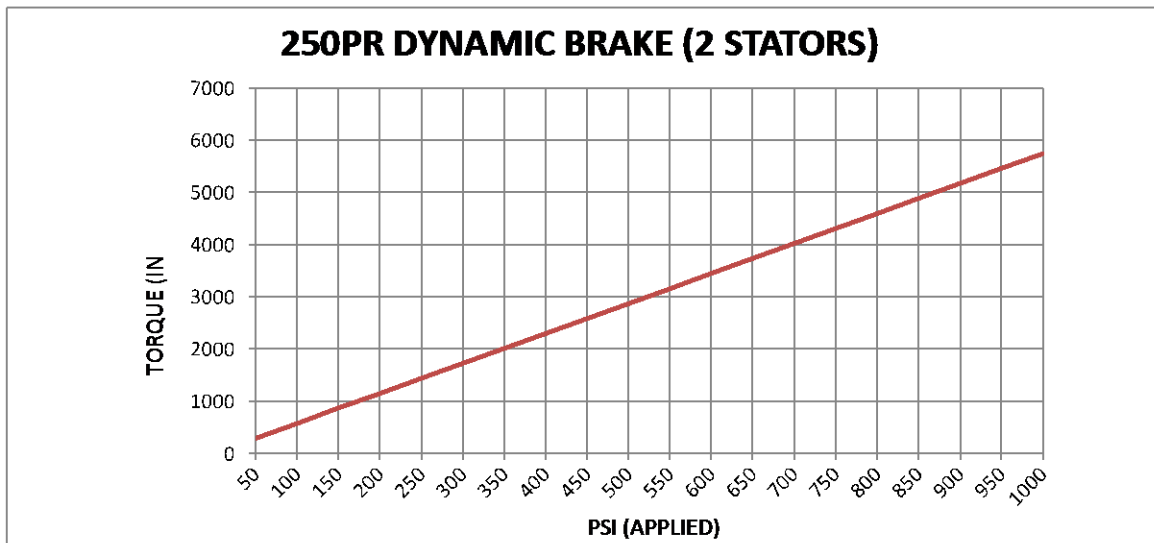
TOOTH FORM:	STUB
DIAMETRAL PITCH:	2
PRESSURE ANGLE:	20°
PITCH DIAMETER:	7.000
NUMBER OF TEETH:	14

SPEED REDUCER PERFORMANCE INFORMATION

GEAR RATIO	38:1
OUTPUT TORQUE (IN-LBS)	250,000 INTERMITTENT 125,000 CONTINUOUS

BRAKE PERFORMANCE

TORQUE	221-271 FT.-LBS.
FULL RELEASE PRESSURE	250 PSI.
GLIDE-SWING	N/A



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