Service and Maintenance Manual

Models
1200SJP
1350SJP

PN - 3121142

April 22, 2019 - Rev V

ANSI

CE

AS/NZS

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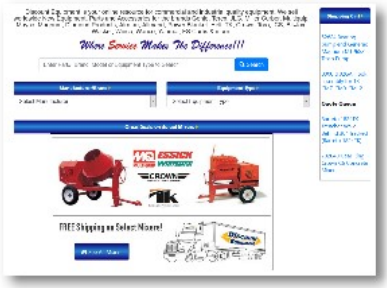

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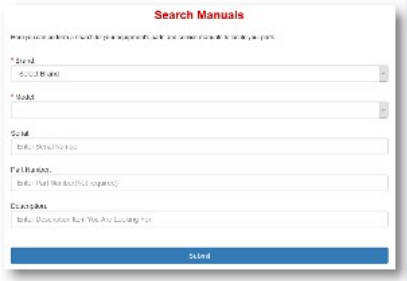

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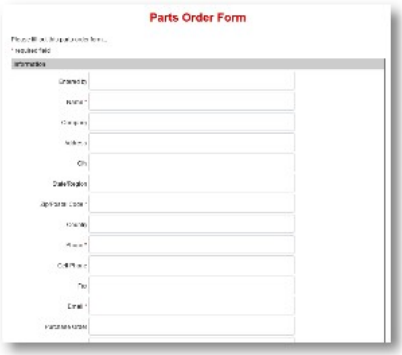

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SECTION A. INTRODUCTION - MAINTENANCE SAFETY PRECAUTIONS

A GENERAL

This section contains the general safety precautions which must be observed during maintenance of the aerial platform. It is of utmost importance that maintenance personnel pay strict attention to these warnings and precautions to avoid possible injury to themselves or others, or damage to the equipment. A maintenance program must be followed to ensure that the machine is safe to operate.

⚠ WARNING

MODIFICATION OR ALTERATION OF AN AERIAL WORK PLATFORM SHALL BE MADE ONLY WITH WRITTEN PERMISSION FROM THE MANUFACTURER.

The specific precautions to be observed during maintenance are inserted at the appropriate point in the manual. These precautions are, for the most part, those that apply when servicing hydraulic and larger machine component parts.

Your safety, and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

⚠ WARNING

SINCE THE MACHINE MANUFACTURER HAS NO DIRECT CONTROL OVER THE FIELD INSPECTION AND MAINTENANCE, SAFETY IN THIS AREA RESPONSIBILITY OF THE OWNER/OPERATOR.

B HYDRAULIC SYSTEM SAFETY

It should be noted that the machines hydraulic systems operate at extremely high potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system.

Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Wear gloves to help protect hands from spraying fluid.

C MAINTENANCE

⚠ WARNING

FAILURE TO COMPLY WITH SAFETY PRECAUTIONS LISTED IN THIS SECTION COULD RESULT IN MACHINE DAMAGE, PERSONNEL INJURY OR DEATH AND IS A SAFETY VIOLATION.

- ENSURE REPLACEMENT PARTS OR COMPONENTS ARE IDENTICAL OR EQUIVALENT TO ORIGINAL PARTS OR COMPONENTS.
- NO SMOKING IS MANDATORY. NEVER REFUEL DURING ELECTRICAL STORMS. ENSURE THAT FUEL CAP IS CLOSED AND SECURE AT ALL OTHER TIMES.
- REMOVE ALL RINGS, WATCHES AND JEWELRY WHEN PERFORMING ANY MAINTENANCE.
- DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE-FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.
- OBSERVE AND OBEY ALL WARNINGS AND CAUTIONS ON MACHINE AND IN SERVICE MANUAL.
- KEEP OIL, GREASE, WATER, ETC. WIPED FROM STANDING SURFACES AND HAND HOLDS.
- USE CAUTION WHEN CHECKING A HOT, PRESSURIZED COOLANT SYSTEM.
- NEVER WORK UNDER AN ELEVATED BOOM UNTIL BOOM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING, OR BOOM SAFETY PROP HAS BEEN ENGAGED.
- BEFORE MAKING ADJUSTMENTS, LUBRICATING OR PERFORMING ANY OTHER MAINTENANCE, SHUT OFF ALL POWER CONTROLS.
- BATTERY SHOULD ALWAYS BE DISCONNECTEDDURING REPLACEMENT OF ELECTRICAL COMPONENTS.
- KEEP ALL SUPPORT EQUIPMENT AND ATTACHMENTS STOWED IN THEIR PROPER PLACE.
- USE ONLY APPROVED, NONFLAMMABLE CLEANING SOLVENTS.

REVISON LOG

Original Issue	A - June 5, 2002
Revised	B - January 15, 2003
Revised	C - May 23, 2003
Revised	D - August 30, 2004
Revised	E - January 12, 2006
Revised	F - July 12, 2006
Revised	G - November 30, 2006
Revised	H - January 18, 2007
Revised	I - November 9, 2007
Revised	J - April 9, 2008
Revised	K - August 27, 2008
Revised	L - January 22, 2009
Revised	M - October 27, 2011
Revised	N - March 28, 2012
Revised	O - January 23, 2013
Revised	P - July 22, 2014
Revised	Q - June 17, 2015
Revised	R - November 8, 2016
Revised	S - May 23, 2017
Revised	T - May 30, 2018
Revised	U - June 29, 2018 - Revised Covers
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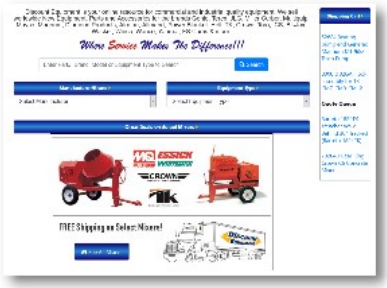

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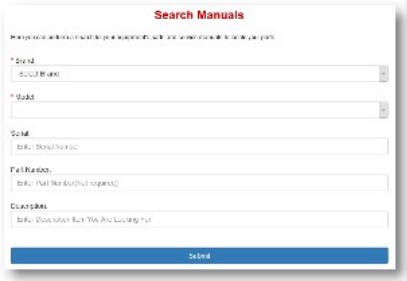

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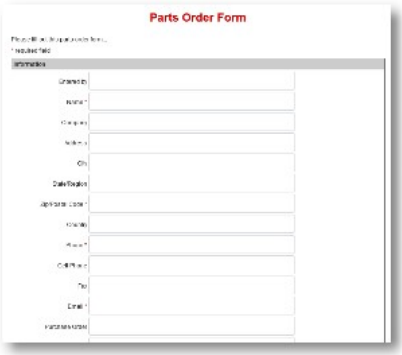

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SECTION 1. SPECIFICATIONS

1.1 CAPACITIES

Table 1-1. Capacities

Hydraulic Tank	55 gallons (208 liters)
Fuel Tank Standard Optional	 31 gallons (117 liters) 52.8 gallons (200 liters)
Hydraulic System	66 gallons (250 liters)

1.2 TIRES

Table 1-2. Tire Specifications

Size	445/50D710
Load Range	J
Ply Rating	18
Load Rating	26,500 lbs. @ 100 psi (12020 kg @ 6.9 Bar)
Foam Fill	Poly urethane HD (55 Durometer) Foam
Max Tire Load 1200SJP 1350SJP	 25,000 lbs. (11,340 kg) 26,250 lbs. (11,907 kg)
Max Tire Load (Non-Marking Tire) @6 km/h @10km/h @25km/h	 33,000 lbs. (15,000 kg) 29,700 lbs. (13,500 kg) 25,300 lbs. (11,500 kg)

1.3 ENGINE DATA

Deutz Prior to SN 0300127698

Table 1-3. Deutz BF4M2011 Specifications

Type	Liquid Cooled
Number of Cylinders	4
Bore	3.7 in. (94 mm)
Stroke	4.4 in. (112 mm)
Total Displacement	190 cu. in. (3108 cm^3)
Compression Ratio	17.5
Firing Order	1-3-4-2
Output	87 hp (65 kW)
Oil Capacity Cooling System w/Filter Total Capacity	 5 Quarts (4.5 L) 11 Quarts (10.5 L) 16 Quarts (15 L)
Average Fuel Consumption	1.1 gph (4.1 lph)
Idle Engine RPM	1200
Mid Engine RPM	1800
High Engine RPM	2475

Deutz SN 0300127698 to Present

Table 1-4. Deutz TD2011L4 Specifications

Type	Liquid Cooled
Number of Cylinders	4
Bore	3.7 in. (94 mm)
Stroke	4.4 in. (112 mm)
Total Displacement	190 cu. in. (3108 cm^3)
Compression Ratio	17.5
Firing Order	1-3-4-2
Output	75 hp (56 kW)
Oil Capacity Cooling System w/Filter Total Capacity	 5 Quarts (4.5 L) 11 Quarts (10.5 L) 16 Quarts (15 L)
Average Fuel Consumption	1.1 gph (4.1 lph)
Idle Engine RPM	1200
Mid Engine RPM	1800
High Engine RPM	2475

Deutz TCD 2.9

Table 1-5. Deutz TCD 2.9L4 Specifications

Type	Liquid Cooled
Output Power	74.2hp (55.4 kW)
Output Torque	192 ft.lbs. (260 Nm) @ 1800 rpm
Max High Engine RPM	2500
Min Low Engine RPM	900
High RPM set	2500 ± 50 RPM
Low RPM set	1200 ± 50 RPM
Engine Oil Capacity	2.4 gal. (8.9 L)
Coolant Capacity (Engine Only)	0.79 gal. (3 L)
Average Fuel Consumption	1.2 gph (4.1 lph)
Acceptable Fuel Grades (Dependent upon Regulated Area)	Ultra Low Sulfur (15 ppm) Up to 5% Biodiesel

Deutz TCD 2.9 GUOIII

Table 1-6. Deutz TCD 2.9L4 GUOIII Specifications

Type	Liquid Cooled
Output Power	74.2 hp (55.4 kW)
Output Torque	192 ft.lbs. (260 Nm) @ 1800 rpm
Max High Engine RPM	2600
Min Low Engine RPM	900
High RPM set	2500 ± 50 RPM
Low RPM set	1200 ± 50 RPM
Engine Oil Capacity	2.11 gal. (8.0 L)
Coolant Capacity (Engine Only)	0.92 gal. (3.5 L)
Average Fuel Consumption	1.2 gph (4.1 lph)
Acceptable Fuel Grades (Dependent upon Regulated Area)	Ultra Low Sulfur (15 ppm) Up to 5% Biodiesel

1.4 SPECIFICATIONS AND PERFORMANCE DATA

Reach Specifications

Table 1-7. Reach Specifications

Maximum Work Load (Capacity)	
Unrestricted	500 lb (230 kg)
Restricted	1000 lb (450 kg)
Max.Vertical Platform Height (Unrestricted)	
1200SJP	120 ft. 6 in. (36.73 m)
1350SJP	135 ft. 6 in. (41.3 m)
Max.Vertical Platform Height (Restricted)	
1200SJP	115 ft. 8 in. (35.26 m)
1350SJP	125 ft. 10 in. (38.35 m)
Max.Horizontal Platform Reach (Unrestricted)	
1200SJP	75 ft. (22.9 m)
1350SJP	80 ft. (24.4 m)
Max.Horizontal Platform Reach (Restricted)	
1200SJP	65 ft. (19.8 m)
1350SJP	70 ft. (21.3 m)
JibPLUS	
Length	8 ft. (2.44m)
Horizontal Motion	180° working, 244° stowed
Vertical Motion	130° (+75/-55)

Dimensional Data

Table 1-8. Dimensional Data

Overall Width	
Axles Retracted	8 ft. 2 in. (2.49 m)
Axles Extended	12 ft. 6 in. (3.8 m)
Stowed Height	10 ft. (3.04 m)
Stowed Length (Transport Mode)	
1200SJP	34 ft. 11 in. (10.64 m)
1350SJP	38 ft. 11 in. (11.86 m)
Stowed Length (Working Mode)	
1200SJP	44 ft. 11 in. (13.69 m)
1350SJP	48 ft. 11 in. (14.91 m)
Wheelbase	12 ft. 6 in. (3.81 m)
Tailswing	5 ft. 6 in. (1.6 m)
Ground Clearance (Axle)	12 in. (30.4 cm)
Ground Clearance (Chassis)	25.5 in. (64.7 cm)

Chassis

Table 1-9. Chassis Specifications

Maximum Travel Grade With boom in stowed position (Gradeability)	45%
Maximum Travel Grade With boom in stowed position (Side Slope)	5°
Turning Radius (Axles Retracted)	
Outside	22 ft. 6 in. (6.8 m)
Inside	14 ft. 5 in. (4.4 m)
Turning Radius (Axles Extended)	
Inside	8 ft. (2.4 m)
Outside	19 ft. 4 in. (5.9 m)
Max Tire Load	
1200SJP	25,000 lbs. (11,340 kg)
1350SJP	26,250 lbs. (11,907 kg)
Max Ground Bearing Pressure	
1200SJP	100 psi (7.03 kg/cm^2)
1350SJP	105 psi (7.38 kg/cm^2)
Maximum Drive Speed	3.25 mph (5.2 kph)
Max. Hydraulic System Pressure	4600 psi (317 bar)
Maximum Wind Speed	28 mph (12.5 m/s)
Maximum Manual Force	400 N
Electrical System Voltage	12 Volts
Gross Machine Weight (Platform Empty)	
1200SJP	41,100 lb (18,650 kg)
1350SJP	44,750 lb (20,300 kg)

1.5 TORQUE REQUIREMENTS

Table 1-10. Torque Requirements

Description	Torque Value (Dry)	Interval Hours
Wheel Bolts	180 ft. lbs. (252 Nm)	150
Swing Bearing Bolts	190 ft. lbs. (258 Nm)	50/600*
Tele Cylinder Regen Valve Mounting Bolts	13 ft. lbs. (18 Nm)	As required
Starter Solenoid Contacts Coil	 95 in. lbs. (9.5 Nm) 40 in. lbs. (4 Nm)	As required
*Check swing bearing bolts for security after first 50 hours of operation and every 600 hours thereafter. (See Swing Bearing in Section 3.)		
NOTE: *When maintenance becomes necessary or a fastener has loosened, refer to the Torque Chart to determine proper torque value.*		

1.6 HYDRAULIC OIL

Table 1-11. Hydraulic Oil Specifications

Hydraulic System Operating Temperature Range	S.A.E. Viscosity Grade
+0° to +180° F (-18° to +83° C)	10W
+0° to +210° F (-18° to +99° C)	10W-20, 10W30
+50° to +210° F (+10° to +99° C)	20W-20

NOTE: *Hydraulic oils must have anti-wear qualities at least to API Service Classification GL-3, and sufficient chemical stability for mobile hydraulic system service. JLG Industries recommends Mobilfluid 424 hydraulic oil, which has an SAE viscosity index of 152.*

NOTE: *When temperatures remain consistently below 20 degrees F. (-7 degrees C.), JLG Industries recommends the use of Mobil DTE13.*

NOTE: *Aside from JLG recommendations, it is not advisable to mix oils of different brands or types, as they may not contain the same required additives or be of comparable viscosities.*

Table 1-12. Mobilfluid 424 Specs

SAE Grade	10W30
Gravity, API	29.0
Density, Lb/Gal. 60°F	7.35
Pour Point, Max	-46°F (-43°C)
Flash Point, Min.	442°F (228°C)
Viscosity	
Brookfield, at -18°C	2700 cP
at 40° C	55 cSt
at 100° C	9.3 cSt
Viscosity Index	152

Table 1-13. Mobil DTE 10 Excel 32 Specs

ISO Viscosity Grade	#32
Specific Gravity	0.877
Pour Point, Max	-65.2°F (-54°C)
Flash Point, Min.	482°F (250°C)
Viscosity	
at 40° C	32cSt
at 100° C	6.6 cSt
at 100° F	32.7 cSt
at 212° F	6.63 cSt
at -30° F	6,200 cp
Viscosity Index	164

Table 1-14. UCon Hydrolube HP-5046

Type	Synthetic Biodegradable
Specific Gravity	1.082
Pour Point, Max	-58°F (-50°C)
pH	9.1
Viscosity	
at 0° C (32° F)	340 cSt (1600SUS)
at 40° C (104° F)	46 cSt (215SUS)
at 65° C (150° F)	22 cSt (106SUS)
Viscosity Index	170

Table 1-15. Mobil EAL H 46 Specs

Type	Synthetic Biodegradable
ISO Viscosity Grade	46
Specific Gravity	.910
Pour Point	-49°F (-45°C)
Flash Point	500°F (260°C)
Operating Temp.	-20 to 200°F (-29 to 93°C)
Weight	7.64 lb. per gal. (0.9 kg per liter)
Viscosity	
at 40° C	45 cSt
at 100° C	8.0 cSt
Viscosity Index	153

Table 1-16. Exxon Univis HVI 26 Specs

Specific Gravity	32.1
Pour Point	-76°F (-60°C)
Flash Point	217°F (103°C)
Viscosity	
at 40° C	25.8 cSt
at 100° C	9.3 cSt
Viscosity Index	376
NOTE: *Mobil/Exxon recommends that this oil be checked on a yearly basis for viscosity.*	

1.7 MAJOR COMPONENT WEIGHTS

Table 1-17. Component Weights

Component	Pounds	Kilograms
Tire & Wheel (Foam Filled)	867	393
Tire & Wheel (Solid)	990	449
Drive Hub & Motor	275.5	123
Swing Drive	290	132
Engine Assembly	1275	579
1350 Boom (Complete)	11850	5375
1200 Boom (Complete)	11100	5035
Lift Cylinder	787	357
1350 Tele Cylinder	1322	600
1200 Tele Cylinder	1170	531
Jib Cylinder	69	31
Axle Oscillation Cylinder	74	34
Axle Extend Cylinder	92	42
Level Cylinder	89	40
Platform 36 x 96	245	111
Platform 36 x 72	195	89
1350 Counterweight	8500	3856
1200 Counterweight	5494	2492
T/T Assy. (less Cwt)	9450	4286

1.8 PRESSURE SETTINGS

Table 1-18. Pressure Settings

Circuit	PSI	Bar
Function Pump, High	3400	234.4
Function Pump, Low	300	20.6
Drive, Pre-Set	5000	344.7
Lift Up	2750	189.6
Lift Down	1500	103.4
Swing	1500	103.4
Tele Out	3000	206.8
Telescope In	3200	220.6
Steer Right	2000	137.9
Steer Left	2600	172.3
Platform Level Up	2500	172.3
Platform Level Down	1500	103.4
Jib Up	2750	189.6
Jib Down	2750	189.6
Extendable Axles	2500	172.3

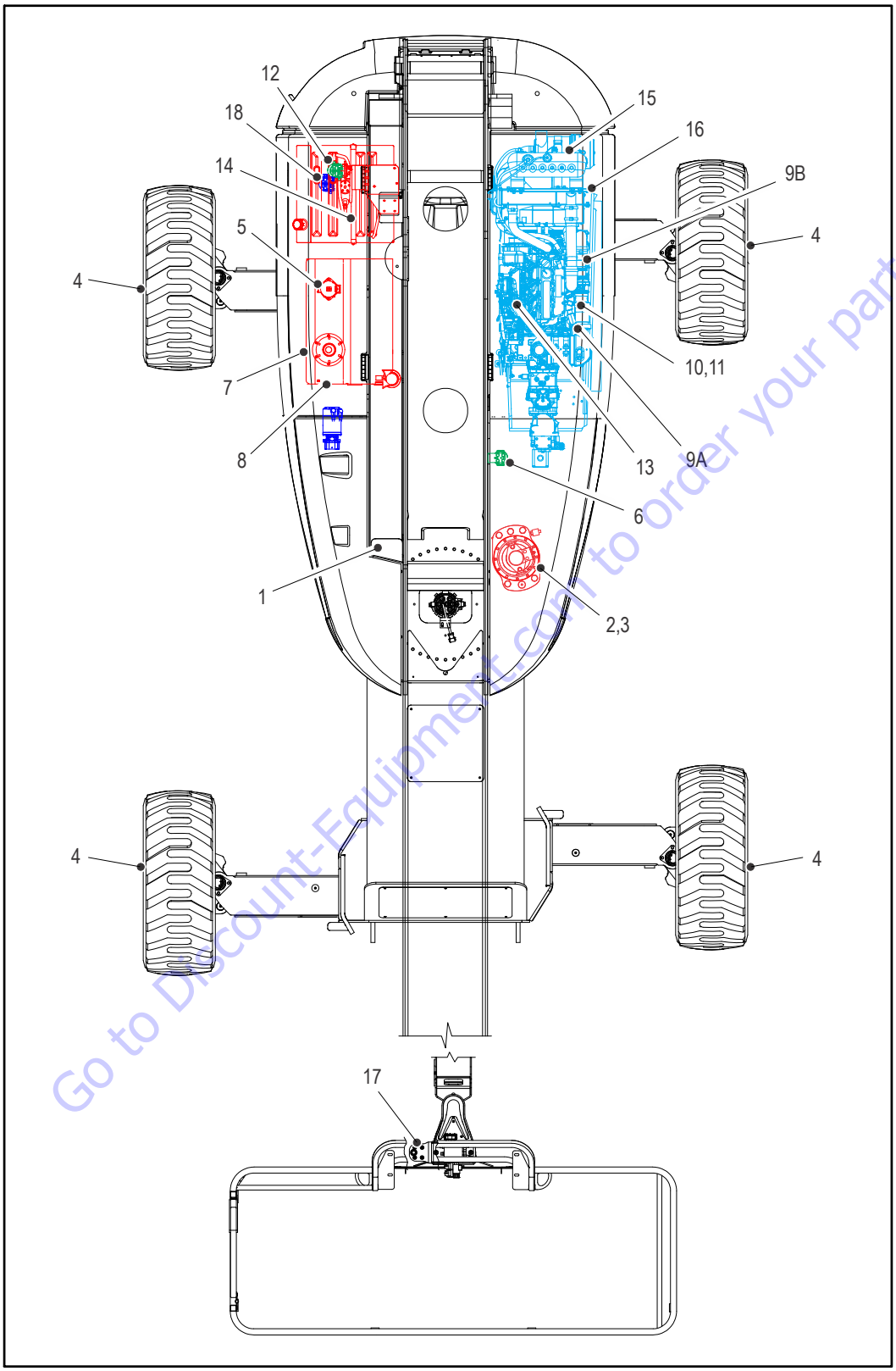


Figure 1-1. Lubrication and Maintenance Diagram

1.9 LUBRICATION AND MAINTENANCE

NOTE: *The following numbers correspond to those in Figure 1-1., Lubrication and Maintenance Diagram.*

Table 1-19. Lubrication Specifications

KEY	SPECIFICATIONS
MPG	Multipurpose Grease having a minimum dripping point of 350° F (177° C). Excellent water resistance and adhesive qualities, and being of extreme pressure type. (Timken OK 40 pounds minimum.)
EPGL	Extreme Pressure Gear Lube (oil) meeting API service classification GL-5 or MIL-Spec MIL-L-2105
HO	Hydraulic Oil. API service classification GL-3, e.g. Mobilfluid 424.
EO	Engine (crankcase) Oil. Gas - API SF, SH, SG class, MIL-L-2104. Diesel - API CC/CD class, MIL-L-2104B/MIL-L-2104C.

NOTICE

LUBRICATION INTERVALS ARE BASED ON MACHINE OPERATION UNDER NORMAL CONDITIONS. FOR MACHINES USED IN MULTI-SHIFT OPERATIONS AND/OR EXPOSED TO HOSTILE ENVIRONMENTS OR CONDITIONS, LUBRICATION FREQUENCIES MUST BE INCREASED ACCORDINGLY.

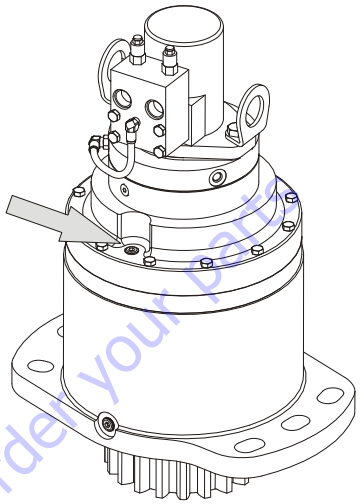
NOTE: *It is recommended as a good practice to replace all filters at the same time.*

1. Swing Bearing - Remote Lube

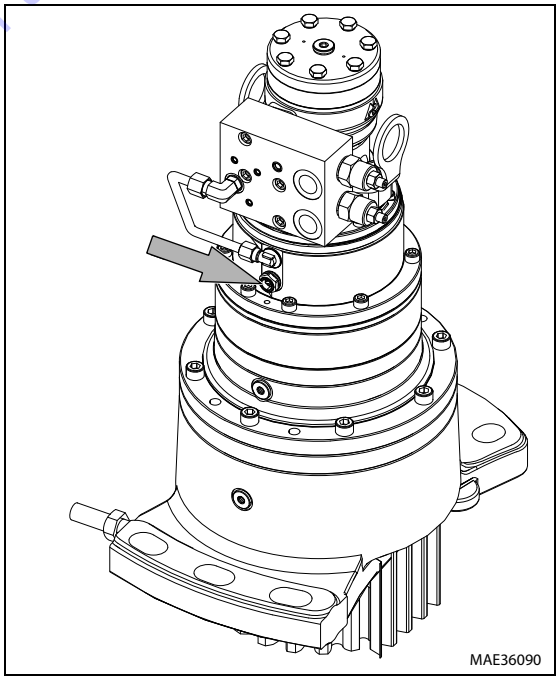
Lube Point(s) - 2 Grease Fitting
Capacity - A/R
Lube - MPG
Interval - Every 3 months or 150 hours of operation.

2. Swing Gearbox

a. Swing Gearbox (SN 0300201016 through 0300254466, SN B300002238 to Present)



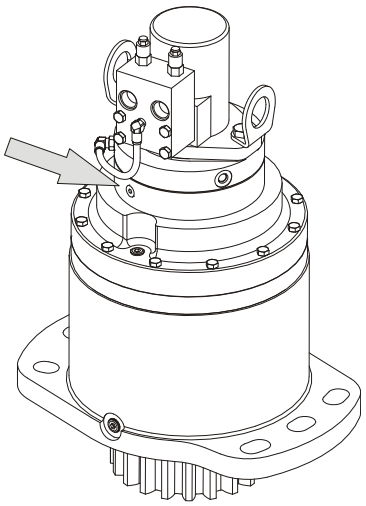
b. Swing Gearbox (SN 0300254467 to Present)



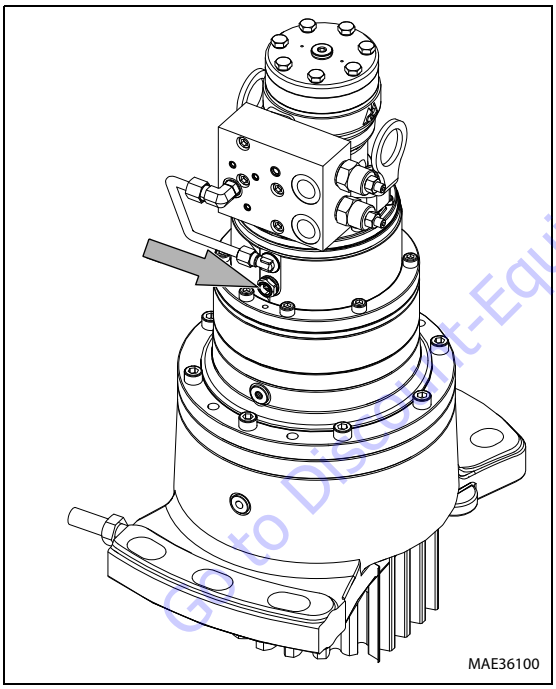
Lube Point(s) - Fill Plug
Capacity - 79 ounces (2.3 L)
Lube - GL-5
Interval - Check level every 150 hrs/Change every 1200 hours of operation. Fill to cover ring gear.

3. Swing Brake

a. Swing Brake (SN 0300201016 through 0300254466, SN B300002238 to Present)



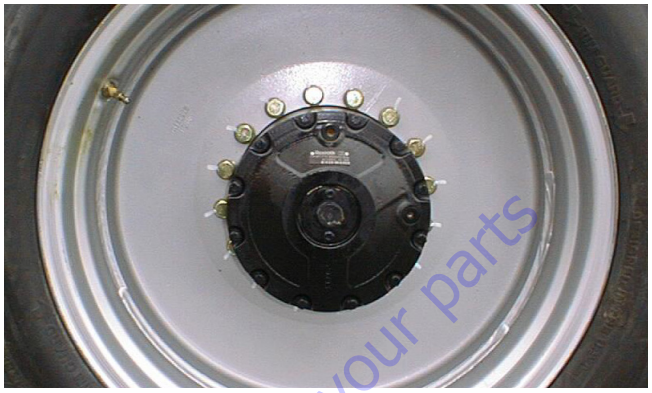
b. Swing Brake (SN 0300254467 to Present)



Lube Point(s) - Fill Plug
Capacity - 2.7 ounces (80 ml)
Lube - DTE24
Interval - Check level every 150 hrs/Change every 1200 hours of operation.

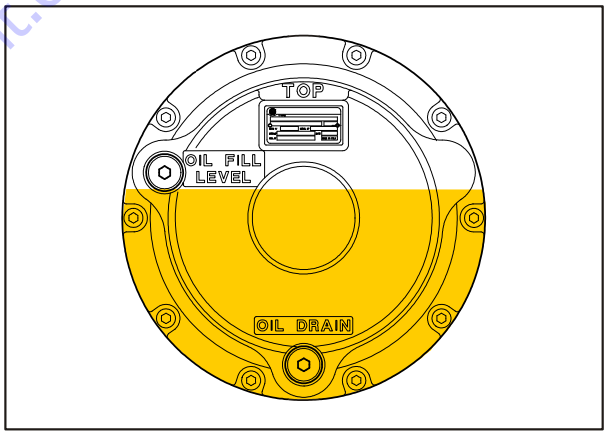
NOTE: *After S/N 0300134389 machines may be built with either Bonfiglioli or Reggiana Riduttori wheel drive hubs.*

4. A. Wheel Drive Hub - Rexroth (Prior to S/N 100128)



Lube Point(s) - Level/Fill Plug
Capacity - 0.5 liters (1/2 full)
Lube - EPGL
Interval - Change after first 150 hours then every 1200 hours of operation
Comments - Place Fill port at 12 o'clock position and Check port at 3 o'clock position. Pour lubricant into fill port until it just starts to flow out of check port.

B: Wheel Drive Hub - Bonfiglioli (S/N 100131 to Present)



Lube Point(s) - Level/Fill Plug
Capacity - 2.1 quarts (2 liters) ± 10%
Lube - EPGL
Interval - Change after first 150 hours then every 1200 hours of operation
Comments - Place Fill port at 12 o'clock position and Check port at 8 o'clock position. Pour lubricant into fill port until it just starts to flow out of check port.

C: Wheel Drive Hub - Reggiana Riduttori (S/N 134389 to Present)

Lube Point(s) - Level/Fill Plug
Capacity - 0.5 quarts (0.5 liters) ± 10%
Lube - EPGL
Interval - Change after first 150 hours then every 1200 hours of operation
Comments - Place Fill port at 12 o'clock position and Check port at 3 o'clock position. Pour lubricant into fill port until it just starts to flow out of check port.

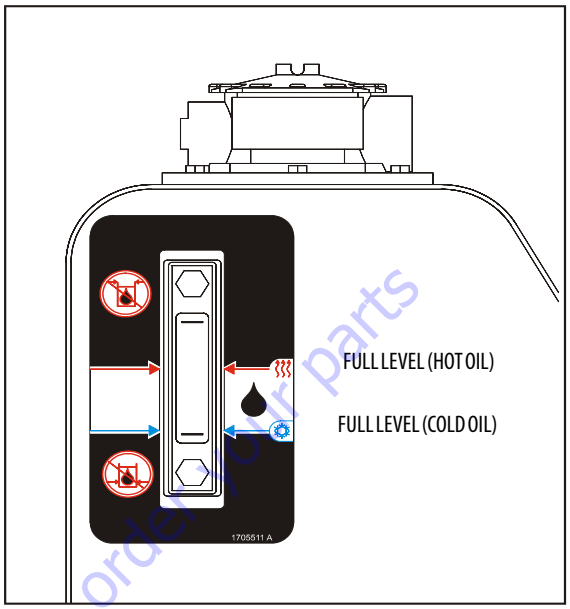
5. Hydraulic Return Filter

Lube Point(s) - Replaceable Element
Interval - Change after first 50 hours and every 300 hours thereafter or as indicated by condition indicator.

6. Hydraulic Charge Filter

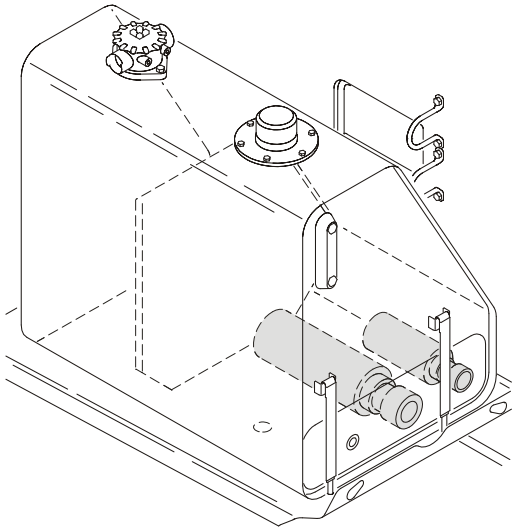
Lube Point(s) - Replaceable Element
Interval - Change after first 50 hours and every 300 hours thereafter or as indicated by condition indicator.

7. Hydraulic Oil



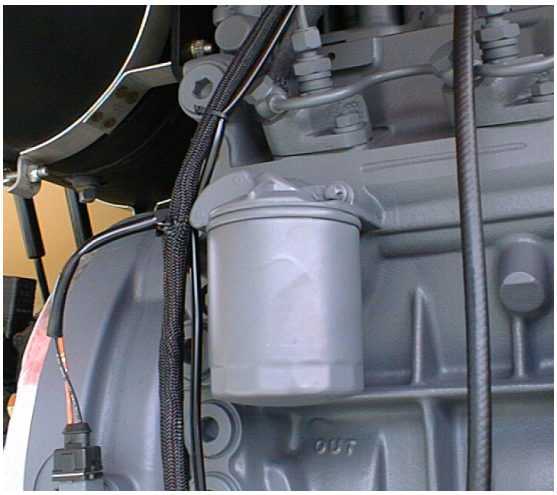
Lube Point(s) - Fill Cap
Capacity - 55 gallons (208 liters) Tank
Lube - HO
Interval - Check level daily. Change every 2 years or 1200 hours of operation.

8. Suction Strainers (In Tank)



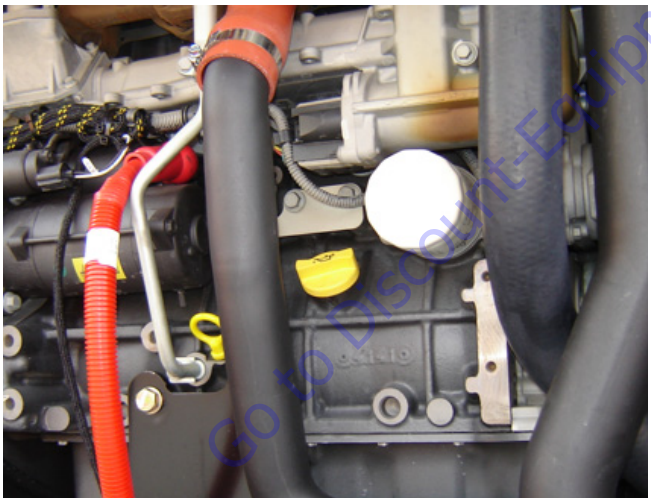
Lube Point(s) - 2
Interval - Every 2 years or 1200 hours of operation. Remove and clean at time of hydraulic oil change.

9. A. Oil Change w/Filter - Deutz 2011



Lube Point(s) - Fill Cap/Spin-on Element
Capacity -
5 Quarts (4.5 L) Cooling System
11 Quarts (10.5 L) w/Filter
16 Quarts (15 L) Total Capacity
Lube - EO
Interval - Check level daily; change every 500 hours or six months, whichever comes first. Adjust final oil level by mark on dipstick.

B. Oil Change w/Filter - Deutz TCD2.9



Lube Point(s) - Fill Cap/Spin-on Element
Capacity - 2.4 Gallon (8.9 L)
Lube - EO
Interval - Check level daily; change every 500 hours or six months, whichever comes first. Adjust final oil level by mark on dipstick.

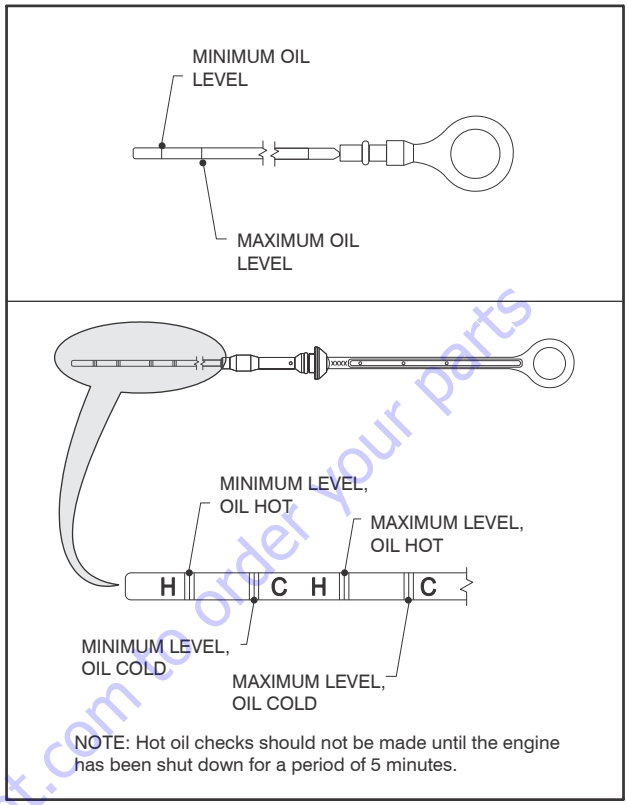
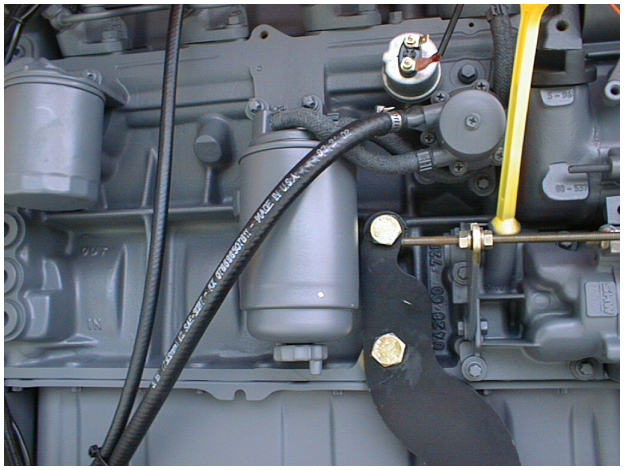


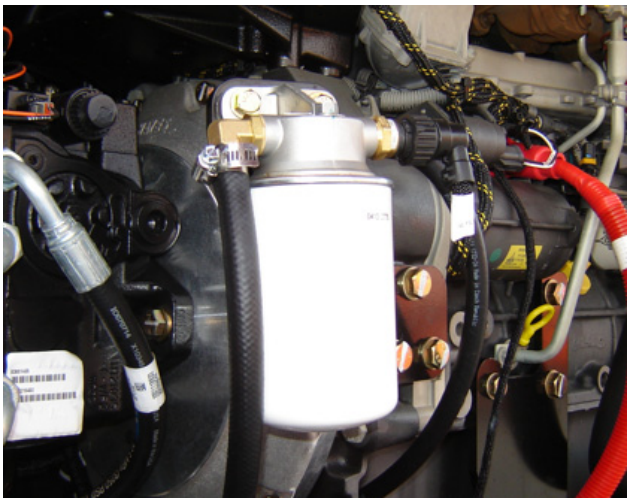
Figure 1-2. Deutz Engine Dipstick

10. A. Fuel Filter - Deutz 2011



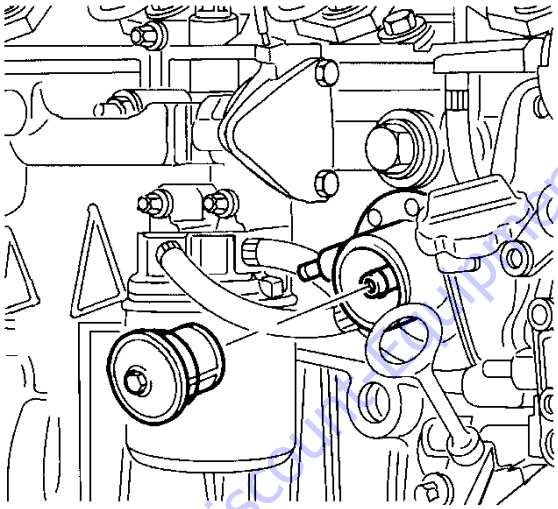
Lube Point(s) - Replaceable Element
Interval - Every year or 600 hours of operation.

B. Fuel Filter - Deutz TCD2.9



Lube Point(s) - Replaceable Element
Interval - Every year or 600 hours of operation.

11. Fuel Strainer - Deutz 2011

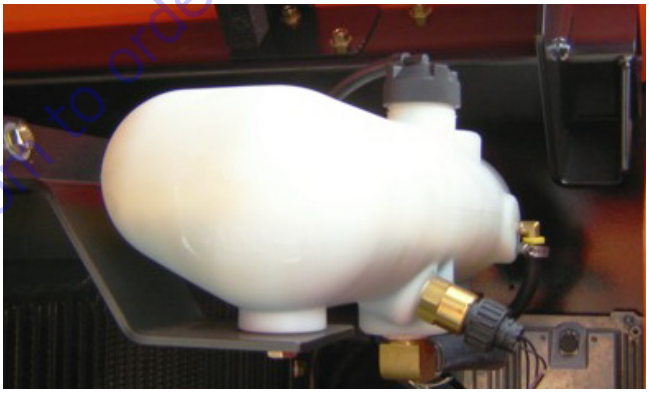


Lube Point(s) - Replaceable Element
Interval - Every year or 600 hours of operation.

12. Fuel Pre-Filter TCD2.9

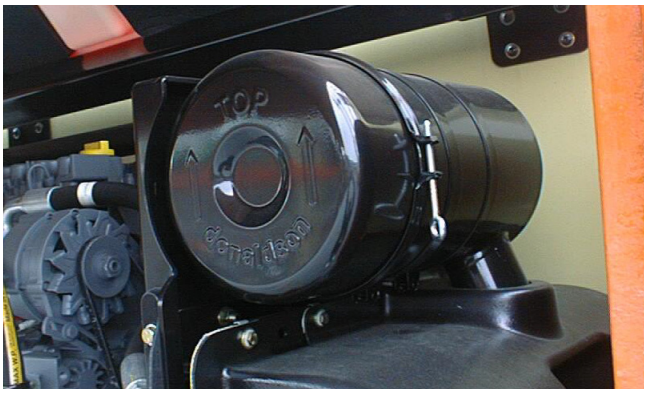
Lube Point(s) - Replaceable Element
Interval - Drain water daily; Change every year or 600 hours of operation.

13. Radiator Coolant TCD2.9



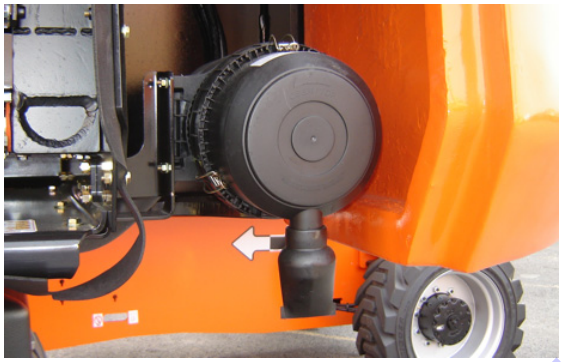
Lube Point(s) - Fill Cap
Capacity - 3.2Gallon (12.1 L)
Lube - Anti-Freeze
Interval - Check level daily; change every 1000 hours or 2 years, whichever comes first.

14. A. Air Filter - Deutz 2011



Lube Point(s) - Replaceable Element
Interval - Every 6 months or 300 hours of operation or as indicated by the condition indicator.

B. Air Filter - Deutz TCD2.9

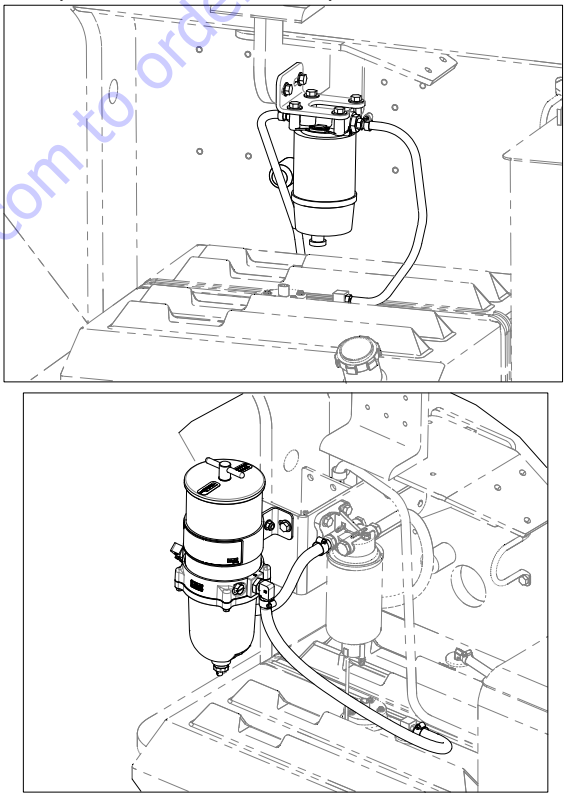


Lube Point(s) - Replaceable Element
Interval - Every 6 months or 300 hours of operation or as indicated by the condition indicator
Comments - Check Dust Valve daily.

15. Platform Filter

Lube Point(s) - Replaceable Element
Interval - Change after first 50 hours and then every year or 600 hours of operation thereafter.

16. Optional Fuel Filter/Water Separator



Lube Point(s) - Replaceable Element
Interval - Drain water daily; Change every year or 600 hours of operation.

Values for Zinc Yellow Chromate Fasteners (Ref 4150707)																			
SAE GRADE 5 BOLTS & GRADE 2 NUTS													SAE GRADE 8 (HEX HD) BOLTS & GRADE 8 NUTS*						
Size	TPI	Bolt Dia	Tensile Stress Area	Clamp Load	Torque (Dry)		Torque Lubricated		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140)		Torque (Loctite® 262™ or Vibra-TITE™ 131)		Clamp Load	Torque (Dry or Loctite® 263) K= 0.20		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K=.18		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15	
		In	Sq In	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]
4	40	0.1120	0.00604	380	8	0.9	6	0.7											
	48	0.1120	0.00661	420	9	1.0	7	0.8											
6	32	0.1380	0.00909	580	16	1.8	12	1.4											
	40	0.1380	0.01015	610	18	2.0	13	1.5											
8	32	0.1640	0.01400	900	30	3.4	22	2.5											
	36	0.1640	0.01474	940	31	3.5	23	2.6					1320	43	5				
10	24	0.1900	0.01750	1120	43	4.8	32	3.5					1580	60	7				
	32	0.1900	0.02000	1285	49	5.5	36	4					1800	68	8				
1/4	20	0.2500	0.0318	2020	96	10.8	75	9	105	12			2860	143	16	129	15		
	28	0.2500	0.0364	2320	120	13.5	86	10	135	15			3280	164	19	148	17		
		In	Sq In	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]
5/16	18	0.3125	0.0524	3340	17	23	13	18	19	26	16	22	4720	25	35	20	25	20	25
	24	0.3125	0.0580	3700	19	26	14	19	21	29	17	23	5220	25	35	25	35	20	25
3/8	16	0.3750	0.0775	4940	30	41	23	31	35	48	28	38	7000	45	60	40	55	35	50
	24	0.3750	0.0878	5600	35	47	25	34	40	54	32	43	7900	50	70	45	60	35	50
7/16	14	0.4375	0.1063	6800	50	68	35	47	55	75	45	61	9550	70	95	65	90	50	70
	20	0.4375	0.1187	7550	55	75	40	54	60	82	50	68	10700	80	110	70	95	60	80
1/2	13	0.5000	0.1419	9050	75	102	55	75	85	116	68	92	12750	105	145	95	130	80	110
	20	0.5000	0.1599	10700	90	122	65	88	100	136	80	108	14400	120	165	110	150	90	120
9/16	12	0.5625	0.1820	11600	110	149	80	108	120	163	98	133	16400	155	210	140	190	115	155
	18	0.5625	0.2030	12950	120	163	90	122	135	184	109	148	18250	170	230	155	210	130	175
5/8	11	0.6250	0.2260	14400	150	203	110	149	165	224	135	183	20350	210	285	190	260	160	220
	18	0.6250	0.2560	16300	170	230	130	176	190	258	153	207	23000	240	325	215	290	180	245
3/4	10	0.7500	0.3340	21300	260	353	200		285	388	240	325	30100	375	510	340	460	280	380
	16	0.7500	0.3730	23800	300	407	220	298	330	449	268	363	33600	420	570	380	515	315	430
7/8	9	0.8750	0.4620	29400	430	583	320	434	475	646	386	523	41600	605	825	545	740	455	620
	14	0.8750	0.5090	32400	470	637	350	475	520	707	425	576	45800	670	910	600	815	500	680
1	8	1.0000	0.6060	38600	640	868	480	651	675	918	579	785	51500	860	1170	770	1045	645	875
	12	1.0000	0.6630	42200	700	949	530	719	735	1000	633	858	59700	995	1355	895	1215	745	1015
1 1/8	7	1.1250	0.7630	42300	800	1085	600	813	840	1142	714	968	68700	1290	1755	1160	1580	965	1310
	12	1.1250	0.8560	47500	880	1193	660	895	925	1258	802	1087	77000	1445	1965	1300	1770	1085	1475
1 1/4	7	1.2500	0.9690	53800	1120	1518	840	1139	1175	1598	1009	1368	87200	1815	2470	1635	2225	1365	1855
	12	1.2500	1.0730	59600	1240	1681	920	1247	1300	1768	1118	1516	96600	2015	2740	1810	2460	1510	2055
1 3/8	6	1.3750	1.1550	64100	1460	1979	1100	1491	1525	2074	1322	1792	104000	2385	3245	2145	2915	1785	2430
	12	1.3750	1.3150	73000	1680	2278	1260	1708	1750	2380	1506	2042	118100	2705	3680	2435	3310	2030	2760
1 1/2	6	1.5000	1.4050	78000	1940	2630	1460	1979	2025	2754	1755	2379	126500	3165	4305	2845	3870	2370	3225
	12	1.5000	1.5800	87700	2200	2983	1640	2224	2300	3128	1974	2676	142200	3555	4835	3200	4350	2665	3625

NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%
3. * ASSEMBLY USES HARDENED WASHER

NO. 5000059 REV. K

Figure 1-3. Torque Chart - Sheet 1 of 5 - (SAE Fasteners)

REFERENCE JLG THREAD LOCKING COMPOUND			
JLG P/N	Loctite® P/N	ND Industries P/N	Description
0100011	242™	Vibra-TITE™ 121	Medium Strength (Blue)
0100019	271™	Vibra-TITE™ 140	High Strength (Red)
0100071	262™	Vibra-TITE™ 131	Medium - High Strength (Red)

Values for Magni Coating Fasteners (Ref 4150701)																	
SAE GRADE 5 BOLTS & GRADE 2 NUTS											SAE GRADE 8 (HEX HD) BOLTS & GRADE 8 NUTS*						
Size	TPI	Bolt Dia	Tensile Stress Area	Clamp Load	Torque (Dry) K=0.17		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K=0.16		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15		Clamp Load	Torque (Dry or Loctite® 263) K= 0.17		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K=.16		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15	
		In	Sq In	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]
4	40	0.1120	0.00604	380	7	0.8											
	48	0.1120	0.00661	420	8	0.9											
6	32	0.1380	0.00909	580	14	1.5											
	40	0.1380	0.01015	610	14	1.6											
8	32	0.1640	0.01400	900	25	2.8											
	36	0.1640	0.01474	940	26	2.9					1320	37	4				
10	24	0.1900	0.01750	1120	36	4.1					1580	51	6				
	32	0.1900	0.02000	1285	42	4.7					1800	58	7				
1/4	20	0.2500	0.0318	2020	86	9.7	80	9			2860	122	14	114	13		
	28	0.2500	0.0364	2320	99	11.1	95	11			3280	139	16	131	15		
		In	Sq In	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]
5/16	18	0.3125	0.0524	3340	15	20	14	19	15	20	4720	20	25	20	25	20	25
	24	0.3125	0.0580	3700	15	20	15	21	15	20	5220	25	35	20	25	20	25
3/8	16	0.3750	0.0775	4940	25	35	25	34	25	34	7000	35	50	35	50	35	50
	24	0.3750	0.0878	5600	30	40	28	38	25	34	7900	40	55	40	55	35	50
7/16	14	0.4375	0.1063	6800	40	55	40	54	35	48	9550	60	80	55	75	50	70
	20	0.4375	0.1187	7550	45	60	44	60	40	54	10700	65	90	60	80	60	80
1/2	13	0.5000	0.1419	9050	65	90	60	82	55	75	12750	90	120	85	115	80	110
	20	0.5000	0.1599	10700	75	100	71	97	65	88	14400	100	135	95	130	90	120
9/16	12	0.5625	0.1820	11600	90	120	87	118	80	109	16400	130	175	125	170	115	155
	18	0.5625	0.2030	12950	105	145	97	132	90	122	18250	145	195	135	185	130	175
5/8	11	0.6250	0.2260	14400	130	175	120	163	115	156	20350	180	245	170	230	160	220
	18	0.6250	0.2560	16300	145	195	136	185	125	170	23000	205	280	190	260	180	245
3/4	10	0.7500	0.3340	21300	225	305	213	290	200	272	30100	320	435	300	410	280	380
	16	0.7500	0.3730	23800	255	345	238	324	225	306	33600	355	485	335	455	315	430
7/8	9	0.8750	0.4620	29400	365	495	343	466	320	435	41600	515	700	485	660	455	620
	14	0.8750	0.5090	32400	400	545	378	514	355	483	45800	570	775	535	730	500	680
1	8	1.0000	0.6060	38600	545	740	515	700	480	653	51500	730	995	685	930	645	875
	12	1.0000	0.6630	42200	600	815	563	765	530	721	59700	845	1150	795	1080	745	1015
1 1/8	7	1.1250	0.7630	42300	675	920	635	863	595	809	68700	1095	1490	1030	1400	965	1310
	12	1.1250	0.8560	47500	755	1025	713	969	670	911	77000	1225	1665	1155	1570	1085	1475
1 1/4	7	1.2500	0.9690	53800	955	1300	897	1219	840	1142	87200	1545	2100	1455	1980	1365	1855
	12	1.2500	1.0730	59600	1055	1435	993	1351	930	1265	96600	1710	2325	1610	2190	1510	2055
1 3/8	6	1.3750	1.1550	64100	1250	1700	1175	1598	1100	1496	104000	2025	2755	1905	2590	1785	2430
	12	1.3750	1.3150	73000	1420	1930	1338	1820	1255	1707	118100	2300	3130	2165	2945	2030	2760
1 1/2	6	1.5000	1.4050	78000	1660	2260	1560	2122	1465	1992	126500	2690	3660	2530	3440	2370	3225
	12	1.5000	1.5800	87700	1865	2535	1754	2385	1645	2237	142200	3020	4105	2845	3870	2665	3625

NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%
3. * ASSEMBLY USES HARDENED WASHER

NO. 5000059 REV. K

Figure 1-4. Torque Chart - Sheet 2 of 5 - (SAE Fasteners)

				SOCKET HEAD CAP SCREWS												
				Magni Coating (Ref 4150701)*							Zinc Yellow Chromate Fasteners (Ref 4150707)*						
Size	TPI	Bolt Dia	Tensile Stress Area	Clamp Load See Note 4	Torque (Dry) K = .17		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140 OR Precoat 85®) K=0.16		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15		Clamp Load See Note 4	Torque (Dry) K = .20		Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140 OR Precoat 85®) K=0.18		Torque (Loctite® 262™ or Vibra-TITE™ 131) K=0.15	
		In	Sq In	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]	LB	IN-LB	[N.m]	IN-LB	[N.m]	IN-LB	[N.m]
4	40	0.1120	0.00604														
	48	0.1120	0.00661														
6	32	0.1380	0.00909														
	40	0.1380	0.01015														
8	32	0.1640	0.01400														
	36	0.1640	0.01474														
10	24	0.1900	0.01750														
	32	0.1900	0.02000														
1/4	20	0.2500	0.0318	2860	122	14	114	13			2860	143	16	129	15		
	28	0.2500	0.0364	3280	139	16	131	15			3280	164	19	148	17		
		In	Sq In	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]	LB	FT-LB	[N.m]	FT-LB	[N.m]	FT-LB	[N.m]
5/16	18	0.3125	0.0524	4720	20	25	20	25	20	25	4720	25	35	20	25	20	25
	24	0.3125	0.0580	5220	25	35	20	25	20	25	5220	25	35	25	35	20	25
3/8	16	0.3750	0.0775	7000	35	50	35	50	35	50	7000	45	60	40	55	35	50
	24	0.3750	0.0878	7900	40	55	40	55	35	50	7900	50	70	45	60	35	50
7/16	14	0.4375	0.1063	9550	60	80	55	75	50	70	9550	70	95	65	90	50	70
	20	0.4375	0.1187	10700	65	90	60	80	60	80	10700	80	110	70	95	60	80
1/2	13	0.5000	0.1419	12750	90	120	85	115	80	110	12750	105	145	95	130	80	110
	20	0.5000	0.1599	14400	100	135	95	130	90	120	14400	120	165	110	150	90	120
9/16	12	0.5625	0.1820	16400	130	175	125	170	115	155	16400	155	210	140	190	115	155
	18	0.5625	0.2030	18250	145	195	135	185	130	175	18250	170	230	155	210	130	175
5/8	11	0.6250	0.2260	20350	180	245	170	230	160	220	20350	210	285	190	260	160	220
	18	0.6250	0.2560	23000	205	280	190	260	180	245	23000	240	325	215	290	180	245
3/4	10	0.7500	0.3340	30100	320	435	300		280	380	30100	375	510	340	460	280	380
	16	0.7500	0.3730	33600	355	485	335	455	315	430	33600	420	570	380	515	315	430
7/8	9	0.8750	0.4620	41600	515	700	485	660	455	620	41600	605	825	545	740	455	620
	14	0.8750	0.5090	45800	570	775	535	730	500	680	45800	670	910	600	815	500	680
1	8	1.0000	0.6060	51500	730	995	685	930	645	875	51500	860	1170	775	1055	645	875
	12	1.0000	0.6630	59700	845	1150	795	1080	745	1015	59700	995	1355	895	1215	745	1015
1 1/8	7	1.1250	0.7630	68700	1095	1490	1030	1400	965	1310	68700	1290	1755	1160	1580	965	1310
	12	1.1250	0.8560	77000	1225	1665	1155	1570	1085	1475	77000	1445	1965	1300	1770	1085	1475
1 1/4	7	1.2500	0.9690	87200	1545	2100	1455	1980	1365	1855	87200	1815	2470	1635	2225	1365	1855
	12	1.2500	1.0730	96600	1710	2325	1610	2190	1510	2055	96600	2015	2740	1810	2460	1510	2055
1 3/8	6	1.3750	1.1550	104000	2025	2755	1905	2590	1785	2430	104000	2385	3245	2145	2915	1785	2430
	12	1.3750	1.3150	118100	2300	3130	2165	2945	2030	2760	118100	2705	3680	2435	3310	2030	2760
1 1/2	6	1.5000	1.4050	126500	2690	3660	2530	3440	2370	3225	126500	3165	4305	2845	3870	2370	3225
	12	1.5000	1.5800	142200	3020	4105	2845	3870	2665	3625	142200	3555	4835	3200	4350	2665	3625

NOTES: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS

2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%

*3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED STEEL OR RAW ALUMINUM

4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED, ADDITIONAL TESTING IS REQUIRED.

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Figure 1-5. Torque Chart - Sheet 3 of 5 - (SAE Fasteners)

Values for Zinc Yellow Chromate Fasteners (Ref 4150707)												
			CLASS 8.8 METRIC (HEX/SOCKET HEAD) BOLTS CLASS 8 METRIC NUTS					CLASS 10.9 METRIC (HEX HEAD) BOLTS CLASS 10 METRIC NUTS CLASS 12.9 SOCKET HEAD CAP SCREWS M3 - M5*				
Size	PITCH	Tensile Stress Area	Clamp Load	Torque (Dry or Loctite® 263™)	Torque (Lub)	Torque (Loctite® 262™ OR Vibra-TITE™ 131)	Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140)	Clamp Load	Torque (Dry or Loctite® 263™) K = 0.20	Torque (Lub OR Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K= 0.18	Torque (Loctite® 262™ OR Vibra-TITE™ 131) K=0.15
		Sq mm	KN	[N.m]	[N.m]	[N.m]	[N.m]	KN	[N.m]	[N.m]	[N.m]
3	0.5	5.03	2.19	1.3	1.0	1.2	1.4	3.13			
3.5	0.6	6.78	2.95	2.1	1.6	1.9	2.3	4.22			
4	0.7	8.78	3.82	3.1	2.3	2.8	3.4	5.47			
5	0.8	14.20	6.18	6.2	4.6	5.6	6.8	8.85			
6	1	20.10	8.74	11	7.9	9.4	12	12.5			
7	1	28.90	12.6	18	13	16	19	18.0	25	23	19
8	1.25	36.60	15.9	26	19	23	28	22.8	37	33	27
10	1.5	58.00	25.2	50	38	45	55	36.1	70	65	55
12	1.75	84.30	36.7	88	66	79	97	52.5	125	115	95
14	2	115	50.0	140	105	126	154	71.6	200	180	150
16	2	157	68.3	219	164	197	241	97.8	315	280	235
18	2.5	192	83.5	301	226	271	331	119.5	430	385	325
20	2.5	245	106.5	426	320	383	469	152.5	610	550	460
22	2.5	303	132.0	581	436	523	639	189.0	830	750	625
24	3	353	153.5	737	553	663	811	222.0	1065	960	800
27	3	459	199.5	1080	810	970	1130	286.0	1545	1390	1160
30	3.5	561	244.0	1460	1100	1320	1530	349.5	2095	1885	1575
33	3.5	694	302.0	1990	1490	1790	2090	432.5	2855	2570	2140
36	4	817	355.5	2560	1920	2300	2690	509.0	3665	3300	2750
42	4.5	1120	487.0	4090	3070	3680	4290	698.0	5865	5275	4395

: 1. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS
2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%
*3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED STEEL OR RAW ALUMINUM
4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED, ADDITIONAL TESTING IS REQ

NO. 5000059 REV. K

Figure 1-6. Torque Chart - Sheet 4 of 5 - (METRIC Fasteners)

Values for Magni Coated Fasteners (Ref 4150701)										
			CLASS 8.8 METRIC (HEX/SOCKET HEAD) BOLTS CLASS 8 METRIC NUTS				CLASS 10.9 METRIC (HEX HEAD) BOLTS CLASS 10 METRIC NUTS CLASS 12.9 SOCKET HEAD CAP SCREWS M6 AND ABOVE*			
Size	PITCH	Tensile Stress Area	Clamp Load	Torque (Dry or Loctite® 263™) K=0.17	Torque (Loctite® 262™ OR Vibra-TITE™ 131) K=0.16	Torque (Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K=0.15	Clamp Load	Torque (Dry or Loctite® 263™) K = 0.17	Torque (Lub OR Loctite® 242™ or 271™ OR Vibra-TITE™ 111 or 140) K= 0.16	Torque (Loctite® 262™ OR Vibra-TITE™ 131) K=0.15
		Sq mm	KN	[N.m]	[N.m]	[N.m]	KN	[N.m]	[N.m]	[N.m]
3	0.5	5.03	2.19	1.1	1.1	1.0	3.13			
3.5	0.6	6.78	2.95	1.8	1.7	1.5	4.22			
4	0.7	8.78	3.82	2.6	2.4	2.3	5.47			
5	0.8	14.20	6.18	5.3	4.9	4.6	8.85			
6	1	20.10	8.74	9	8.4	7.9	12.5	13	12	11
7	1	28.90	12.6	15	14	13	18.0	21	20	19
8	1.25	36.60	15.9	22	20	19	22.8	31	29	27
10	1.5	58.00	25.2	43	40	38	36.1	61	58	55
12	1.75	84.30	36.7	75	70	66	52.5	105	100	95
14	2	115	50.0	119	110	105	71.6	170	160	150
16	2	157	68.3	186	175	165	97.8	265	250	235
18	2.5	192	83.5	256	240	225	119.5	365	345	325
20	2.5	245	106.5	362	340	320	152.5	520	490	460
22	2.5	303	132.0	494	465	435	189.0	705	665	625
24	3	353	153.5	627	590	555	222.0	905	850	800
27	3	459	199.5	916	860	810	286.0	1315	1235	1160
30	3.5	561	244.0	1245	1170	1100	349.5	1780	1680	1575
33	3.5	694	302.0	1694	1595	1495	432.5	2425	2285	2140
36	4	817	355.5	2176	2050	1920	509.0	3115	2930	2750
42	4.5	1120	487.0	3477	3275	3070	698.0	4985	4690	4395

. THESE TORQUE VALUES DO NOT APPLY TO CADMIUM PLATED FASTENERS

NO. 5000059 REV. K

2. ALL TORQUE VALUES ARE STATIC TORQUE MEASURED PER STANDARD AUDIT METHODS TOLERANCE = ±10%

3. ASSEMBLY USES HARDENED WASHER OR FASTENER IS PLACED AGAINST PLATED STEEL OR RAW ALUMINUM

4. CLAMP LOAD LISTED FOR SHCS IS SAME AS GRADE 8 OR CLASS 10.9 AND DOES NOT REPRESENT FULL STRENGTH CAPABILITY OF SHCS. IF HIGHER LOAD IS REQUIRED, ADDITIONAL TESTING IS REQUIRED.

Figure 1-7. Torque Chart - Sheet 5 of 5 - (METRIC Fasteners)

PARTS FINDER

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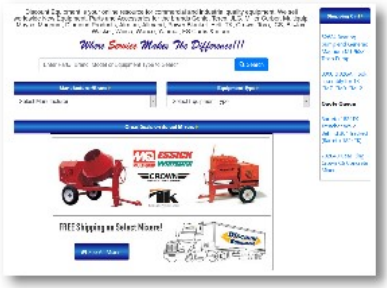

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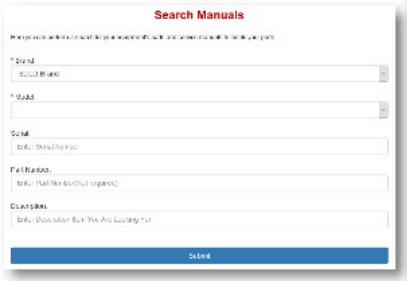

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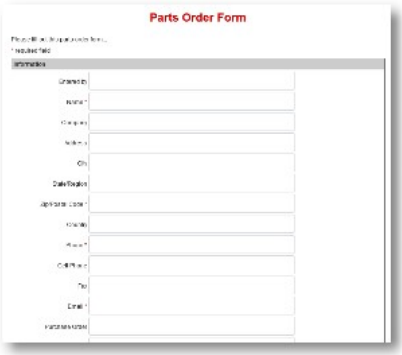

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We sell worldwide for the brands: Genie, Terex, JLG, MultiQuip, Mikasa, Essick, Whiteman, Mayco, Toro Stone, Diamond Products, Generac Magnum, Airman, Haulotte, Barreto, Power Blanket, Nifty Lift, Atlas Copco, Chicago Pneumatic, Allmand, Miller Curber, Skyjack, Lull, Skytrak, Tsurumi, Husquvarna Target, , Stow, Wacker, Sakai, Mi-T- M, Sullair, Basic, Dynapac, MBW, Weber, Bartell, Bennar Newman, Haulotte, Ditch Runner, Menegotti, Morrison, Contec, Buddy, Crown, Edco, Wyco, Bomag, Laymor, Barreto, EZ Trench, Bil-Jax, F.S. Curtis, Gehl Pavers, Heli, Honda, ICS/PowerGrit, IHI, Partner, Imer, Clipper, MMD, Koshin, Rice, CH&E, General Equipment, ,AMida, Coleman, NAC, Gradall, Square Shooter, Kent, Stanley, Tamco, Toku, Hatz, Kohler, Robin, Wisconsin, Northrock, Oztec, Toker TK, Rol-Air, Small Line, Wanco, Yanmar

SECTION 2. GENERAL

2.1 MACHINE PREPARATION, INSPECTION, AND MAINTENANCE

General

This section provides the necessary information needed by those personnel that are responsible to place the machine in operation readiness and maintain its safe operating condition. For maximum service life and safe operation, ensure that all the necessary inspections and maintenance have been completed before placing the machine into service. With proper care, maintenance, and inspections performed per JLG's recommendations, and with any and all discrepancies corrected, this product will be fit for continued use.

Preparation, Inspection, and Maintenance

It is important to establish and conform to a comprehensive inspection and preventive maintenance program. The following table outlines the periodic machine inspections and maintenance recommended by JLG Industries, Inc. Consult your national, regional, or local regulations for further requirements for aerial work platforms. The frequency of inspections and maintenance must be increased as environment, severity and frequency of usage requires.

Pre-Start Inspection

It is the User's or Operator's primary responsibility to perform a Pre-Start Inspection of the machine prior to use daily or at each change of operator. Reference the Operator's and Safety Manual for completion procedures for the Pre-Start Inspection. The Operator and Safety Manual must be read in its entirety and understood prior to performing the Pre-Start Inspection.

Pre-Delivery Inspection and Frequent Inspection

The Pre-Delivery Inspection and Frequent Inspection shall be performed by a qualified JLG equipment mechanic. JLG Industries, Inc. recognizes a qualified JLG equipment mechanic as a person who, by possession of a recognized degree, certificate, extensive knowledge, training, or experience, has successfully demonstrated the ability and proficiency to service, repair, and maintain the subject JLG product model.

The Pre-Delivery Inspection and Frequent Inspection procedures are performed in the same manner, but at different times. The Pre-Delivery Inspection shall be performed prior to each sale, lease, or rental delivery. The Frequent Inspection shall be accomplished for each machine in service for 3 months or 150 hours (whichever comes first); out of service for a period of more than 3 months; or when purchased used. The frequency of this inspection must be increased as environment, severity and frequency of usage requires.

Reference the JLG Pre-Delivery and Frequent Inspection Form and the Inspection and Preventative Maintenance Schedule for items requiring inspection during the performance of these inspections. Reference the appropriate areas of this manual for servicing and maintenance procedures.

Annual Machine Inspection

The Annual Machine Inspection must be performed on an annual basis, no later than thirteen (13) months from the date of the prior Annual Machine Inspection. JLG Industries recommends this task be performed by a Factory-Trained Service Technician. JLG Industries, Inc. recognizes a Factory-Trained Service Technician as a person who has successfully completed the JLG Service Training School for the subject JLG product model. Reference the machine Service and Maintenance Manual and appropriate JLG inspection form for performance of this inspection.

Reference the JLG Annual Machine Inspection Form and the Inspection and Preventative Maintenance Schedule for items requiring inspection during the performance of this inspection. Reference the appropriate areas of this manual for servicing and maintenance procedures.

For the purpose of receiving safety-related bulletins, it is important that JLG Industries, Inc. has updated ownership information for each machine. When performing each Annual Machine Inspection, notify JLG Industries, Inc. of the current machine ownership.

Preventative Maintenance

In conjunction with the specified inspections, maintenance shall be performed by a qualified JLG equipment mechanic. JLG Industries, Inc. recognizes a qualified JLG equipment mechanic as a person who, by possession of a recognized degree, certificate, extensive knowledge, training, or experience, has successfully demonstrated the ability and proficiency to service, repair, and maintain the subject JLG product model.

Reference the Preventative Maintenance Schedule and the appropriate areas of this manual for servicing and maintenance procedures. The frequency of service and maintenance must be increased as environment, severity and frequency of usage requires.

Table 2-1. Inspection and Maintenance

Type	Frequency	Primary Responsibility	Service Qualification	Reference
Pre-Start Inspection	Prior to use each day; or At each Operator change.	User or Operator	User or Operator	Operation and Safety Manual
Pre-Delivery Inspection	Prior to each sale, lease, or rental delivery.	Owner, Dealer, or User	Qualified JLG Mechanic	Service and Maintenance Manual and applicable JLG inspection form.
Frequent Inspection	In service for 3 months or 150 hours, whichever comes first; or Out of service for a period of more than 3 months; or purchased used.	Owner, Dealer, or User	Qualified JLG Mechanic	Service and Maintenance Manual and applicable JLG inspection form.
Annual Machine Inspection	Annually, no later than 13 months from the date of the prior inspection.	Owner, Dealer, or User	Factory Trained Service Technician (Recommended)	Service and Maintenance Manual and applicable JLG inspection form.
Preventive Maintenance	At intervals as specified in the Service and Maintenance Manual.	Owner, Dealer, or User	Qualified JLG Mechanic	Service and Maintenance Manual

2.2 SERVICE AND GUIDELINES

General

The following information is provided to assist you in the use and application of servicing and maintenance procedures contained in this book.

Safety and Workmanship

Your safety, and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

Cleanliness

1. The most important single item in preserving the long service life of a machine is to keep dirt and foreign materials out of the vital components. Precautions have been taken to safeguard against this. Shields, covers, seals, and filters are provided to keep air, fuel, and oil supplies clean; however, these items must be maintained on a scheduled basis in order to function properly.

2. At any time when air, fuel, or oil lines are disconnected, clear adjacent areas as well as the openings and fittings themselves. As soon as a line or component is disconnected, cap or cover all openings to prevent entry of foreign matter.

3. Clean and inspect all parts during servicing or maintenance, and assure that all passages and openings are unobstructed. Cover all parts to keep them clean. Be sure all parts are clean before they are installed. New parts should remain in their containers until they are ready to be used.

Components Removal and Installation

1. Use adjustable lifting devices, whenever possible, if mechanical assistance is required. All slings (chains, cables, etc.) should be parallel to each other and as near perpendicular as possible to top of part being lifted.

2. Should it be necessary to remove a component on an angle, keep in mind that the capacity of an eyebolt or similar bracket lessens, as the angle between the supporting structure and the component becomes less than 90 degrees.

3. If a part resists removal, check to see whether all nuts, bolts, cables, brackets, wiring, etc., have been removed and that no adjacent parts are interfering.

Component Disassembly and Reassembly

When disassembling or reassembling a component, complete the procedural steps in sequence. Do not partially disassemble or assemble one part, then start on another. Always recheck your work to assure that nothing has been overlooked. Do not make any adjustments, other than those recommended, without obtaining proper approval.

Pressure-Fit Parts

When assembling pressure-fit parts, use an anti-seize or molybdenum disulfide base compound to lubricate the mating surface.

Bearings

1. When a bearing is removed, cover it to keep out dirt and abrasives. Clean bearings in nonflammable cleaning solvent and allow to drip dry. Compressed air can be used but do not spin the bearing.
2. Discard bearings if the races and balls (or rollers) are pitted, scored, or burned.
3. If bearing is found to be serviceable, apply a light coat of oil and wrap it in clean (waxed) paper. Do not unwrap reusable or new bearings until they are ready to install.
4. Lubricate new or used serviceable bearings before installation. When pressing a bearing into a retainer or bore, apply pressure to the outer race. If the bearing is to be installed on a shaft, apply pressure to the inner race.

Gaskets

Check that holes in gaskets align with openings in the mating parts. If it becomes necessary to hand-fabricate a gasket, use gasket material or stock of equivalent material and thickness. Be sure to cut holes in the right location, as blank gaskets can cause serious system damage.

Bolt Usage and Torque Application

NOTICE

SELF LOCKING FASTENERS, SUCH AS NYLON INSERT AND THREAD DEFORMING LOCKNUTS, ARE NOT INTENDED TO BE REINSTALLED AFTER REMOVAL.

1. Use bolts of proper length. A bolt which is too long will bottom before the head is tight against its related part. If a bolt is too short, there will not be enough thread area to engage and hold the part properly. When replacing bolts, use only those having the same specifications of the original, or one which is equivalent.
2. Unless specific torque requirements are given within the text, standard torque values should be used on heat-treated bolts, studs, and steel nuts, in accordance with recommended shop practices. (See Torque Chart Section 1.)

Hydraulic Lines and Electrical Wiring

Clearly mark or tag hydraulic lines and electrical wiring, as well as their receptacles, when disconnecting or removing them from the unit. This will assure that they are correctly reinstalled.

Hydraulic System

1. Keep the system clean. If evidence of metal or rubber particles are found in the hydraulic system, drain and flush the entire system.
2. Disassemble and reassemble parts on clean work surface. Clean all metal parts with non-flammable cleaning solvent. Lubricate components, as required, to aid assembly.

Lubrication

Service applicable components with the amount, type, and grade of lubricant recommended in this manual, at the specified intervals. When recommended lubricants are not available, consult your local supplier for an equivalent that meets or exceeds the specifications listed.

Battery

Clean battery, using a non-metallic brush and a solution of baking soda and water. Rinse with clean water. After cleaning, thoroughly dry battery and coat terminals with an anti corrosion compound.

Lubrication and Servicing

Components and assemblies requiring lubrication and servicing are shown in the Lubrication Chart in Section 1.

2.3 LUBRICATION AND INFORMATION

Hydraulic System

1. The primary enemy of a hydraulic system is contamination. Contaminants enter the system by various means, e.g., using inadequate hydraulic oil, allowing moisture, grease, filings, sealing components, sand, etc., to enter when performing maintenance, or by permitting the pump to cavitate due to insufficient system warm-up or leaks in the pump supply (suction) lines.

2. The design and manufacturing tolerances of the component working parts are very close, therefore, even the smallest amount of dirt or foreign matter entering a system can cause wear or damage to the components and generally results in faulty operation. Every precaution must be taken to keep hydraulic oil clean, including reserve oil in storage. Hydraulic system filters should be checked, cleaned, and/or replaced as necessary, at the specified intervals required in the Lubrication Chart in Section 1. Always examine filters for evidence of metal particles.

3. Cloudy oils indicate a high moisture content which permits organic growth, resulting in oxidation or corrosion. If this condition occurs, the system must be drained, flushed, and refilled with clean oil.

4. It is not advisable to mix oils of different brands or types, as they may not contain the same required additives or be of comparable viscosities. Good grade mineral oils, with viscosities suited to the ambient temperatures in which the machine is operating, are recommended for use.

NOTE: *Metal particles may appear in the oil or filters of new machines due to the wear-in of meshing components.*

Hydraulic Oil

1. Refer to Section 1 for recommendations for viscosity ranges.

2. JLG recommends Mobilfluid 424 hydraulic oil, which has an SAE viscosity of 10W-30 and a viscosity index of 152.

NOTE: *Start-up of hydraulic system with oil temperatures below -15 degrees F (-26 degrees C) is not recommended. If it is necessary to start the system in a sub-zero environment, it will be necessary to heat the oil with a low density, 100VAC heater to a minimum temperature of -15 degrees F (-26 degrees C).*

3. The only exception to the above is to drain and fill the system with Mobil DTE 13 oil or its equivalent. This will allow start up at temperatures down to -20 degrees F (-29 degrees C). However, use of this oil will give poor performance at temperatures above 120 degrees F (49 degrees C). Systems using DTE 13 oil should not be operated at temperatures above 200 degrees F (94 degrees C) under any condition.

Changing Hydraulic Oil

1. Filter elements must be changed after the first 50 hours of operation and every 300 hours (unless specified otherwise) thereafter. If it is necessary to change the oil, use only those oils meeting or exceeding the specifications appearing in this manual. If unable to obtain the same type of oil supplied with the machine, consult local supplier for assistance in selecting the proper equivalent. Avoid mixing petroleum and synthetic base oils.

2. Use every precaution to keep the hydraulic oil clean. If the oil must be poured from the original container into another, be sure to clean all possible contaminants from the service container. Always clean the mesh element of the filter and replace the cartridge any time the system oil is changed.

3. While the unit is shut down, a good preventive maintenance measure is to make a thorough inspection of all hydraulic components, lines, fittings, etc., as well as a functional check of each system, before placing the machine back in service.

Lubrication Specifications

Specified lubricants, as recommended by the component manufacturers, are always the best choice, however, multi-purpose greases usually have the qualities which meet a variety of single purpose grease requirements. Should any question arise, regarding the use of greases in maintenance stock, consult your local supplier for evaluation. Refer to Section 1 for an explanation of the lubricant key designations appearing in the Lubrication Chart.

2.4 CYLINDER DRIFT

Theory

When a hydraulic cylinder is supporting a load, cylinder drift may occur as a result of any of the circumstances below:

- Normal leakage of load holding valves or malfunction of load holding valves. See Cylinder Leakage Test and Table 2-2, Cylinder Drift below for evaluation.
- Damaged or worn piston seals.
- Normal thermal expansion or contraction of the hydraulic oil within cylinders (See Cylinder Thermal Drift below).

The first two circumstances may result in cylinder movement due to oil leaking out of the cylinder externally or by leaking back to tank or due to oil leaking internally from one cylinder chamber to the other.

Thermal expansion or contraction of oil in hydraulic cylinders is a normal occurrence and does not result in oil leaking out of the cylinder or leaking internally from one cylinder chamber to the other. Thermal expansion or contraction is the tendency for materials to change size in response to a change in temperature.

Cylinder Leakage Test

Cylinder oil must be at stabilized ambient temperature before beginning this test.

Measure drift at cylinder rod with a calibrated dial indicator.

In an area free of obstructions, cylinder must have load applied and appropriately positioned to detect drift.

Cylinder leakage is acceptable if it passes this test.

Table 2-2. Cylinder Drift

Cylinder Bore Diameter		Max. Acceptable Drift in 10 Minutes	
inches	mm	inches	mm
3	76.2	0.026	0.66
3.5	89	0.019	0.48
4	101.6	0.015	0.38
5	127	0.009	0.22
6	152.4	0.006	0.15
7	177.8	0.005	0.13
8	203.2	0.004	0.10
9	228.6	0.003	0.08

NOTE: *This information is based on 6 drops per minute cylinder leakage.*

Cylinder Thermal Drift

The oil in all hydraulic cylinders will expand or contract due to thermal effects over time and may result in changes to the boom and/or platform position while the machine is stationary. These effects occur as the cylinder oil changes temperature, usually from a higher oil temperature as it cools and approaches the ambient air temperature. Results of these effects are related to several factors including cylinder length and change in temperature over the time the cylinder remains stationary.

2.5 PINS AND COMPOSITE BEARING REPAIR GUIDELINES

Filament wound bearings.

1. Pinned joints should be disassembled and inspected if the following occurs:
   a. Excessive sloppiness in joints.
   b. Noise originating from the joint during operation.
2. Filament wound bearings should be replaced if any of the following is observed:
   a. Frayed or separated fibers on the liner surface.
   b. Cracked or damaged liner backing.
   c. Bearings that have moved or spun in their housing.
   d. Debris embedded in liner surface.
3. Pins should be replaced if any of the following is observed (pin should be properly cleaned prior to inspection):
   a. Detectable wear in the bearing area.
   b. Flaking, pealing, scoring, or scratches on the pin surface.
   c. Rusting of the pin in the bearing area.
4. Re-assembly of pinned joints using filament wound bearings.
   a. Housing should be blown out to remove all dirt and debris bearings and bearing housings must be free of all contamination.
   b. Bearing / pins should be cleaned with a solvent to remove all grease and oil filament wound bearing are a dry joint and should not be lubricated unless otherwise instructed (i.e. sheave pins).
   c. Pins should be inspected to ensure it is free of burrs, nicks, and scratches which would damage the bearing during installation and operation.

2.6 WELDING ON JLG EQUIPMENT

NOTE: *This instruction applies to repairs, or modifications to the machine and to welding performed from the machine on an external structure, or component,*

Do the Following When Welding on JLG Equipment

- Disconnect the battery.
- Disconnect the moment pin connection (where fitted)
- Ground only to structure being welded.

Do NOT Do the Following When Welding on JLG Equipment

- Ground on frame and weld on any other area than the chassis.
- Ground on turntable and weld on any other area than the turntable.
- Ground on the platform/support and weld on any other area than the platform/support.
- Ground on a specific boom section and weld on any other area than that specific boom section.
- Allow pins, wear pads, wire ropes, bearings, gearing, seals, valves, electrical wiring, or hoses to be between the grounding position and the welded area.

NOTICE

FAILURE TO COMPLY WITH THE ABOVE REQUIREMENTS MAY RESULT IN COMPONENT DAMAGE (I.E. ELECTRONIC MODULES, SWING BEARING, COLLECTOR RING, BOOM WIRE ROPES ETC.)

Table 2-3. Inspection and Preventive Maintenance Schedule

AREA	INTERVAL	
	Pre-Delivery[2] or Frequent[3] Inspection	Annual[4] (Yearly) Inspection
Boom Assembly	9	
Boom Weldments	1,2,4	1,2,4
Hose/Cable Carrier Installations	1,2,9,12	1,2,9,12
Pivot Pins and Pin Retainers	1,2	1,2
Sheaves, Sheave Pins	1,2	1,2
Bearings	1,2	1,2
Wear Pads	1,2	1,2
Covers or Shields	1,2	1,2
Extend/Retract Chain or Cable Systems	1,2,3	1,2,3
Platform Assembly	9	
Platform	1,2	1,2
Railing	1,2	1,2
Gate	1,5	1,5
Floor	1,2	1,2
Rotator	9,5,15	9,5,15
Lanyard Anchorage Point	1,2,10	1,2,10
Turntable Assembly	9	
Swing Bearing or Worm Gear	1,2,14	1,2,3,13,14
Oil Coupling		
Swing Drive System	11	11
Turntable Lock	1,2,5	1,2,5
Hood, Hood Props, Hood Latches	5	1,2,5
Chassis Assembly	9	
Tires	1,16,17,18	16,17,18
Wheel Nuts/Bolts	1,15	15
Wheel Bearings	14,24	14,24
Oscillating Axle/Lockout Cylinder Systems		5,8
Outrigger or Extendable Axle Systems	5,8	5,8
Steer Components		
Drive Motors		
Drive Hubs	11	11

Table 2-3. Inspection and Preventive Maintenance Schedule

AREA	INTERVAL	
	Pre-Delivery[2] or Frequent[3] Inspection	Annual[4] (Yearly) Inspection
Functions/Controls	9	
Platform Controls	5,6	6
Ground Controls	5,6	6
Function Control Locks, Guards, or Detents	1,5	5
Footswitch	1,5	5
Emergency Stop Switches (Ground & Platform)	5	5
Function Limit or Cutout Switch Systems	5	5
Capacity Indicator		5
Drive Brakes	5	5
Swing Brakes	5	5
Boom Synchronization/Sequencing Systems		5
Manual Descent or Auxiliary Power	5	5
Power System		
Engine Idle, Throttle, and RPM	3	3
Engine Fluids (Oil, Coolant, Fuel)	9,11	11
Air/Fuel Filter	1,7	7
Exhaust System	1,9	9
Batteries	1,5,9	19
Battery Fluid	11	11
Battery Charger	5	5
Fuel Reservoir, Cap, and Breather	1,2,5,9,11	1,5
Hydraulic/Electric System		
Hydraulic Pumps	1,2,9	1,2,9
Hydraulic Cylinders	1,2,7,9	1,2,9
Cylinder Attachment Pins and Pin Retainers	1,2,9	1,2
Hydraulic Hoses, Lines, and Fittings	1,2,9,12	1,2,9,12
Hydraulic Reservoir, Cap, and Breather	1,2,5,9,11	1,5
Hydraulic Filter	1,7,9	7
Hydraulic Fluid	7,11	7,11
Electrical Connections	1,20	20
Instruments, Gauges, Switches, Lights, Horn	1	5,23
General		
Operators and Safety Manuals in Storage Box	21	21
ANSI and EMI Manuals/Handbooks Installed		21

Table 2-3. Inspection and Preventive Maintenance Schedule

AREA	INTERVAL	
	Pre-Delivery[2] or Frequent[3] Inspection	Annual[4] (Yearly) Inspection
Capacity Decals Installed, Secure, Legible	21	21
All Decals/Placards Installed, Secure, Legible	21	21
Walk-Around Inspection Performed	21	21
Annual Machine Inspection Due	21	21
No Unauthorized Modifications or Additions	21	21
All Relevant Safety Publications Incorporated	21	21
General Structural Condition and Welds	2,4	2,4
All Fasteners, Pins, Shields, and Covers	1,2	1,2
Grease and Lubricate to Specifications	22	22
Function Test of All Systems	21	21, 22
Paint and Appearance	7	7
Stamp Inspection Date on Frame		22
Notify JLG of Machine Ownership		22
Footnotes: [1] Prior to use each day; or at each Operator change [2] Prior to each sale, lease, or delivery [3] In service for 3 months or 150 Hours; or Out of service for 3 months or more; or Purchased used [4] Annually, no later than 13 months from the date of the prior inspection		
Performance Codes: 1 - Check for proper and secure installation 2 - Visual inspection for damage, cracks, distortion or excessive wear 3 - Check for proper adjustment 4 - Check for cracked or broken welds 5 - Operates Properly 6 - Returns to neutral or "off" position when released 7 - Clean and free of debris 8 - Interlocks function properly 9 - Check for signs of leakage 10 - Decals installed and legible 11 - Check for proper fluid level 12 - Check for chafing and proper routing 13 - Check for proper tolerances 14 - Properly lubricated 15 - Torqued to proper specification 16 - No gouges, excessive wear, or cords showing 17 - Properly inflated and seated around rim 18 - Proper and authorized components 19 - Fully charged 20 - No loose connections, corrosion, or abrasions 21 - Verify 22 - Perform 23 - Sealed Properly 24 - Drain, Clean, Refill		

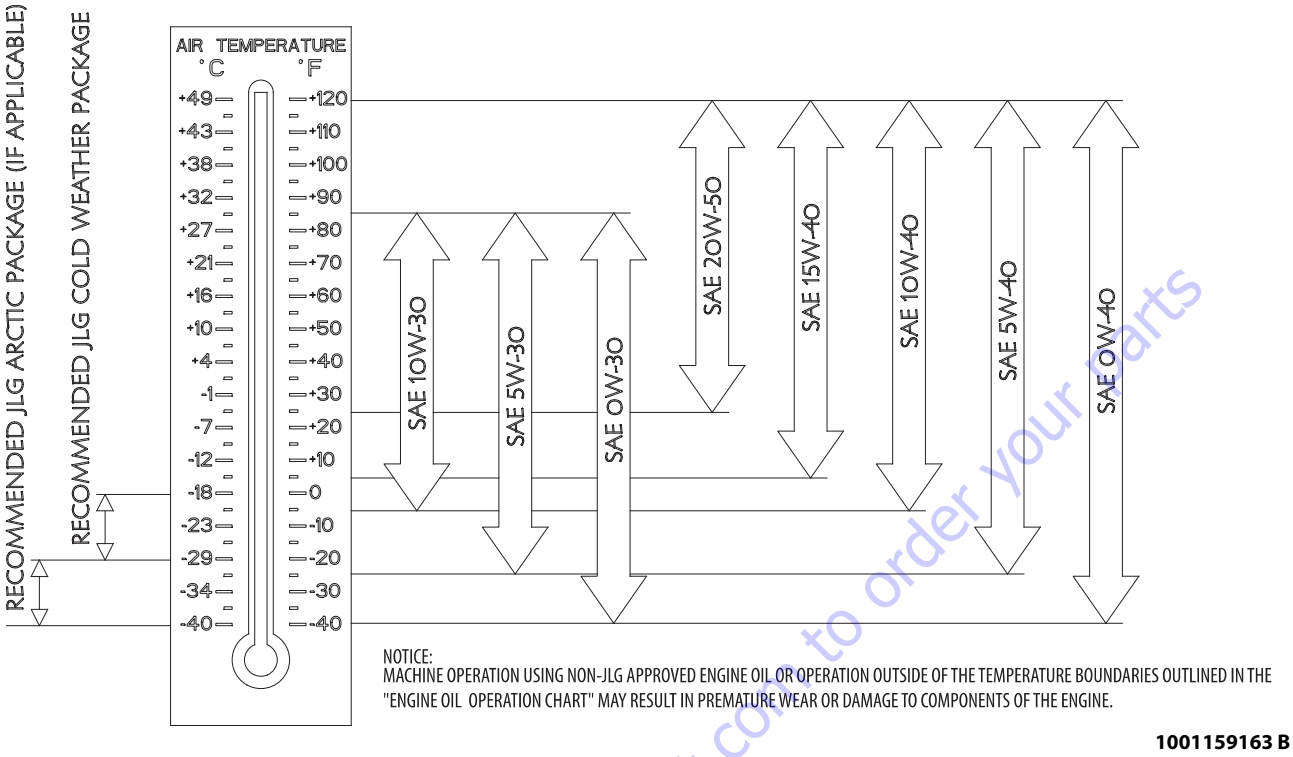
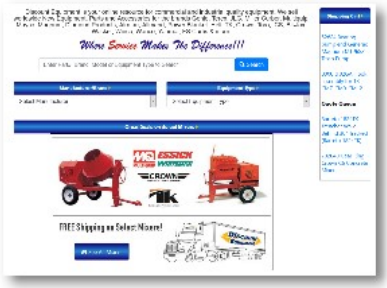


Figure 2-1. Engine Operating Temperature Specifications - Deutz

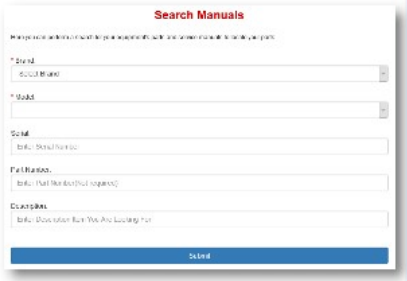
PARTS FINDER

Search Website by Part Number

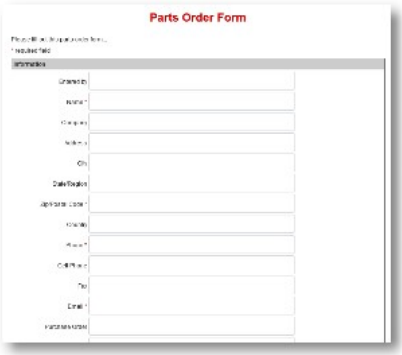
Discount Equipment



Search Manual Library For Parts Manual & Lookup Part Numbers – Purchase or Request Quote



Can't Find Part or Manual? Request Help by Manufacturer, Model & Description



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We sell worldwide for the brands: Genie, Terex, JLG, MultiQuip, Mikasa, Essick, Whiteman, Mayco, Toro Stone, Diamond Products, Generac Magnum, Airman, Haulotte, Barreto, Power Blanket, Nifty Lift, Atlas Copco, Chicago Pneumatic, Allmand, Miller Curber, Skyjack, Lull, Skytrak, Tsurumi, Husquvarna Target, , Stow, Wacker, Sakai, Mi-T- M, Sullair, Basic, Dynapac, MBW, Weber, Bartell, Bennar Newman, Haulotte, Ditch Runner, Menegotti, Morrison, Contec, Buddy, Crown, Edco, Wyco, Bomag, Laymor, Barreto, EZ Trench, Bil-Jax, F.S. Curtis, Gehl Pavers, Heli, Honda, ICS/PowerGrit, IHI, Partner, Imer, Clipper, MMD, Koshin, Rice, CH&E, General Equipment, ,AMida, Coleman, NAC, Gradall, Square Shooter, Kent, Stanley, Tamco, Toku, Hatz, Kohler, Robin, Wisconsin, Northrock, Oztec, Toker TK, Rol-Air, Small Line, Wanco, Yanmar

SECTION 3. CHASSIS & TURNTABLE

3.1 TIRES & WHEELS

Tire Inflation

The air pressure for pneumatic tires must be equal to the air pressure that is stenciled on the side of the JLG product or rim decal for safe and proper operational characteristics.

Tire Damage

For pneumatic tires, JLG Industries, Inc. recommends that when any cut, rip, or tear is discovered that exposes sidewall or tread area cords in the tire, measures must be taken to remove the JLG product from service immediately. Arrangements must be made for replacement of the tire or tire assembly.

For polyurethane foam filled tires, JLG Industries, Inc. recommends that when any of the following are discovered, measures must be taken to remove the JLG product from service immediately and arrangements must be made for replacement of the tire or tire assembly.

- a smooth, even cut through the cord plies which exceeds 3 inches (7.5 cm) in total length
- any tears or rips (ragged edges) in the cord plies which exceeds 1 inch (2.5 cm) in any direction
- any punctures which exceed 1 inch in diameter
- any damage to the bead area cords of the tire

If a tire is damaged but is within the above noted criteria, the tire must be inspected on a daily basis to insure the damage hasn't propagated beyond the allowable criteria.

Wheel and Tire Replacement

The rims installed on each product model have been designed for stability requirements which consist of track width, tire pressure, and load capacity. Size changes such as rim width, center piece location, larger or smaller diameter, etc., without written factory recommendations, may result in an unsafe condition regarding stability.

Wheel Installation

It is extremely important to apply and maintain proper wheel mounting torque.

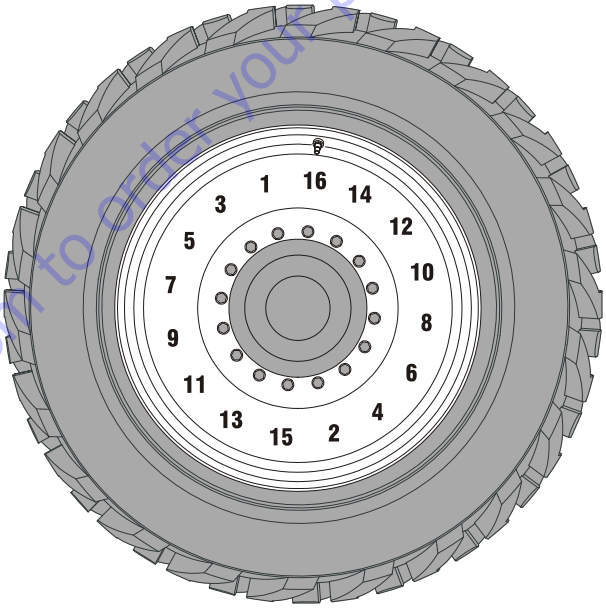
⚠ WARNING

WHEEL NUTS MUST BE INSTALLED AND MAINTAINED AT THE PROPER TORQUE TO PREVENT LOOSE WHEELS, BROKEN STUDS, AND POSSIBLE DANGEROUS SEPARATION OF WHEEL FROM THE AXLE. BE SURE TO USE ONLY THE NUTS MATCHED TO THE CONE ANGLE OF THE WHEEL.

Tighten the lug nuts to the proper torque to prevent wheels from coming loose. Use a torque wrench to tighten the fasteners. If you do not have a torque wrench, tighten the fasteners with a lug wrench, then immediately have a service garage or dealer tighten the lug nuts to the proper torque. Over-tightening will result in breaking the studs or permanently deforming the mounting stud holes in the wheels.

The proper procedure for attaching wheels is as follows:

1. Start all nuts by hand to prevent cross threading. DO NOT use a lubricant on threads or nuts.
2. Tighten nuts in the following sequence:



3. The tightening of the nuts should be done in stages. Following the recommended sequence, tighten nuts per wheel torque chart.

Table 3-1. Wheel Torque Chart

TORQUE SEQUENCE		
1st Stage	2nd Stage	3rd Stage
45 ft. lbs. (60 Nm)	100 ft. lbs. (140 Nm)	180 ft. lbs. (252 Nm)

4. Wheel nuts should be torqued before first road use and after each wheel removal. Check and torque every 3 months or 150 hours of operation.

3.2 EXTENDING AXLES

The Axle Extension System allows each of the four axles to be extended and retracted together while maintaining full steering control as the machine is driven. The system allows the axles to extend or retract only while the boom is in the transport position and in order to minimize wheel scrubbing during axle movement, a minimum drive speed must be attained before axle extension/retraction will be permitted. The system uses four limit switches (one at each axle) to sense when the axles are fully extended. If any of the switches are not made, the control system considers the axles retracted. To extend/retract the axles, the user engages the axle extend/retract switch on the platform console and the drive control at the same time. The axle set indicator will be off when the axles are not fully extended and the axle extend/retract switch is not engaged. It will flash while the axles are extending or retracting and will be on constantly when the axles are fully extended. With the axles not fully extended, the boom is restricted to operation within the transport position. If a signal from any axle extend sensing switch is lost when the boom beyond the transport position, the axle set indicator will flash and drive/steer functions will be disabled until the boom is brought back into the transport position. The steering angle will be automatically limited to +/- 25 degrees anytime the axles are not fully extended. If the wheel angle is more than +/- 25 degrees when the axle retract command is engaged, the control system will automatically reduce the wheel angle to 25 degrees during axle retraction.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

3.3 AXLE LIMIT SWITCH ADJUSTMENT PROCEDURE

1. Fully extend the axles.
2. Initially position the limit switch arm straight.
3. Select the mounting plate bolt pattern to position the switch roller within 0.125 inches (3.1 mm) from the edge of the axle cutout. It may be necessary to reposition the switch arm ±10° to accomplish this.
4. Ensure the arm will clear the axle (without bottoming out to 70° stroke of the switch) in the retracted position.
5. Check for proper operation. Axle set light is to deactivate when the axle is retracted 0.625 inches (16 mm) maximum from fully extended.

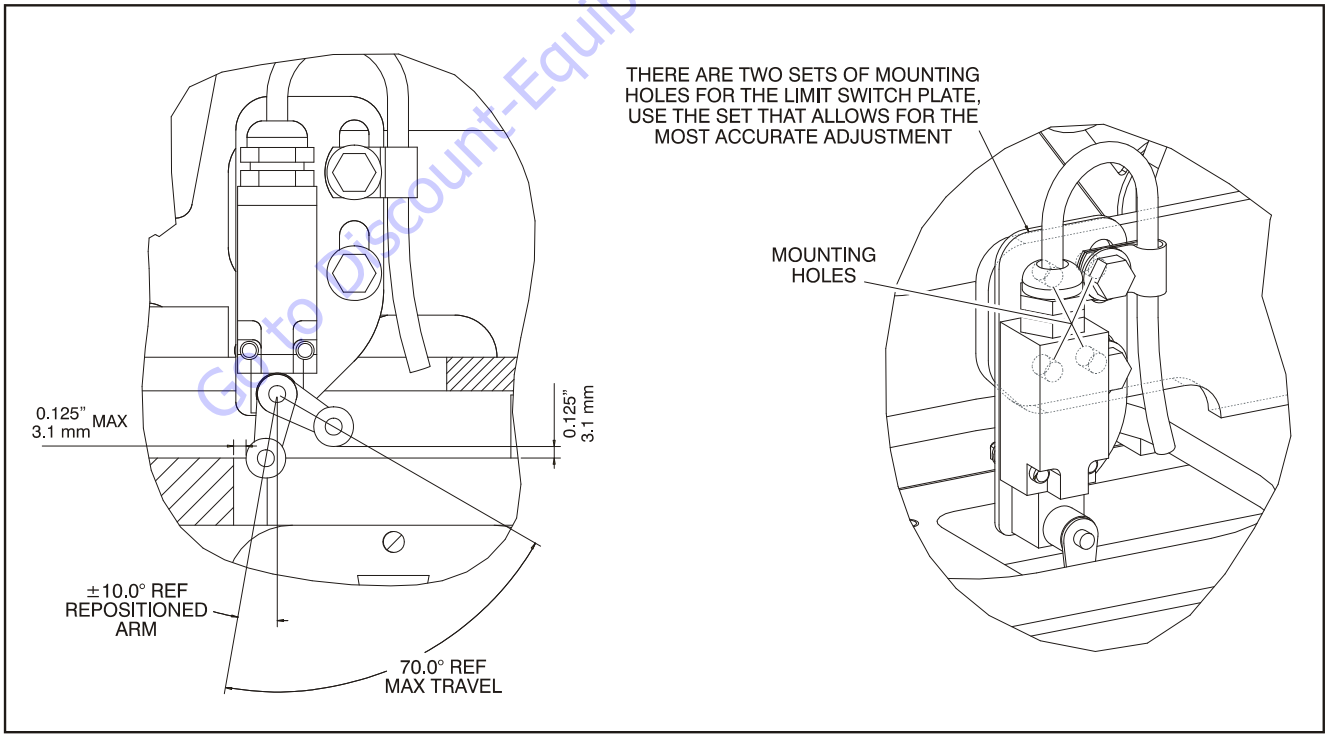


Figure 3-1. Axle Limit Switch Adjustment

3.4 DRIVE SYSTEM

The drive system utilizes 2 traction pumps so each side is powered individually. This produces maximum tractive effort to wheels by minimizing flow divider losses. The maximum drive speed is modulated with the steered angle of the wheels to eliminate the whiplash effect of driving at full speed and maximum steering lock.

3.5 STEERING CONTROL SYSTEM

Each wheel is individually steered by means of a closed circuit control system utilizing a steer sensor on each wheel, 4 steer cylinders, and proportional valves.

The control system senses the wheel position in relation to the steering command (direction and steering mode) and automatically synchronizes the movement of all 4 wheels to the desired position.

There are three different modes of steering selectable by the position of the steer select switch on the platform control panel: conventional two wheel steering, crab and coordinated. These are shown below.

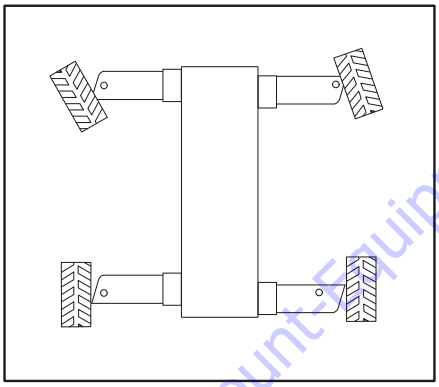


Figure 3-2. Conventional Two Wheel Steer Mode

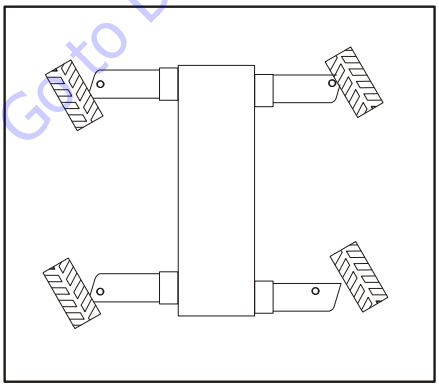


Figure 3-3. Crab Steer Mode

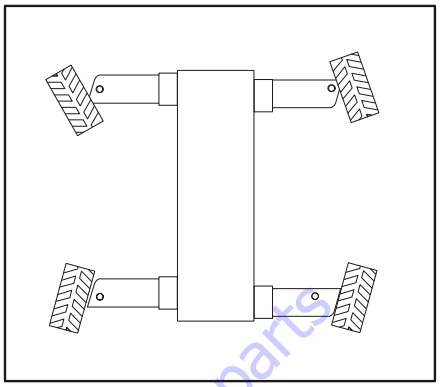


Figure 3-4. Coordinated Steer Mode

Each wheel has its own steer cylinder, wheel angle sensor, and proportional valve, allowing the control system to position each wheel to the ideal angle for all steering modes and all steering commands. Changes in steering modes while the footswitch is depressed causes the wheels to automatically adjust to the appropriate angle for the selected steering mode based on the position of the inside front wheel. If the steer select switch is changed without the footswitch depressed or the EMS is off, the wheels will not move until the footswitch is depressed and a steering or drive command has been initiated. The steering angles are limited to +/- 25 degrees anytime the axles are not fully extended. If a wheel cannot achieve its commanded angle within a specified time, it is considered jammed. When a wheel is considered jammed during steering, a fault is reported and the remaining wheels will continue to their commanded position. The fault is cleared when the footswitch is cycled. If a wheel is jammed making it significantly out of position, with regard to the other wheels, the drive motors are restricted to their maximum displacement (slow speed). Wheel angle sensor failures will result in an approximated steering control logic that will allow the operator to move the machine until it can be repaired. The wheel at the failed sensor will be driven based on the information available from the other sensors. This wheel will not track perfectly and will become farther out of position over time. When the wheel becomes prohibitively out of position, the wheels can be re synchronized by fully steering against the mechanical stops.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

3.6 DRIVE/STEERING SPEED CONTROL

The Drive/Steering Speed Control system uses the steering sensors from the steering control system to increase operator control and comfort by reducing the effect of turning the chassis on the resulting lateral platform speed. The system proportionally varies the drive speed based on the predicted turning radius of the chassis for both coordinated and conventional two wheel steer modes. The tighter the turn the slower the allowable drive speed. As crab steer does not steer on a radius, full drive speed is maintained regardless of steer angle.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

3.7 TRACTION CONTROL SYSTEM

The traction control system uses the steering sensors from the steering control system to optimize the performance of the drive system. This is especially important due to the disparity of wheel speeds generated between the inside and outside wheels of the extended axle chassis with large steering angle capability. The steering sensors are used to predict the rolling path and therefore the required wheel speed of each wheel as the steering angles change and steering modes change. The control system can then command the ideal flow from each of the two drive pumps, one for the right side of the machine and one for he left side. Two flow dividers, one for the right side front to back and one for the left side front to back absorb the variation in wheel speed front to back.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

3.8 DRIVE ORIENTATION SYSTEM

The Drive Orientation System (DOS) is intended to indicate to the operator conditions that could make the direction of movement of the chassis different than the direction of movement of the drive/steer control handle. The system indicates to the operator the need to match the black and white directional arrows on the platform control panel to the arrows on the chassis. The system uses a proximity switch mounted on the hydraulic swivel, an indicator light and an override switch on the platform display panel. The proximity switch trips when the turntable is swung +/- 45 degrees off center of the normal driving position. This occurs roughly when the boom is swung past a rear tire. When the turntable is in the normal drive position with the boom between the rear tires, no indications or interlocks are made. When the machine is actively driving when the turntable is swung past the switch point, the system is ignored until drive/steer is released. When drive is initiated with the boom swung past the switch point, the DOS indicator will flash and the drive/steer functions will be disabled. The operator must engage the DOS override switch to enable Drive/steer (high drive will remain disabled). When the DOS is enabled, the DOS indicator will be illuminated continuously and a 3-second enable timer will be started and will continue for 3 seconds after the end the last drive/steer command. If the timer expires, the DOS override switch must be re-engaged to enable drive/steer.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

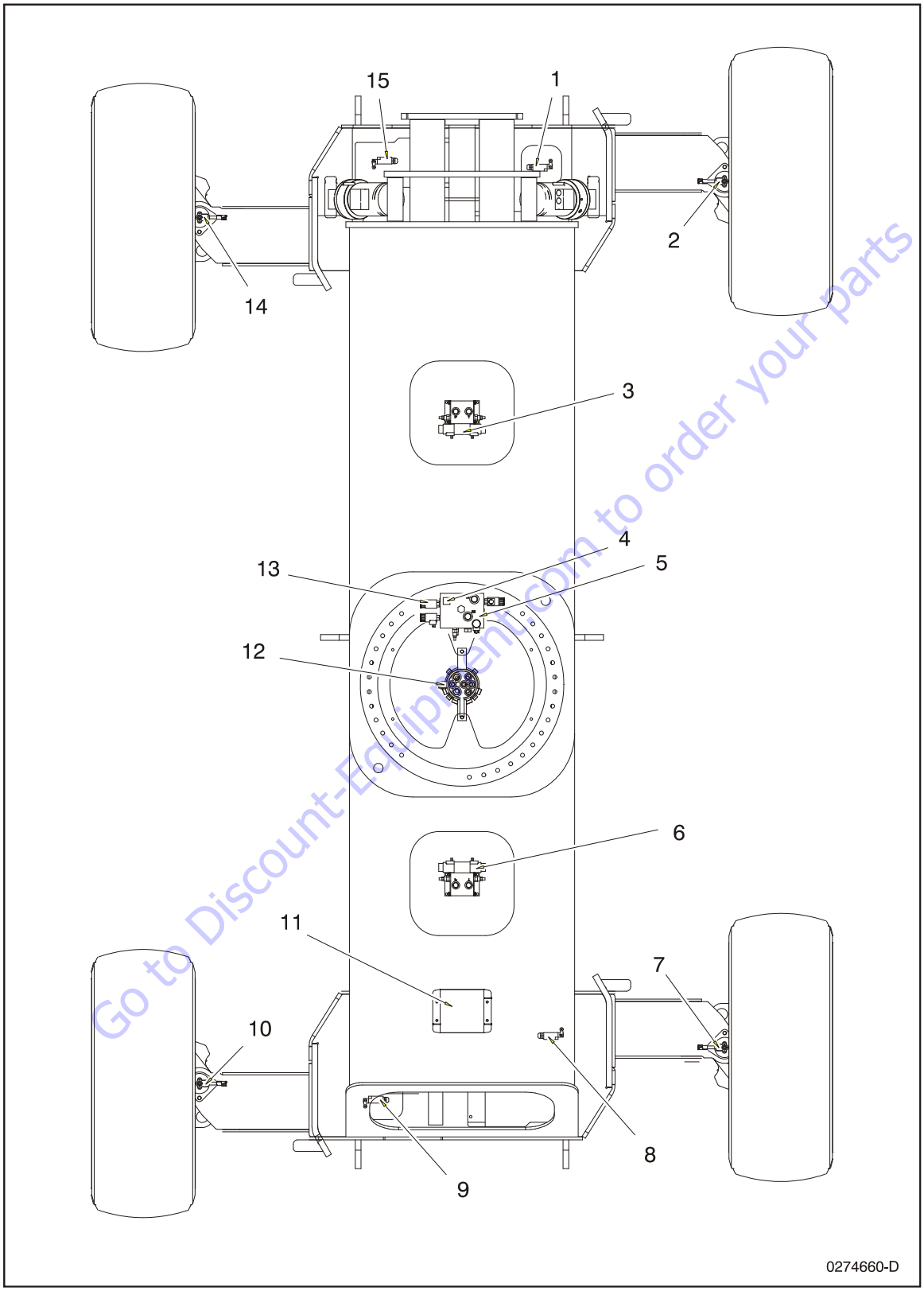


Figure 3-5. Chassis Component Location - Sheet 1 of 2

1. Axle Limit Switch (Right Front)
2. Steer Angle Sensor (Right Front)
3. Steer Valve (Front)
4. Axle Lockout Valve
5. Traction Valve
6. Steer Valve (Rear)
7. Steer Angle Sensor (Right Rear)
8. Axle Limit Switch (Right Rear)
9. Axle Limit Switch (Left Rear)
10. Steer Angle Sensor (Left Rear)
11. Chassis Module
12. Swivel/Collector Ring
13. Axle Lockout Pressure Switch
14. Steer Angle Sensor (Left Front)
15. Axle Limit Switch (Left Front)

Figure 3-6. Chassis Component Location - Sheet 2 of 2

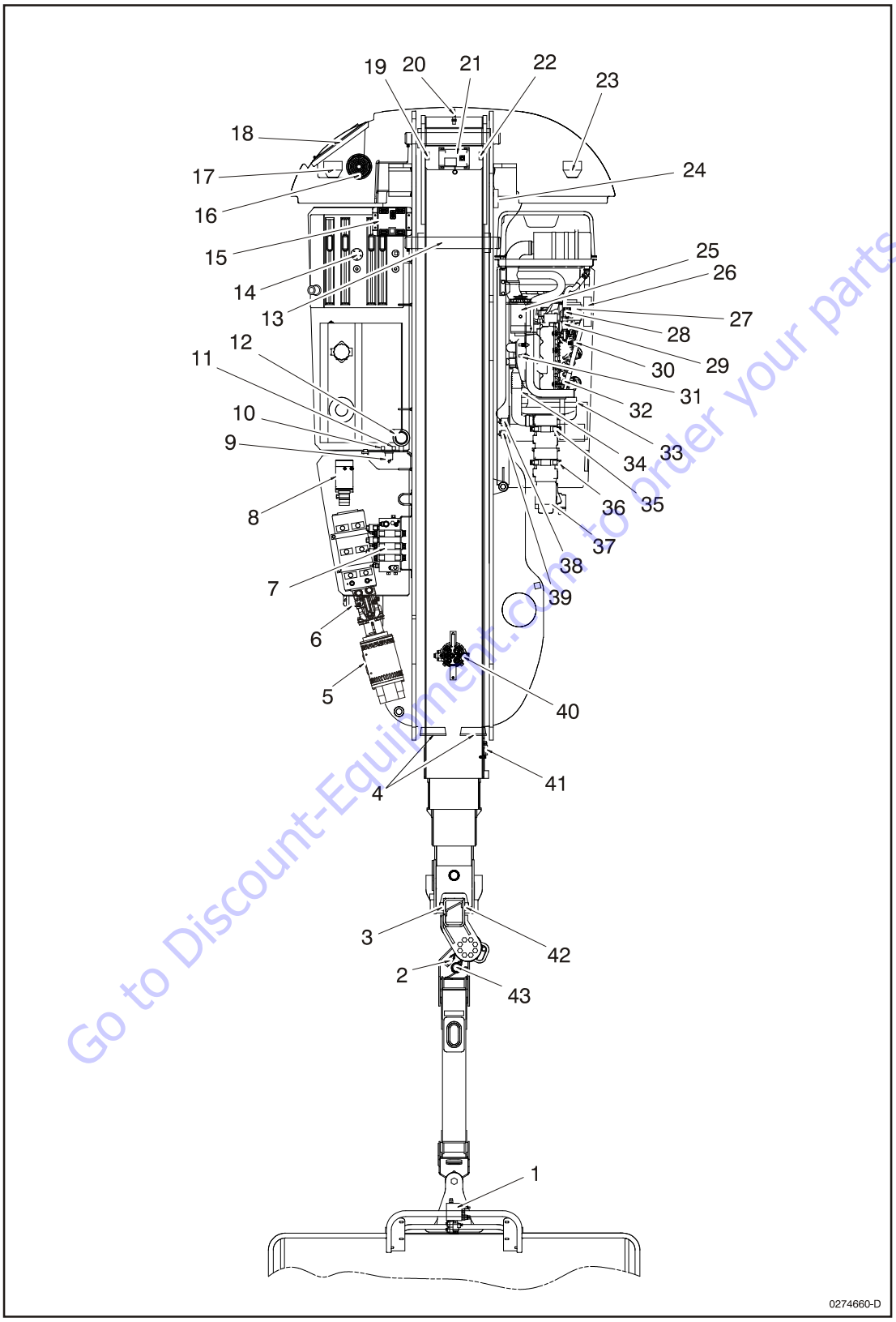


Figure 3-7. Turntable and Boom Component Location - Sheet 1 of 2

1. Platform Control Valve
2. Jib Stow Switch
3. Platform Level Sensor (Secondary - Left)
4. Tail Lights
5. Skypower Generator
6. Alarm
7. Main Control Valve
8. Auxiliary Power Pump
9. Auxiliary Power Relay
10. Chassis Power Distribution Relay
11. Headlight/Tail Light Relay
12. Horn
13. Lift Cylinder Pivot Pin
14. Fuel Level Sensor
15. B.L.A.M. Module
16. Strobe Light
17. Headlight
18. Ground Control Box
19. Boom Angle Sensor (Left)
20. Broken Cable Proximity Switch
21. Boom Length Sensor
22. Boom Angle Sensor (Right)
23. Headlight
24. Deutz EMR2 Module
25. 110V / 220V Generator
26. Generator Control Box
27. Alternator
28. Throttle Actuator
29. Oil Temperature Switch
30. Oil Pressure Switch
31. Intake Heaters
32. In Head Glow Plug
33. Engine Speed Sensor
34. Starter
35. Drive Pump (Right Side)
36. Drive Pump (Left Side)
37. Function Pump
38. Starter Relay
39. Glow Plug Relay
40. Swivel/Collector Ring
41. Transport Limit Switch
42. Platform Level Sensor (Primary - Right)
43. Dual Capacity Jib Position Switch

Figure 3-8. Turntable and Boom Component Location - Sheet 2 of 2

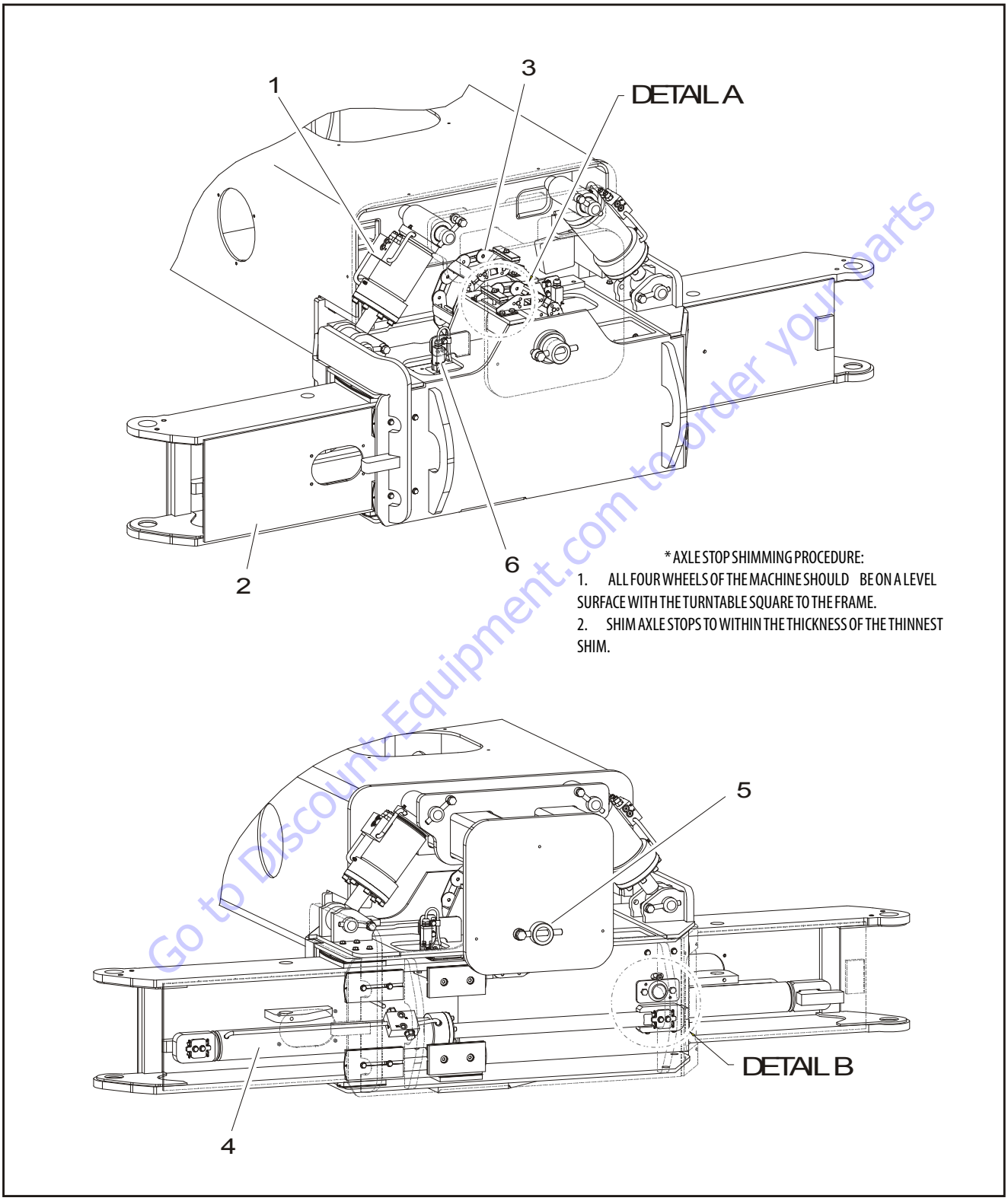
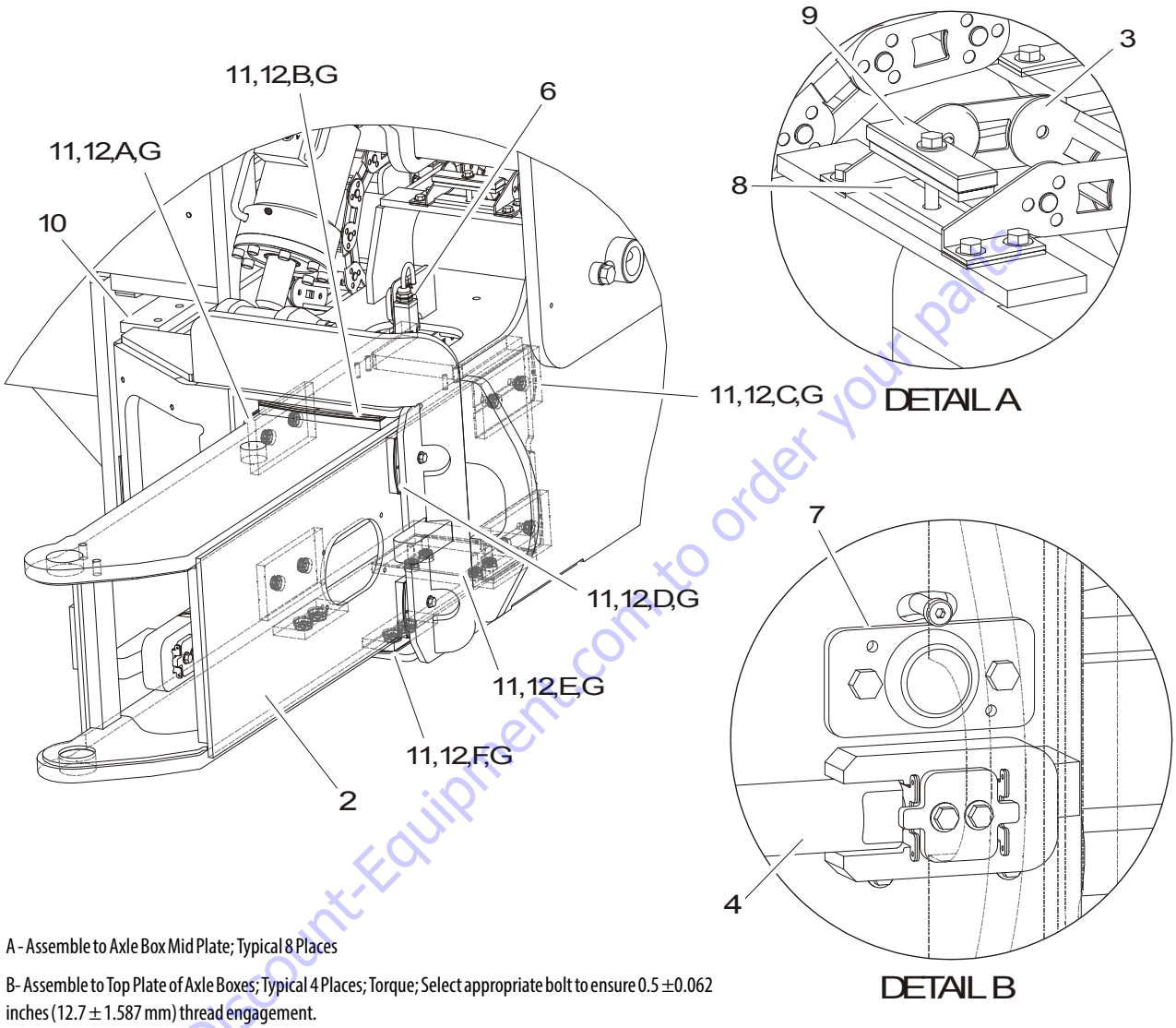


Figure 3-9. Axle Installation - Oscillating (SN 0300196322 through 0300207700) - Sheet 1 of 2



A - Assemble to Axle Box Mid Plate; Typical 8 Places

B- Assemble to Top Plate of Axle Boxes; Typical 4 Places; Torque; Select appropriate bolt to ensure 0.5 ±0.062 inches (12.7 ± 1.587 mm) thread engagement.

C - Assemble to Side Plates of Axle Weldments; Typical 16 Places.

D - Assemble to Front and Rear Plates of Axle Boxes; Typical 8 Places.

E - Assemble to Top Plate of Axle Weldment; Typical 4 Places; Torque; Select appropriate bolt to ensure 0.5 ±0.062 inches (12.7 ± 1.587 mm) thread engagement.

F - Assemble to Bottom Plate of Axle Box Weldment; Typical 8 Places.

G - See Axle Stop Shimming Procedure on Sheet 1

1. Axle Oscillation Cylinder
2. Axle
3. Axle Powertrack
4. Extension Cylinder
5. Axle Pivot Pin
6. Axle Limit Switch
7. Axle Stop Pin
8. Rubber Pad
9. Hose Clamp
10. Stop Block
11. Wear Pad
12. Shim

Figure 3-10. Axle Installation - Oscillating (SN 0300196322 through 0300207700) - Sheet 2 of 2

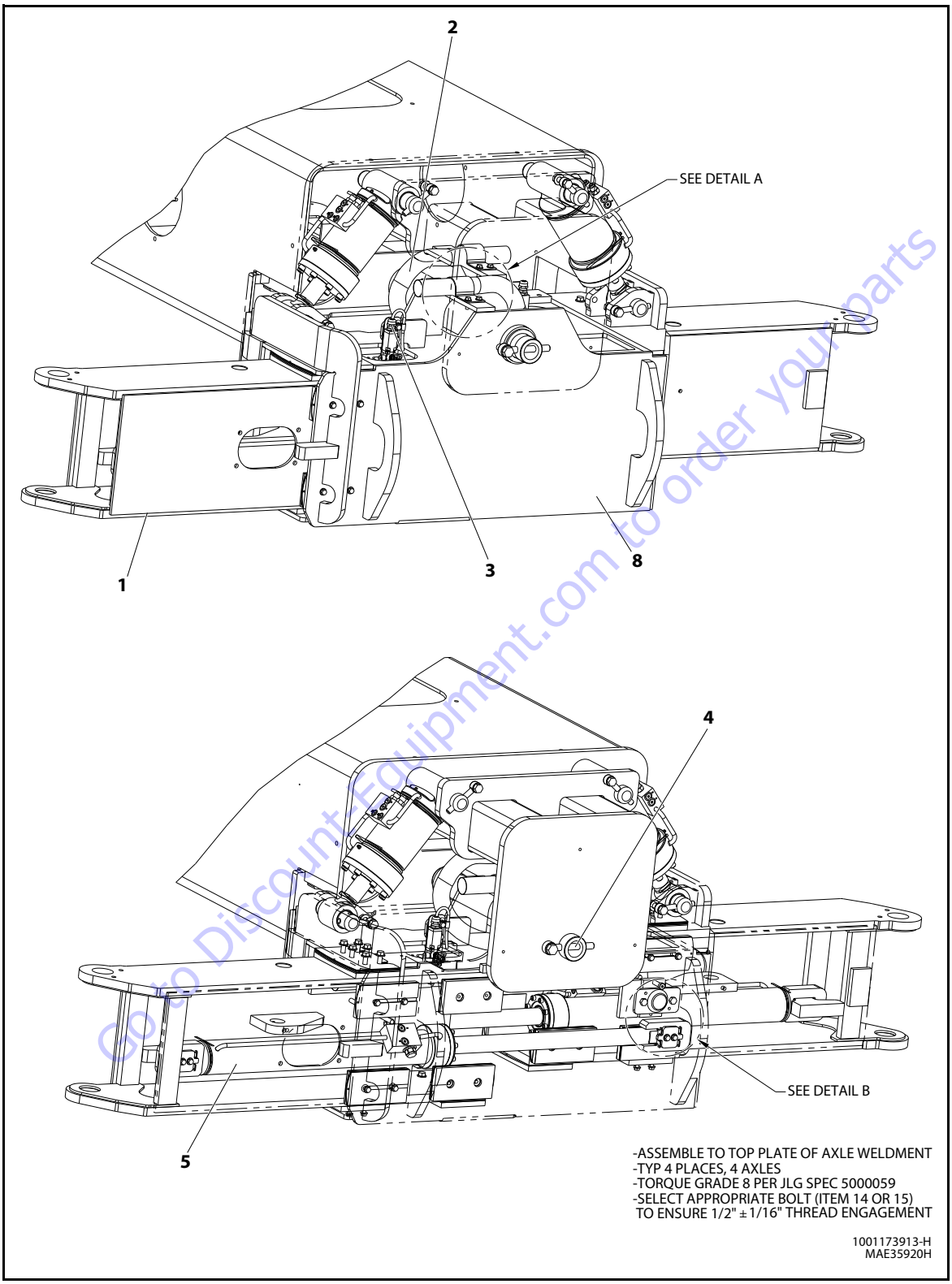
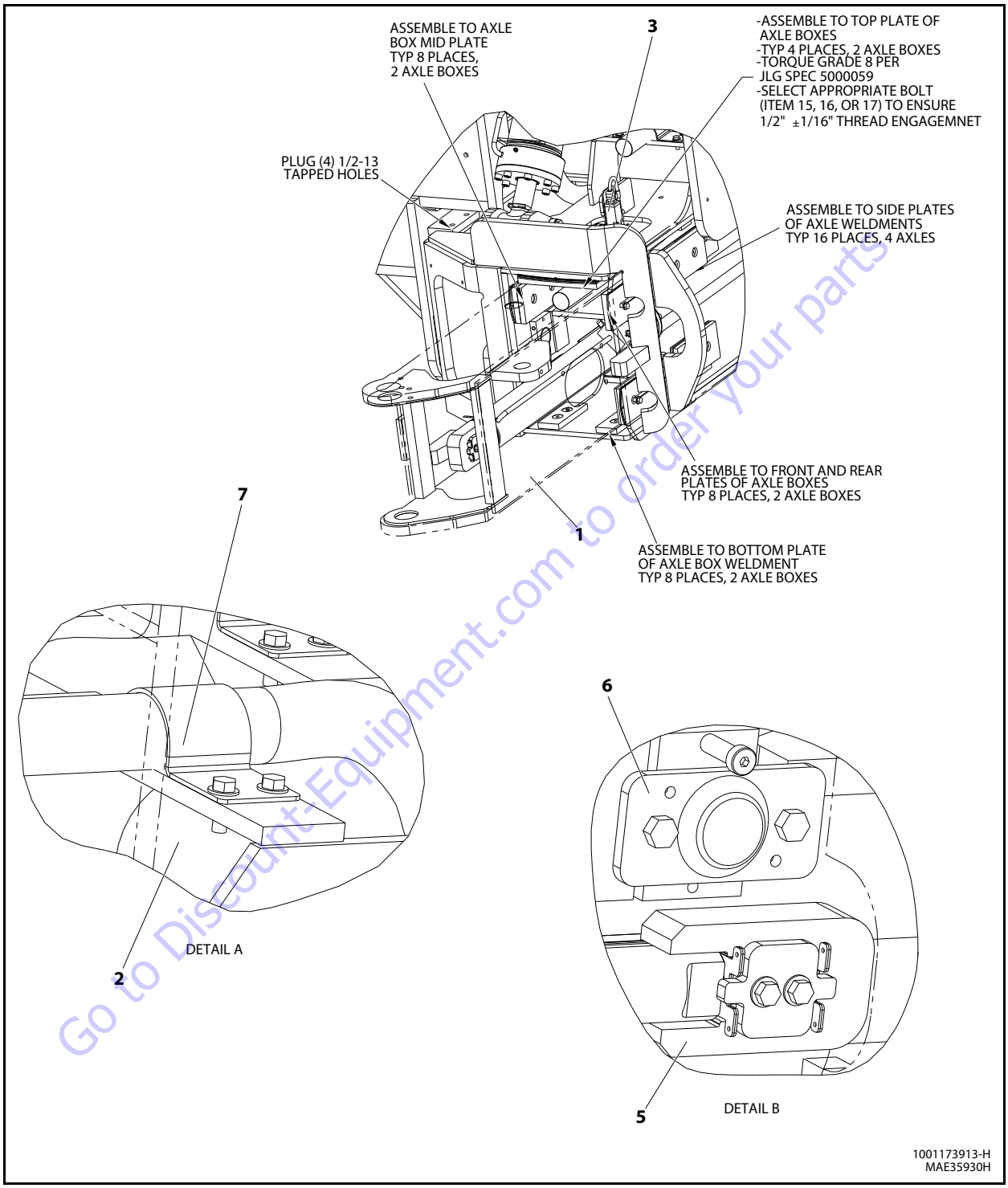


Figure 3-11. Axle Installation - Oscillating (SN 0300207701 to Present, SN B300002238 to Present) - Sheet 1 of 2



1. Axle
2. Sleeve
3. Axle Limit Switch
4. Axle Pivot Pin
5. Extension Cylinder
6. Axle Stop Pin
7. Bracket
8. Axle Pivot Weldment

Figure 3-12. Axle Installation - Oscillating (SN 0300207701 to Present, SN B300002238 to Present) - Sheet 2 of 2

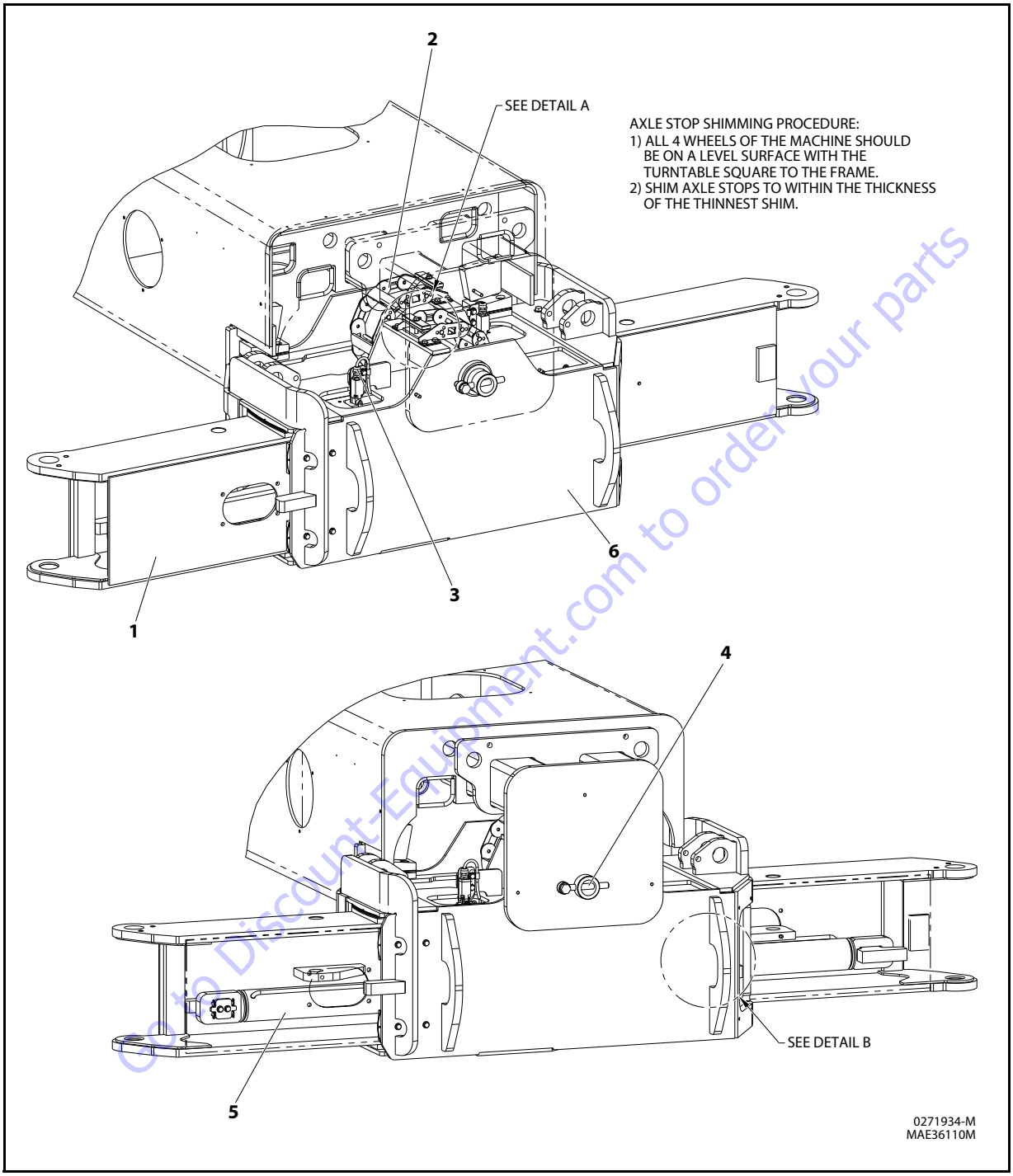
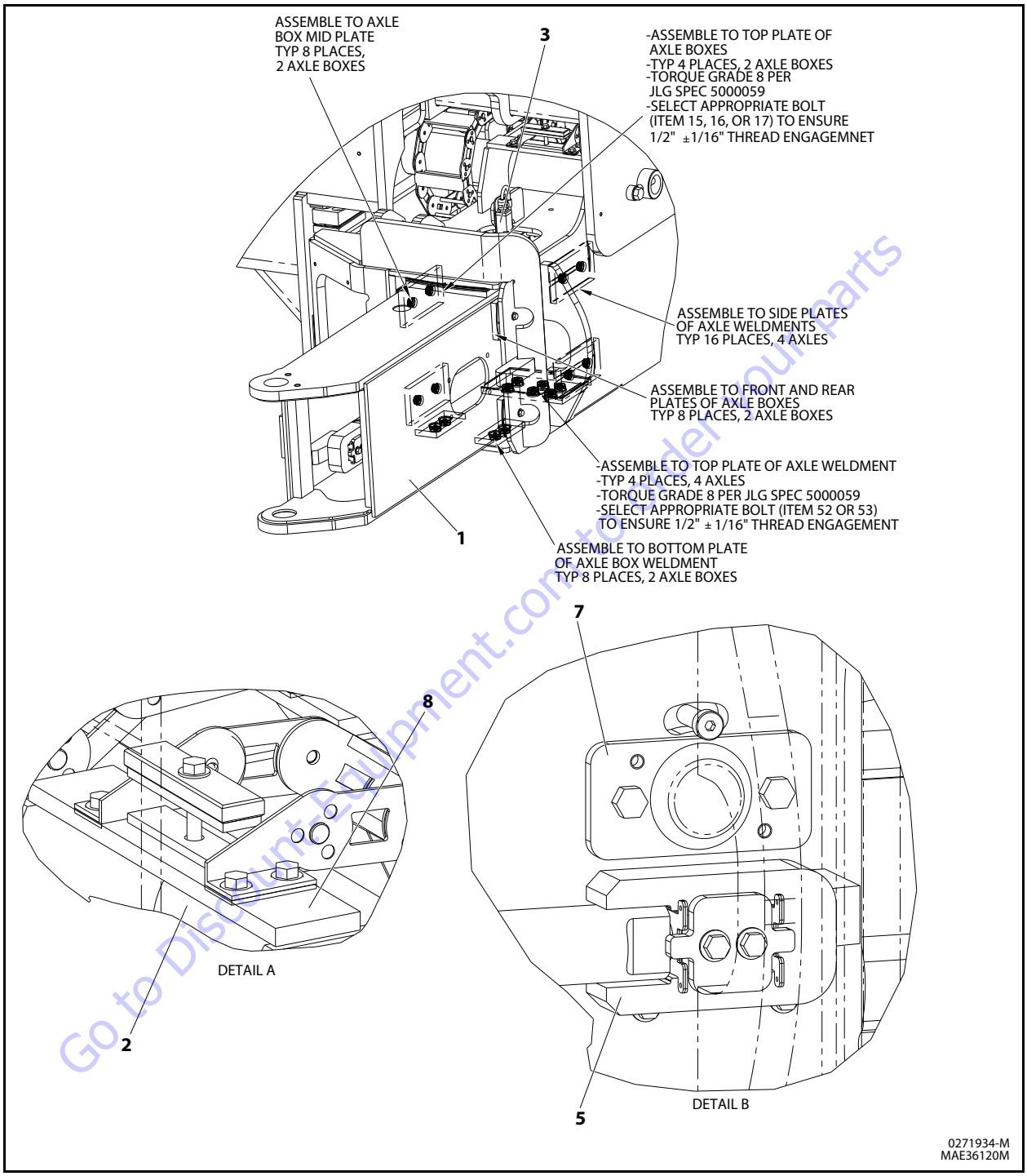


Figure 3-13. Axle Installation - Fixed (SN 0300201016 through SN 0300207700) - Sheet 1 of 2



1. Axle
2. Axle Power Track
3. Axle Limit Switch
4. Axle Pivot Pin
5. Extension Cylinder
6. Axle Pivot Weldment
7. Axle Stop Pin
8. Rubber Pad

Figure 3-14. Axle Installation - Fixed (SN 0300201016 through SN 0300207700) - Sheet 2 of 2

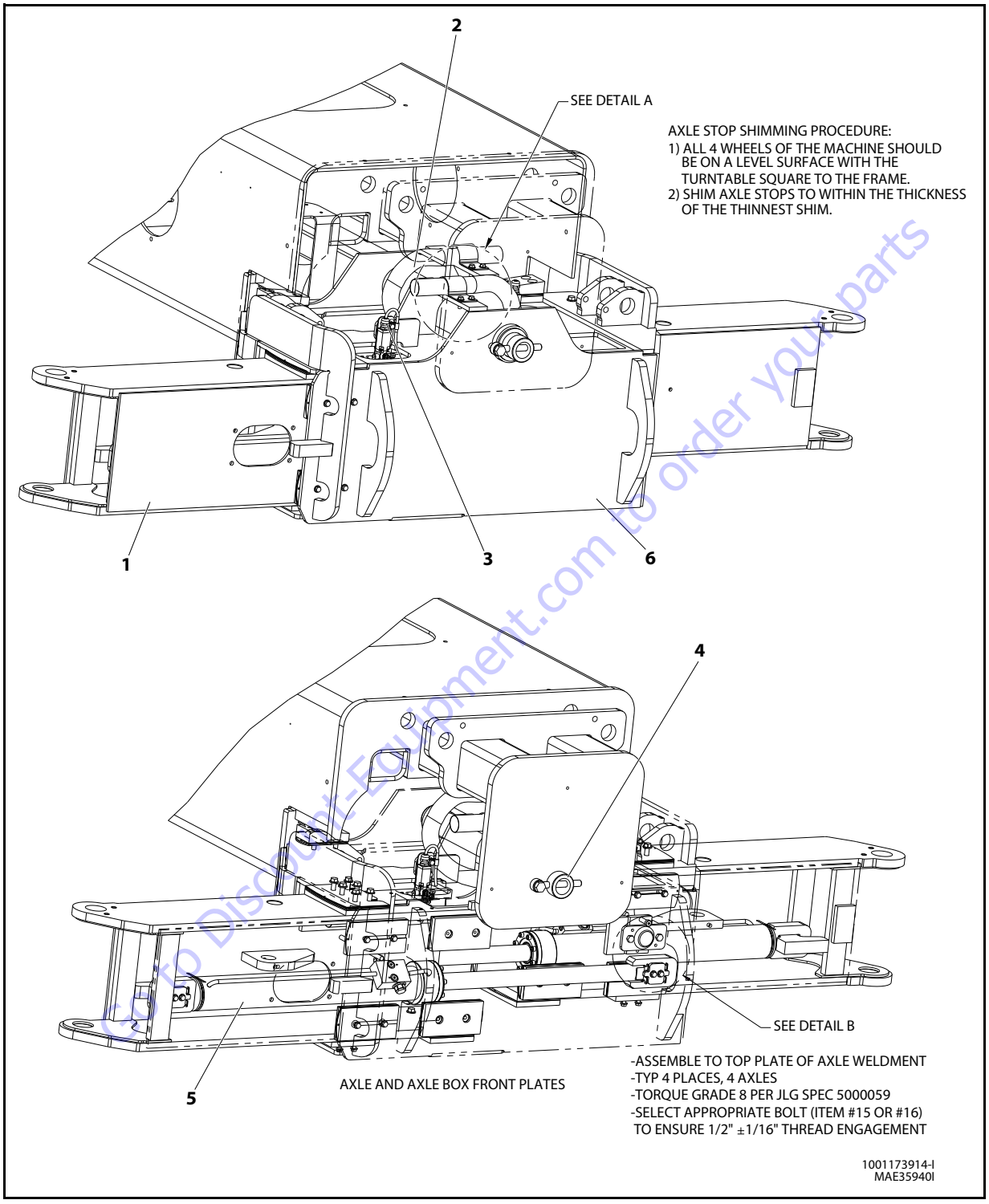
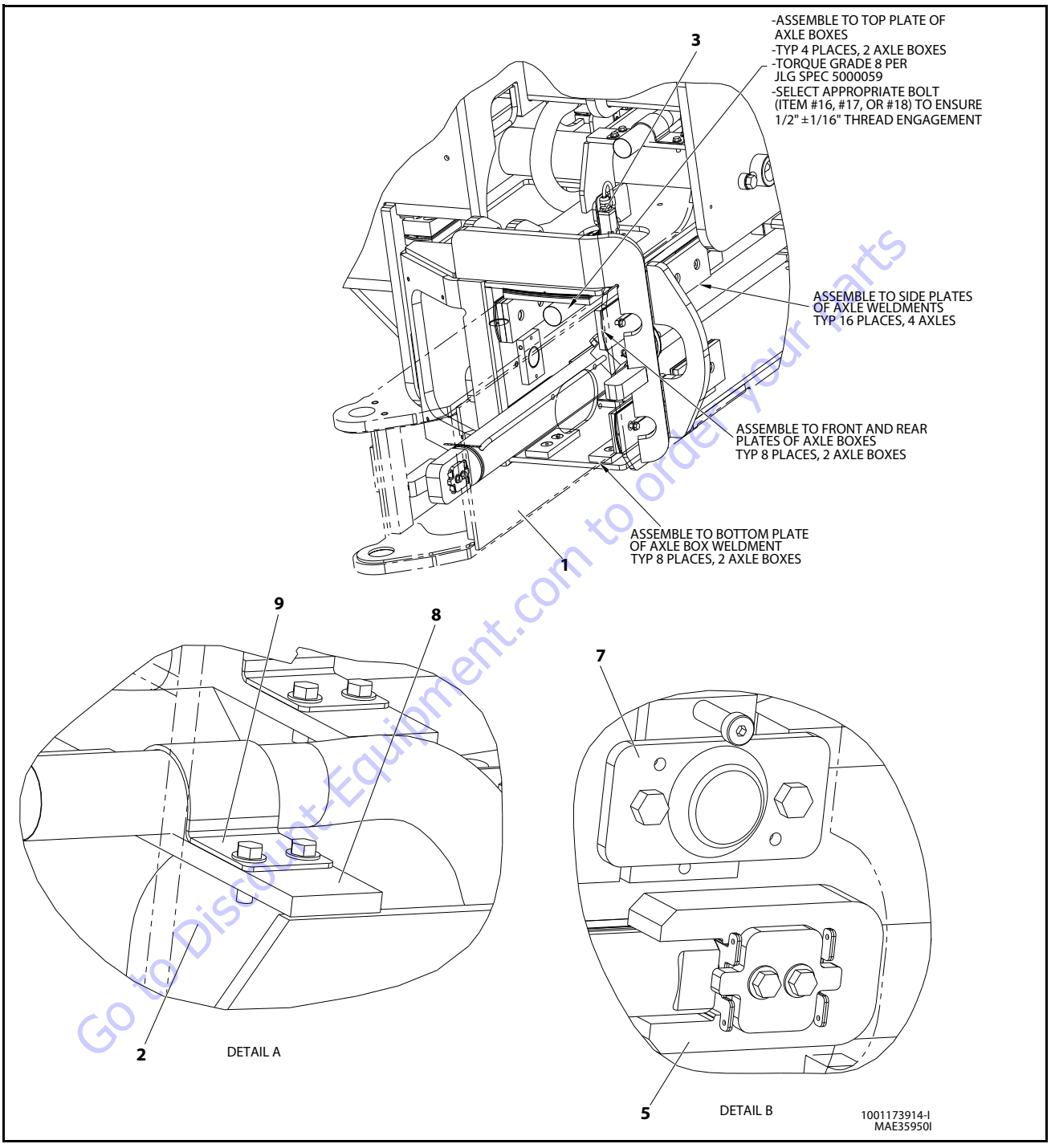


Figure 3-15. Axle Installation - Fixed (SN 0300207701 to Present, SN B30002238 to Present) - Sheet 1 of 2



1. Axle
2. Axle Power Track
3. Axle Limit Switch
4. Axle Pivot Pin
5. Extension Cylinder
6. Axle Pivot Weldment
7. Axle Stop Pin
8. Rubber Pad

Figure 3-16. Axle Installation - Fixed (SN 0300207701 to Present, SN B30002238 to Present) - Sheet 2 of 2

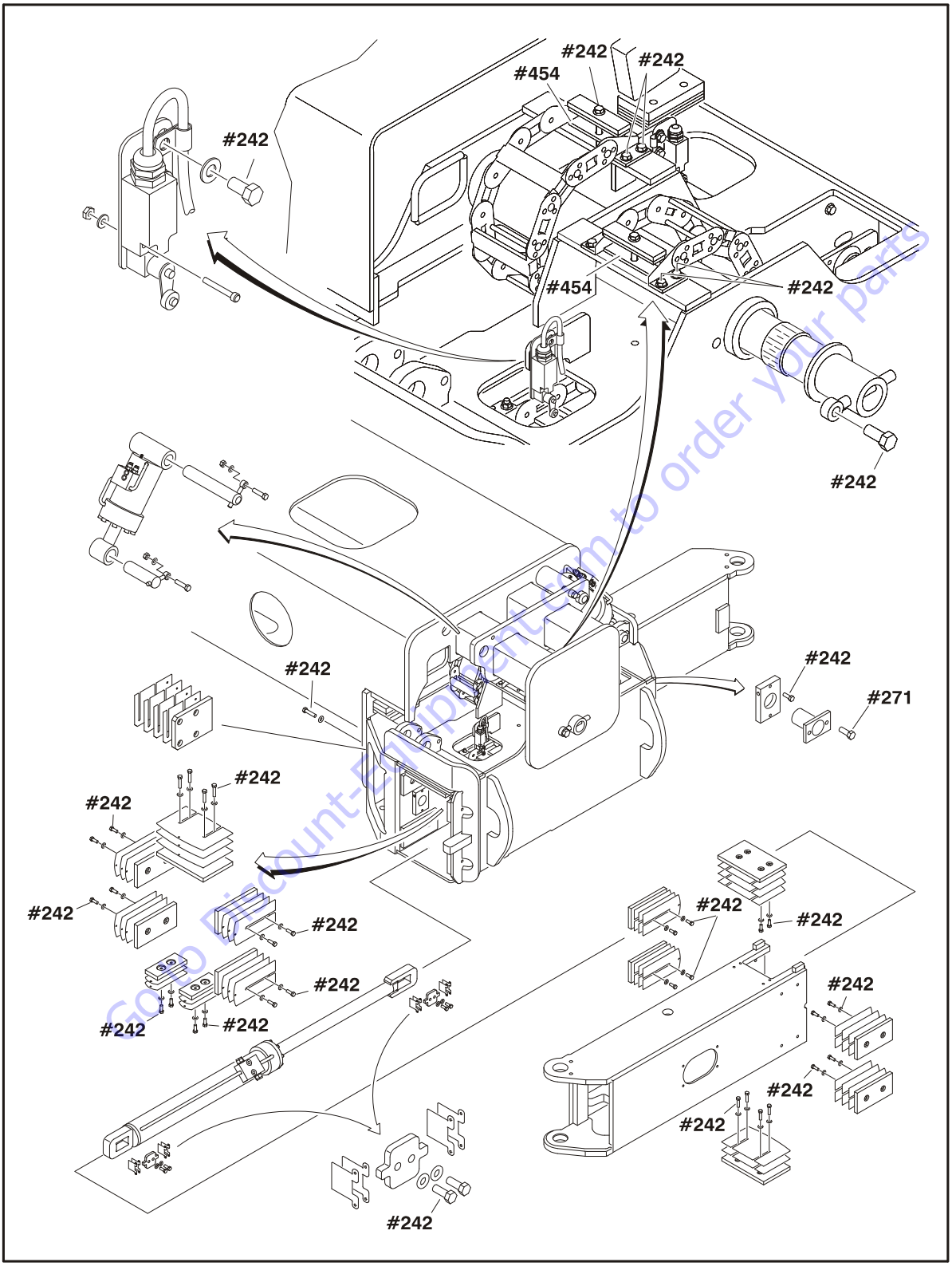


Figure 3-17. Axle Loctite Application

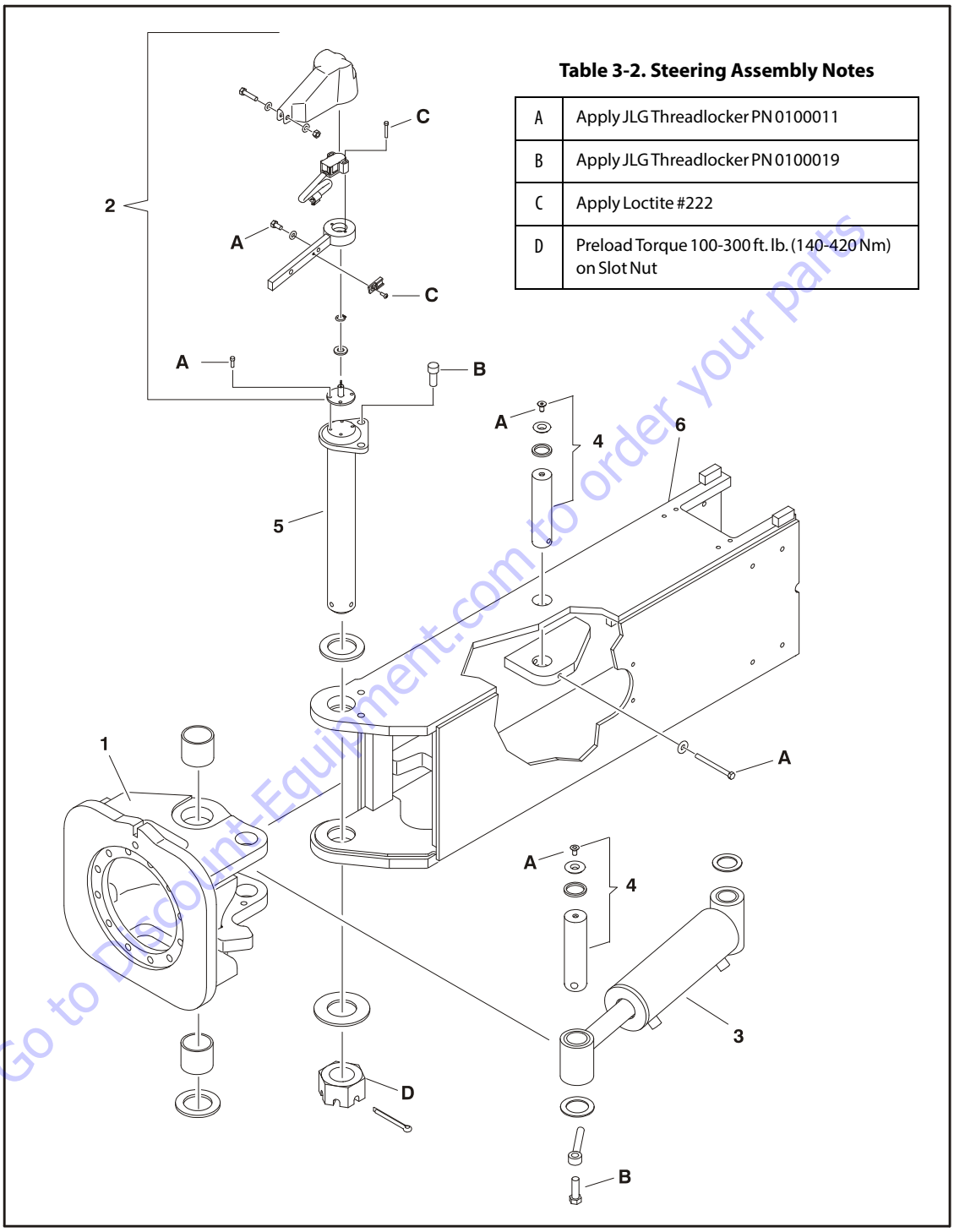


Table 3-2. Steering Assembly Notes

A	Apply JLG Threadlocker PN 0100011
B	Apply JLG Threadlocker PN 0100019
C	Apply Loctite #222
D	Preload Torque 100-300 ft. lb. (140-420 Nm) on Slot Nut

1. Spindle
2. Angle Sensor Assembly
3. Steer Cylinder
4. Steer Cylinder Pivot Pin
5. King Pin
6. Axle

Figure 3-18. Steering Installation

3.9 OSCILLATING AXLE SYSTEM

The oscillating front axle is attached to the frame by a pivot pin, which allows all four wheels to remain on the ground when traveling on rough terrain. The oscillating axle also incorporates two lockout cylinders connected between the frame and the axle. The lockout cylinders permit axle oscillation when the boom is in the transport position and drive is commanded. The lockout cylinders will lock and hold the axle when drive is not commanded or when the boom is outside the transport position. The cylinders unlock when pilot pressure is applied to the holding valves mounted on the cylinders and lock when pilot pressure is removed. Pilot pressure is available from brake pressure and is controlled by a solenoid operated NC lockout valve mounted in the frame. To ensure the lockout valve is functioning correctly, a NO pressure switch is mounted between the lockout valve and the holding valves. The system is "healthy" when pressure trips the pressure switch when the lockout valve is commanded to be open and conversely is healthy when the lack of pressure resets the pressure switch when the lockout valve is commanded to be closed. Failures in the oscillating axle system will cause the control system to disallow lift up and telescope out when the boom is within the transport position and will disallow drive/steer, lift up and telescope out when the boom is beyond the transport position.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

3.10 OSCILLATING AXLE BLEEDING PROCEDURE AND LOCKOUT TEST

Lockout Cylinder Bleeding

To start the test, the axle must be fully oscillated in one direction. Start with oscillating the axle so that the left lock-out cyl. is fully retracted (left front tire up), and the right lock-out cyl. Is fully extended (right front tire down).

NOTICE

ENSURE PLATFORM IS FULLY LOWERED AND BOOM IS CENTERED OVER REAR AXLE PRIOR TO BEGINNING BLEEDING PROCEDURE. MAKING SURE MACHINE IS ON A LEVEL SURFACE AND REAR WHEELS ARE BLOCKED, BRAKE WIRE IS DISCONNECTED.

1. Making sure machine is on a level surface and rear wheels are blocked, machine is in transport mode.
2. Disengage the drive hubs.
3. Use suitable container to catch any residual hydraulic fluid, place container under the lockout cylinder.
4. With the left lock-out cyl. retracted, open the bleeder on top of the cylinder, then have an operator from the platform (on high engine) feather drive. Activate drive fully.
5. Close the bleeder when there is a steady stream of oil and not air.
6. With the axle in the same position, go to the right lock-out cyl. and open the bleeder at the rod end. Activate drive in the same manner and close when all air has been purged.
7. Close the bleeder when there is a steady stream of oil and not air.
8. Oscillate the axle the other direction, left lock-out cyl. extended (tire down), right lock-out cyl. retracted (tire up). Use the same procedure for the bleeder in the rod end of the left lock-out cyl., Then the piston end of the right lock-out cyl. then close.
9. Repeat this process one more time to ensure that all air has been purged from the system.
10. Perform oscillating axle lockout test.
11. If necessary, repeat steps 1 thru 9.

NOTE: *Bleeding of the oscillating axles is an infrequent operation performed after hydraulic line failure and or lock-out cylinder repair.*

Oscillating Axle Lockout Test

The front axles will oscillate when the boom is in the transport position (i.e. when the boom is less than 15° above horizontal and not extended beyond 12" [30.4 cm] on the1350SJP or 24" [60.9 cm] on the 1200SJP) and drive is selected.

NOTICE

LOCKOUT SYSTEM TEST MUST BE PERFORMED QUARTERLY, ANY TIME A SYSTEM COMPONENT IS REPLACED, OR WHEN IMPROPER SYSTEM OPERATION IS SUSPECTED.

NOTE: *Ensure boom is fully retracted, lowered, and centered between drive wheels prior to beginning lockout cylinder test. The axles must also be fully extended.*

1. Place a 6 inch (15.2 cm) high block with ascension ramp in front of left front wheel.
2. From platform control station, activate machine hydraulic system.
3. Place FUNCTION SPEED CONTROL and DRIVE SPEED/ TORQUE SELECT control switches to their respective LOW positions.
4. Place DRIVE control lever to FORWARD position and carefully drive machine up ascension ramp until left front wheel is on top of block.
5. Telescope the boom out of the transport position.
6. Drive machine off of block and ramp back onto the level surface.
7. Have an assistant check to see that left front wheel remains locked in position off of ground.
8. Retract the boom back in to the transport position. Activate drive and the lockout cylinders should release.
9. Place the 6 inch (15.2 cm) high block with ascension ramp in front of right front wheel.
10. Place DRIVE control lever to FORWARD and carefully drive machine up ascension ramp until right front wheel is on top of block.
11. Telescope the boom out of the transport position.
12. Drive machine off of block and ramp back onto the level surface.
13. Have an assistant check to see that right front wheel remains locked in position off of ground.
14. Retract the boom back in to the transport position. Activate drive and the lockout cylinders should release.
15. If lockout cylinders do not function properly, have qualified personnel correct the malfunction prior to any further operation.

3.11 WHEEL DRIVE ASSEMBLY

Removal

NOTE: *The drive motor can be removed through the axle flange as part of the wheel drive assembly or they can be removed separately through the bottom of the frame while leaving the torque hub bolted to the axle.*

1. Use a jack to lift the frame enough so the tire and wheel assembly is off of the ground. Place blocking strong enough to support the weight of the machine under the frame and remove the jack.

NOTE: *The solid tire & wheel assembly weighs approximately 990 lbs. (449 kg). The foam-filled tire & wheel assembly weighs approximately 867 lbs. (393 kg).*

2. Remove hardware securing wheel and remove wheel assembly.
3. Using suitable lifting device lift the wheel assembly and place in a suitable area.

Installation

1. Use a jack to lift the frame enough so the tire and wheel assembly is off of the ground. Place blocking strong enough to support the weight of the machine under the frame and remove the jack.
2. Using adequate support, install wheel into wheel assembly and secure with bolts and washers.

NOTE: *Torque the bolts to 180 ft. lbs. (244 Nm).*

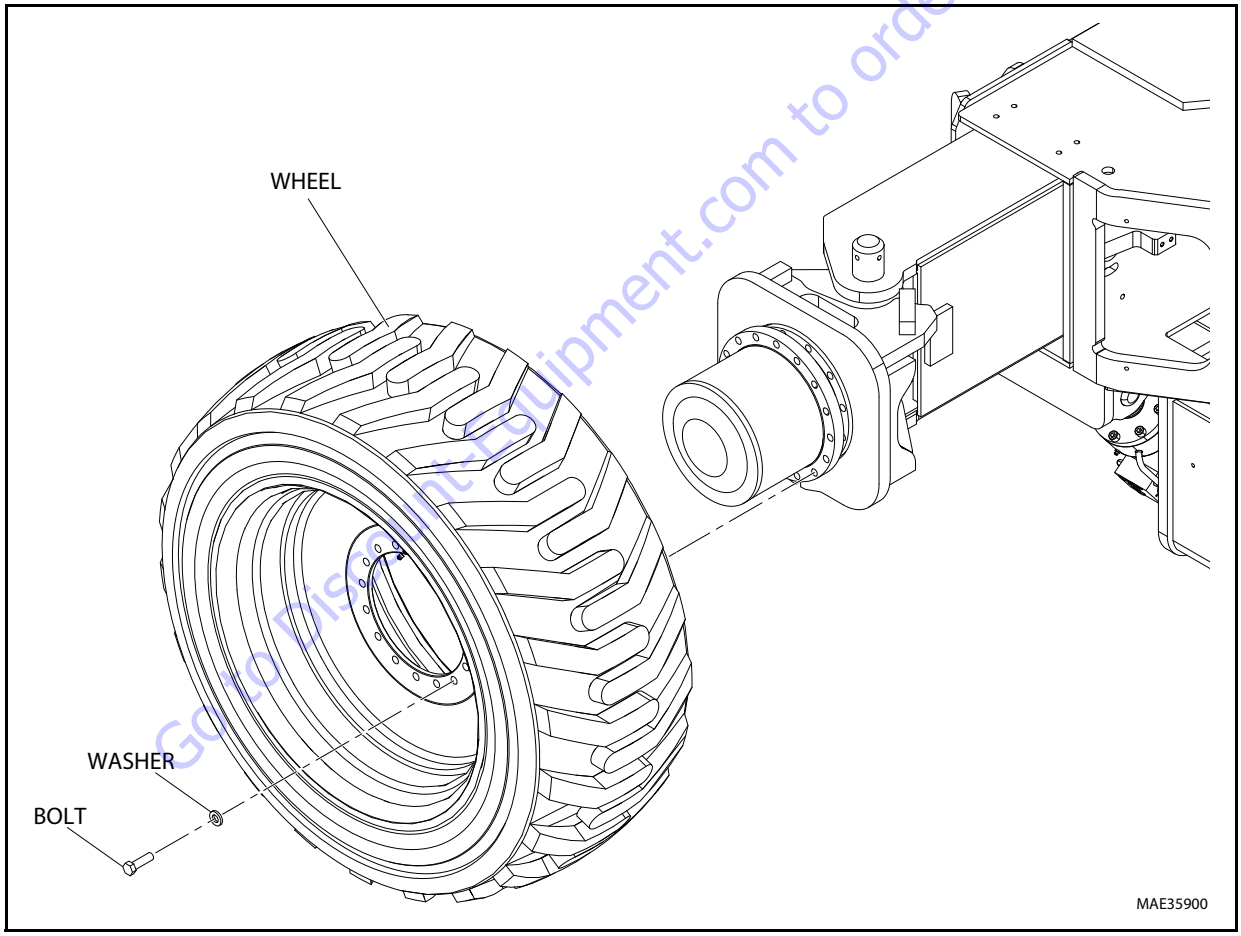


Figure 3-19. Wheel Drive Removal and Installation

3.12 DRIVE HUB

Removal

1. Place machine on the firm level surface.
2. Disconnect the battery power and all electrical connections from the drive motor assembly.
3. Use suitable lifting device to support the drive hub.

NOTE: *The drive hub weighs approximately 267 lbs. (121 kg).*

4. Remove twelve bolts attached drive hub to the frame.
5. Remove the hub from machine and place in a clean work area.

Installation

1. Use suitable lifting device to support the drive hub.

NOTE: *The drive hub weighs approximately 267 lbs. (121 kg).*

2. Install the drive hub to the machine.
3. Use six bolts and attach the drive hub to the machine.
4. Install previously removed hydraulic hoses to drive motor.

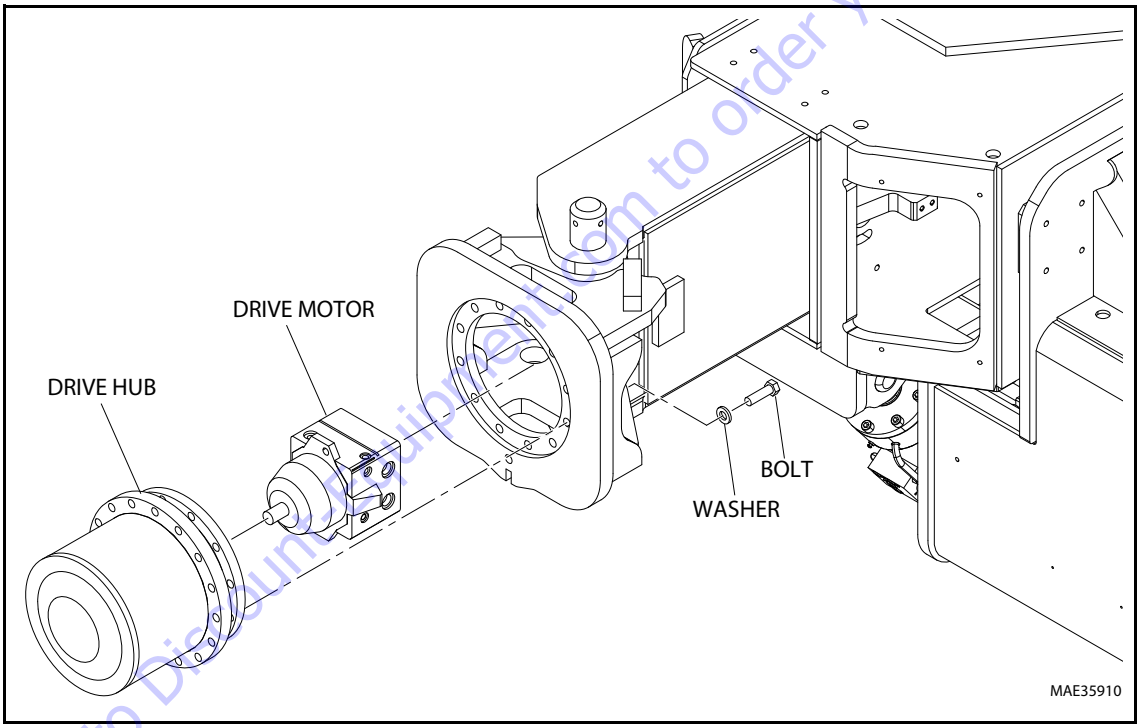


Figure 3-20. Drive Hub Removal and Installation

3.13 DRIVE MOTOR

Removal

1. Place machine on the firm level surface.
2. Disconnect the battery power and all electrical connections from the drive motor.
3. Use suitable lifting device to support the drive motor.

NOTE: *The drive motor weighs approximately 34 lbs. (15.4 kg).*

4. Remove two bolts attached drive motor to the drive hub.
5. Remove the motor from machine and place in a clean work area.
6. Clean the motor for dirt. Remove rust or corrosion from coupling shaft.

Installation

1. Use suitable lifting device to support the drive motor.

NOTE: *The drive motor weighs approximately 34 lbs. (15.4 kg).*

2. Install the drive motor to the drive hub.

⚠ CAUTION

INCORRECT SHAFT ALIGNMENT MAY RESULT IN DAMAGE TO DRIVE SHAFT, BEARINGS, OR SEAL WHICH CAN CAUSE EXTERNAL OIL LEAKAGE.

3. Make sure that the pump shaft is properly aligned.
4. Use the bolts and attach the drive motor to the machine.
5. Reconnect all electrical connections to the drive motor.
6. Start the machine and check the motor for proper functioning.

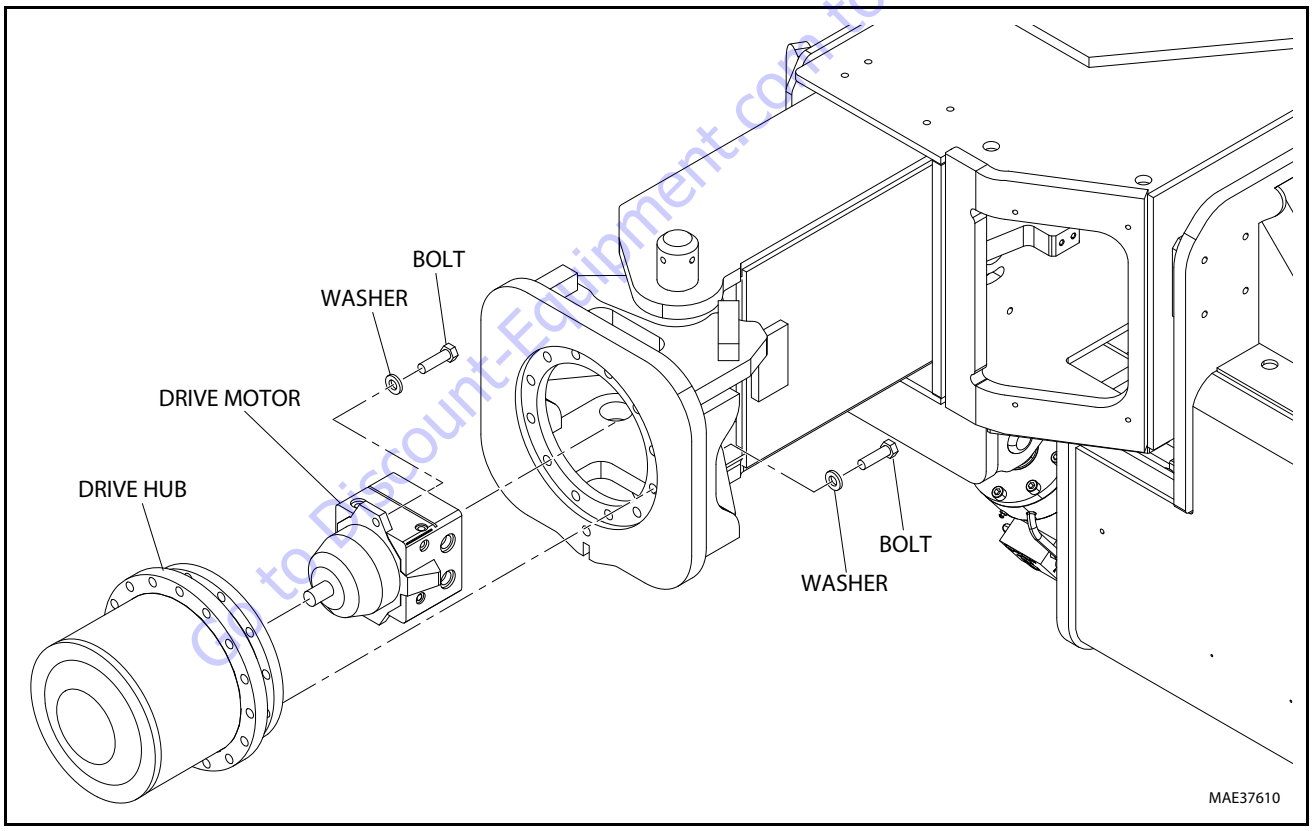
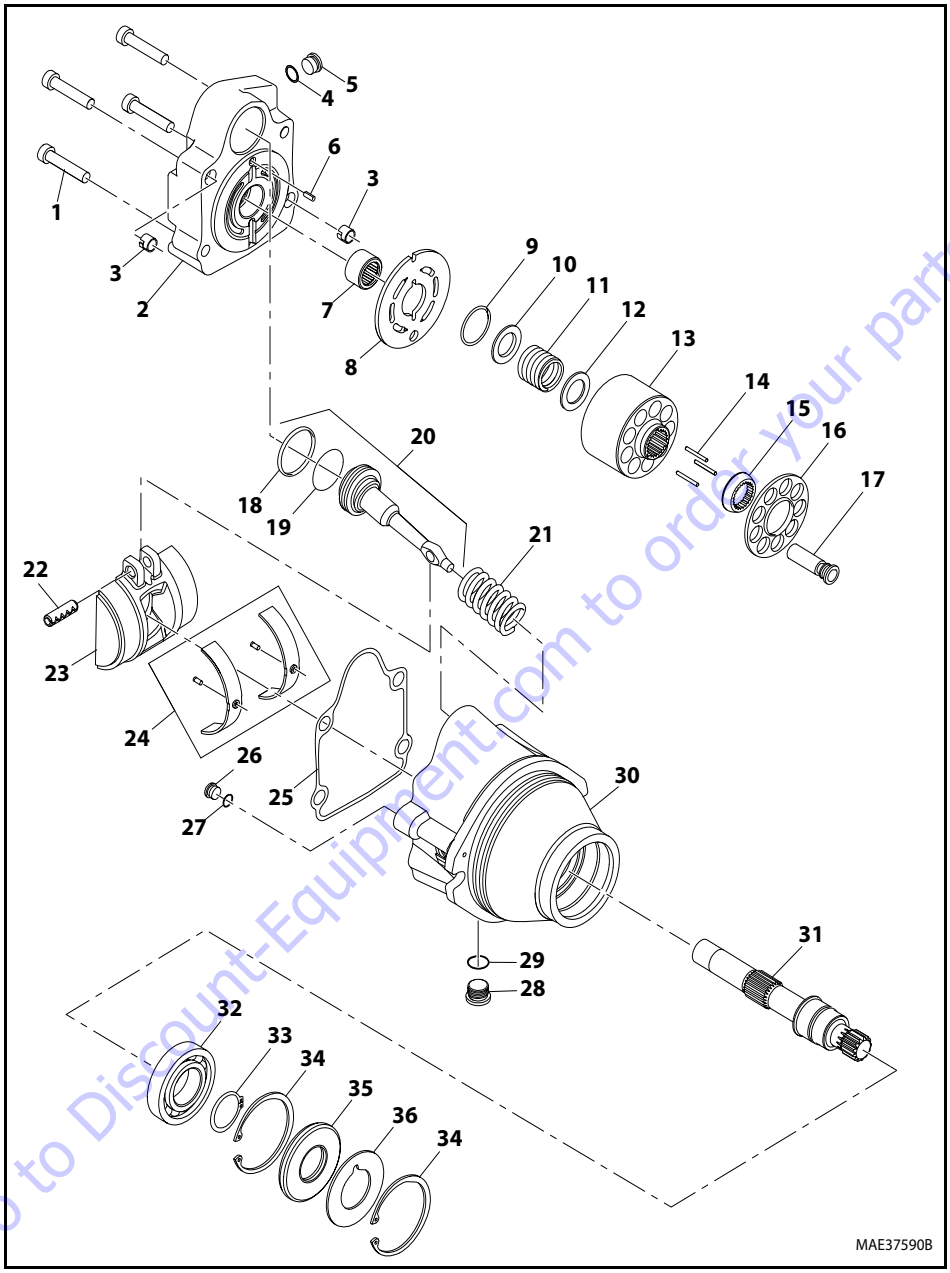


Figure 3-21. Drive Motor Removal and Installation



1. Bolt
2. End cap motor
3. Locating pin
4. O-ring
5. Plug
6. Dower pin
7. Needle Bearing
8. Valve Plate
9. Snap ring
10. Spring Retainer
11. Spring
12. Washer
13. Cylinder block
14. Slipper Pin
15. Guide
16. Slip Retainer
17. Cylinder Piston
18. Piston Ring
19. O-ring
20. Piston
21. Spring
22. Pin
23. Swash Plate
24. Kit Bearing
25. Gasket
26. Plug
27. O-ring
28. Plug
29. O-ring
30. Housing
31. Shaft
32. Bearing
33. Snap ring
34. Snap ring
35. Seal
36. Washer

Figure 3-22. Drive Motor Assembly

3.14 DRIVE HUB (PRIOR TO SN 100131)

The final drive consists of two planetary stages with an integrated disconnect mechanism. Each stage incorporates a set of matched planetary gears, which provide an equal load distribution. All torque transmitting components are made of forged quenched and tempered high-alloy steels. External gears are carburized. Precision roller bearings support the sprocket or wheel loads. A shaft seal protects the unit against contamination.

Disassembly

1. Position drive so that one of the fill holes is at the bottom of the end cover and drain the oil.
2. Remove all bolts holding the motor and Remove motor from drive.
3. Compress the spring (55) using a simple fixture or other suitable device.
4. Remove snap ring (66) and release pressure on the spring (55) until loose.
5. Remove the spring (55).
6. Turn unit so that cover (8) is in the up position.
7. Remove the screw plugs (21) and seal rings (22).
8. Remove "o" ring (33).
9. Remove the first stage planetary assembly (7).
10. Remove hex bolts (23).
11. Remove ring gear (30) and "o" ring (19).
12. Remove snap rings (15).
13. Pull off planet gears (1) together with cylindrical roller bearings (11) from spindle (60).

NOTE: *Further disassembly of the hub is discouraged. reinstallation of the shaft nut (4) requires a special tool and a torque of 626 ft./ lbs. (876 Nm) for proper reassembly. These components Will Fail if not properly reassembled.*

14. Inspect the planetary stage assemblies as complete units. Thoroughly clean and check both the gearing and the bearings for damage and apply new oil. If the gears or bearings need replacing, they must be replaced as complete sets.
15. The first stage planetary gears (2) ***must*** *be changed in sets of three pieces.*
16. The first stage planetary gears (2) ***must*** be changed as a complete set of three and JLG recommends changing the sun gear shaft (43) along with this set of planets.
17. The second stage planetary bearings (11) ***must*** be replaced in sets of four pieces.
18. The second stage planetary gears (1) ***must*** be changed as a complete set of four and JLG recommends changing the sun gear (3) along with this set of planets.

Disassembly of Cover

Loosen and remove hex head bolts (53) to remove cover (51).

Disassembly of the First Stage Planetary Assembly (7)

1. Push sun gear shaft (43) out of the first stage.
2. Remove snap rings (14).
3. Press planet pins (5) out of the planet gears (2).
4. Pull cylindrical roller bearing (10) out of the planet gears (2).
5. Remove snap ring (16) from sun gear (3) and Remove planet carrier (7) from sun gear (3).

Disassembly of Second Stage Planet Gears (1)

Press cylindrical roller bearings out of planet gears (1).

Assembly of First Stage Planetary Assembly (7)

1. Pre-freeze planet pins (5) and install into planet carrier (7).
2. Install planet carrier (7) together with planet pins (5) on sun gear (3), and install snap ring (16).
3. Put sun gear shaft (43) into sun gear (3).
4. Pre-heat stay rings (17) and install onto planet pins (5).
5. Pre-heat cylindrical roller bearings (10) and install onto planet pins (5) and fix bearings with snap rings (14).

Assembly of End Cover Unit (8)

1. Install "o" ring (54) into groove of cover (8).
2. Install the cover (51) into cover (8) and fix cover (51) with hex bolts (53). Tighten bolts with torque wrench to 6.3 ft. lbs. (8.5 Nm).

Final Assembly

1. Install planet gears (1) onto planet pins which are part of spindle (60).
2. Install snap rings (15) on planet pins of spindle (60) in order to fix the planet gears (1).
3. Insert the first stage planetary assembly (7) into drive.
4. Install "o" ring (33) in groove of ring gear (30).
5. Install seal rings (22) and screw plugs (21).
6. Before installation of motor, CHECK THAT THERE IS 1-2 mm OF CLEARANCE BETWEEN THE MOTOR SPLINE SHAFT SHOULDER AND THE COUPLER (62).
7. Install the motor and reconnect hydraulic lines.
8. Roll motor so that one fill plug is at 12 o'clock position, and the other is at 3 o'clock. Fill to bottom of 3 o' clock plug with gear oil. reinstall plugs.

Initial Start-up And After Repairs

Before operating the machine, make sure that the drive is filled with clean oil, approximately 0.2 US gallons(0.8 L). An accurate oil level is determined by the oil level plug, which should be removed before oil fill.

With the gear case filled to their proper levels, start the machine and allow sufficient time for run-in at moderate pressure and speed before running at full speed. After 4 hours of operation, recheck oil level.Maintenance

Daily: - Check for oil leakage

Weekly: - Check oil level

Monthly: - Check mounting bolt torque

Oil Change Interval-Gear Drive

1. Perform the first oil change after approximately 150 hours.
2. Subsequent changes, every 1500 hours or annually, whichever occurs first.

NOTE: *Flush the drive before filling with new oil.*

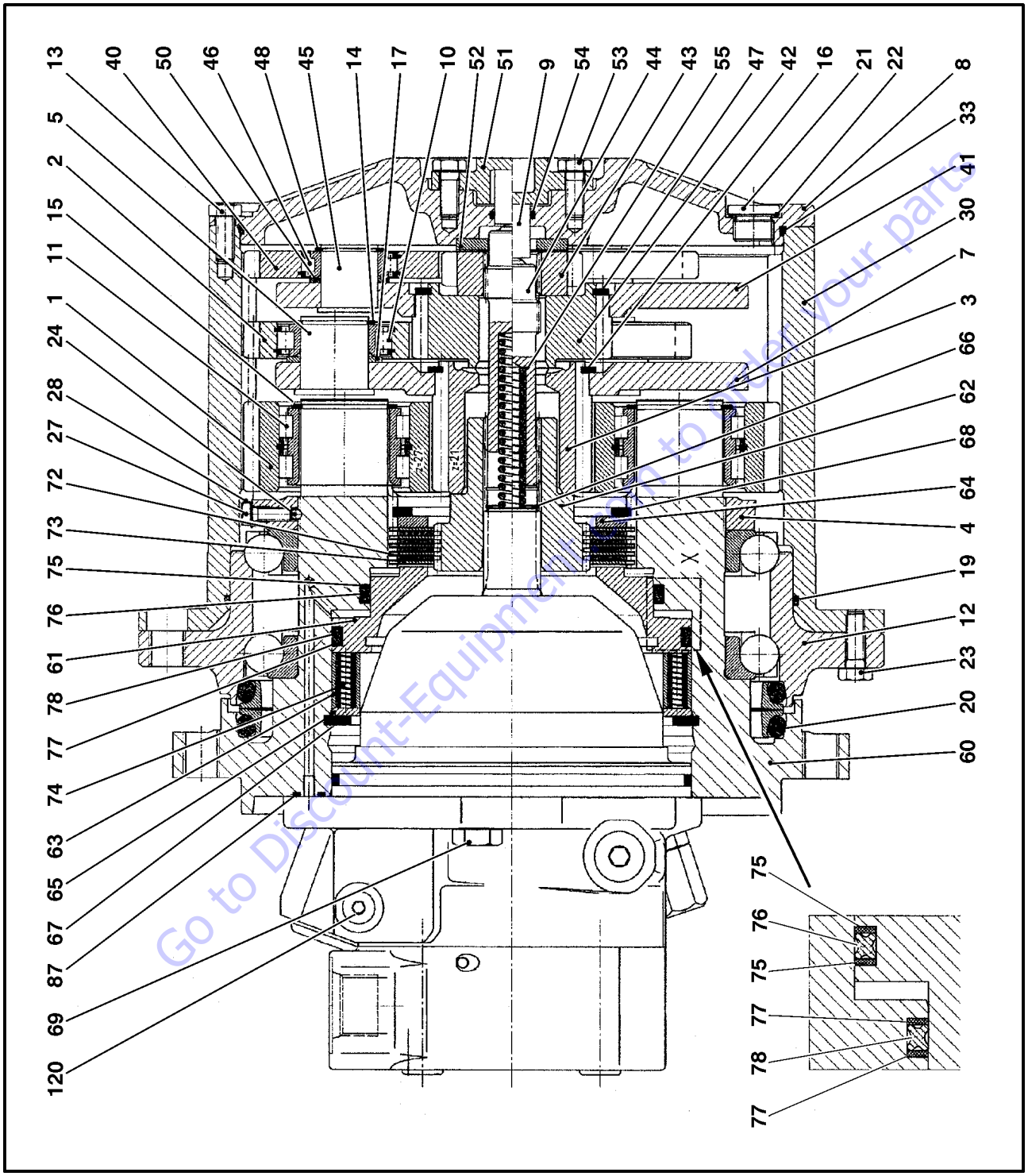


Figure 3-23. Drive Hub - Sheet 1 of 2)

1. Planet Gear
2. Planet Gear
3. Sun Gear
4. Shaft Nut
5. Planet Pin
6. Not Used
7. Planet Carrier
8. Cover
9. Thrust Button
10. Roller Bearing
11. Roller Bearing
12. Ball Bearing
13. Hex Bolt
14. Snap Ring
15. Snap Ring
16. Snap Ring
17. Stay Rings
18. Not Used
19. O-ring
20. Shaft Seal
21. Plug
22. Seal Ring
23. Bolt
24. Detent Ball
25. Not Used
26. Not Used
27. Bolt
28. Washer
29. Not Used
30. Ring Gear
31. Not Used
32. Not Used
33. O-ring
34. thru 40. Not Used
41. Planet Carrier
42. Sun Gear
43. Sun Gear
44. Not Used
45. Planet Pin
46. Roller Bearing
47. Retaining Ring
48. Retaining Ring
49. Not Used
50. Not Used
51. Cover
52. Thrust Washer
53. Bolt
54. O-ring
55. Spring
56. thru 59. Not Used
60. Spindle
61. Piston
62. Coupler
63. Ring Locator
64. Backup Plate
65. Backup Plate
66. Retaining Ring
67. Retaining Ring
68. Retaining Ring
69. Bolt
70. Not Used
71. Not Used
72. Brake Disc
73. Brake Disc
74. Spring
75. Backup Ring
76. Seal
77. Backup Ring
78. Seal
79. Not Used
80. Not Used
81. O-ring

Figure 3-24. Drive Hub - Sheet 2 of 2

3.15 DRIVE HUB - BONFIGLIOLI (SN 100128 TO PRESENT)

NOTE: *After S/N 0300134389 machines may be built with either Bonfiglioli or Reggiana Riduttori wheel drive hubs. See Section 3.16, Drive Hub - Reggiana Riduttori (SN 134389 to Present). Do not use different hubs on the same machine.*

Product Identification

The identification data of the hub is shown on a name plates on the hub. Figure 3-25., Drive Hub Identification Plate shows how the information is displayed.

The informations stamped on the name plates must always be readable. Use the identification data (at least serial number) for spare part enquiries, information and service, etc.

Hydraulic Motor Installation

The mating areas and the pilot diameter of the gearbox where the motor is to be mounted must be clean and without burrs.

Before assembling the hydraulic motor, verify by a depth slide gauge the correct assembly of the unit checking the axial distance as shown in the scheme below as shown in the scheme below.

1. Fit the O-ring seal, supplied with the gearbox, in its seat in the hydraulic motor, and assemble it to the gearbox being careful not to damage the seal already fitted.
2. Torque the bolts to 63.5 ft.lbs. (86 Nm) torque.

Installation of the Wheel Drive on the Machine

1. Clean the mating surfaces from oils or paint and fit the wheel drive on the machine frame.
2. Attach the gearbox to the machine frame with the mounting bolts and torque to 178 ft.lbs. (241 Nm).

Start Up and Running In

If new hubs are being installed, it is advised to follow the measures given below:

1. Bleed air from every part of the hydraulic and add oil in the tank if necessary.

NOTICE

THE PRESENCE OF RESIDUAL AIR IN THE HYDRAULIC CIRCUIT WILL BE RECOGNIZED BY THE PRESENCE OF FOAM IN THE TANK AND WILL LEAD TO A JERKING OF THE MOTOR AS WELL AS EXCESSIVE NOISE COMING FROM THE MOTOR AND THE VALVES.

2. Start the gearmotor at a low speed and gradually increase it after having verified that it is functioning correctly without any noises or vibrations.

NOTICE

DO NOT REACH MAXIMUM PRESSURE UNLESS THE ENTIRE SYSTEM HAS BEEN FILTERED TO ELIMINATE ANY PARTICLES OF DIRT THAT MAY BE PRESENT.

NOTE: *During the running-in stage follow the steps given below.*

3. Check the correct revolution and direction of rotation.
4. Make sure that the functioning is regular and without any excessive noises and vibrations.

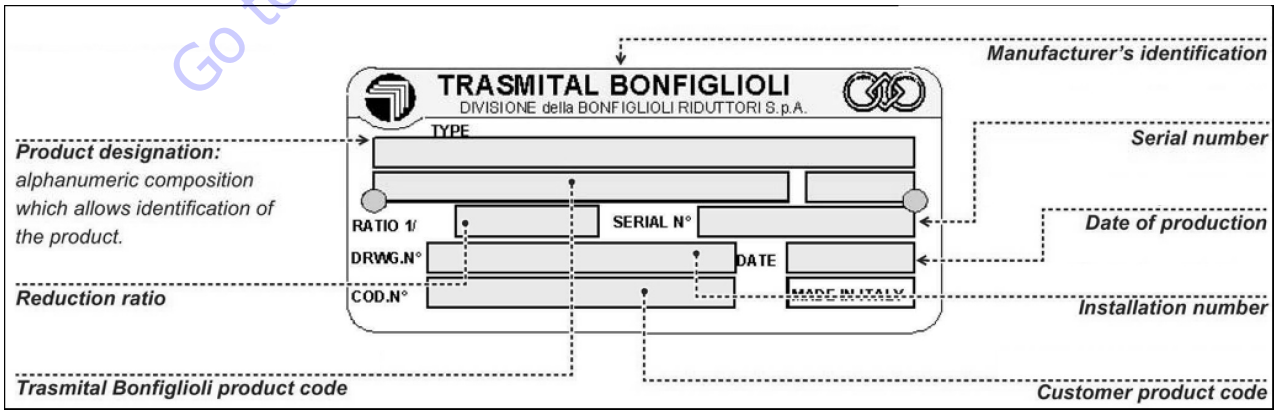


Figure 3-25. Drive Hub Identification Plate

5. Make sure that the oil temperature does not exceed values listed previously.

After having finished running-in the gearbox, follow the steps given below.

6. Check that there are no oil leaks. If leaks are present, fix them before proceeding.
7. Check the level of oil in the gearmotor.
8. It possible that the presence of air in the system during the first start up could cause the application of the brake to be slowed down. It is advised to repeat the application and release functions of the brake to purge air from the brake.
9. Check that there are no other problems in general.

General Information

The gearbox is designed and built for wheel drive.

The unit includes planetary gearbox, 3 stages, rotating housing type.

The illustrations show the parts and the main functions of the gearbox.

A strict and consistent compliance with the specifications of this technical manual ensure the minimum operating costs and a longer unit life.

Photographic documentation and drawings are supplied for educational purposes, so as to safely and properly carry out maintenance operations.

Minor deviations from pictures of this manual may appear on the actual gearbox. However, these discrepancies are not relevant to the main parameters, or maintenance functions.

Connecting the Brake

The gearbox is fitted with a negative multi disk safety brake with hydraulic control release (parking brake). For information regarding the characteristics of the brake refer to the installation drawing.

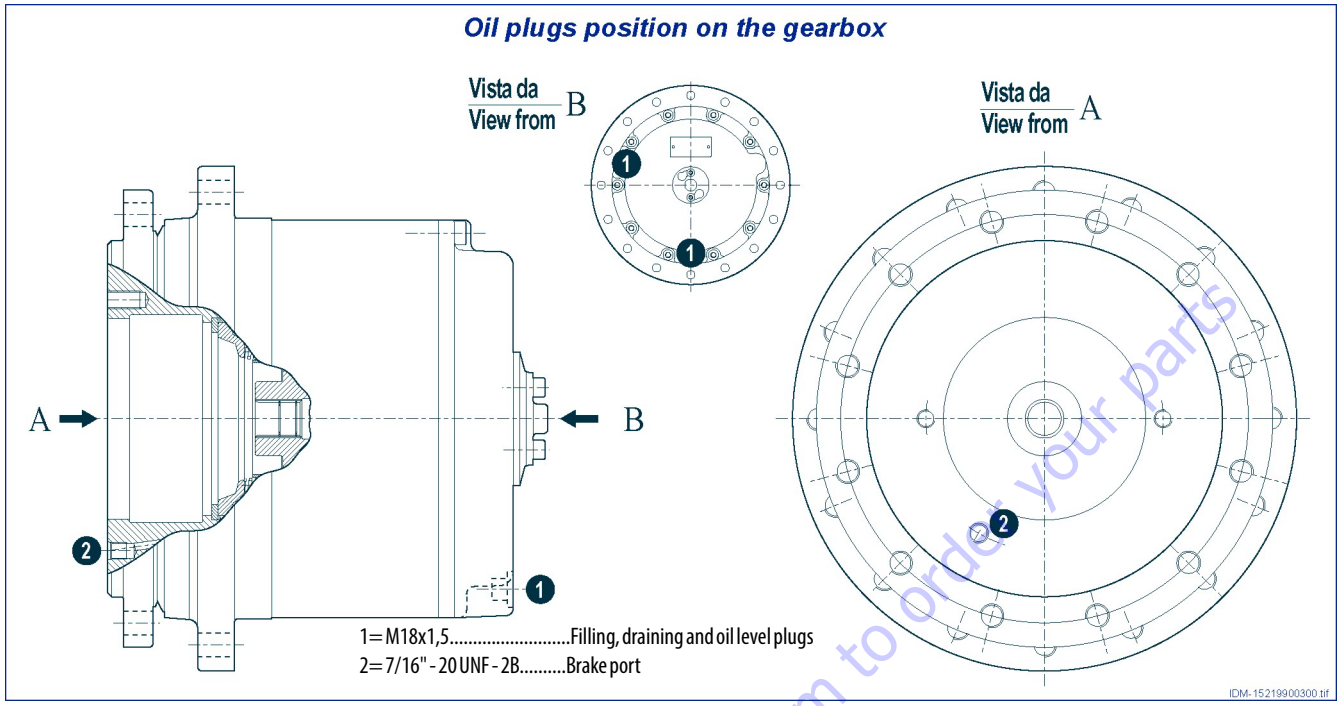
Table 3-3. Brake Technical Data

Brake Release Pressure	(16 bar)
Maximum Operating Pressure Brake	(50 bar)
Braking Torque	(265 ± 10% Nm)

Filling-up the Gearbox with Lubricating Oil

The motor and the gearbox have separate lubrication. The gearbox is lubricated by oil splashing. The recommended type of oil is SAE 80W/90 or SAE 85W/140 with EP features complying with MIL-L-2105 C & API GL5. Refer to Table 3-4, Suggested Lubricants According SAE 80W/90 and SAE 85W/140 API GL5 Grade.

NOTE: *During operation the oil temperature must not exceed 85-90° C intermittent.*



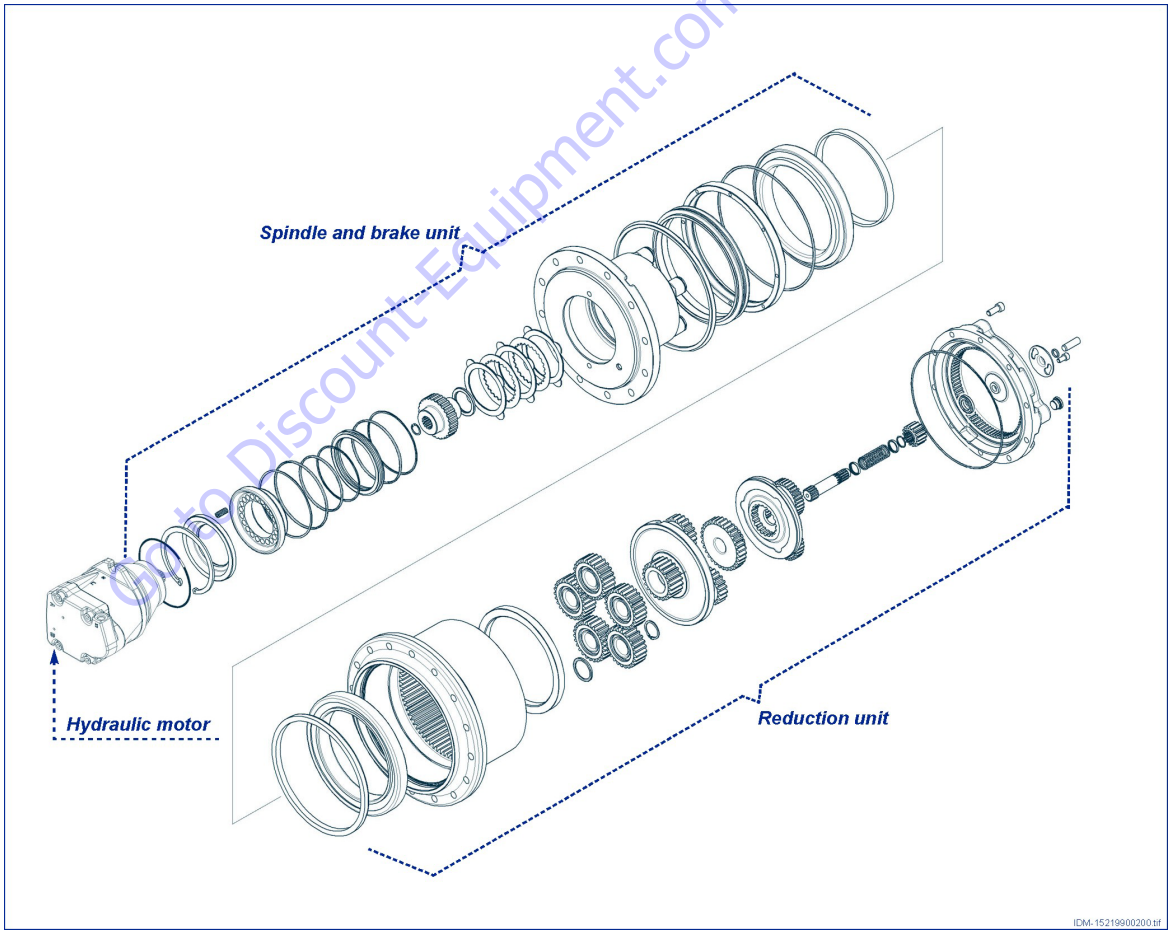


Figure 3-26. Hub Assembly

Table 3-4. Suggested Lubricants According SAE 80W/90 and SAE 85W/140 API GL5 Grade

Ambient temperature Oil viscosity		-20°C / +30°C SAE 80W/90	+10°C / +45°C SAE 85W/140
Manufacturer		Oil Brand	
	SHELL	SPIRAX HD	SPIRAX HD
	AGIP	ROTRA MP	ROTRA MP
	ARAL	GETRIEBEOL HYP	GETRIEBEOL HYP
	BP-MACH	HYPOGEAR EP	HYPOGEAR EP
	CASTROL	HYPOY	HYPOY
	CHEVRON	UNIVERSAL GEAR LUBRICANT	UNIVERSAL GEAR LUBRICANT
	ELF	TRANSELF B	TRANSELF B
	ESSO	GEAR OIL GX PONTONIC MP	GEAR OIL GX PONTONIC MP
	I.P.	PONTIAX HD	PONTIAX HD
	MOBIL	MOBILUBE HD	MOBILUBE HD
	TOTAL	TRASMISSION TM	TRASMISSION TM

NOTE: *Do not mix together oils of different brands or characteristics.*

NOTE: *The gearbox is supplied without oil; before putting the gearbox into operation, it is necessary to fill it with oil.*

This procedure is undertaken following the indications given below.

1. Check that the gearbox axis is horizontal. Rotate the gearbox housing until the drain plug (A) is on the bottom on the vertical axis of the end cover.
2. Unscrew the fill and level oil plug (B).
3. Fill from the hole until the lubricant flows out.
4. Tighten the fill and level oil plug (B) and let the gearbox run. After a few minutes, stop and check the oil level.
5. If necessary, refill with lubricant oil. Approximate oil capacity = 2 liters ±10%

Gearbox Disengagement

The gearbox is supplied with mechanical disengagement.

⚠ WARNING

THE DISENGAGEMENT OPTION MUST BE CONNECTED OR DISCONNECTED ONLY WHEN THE GEARBOX IS STOPPED ON FLAT GROUND.

NOTICE

THE MAX WHEEL SPEED WITH DISENGAGED GEARBOX MUST NOT EXCEED 25 REV/MIN.

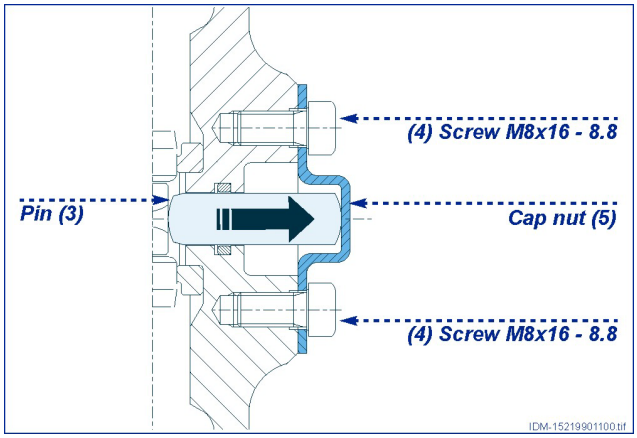
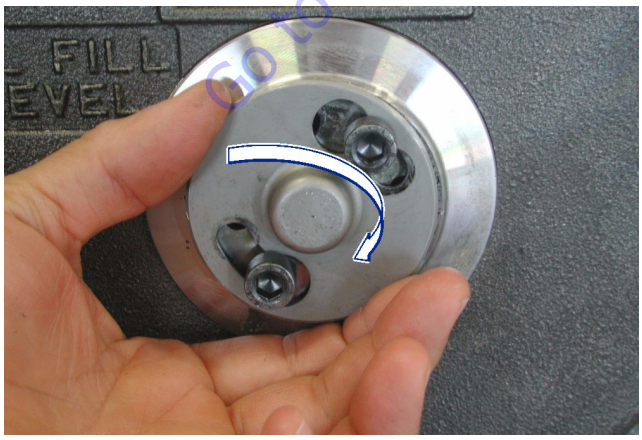


Figure 3-27. Gearbox engaged

1. Unscrew the 2 socket head screws M8x16 (4), grade 8.8, of the end cover (7) with a male hex head wrench.

2. Rotate the cap nut (5).



3. Take out the cap nut (5).

4. Turn the cap nut (5) upside down. As result the pin (3) will be pushed inside in order to permit disengagement of the gearbox.

5. Rotate the cap nut (5).

6. Tighten the 2 socket head screws M8x16 (4) with a male hex head torque wrench at 18.4 ft.lbs. (25 Nm) torque.

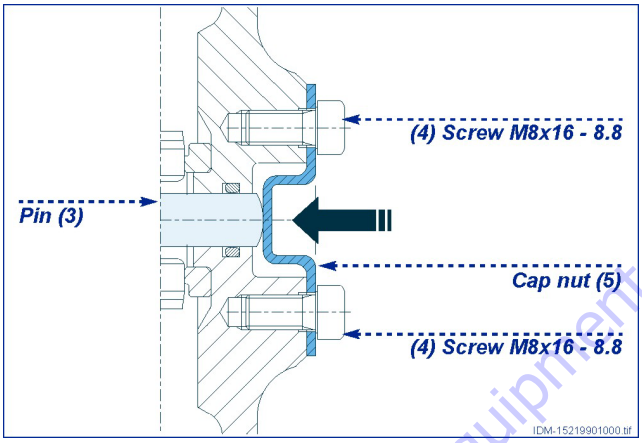


Figure 3-28. Gearbox Disengaged

7. Repeat the above steps to engage the gearbox again.

Operation:

a. Engaged gearbox

At this condition the motion is transmitted from the hydraulic motor to the gearbox.

b. Disengaged gearbox

NOTICE

AT THIS CONDITION THE HYDRAULIC MOTOR AND THE BRAKE ARE DISCONNECTED TO THE GEARBOX: THE WHEEL IS IDLE.

Maintenance Information

PERIODIC MAINTENANCE

The gearbox only requires the scheduled maintenance procedures set out by the manufacturer (see Table 3-5).

Good maintenance will ensure an ongoing functioning in time as well as maximum reliability.

Should irregularities in function arise, it will be necessary to consult the troubleshooting checklist to find the most adequate solution.

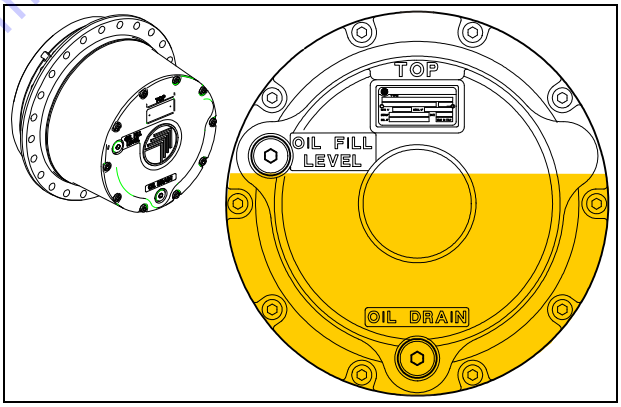
If unsuccessful, it may be necessary to partially or completely disassemble the gearbox.

Table 3-5. Drive Hub Maintenance Schedule

Inspection	Frequency	Action
Tightening bolts	After the first 50 operating hours of the gearbox	Bolt tightening torque check
Oil level	Every 150 operating hours of the gearbox	Refill oil if necessary
1st oil change	At 150 operating hours of the gearbox	Oil replacement
Next oil change	Every 1200 operating hours	Oil replacement

Changing the Lubricating oil

1. Check that the gearbox axis is horizontal. Rotate the gearbox housing until the drain plug is on the bottom of the vertical axis of the end cover.



2. Unscrew the both plugs (Fill and Drain) and let the oil flow in a large enough container; in order to facilitate draining the oil must still be warm.
3. Wait a few minutes until all the oil is drained and then proceed to screw on the plugs.
4. Proceed with the oil fill-up. Refer to Filling-up the Gearbox with Lubricating Oil.

NOTE: *Never mix mineral oils with synthetic oils and vice versa.*

NOTICE

DO NOT DISPOSE OF THE OIL IN THE NATURAL ENVIRONMENT. BE CAREFUL TO ELIMINATE IT IN COMPLIANCE WITH THE RELATIVE RULES AND REGULATIONS THAT GOVERN LOCALLY.

Troubleshooting

The following table is provided to help locate problems in the gearbox.

Table 3-6. Troubleshooting

Symptom	Causes	Remedies
External oil leakage:		
From the lifetime seal	a)Lifetime seal damaged	a)Replace lifetime seal
From the end cover	a)O-ring seal damaged	a)Replace O-ring seals
From the plugs	a)Plug seal damaged	a)Replace plug seal
	b)Plugs or screws loose	b)Tighten the plugs/screws
Too much noise:		
Hydraulic noise (during the slowing down of the motor speed)	a)Hydraulic circuit malfunctioning	a)Verify hydraulic circuit
Inside the gearmotor (reductions)	a)Internal damage	a)Check the gearbox
Other:		
Overheating	a)Insufficient oil level	a)Check the oil level and refill if necessary
	b)Hydraulic oil too warm	b)Check the hydraulic circuit
	c)Brake not fully released	c)Check brake release pressure
Parking brake malfunctioning		
Insufficient braking torque	a)Brake discs worn	a)Replace brake disc pack
	b)Damaged parts	b)Check brake components
Wheel Locked	a)Parking brake locked	a)Check the complete brake release
	b)Mechanical components damaged	b)Replace damaged parts

Disassembly Information

It is also important that this procedure is undertaken in a workshop that is equipped with the proper tools. As well as normal workshop tools it will be necessary to use special tools that can be made (see special tools attachment) or may be requested from the manufacturer.

Special Tools:

Puller.....Code/: 6689960240

Tool for lifetime seal assembly.....Code/: 6689960300

Puller for brake disassembly.....Code/: 6689960310

Torque multiplier.....Code/: ATZ.09.016.0

To be able to produce these special tools refer to Figure 3-30. thru Figure 3-33.

It is important to strictly adhere to all the procedures for disassembling and reassembling the gearbox. Proceed with these instructions using all the necessary safety measures, for example:

1. Plug all the Hydraulic ports on the gearbox to avoid the introduction of any foreign particles in the circuit and the gearbox.
2. Making sure that the coupling surfaces are not damaged.
3. Handle with care so as to be sure that there are no risks for personnel safety and to guarantee the reliability of the gearbox.
4. Making available a work area that is in line with work and health safety in the workplace guidelines.

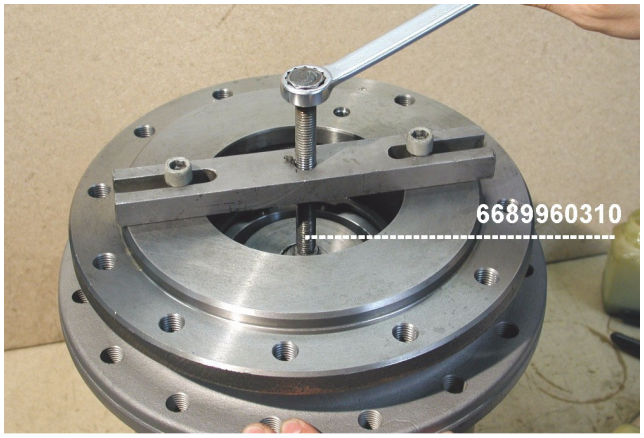
Disassembly Procedure

NOTE: *Below are all the steps to follow during Disassembly and Assembly. Numbers in brackets in the text correspond to the references in the exploded view.*

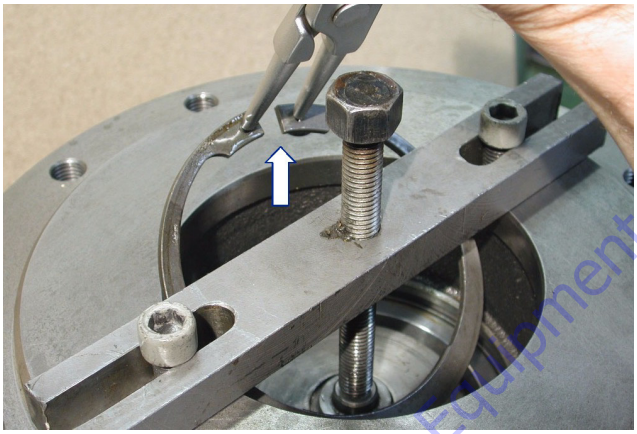
Initial inspection can be made without disassembling the hub from the machine. Before wheel drive disassembling, make sure that the oil is drained from the hub.

Unscrew and remove the nos. 2 screws M12, grade 8,8, and remove the hydraulic motor and its O-ring seal (48).

1. Install the special tool (6689960310) on the flanged hub (31) and turn the screw until it compresses the springs (45).

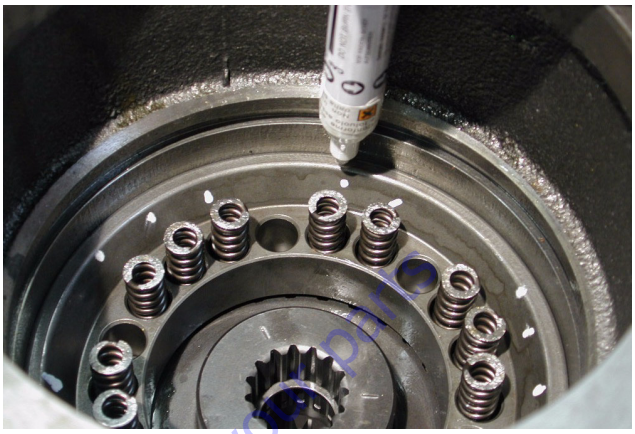


2. Remove the circlip (47) and remove the special tool.

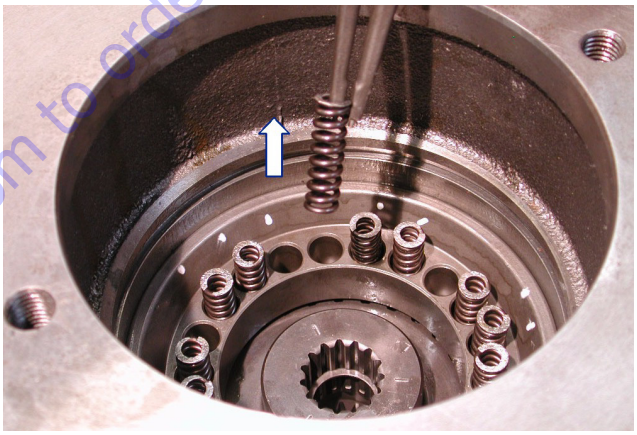


3. Remove the spring retainer disc (46).

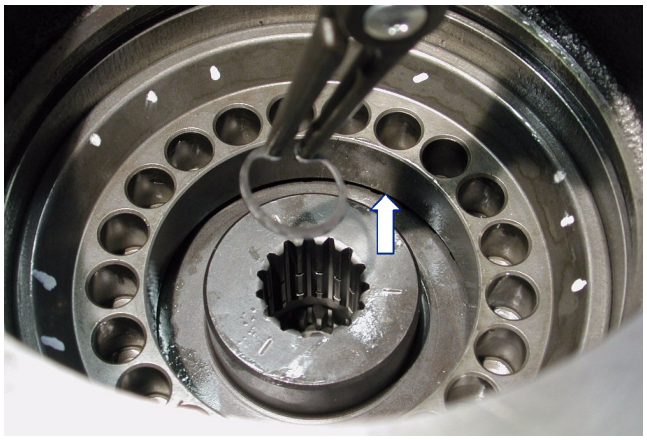
4. Mark the position of the springs (45) as a reference for the reassembly.

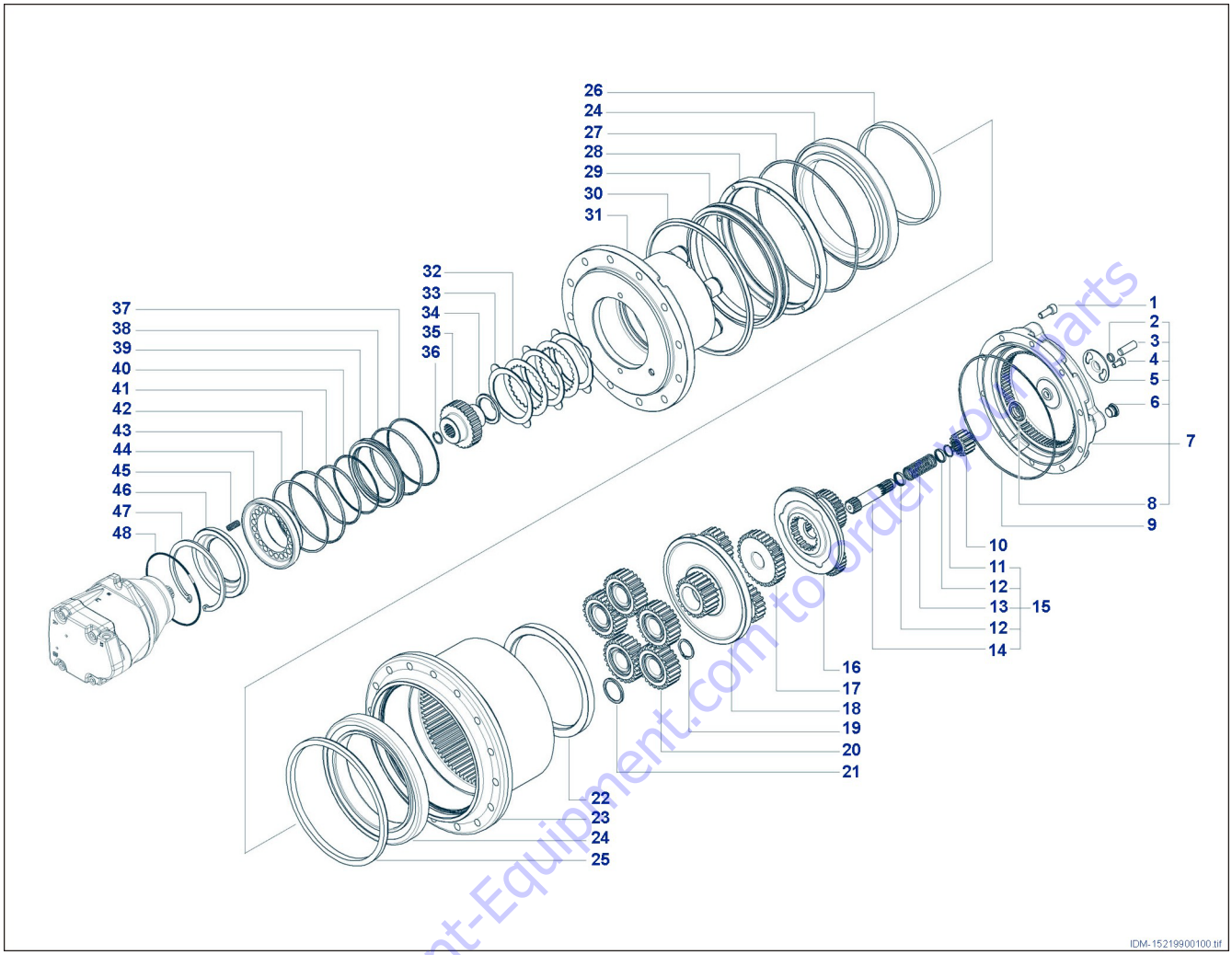


5. Remove the springs (45) from their seats in the brake piston (44).



6. By using pliers remove the circlip (36) from its seat in the brake shaft (35).

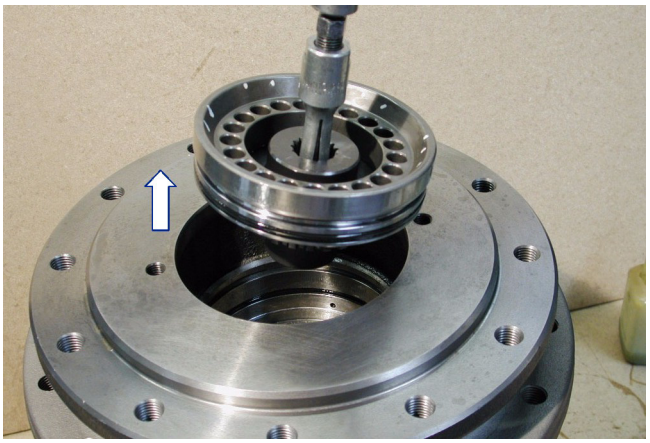




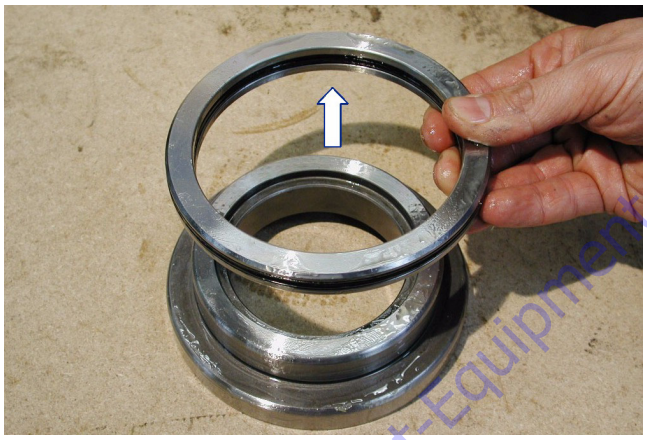
1. Screw
2. O-ring
3. Pin
4. Screw
5. Cap Nut
6. Oil Plug
7. End Cover
8. Pad
9. O-ring
10. 1st Stage Sun Gear
11. Elastic Ring
12. Washers
13. Spring
14. Splined Shaft
15. Disengagement Shaft
16. 1st Reduction Assembly
17. 2nd Stage Sun Gear
18. 2nd Reduction Assembly
19. Circlip
20. 3rd Reduction Assembly
21. Spacer
22. Ring Nut
23. Gearbox Housing
24. Bearing
25. Spacer
26. Spacer
27. O-ring
28. Spacer
29. Half Seal
30. Seal Ring
31. Flanged Hub
32. Disc (Internal Teeth
33. Disc (External Teeth)
34. Spacer
35. Brake Shaft
36. Circlip
37. Backup Ring
38. O-ring
39. Spacer
40. Backup Ring
41. O-ring
42. O-ring
43. Backup Ring
44. Brake Piston
45. Springs
46. Retainer Disc
47. Circlip
48. O- ring

Figure 3-29. Drive Hub S/N 100128 to Present

7. By using a puller remove, at the same time, the brake piston (44), the spacer (39) and the brake shaft (35).



8. Remove the spacer (39) from the brake piston (44).

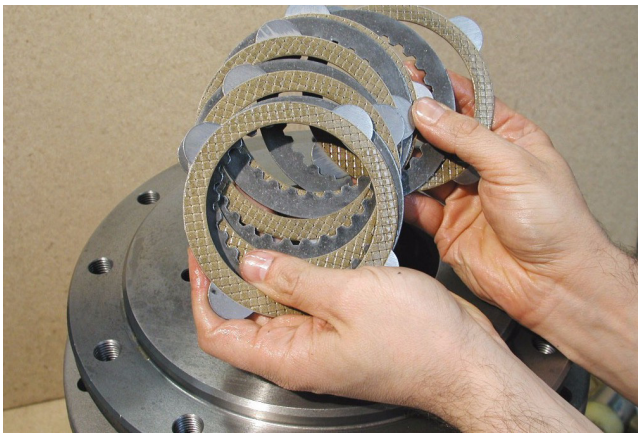


9. Remove the internal O-Ring seal (41) and the backup ring (40) from their seat in the spacer (39).

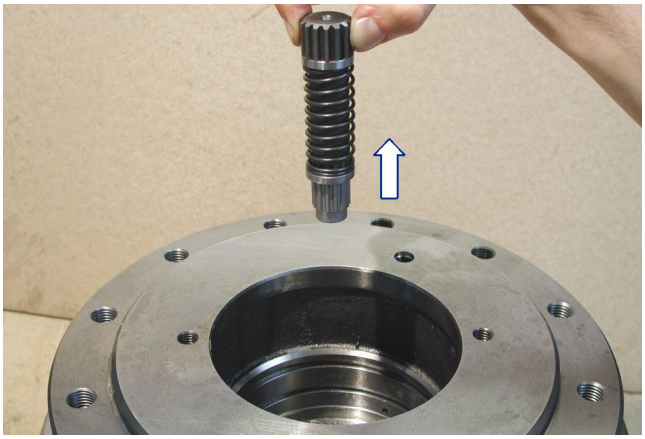
10. Remove the external O-Ring seal (38) and the backup ring (37) from their seat in the spacer (39).

11. Remove the O-ring seal (42) and the backup ring (43) from their seats in the flanged hub (31).

12. Remove brake discs pack (32-33).

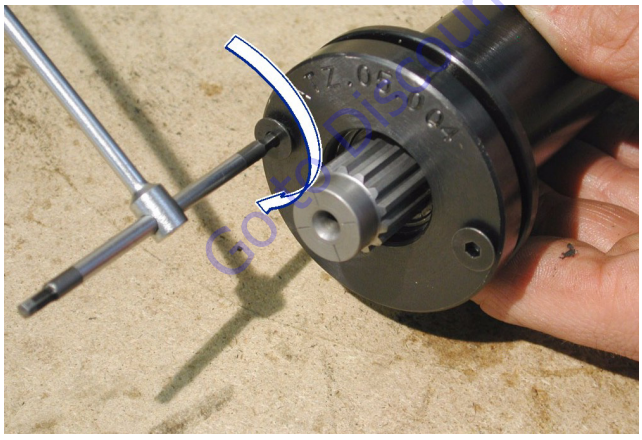


13. Remove the disengagement shaft kit (15).

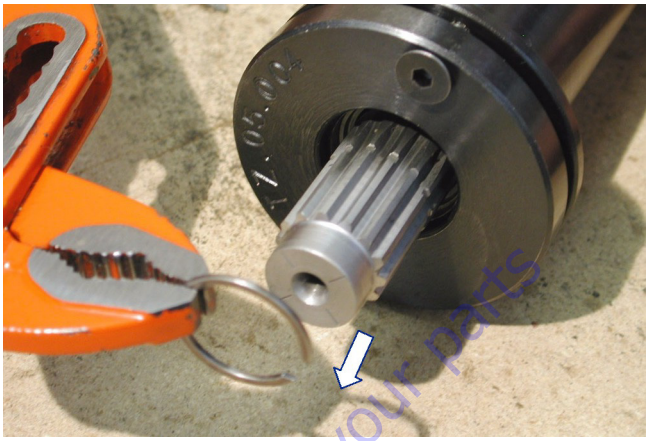


14. Place the disengagement shaft kit (15) inside the special tool (6689960240).

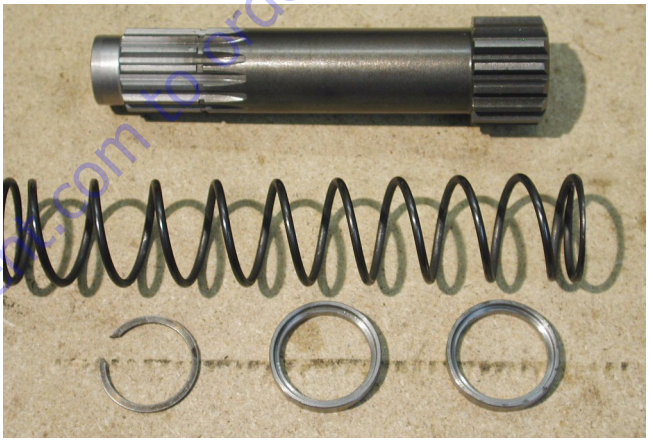
15. Tighten the 2 screws M5x16, grade 8.8, of the cover by a torque wrench to 18.4 ft.lbs. (25 Nm).



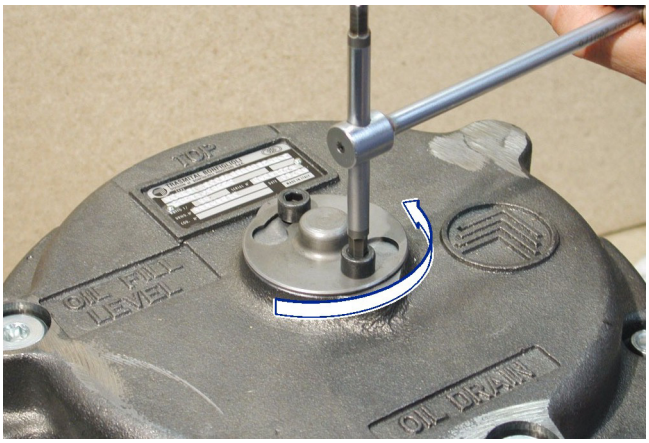
16. By using pliers remove the elastic ring (11) from the splined shaft (14).



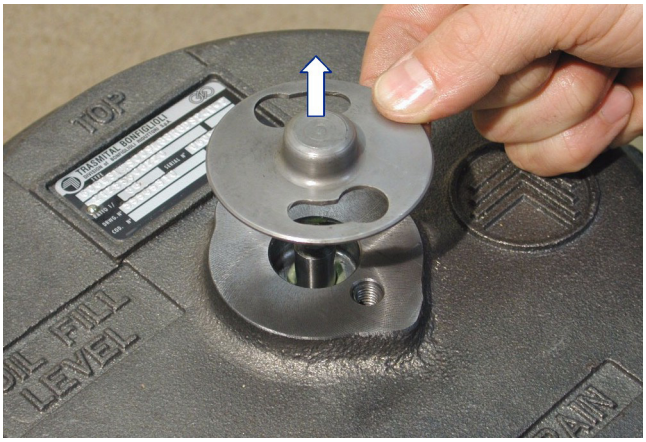
17. Remove the special tool and remove the spring (13) and the washers (12).



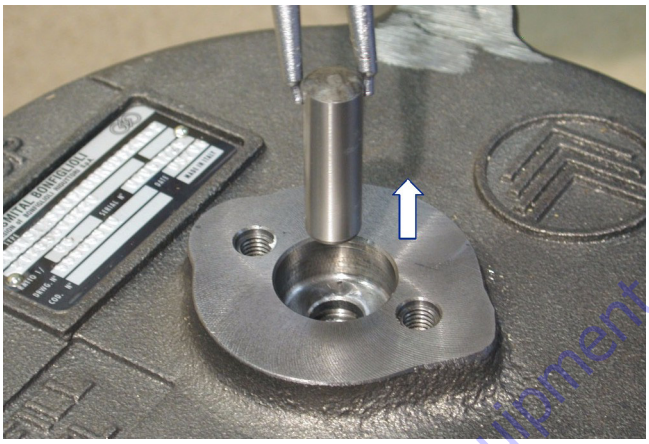
18. Turn the gearbox upside down and unscrew the 2 screws M8x16 (4), grade 8.8, of the end cover (7).



19. Remove the cap nut (5).



20. Remove the pin (3).



21. Remove the O-ring seal (2) from its seat in the end cover (7).

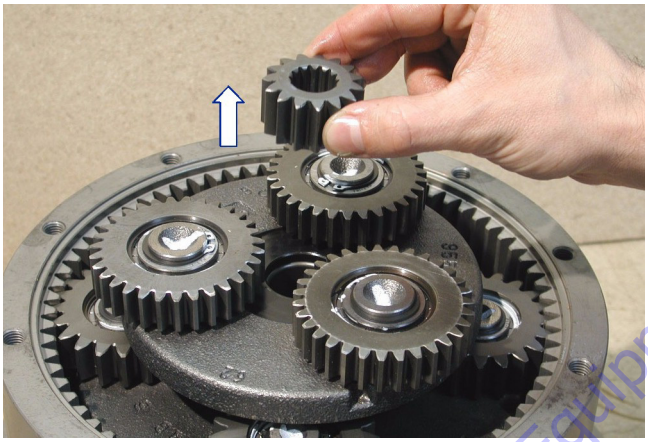
22. Unscrew the draining-filling-level oil plugs (6) by a male hex head wrench.

23. Unscrew the 10 screws M10X25 (1), grade 12,9, from the end cover (7).

24. Remove the end cover (7).

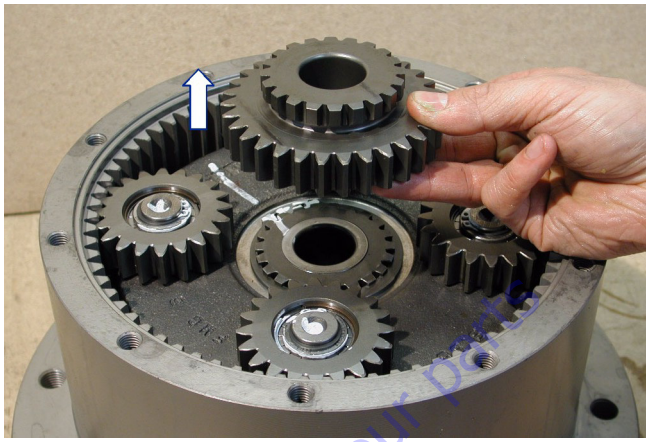
25. Remove the O-ring seal (9) from its seat in the end cover (7).

26. Remove the 1st stage sun gear (10).

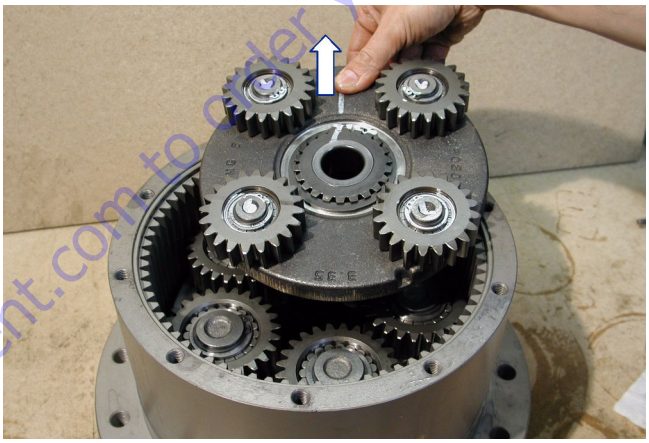


27. Remove the 1st reduction assembly (16).

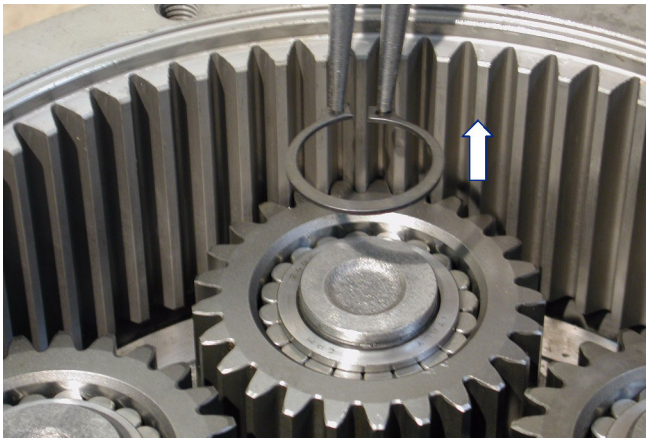
28. Remove the 2nd stage sun gear (17).



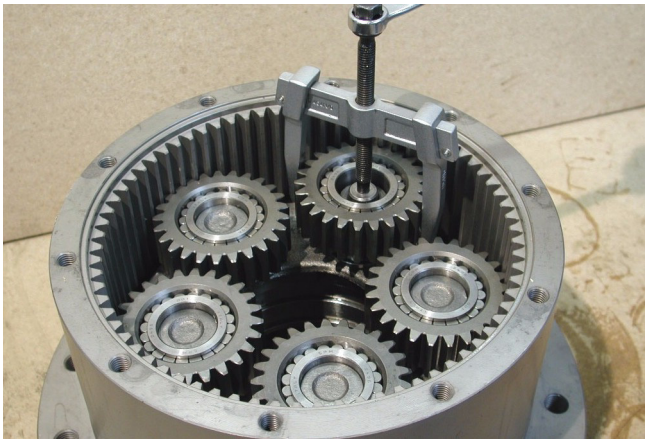
29. Remove the 2nd reduction assembly (18).



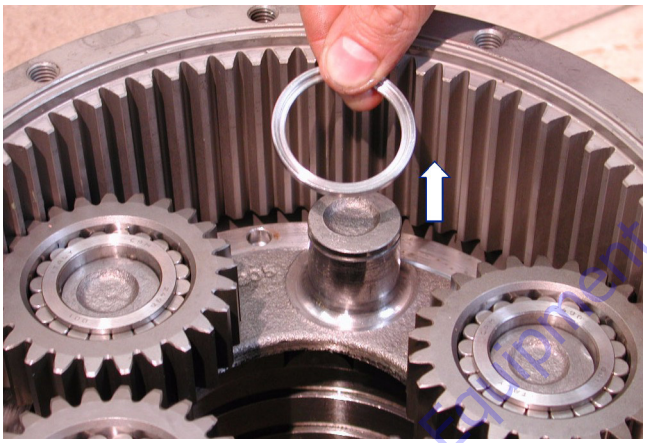
30. By using pliers remove the circlips (19) from their seats in the flanged hub's pins (31).



31. By using a puller remove the planet assemblies of the 3rd reduction (20).



32. Remove the spacer (21) from their seats in the pins of the flanged hub (31).



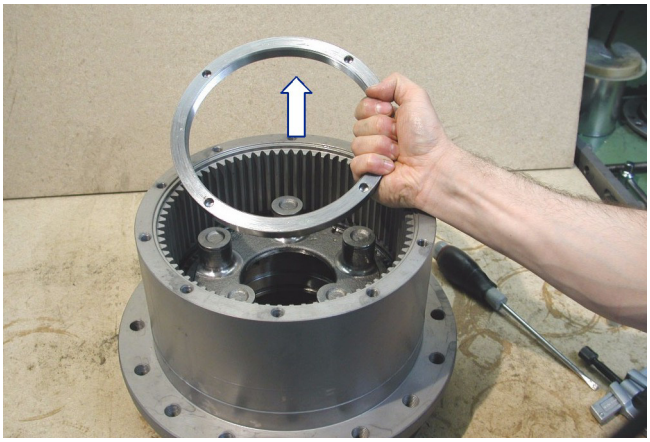
NOTE: *In order to proceed with the gearbox disassembly, it is now necessary to remove it from the machine and bring it to a properly equipped workshop.*

33. By using a drill remove the caulkings on the ring nut (22).

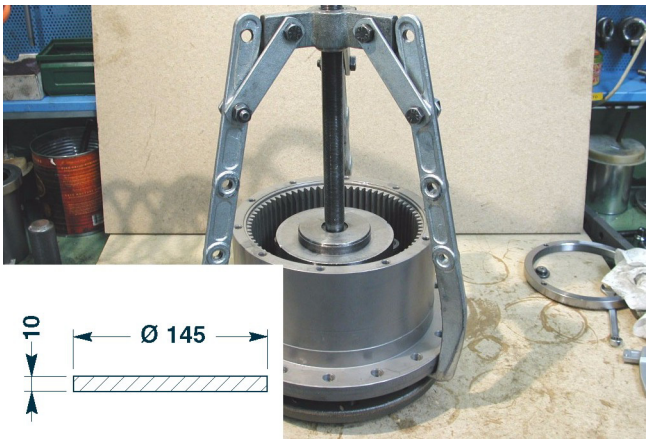
34. By using a tackle place the torque multiplier (ATZ.09.016.0) on the ring nut (22).

35. By using the torque multiplier (ATZ.09.016.0) loosen the ring nut (22).

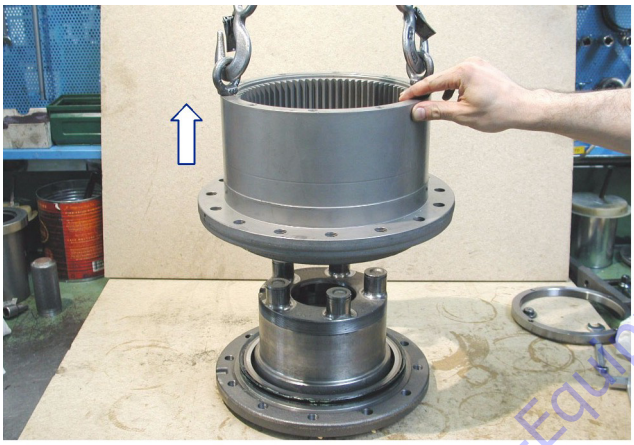
36. Take out the ring nut (22).



37. By using a puller and a metal stopper, remove the flanged hub (31) from the gearbox housing (23).



38. By using a tackle remove the gearbox housing (23) from the flanged hub (31).



39. Remove the seal ring (30) from its seat in the flanged hub (31).

NOTE: *In case of oil leaks, it may be necessary to check and eventually replace the lifetime seal (29), which means both the metal rings parts and the O-ring seals.*

40. By using a screwdriver, remove the 1st half-seal (29) from the flanged hub (31).

41. By using a screwdriver, remove the 2nd half-seal (29) from the gearbox housing (23).

NOTE: *The gearbox disassembly ends with the above operation. All items are now available for the necessary inspections.*

Inspection of Parts

The pieces that are subject to general wear and tear are the following:

- Gears.
- Bearings.
- All the seals

Replace the used or irregular parts using the following steps:

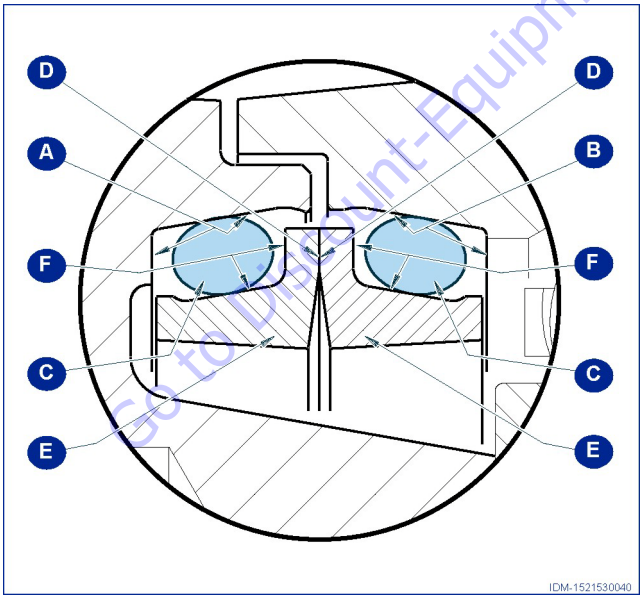
1. Remove dirt, and in particular properly clean the seals, bearings and locking rings seating.
2. Lubricate the parts before connecting them.
3. In the case of damaged gears, for example a planetary, do not proceed to replace the individual gear but the entire reduction assembly.

4. When reassembling a part always replace all the seals involved. Add some grease on the seats and on the new seals to make reassembly easier.
5. Replace all the damaged parts with original spare parts.

Assembly

Apply grease TECNOLUBE SEAL GS730 on the gearbox housing (23).

1. Follow the steps below to prepare the lifetime seal for assembly:
   a. Carefully clean the seats (A and B) using, if necessary, metallic brushes or solvent (surfaces in contact with or (C) must be perfectly clean and dry).

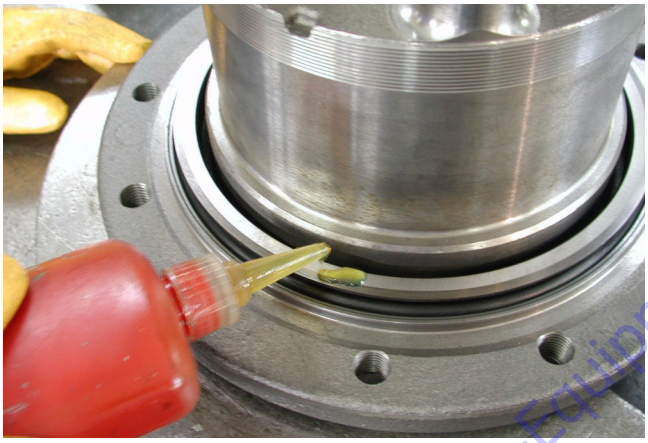


   b. Make sure that sealing surfaces (D) of metal rings (E) are free from scratches, dinges or foreign substances; metallic ring surfaces must be perfectly clean and dry. We suggest to dip the metallic rings in volatile solvent or industrial degreasing alcohol.
   c. Carefully clean the lapped surface (D) of metal rings (E) and remove dust or fingerprints. Then lubricate them with a thin oil film, taking care not to oil the other components.
2. Assemble the half seal (29) on the tool (6689960300).

3. Assemble the 1st half seal (29) on the gearbox housing (23).

4. Using the same tool (6689960300), assemble the 2nd half seal (29) on the flanged hub (31).

5. Carefully clean the metallic faces of the lifetime seal (29) and lube the surfaces with oil.



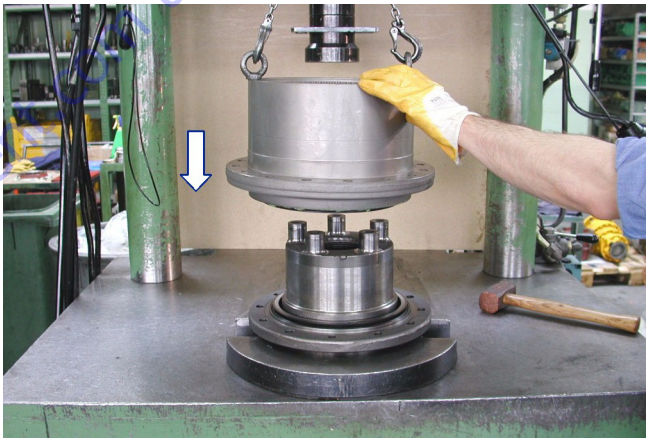
6. Insert the seal ring (30) in its seat in the flanged hub (31).

7. Apply grease TECNOLUBE SEAL GS730 on the seal ring (30).

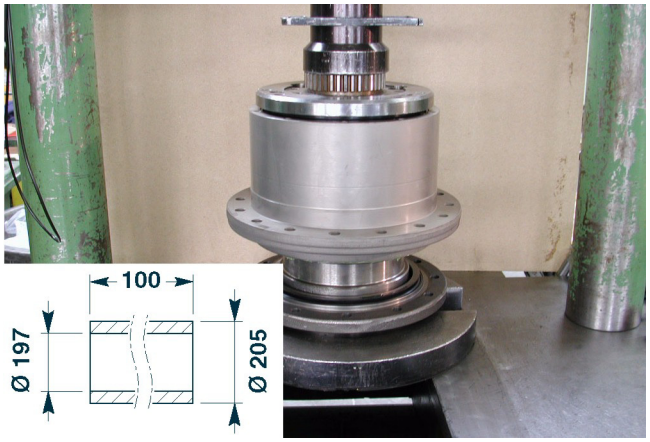
NOTICE

AVOID GETTING GREASE IN CONTACT WITH THE LIFETIME SEAL (29)

8. By using a hoist, place the gearbox housing (23) on the flanged hub (31).



9. By using a press and a metallic stopper, push the gear-box housing (23) against the shoulder on the flanged hub (31) until assembling of the unit is complete.



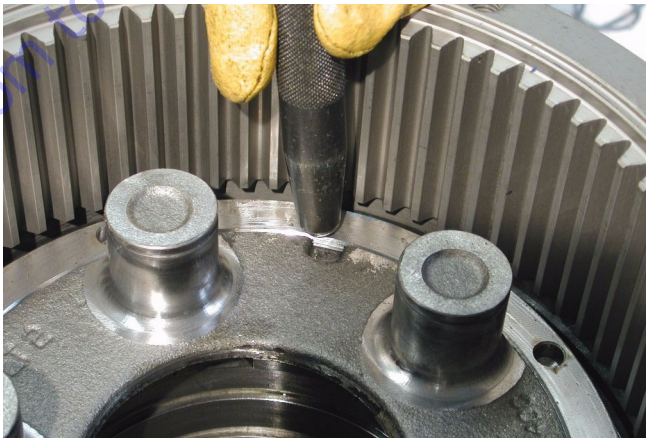
NOTICE

SCREW THE NUT (22) ON PARTIALLY IN ORDER TO PREVENT THE FLANGED HUB (31) FROM COMING OUT OF THE GEARBOX HOUSING (23) DURING THE FOLLOWING STEPS.

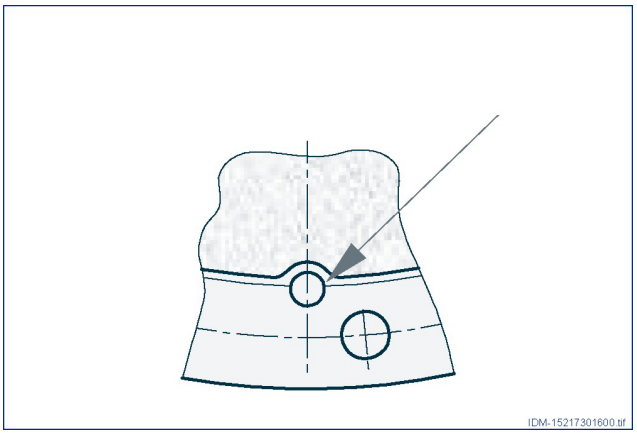
10. By using a hoist place the torque multiplier (ATZ.09.016.0) on the ring nut (22).

11. By using the mutiplier (ATZ.09.016.0), tighten the ring nut (22), using a torque wrench with an input multiplier torque of 71 ± 3 ft.lbs.(96,5 ± 4, 5 Nm) corresponding to an output multiplier torque of 3688 ± 184 ft.lbs. (5000 ± 250 Nm).

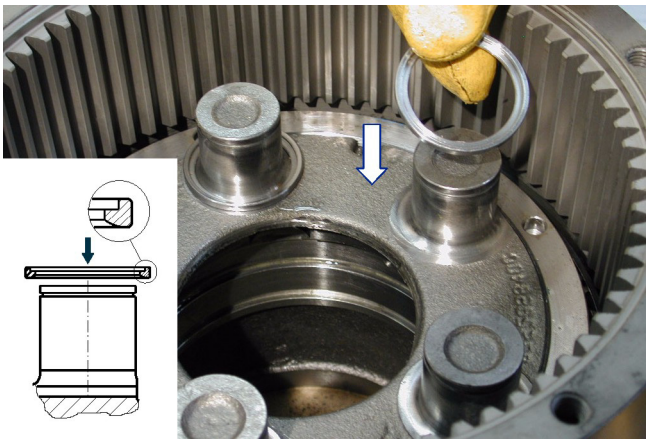
12. Stake the ring nut (22) near 2 seats at 180° of the flanged hub (31) on the right side.



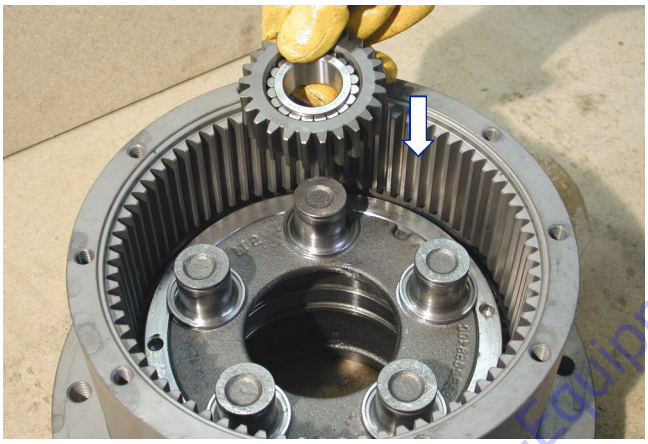
NOTE: *Stake Ø 4+5 mm (depth 1+1,5 mm).*



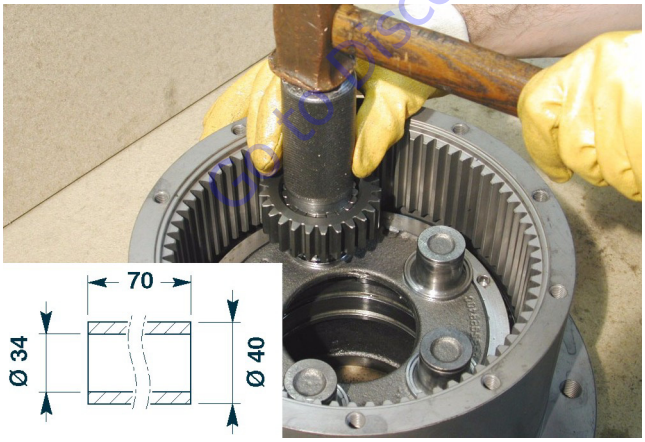
13. Assemble correctly the spacers (21) on the pins of the flanged hub (31).



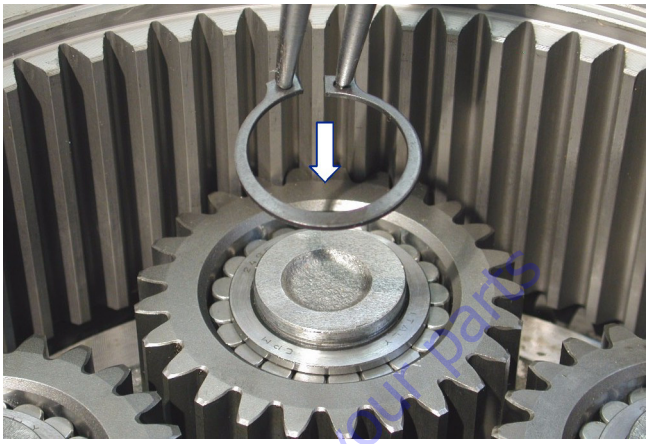
14. Place the 5 planet assemblies of the 3rd reduction (20) in the flanged hub's pin (31).



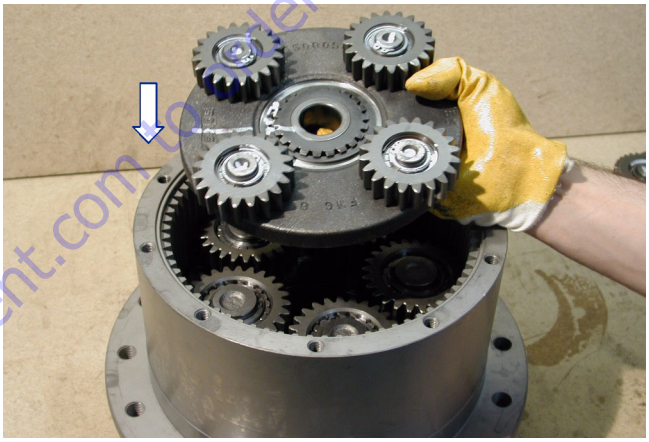
15. By using a rubber hammer and a metal stopper push the planet assemblies of the 3rd reduction (20) against the shoulder until assembly is complete.



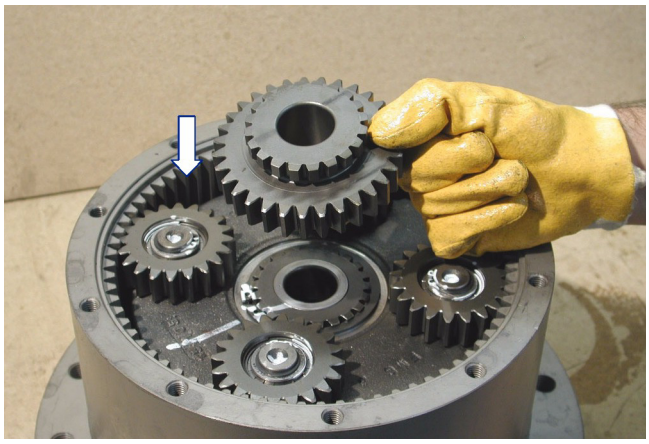
16. By using pliers, assemble the circlips (19) in the flanged hub pin seats (31).



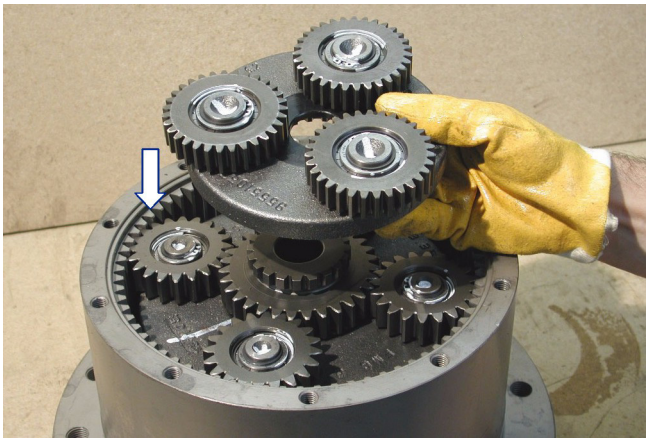
17. Assemble the 2nd reduction assembly (18).



18. Insert the 2nd stage sun gear (17).



19. Assemble the 1st reduction assembly (16).



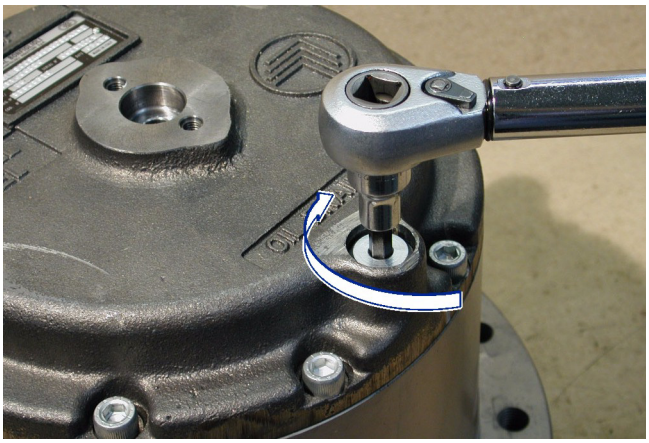
20. Insert the 1st stage sun gear (10).

21. Assemble the O-ring seal (9) into its seat in the end cover (7).

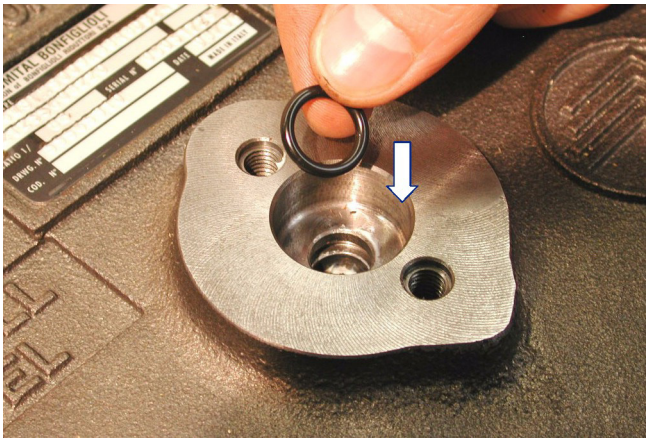
22. Place the end cover (7) on the gearbox housing (23).

23. Tighten the 10 socket head screws M10x25 (1),grade 12,9, by a torque wrench at 62.7 ft.lbs. torque (85 Nm).

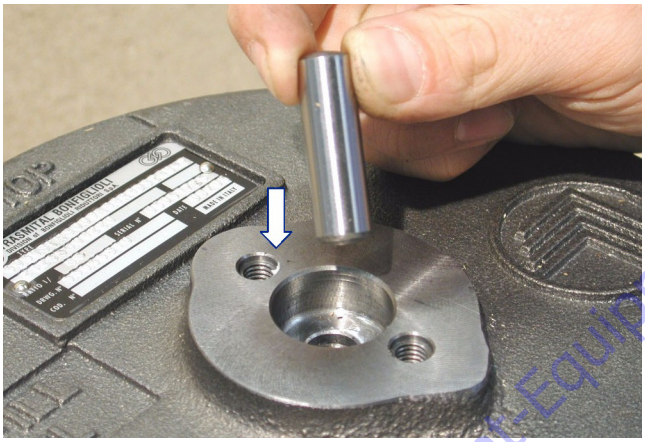
24. Insert the plugs (6) into the oil draining-filling holes of the end cover (7). Torque the plugs to 52 ± 7 ft.lbs. (70±10 Nm).



25. Assemble the O-ring seal (2) into its seat in the end cover (7).

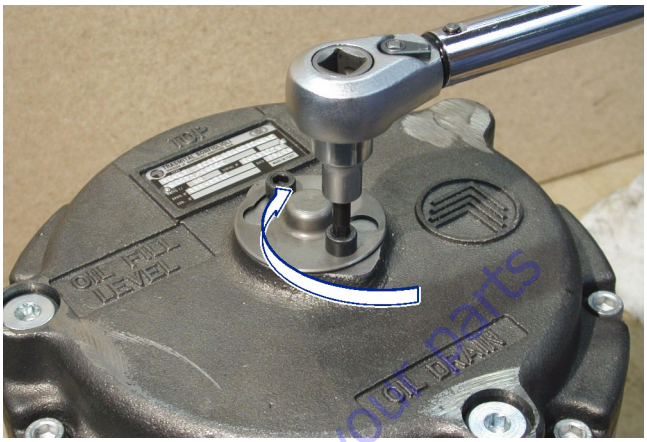


26. Protect the seat and the pin (3) with grease type MOLYKOTE G6000. Wait 15 minutes for it to completely dry. Insert the pin (3) in its seat in the end cover (7).



27. Assemble the cap nut (5).

28. Torque the 2 screws M8x16 (4) grade 8.8, to 18.4 ft.lbs. (25 Nm).



29. Insert the 1st washer (12) in the splined shaft (14).

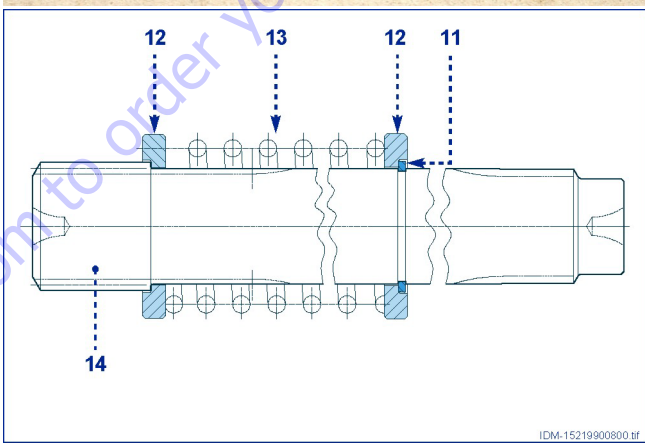
30. Insert the spring (13) in the splined shaft (14).

31. Insert the splined shaft (14) in the equipment (6689960240).

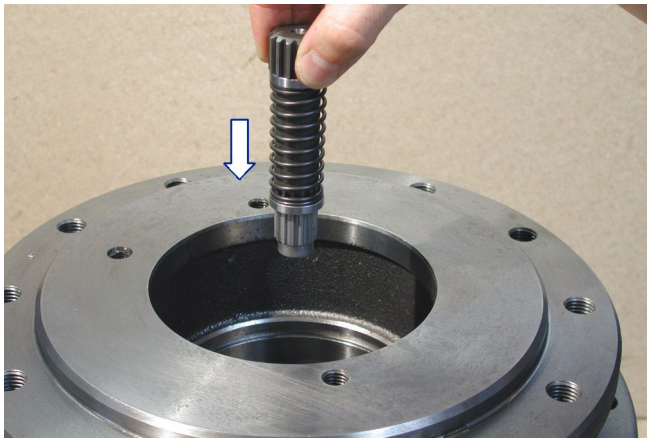
32. Insert the 2nd washer (12) correctly in the splined shaft (14).

33. Torque the 2 screws M5x16, grade 8.8, of the cover to 18.4 ft.lbs. (25 Nm).

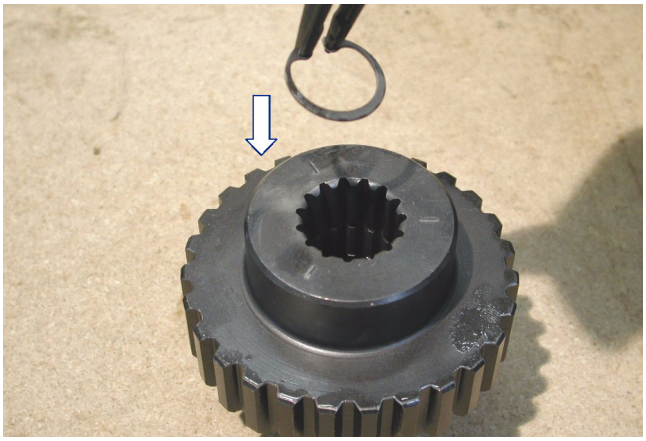
34. By using pliers, assemble the elastic ring (11) into its seat in the splined shaft (14).



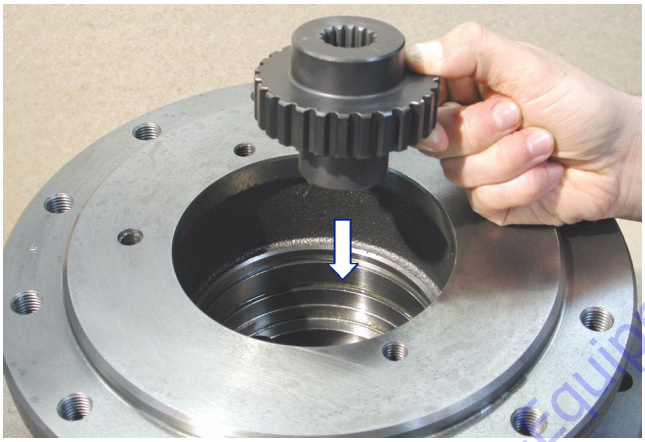
35. Insert the disengagement shaft kit (15) in the flanged hub (31).



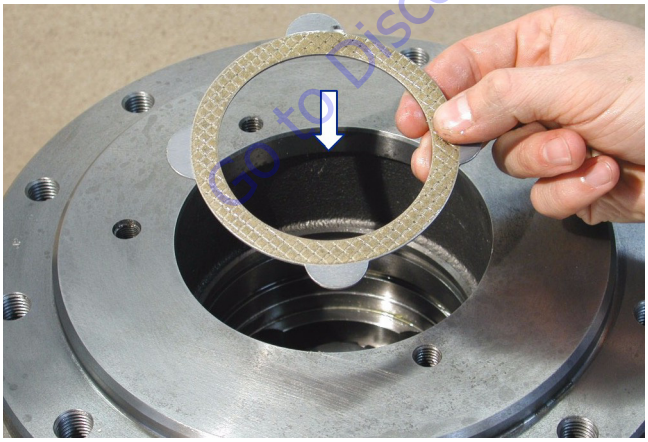
36. By using pliers assemble the circlip (36) into its seat in the brake shaft (35).



37. Turn the gearbox upside down and assemble the brake shaft (35) inside the flanged hub (31).



38. Assemble the brake discs package according to the following order: first, insert one sintered bronze disc with external teeth (33).

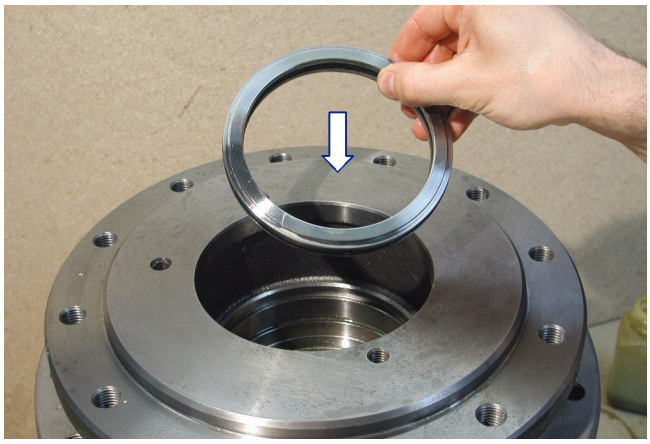


39. Then insert an internally toothed steel disc (32). Repeat the operation until all 5 sintered bronze discs and 4 steel discs have been assembled.

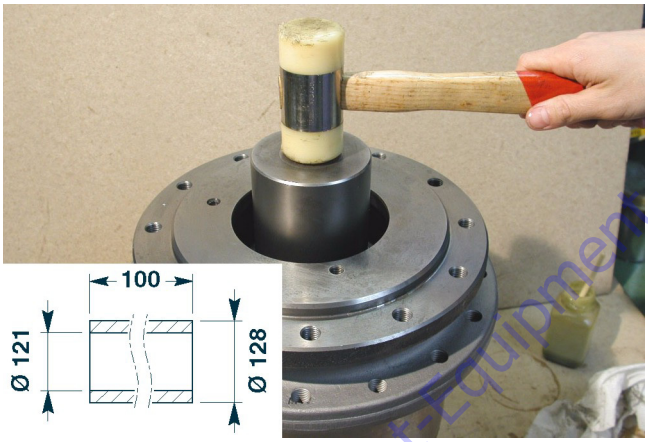
40. Fit the internal O-ring seal (41) and the backup ring (40) into their seats in the spacer (39).

41. Fit the external O-ring seal (38) and the backup ring (37) into their seats in the spacer (39).

42. Insert the spacer (39) inside the flanged hub (31), paying attention not to damage the seals already fitted.

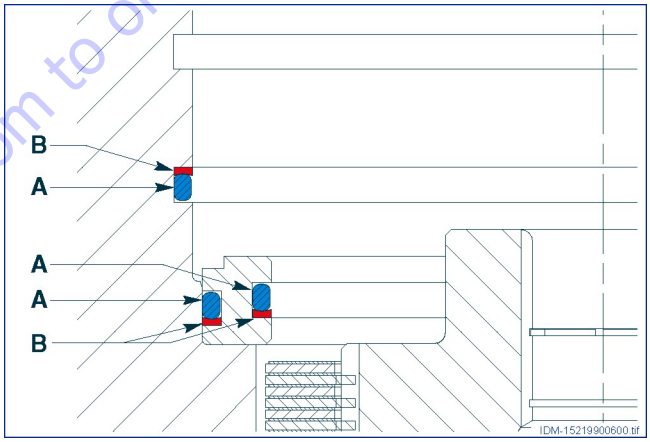


43. By using a rubber hammer and a metal stopper push the spacer (39) against the flanged hub (31), paying attention not to damage the seals already fitted.



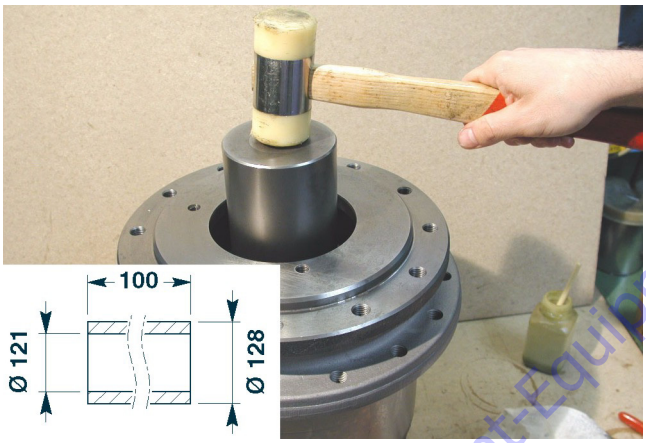
44. Lube the seal seats into the flanged hub (31) and assemble the O-ring seal (42) and the backup ring (43).

NOTE: *The O-ring seals (A) and backup rings (B) must be fitted in the seats according the mutual position as shown in the scheme.*

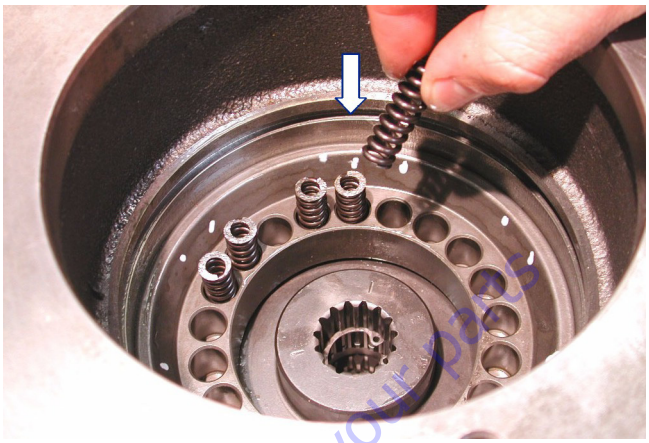


45. Insert the brake piston (44) inside the flanged hub (31), paying attention not to damage the seals already fitted.

46. By using a rubber hammer and a metal stopper push the brake piston (44) against the flanged hub (31), paying attention not to damage the seals already fitted.

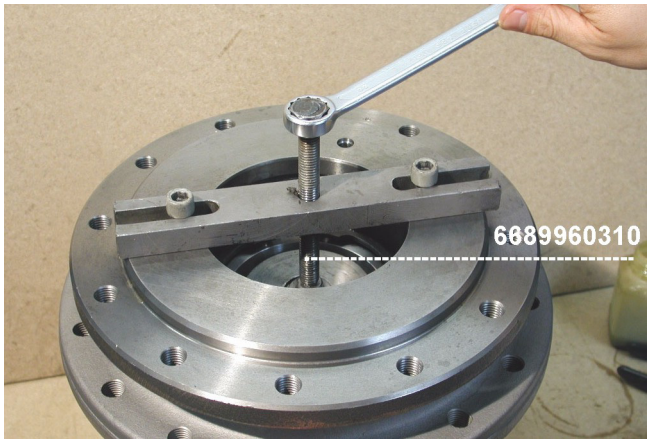


47. Insert the springs (45) into the holes in the brake piston (44) marked previously.

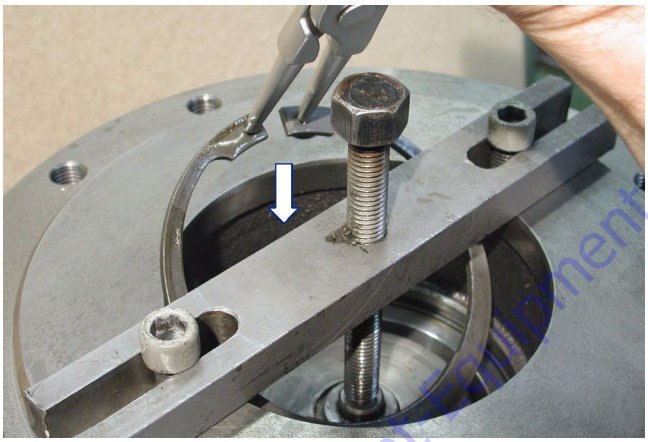


48. Insert the spring retainer disc (46).

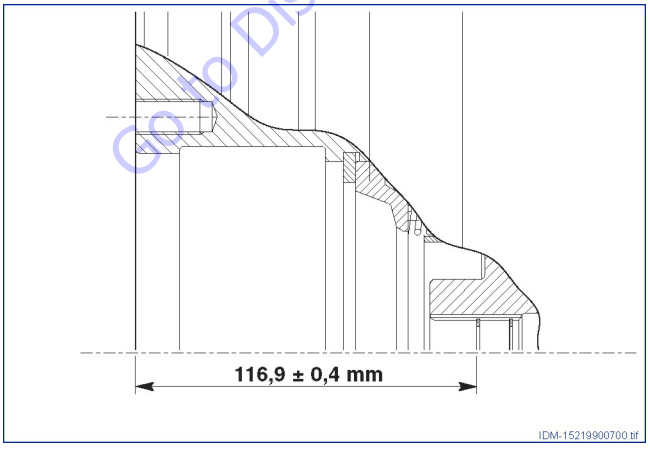
49. Install the special tool (6689960310) on the flanged hub (31) and turn the screw until it compresses the springs (45).



50. Assemble the circlip (47) in its seat and remove the special tool.



NOTE: *Before assembling the hydraulic motor, verify by a depth slide gauge the correct assembly of the unit checking the axial distance as shown below.*



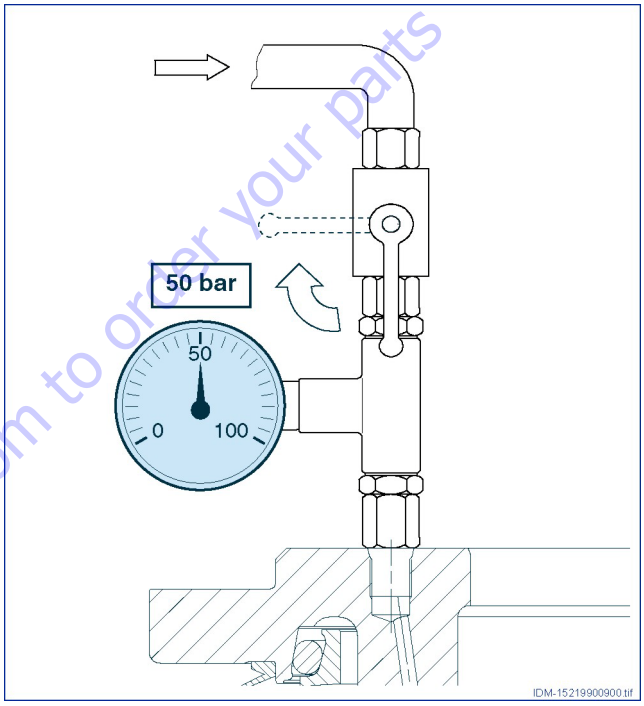
Final Test and Reinstallation

Check the product by remounting it to the machine.

Check the function of the drive hub following all the checks shown in Startup and Running In.

If work on the brake was undertaken, it is important to check that there are no oil leaks. Follow the procedure below:

1. Connect the pressure pilot line with the manometer (with a base scale of 100 bars) to the brake release port.



2. Open the flow valve and release the brake with the pilot pressure of 50 bar.

3. Close the flow valve and keep the brake released 3 minutes or longer.

4. Using the manometer, check that the pressure remains constant.

NOTE: *If the pressure drops it may mean that the brake seals are not tight and consequently they must be replaced or it may mean that the reassembling was not completed properly.*

5. After having reassembled the gearbox, install the hydraulic motor.

6. Fill the gearmotor with the lubricant oil.

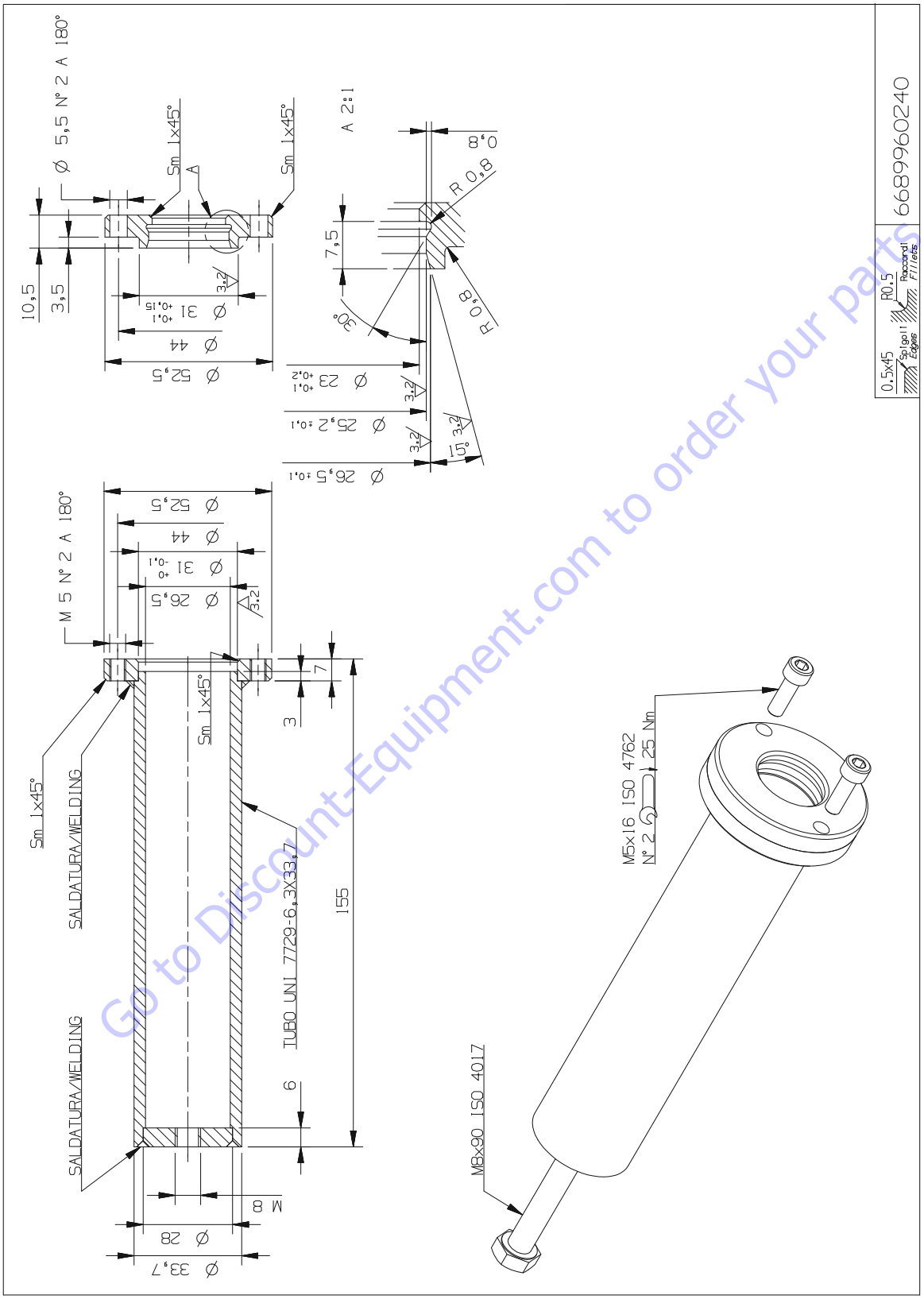


Figure 3-30. Drive Hub Special Tools - Sheet 1 of 4

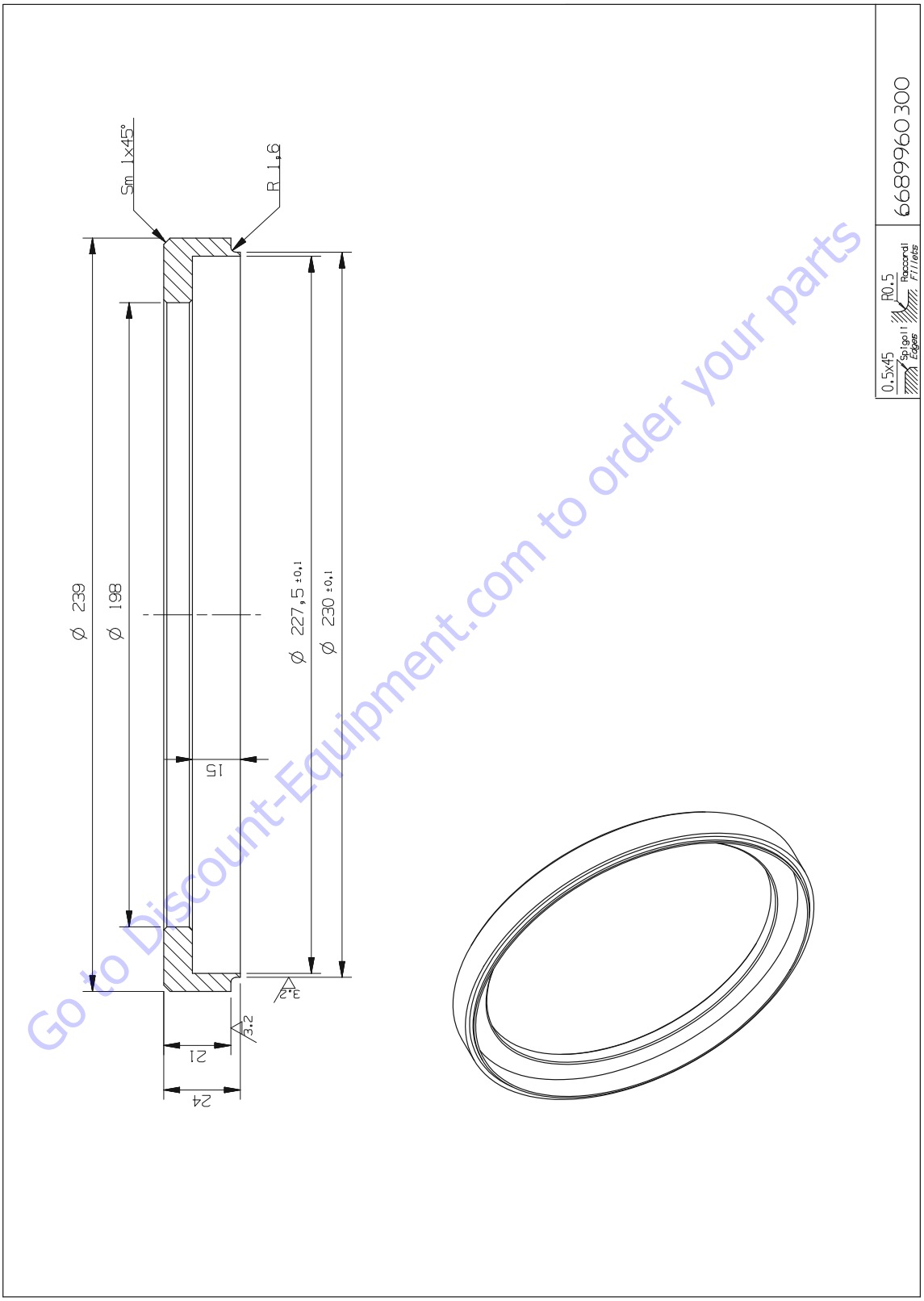


Figure 3-31. Drive Hub Special Tools - Sheet 2 of 4

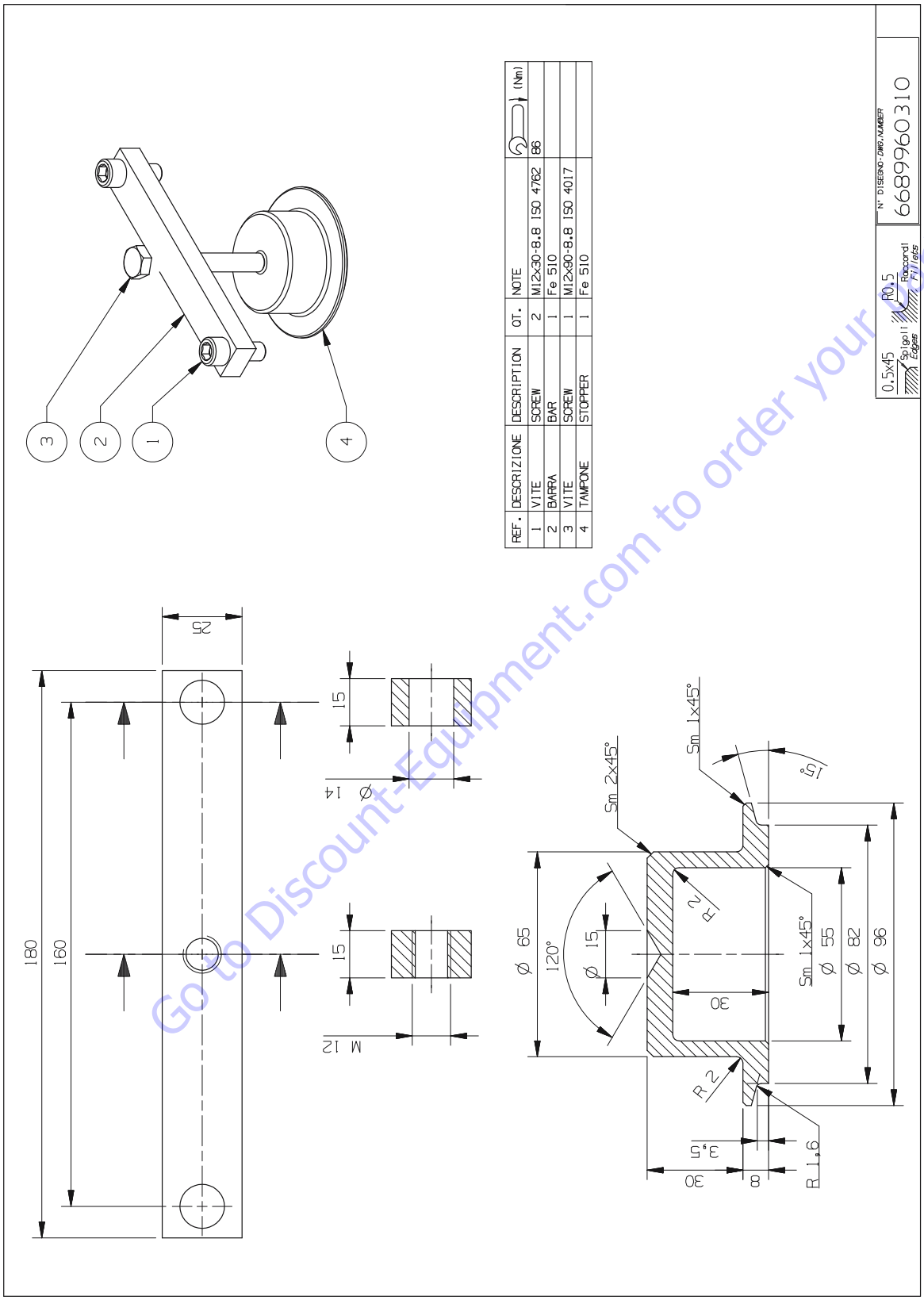


Figure 3-32. Drive Hub Special Tools - Sheet 3 of 4

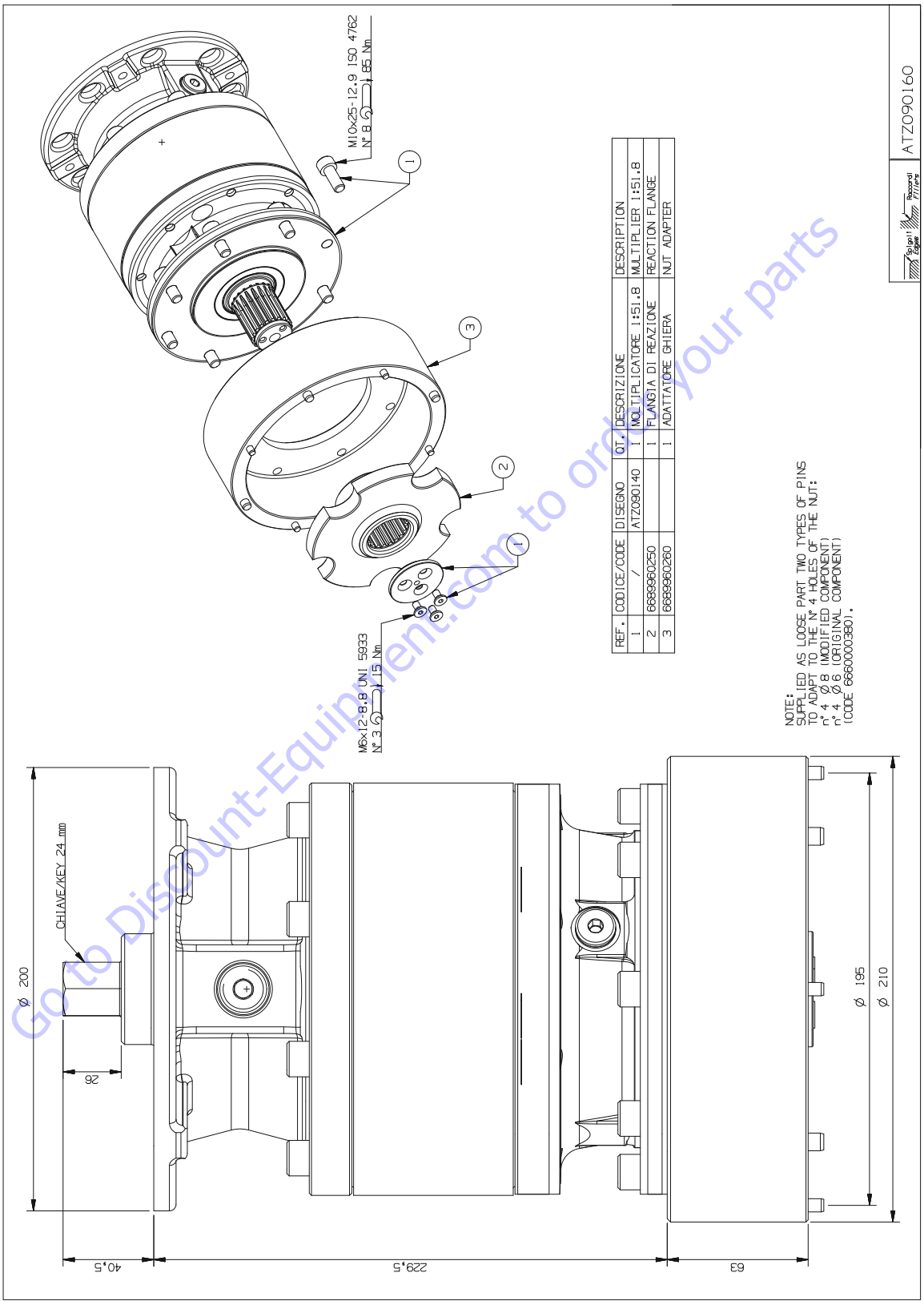


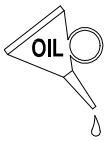
Figure 3-33. Drive Hub Special Tools - Sheet 4 of 4

3.16 DRIVE HUB - REGGIANA RIDUTTORI (SN 134389 TO PRESENT)

NOTE: *After S/N 0300134389 machines may be built with either Bonfiglioli or Reggiana Riduttori wheel drive hubs. See Section 3.15, Drive Hub - Bonfiglioli (SN 100128 to Present). Do not use different hubs on the same machine.*

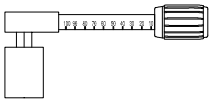
Symbol Nomenclature

= ADHESIVE



= LUBRICANT

= GREASE



= TORQUE WRENCH

= DISPOSAL

Tools

Tools required for assembling and disassembling the wheel gear RRTD1701TB

1. Hammer;
2. Clamps for inner retention rings;
3. Clamps for outer retention rings;
4. Electric or pneumatic screwdriver;
5. Special spacer mounting;
6. Torque wrench;
7. Hydraulic press;
8. Wrench for M6, M8, M10 socket head screws and 1/4"G plug.
9. Socket wrench for M6 hexagonal screw.

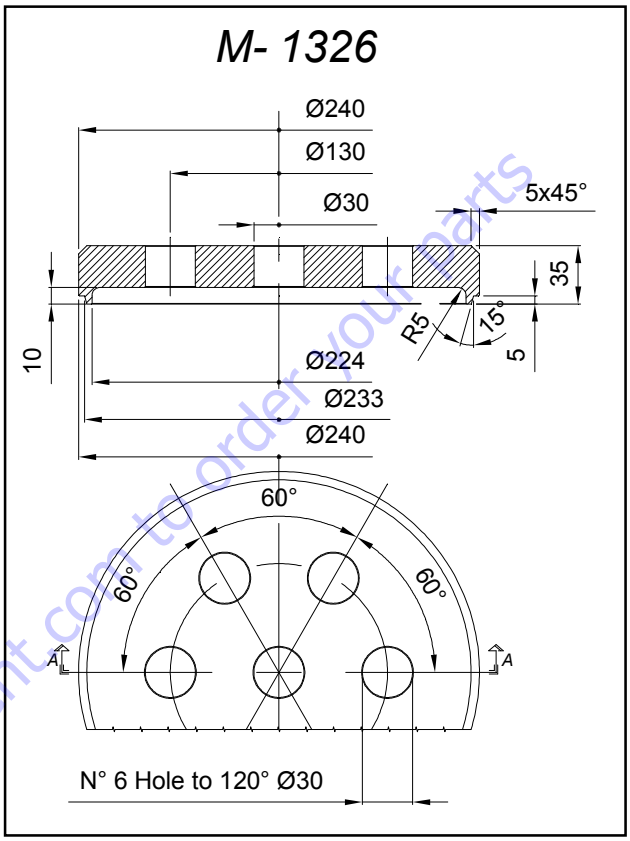


Figure 3-34. Bearing Track Spacer Mounting C016117

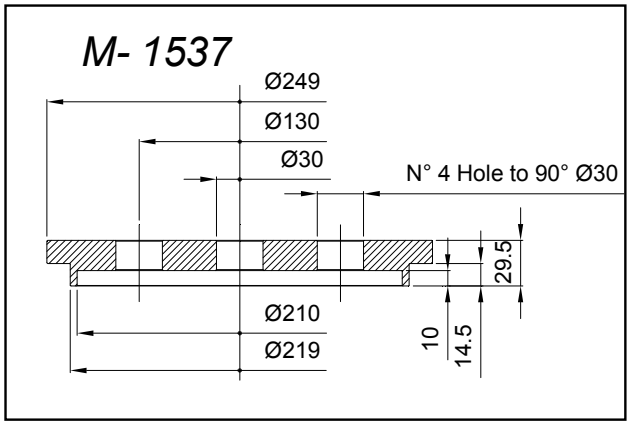


Figure 3-35. Oil Seal Spacer Mounting C125049

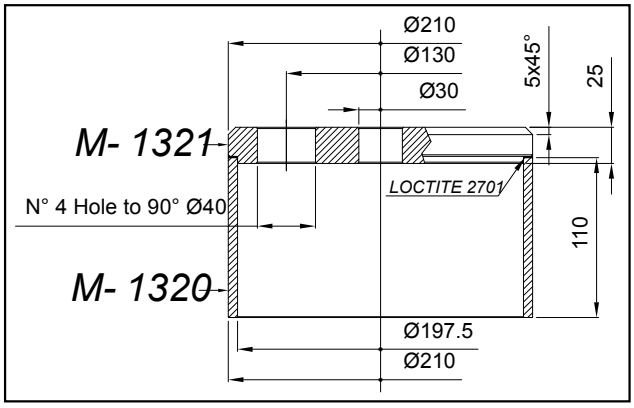


Figure 3-36. Bearing Spacer Mountng CO16117

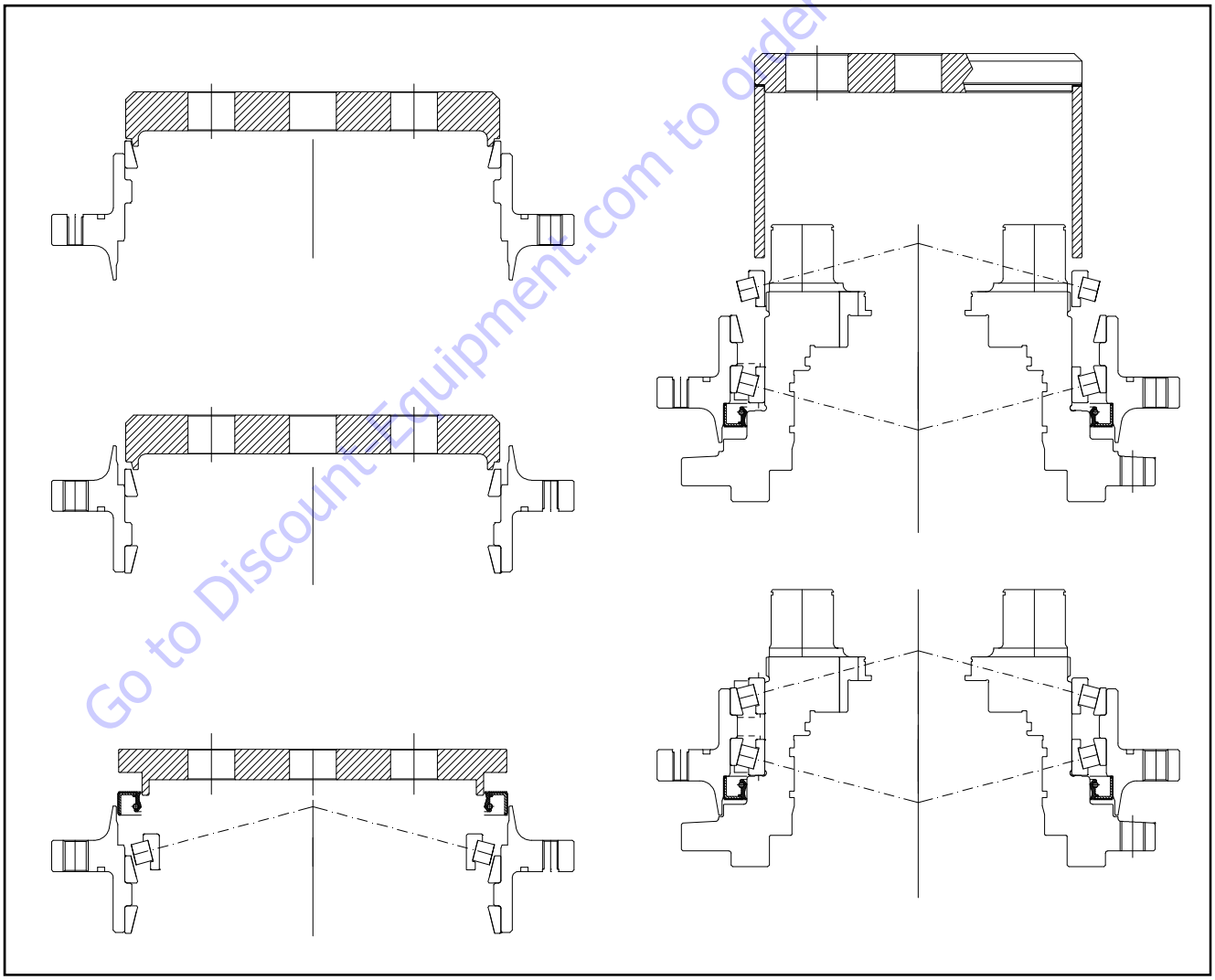


Figure 3-37. Assembly Diagram 1

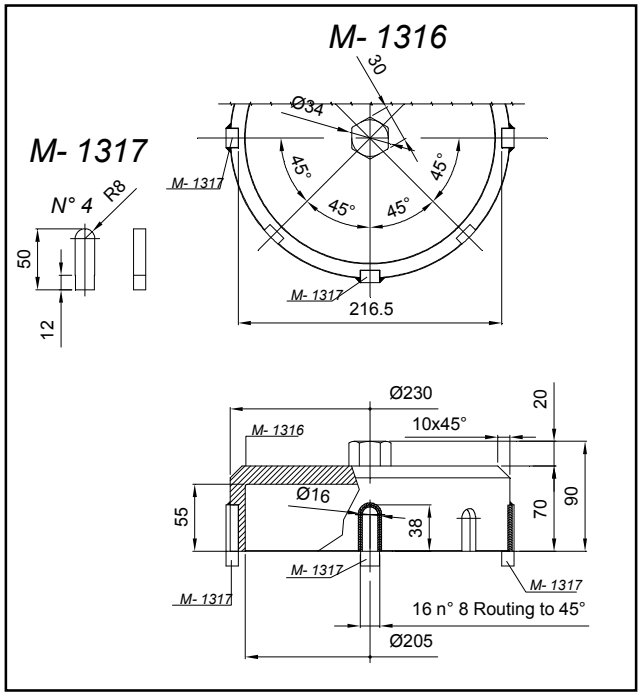


Figure 3-38. Wrench For Ring Nut

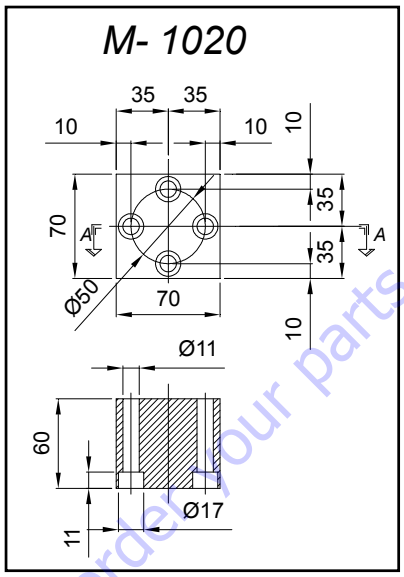


Figure 3-40. Anti-rotation Block

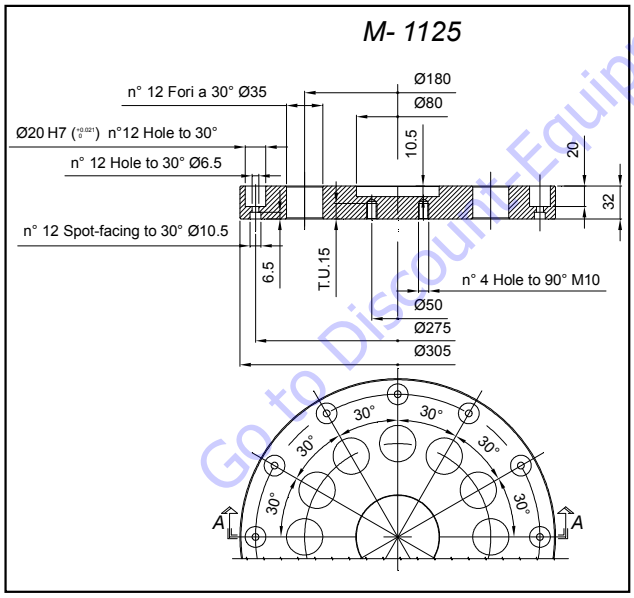


Figure 3-39. Anti-rotation Flange

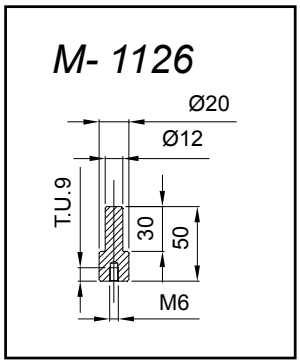


Figure 3-41. Anti-rotation Pin

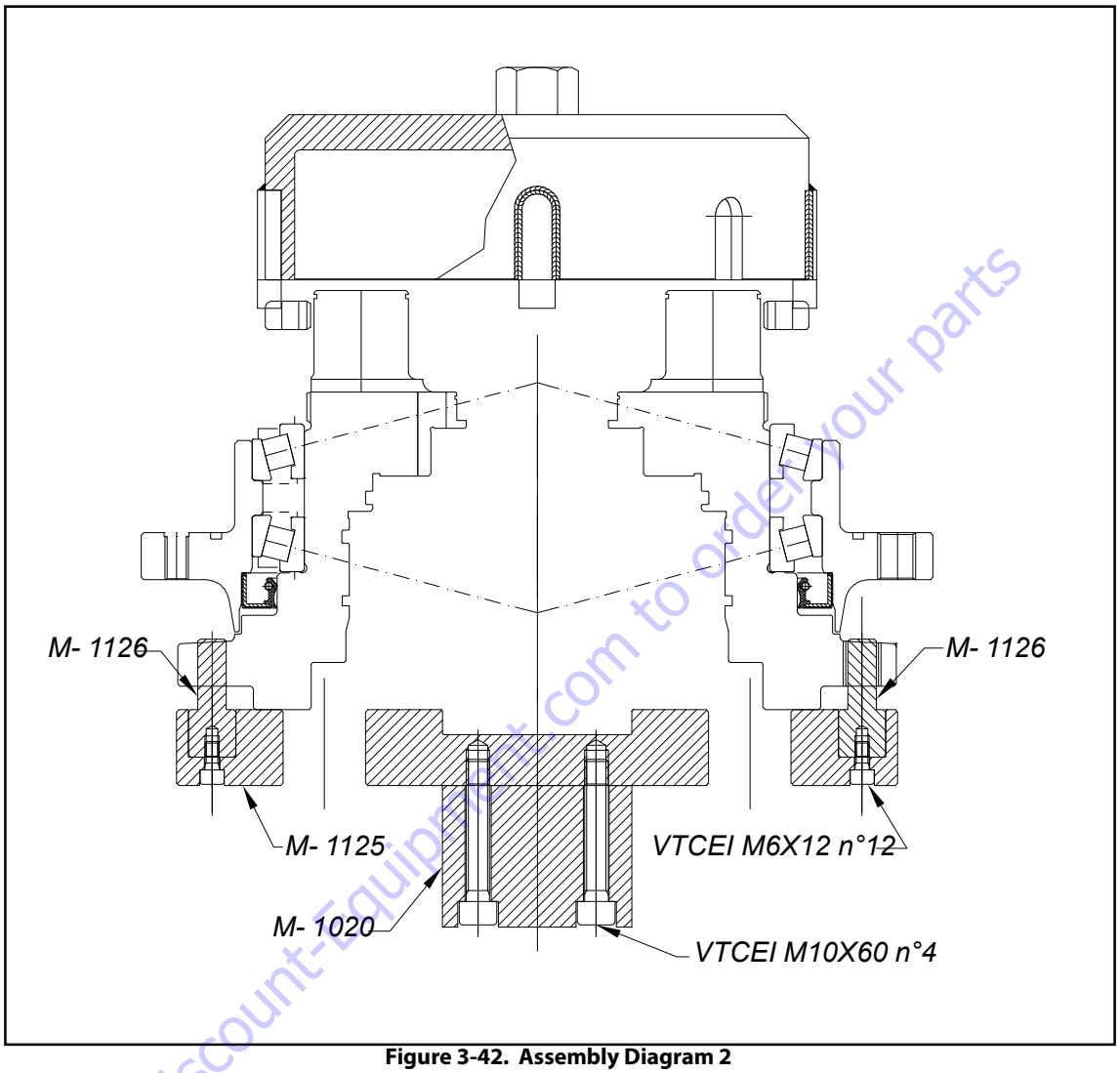


Figure 3-42. Assembly Diagram 2

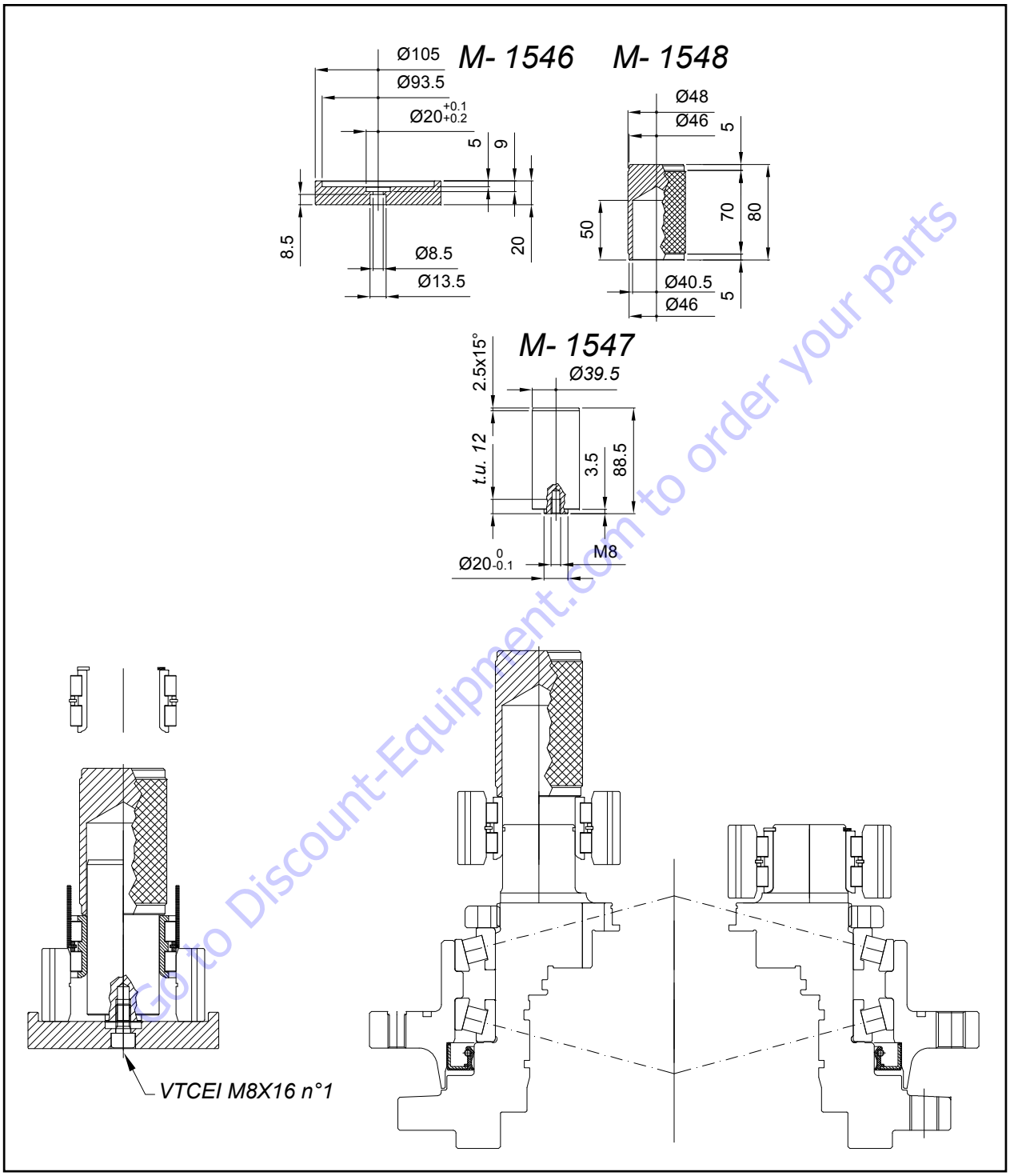
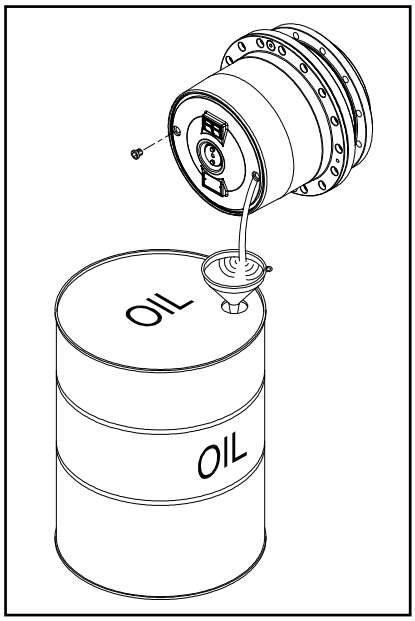


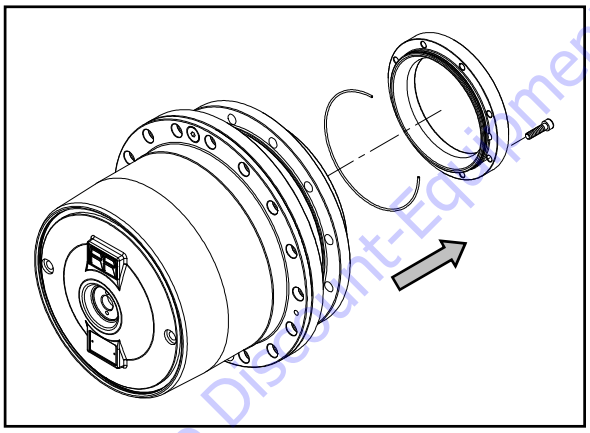
Figure 3-43. Tools For Assembling Bearing 3rd Stage Planetary Gear Assembly Diagram

Disassembly

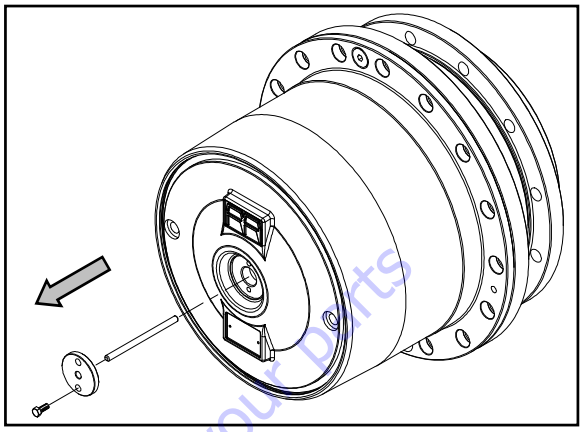
1. Remove the plugs and pour the lubricant in a container.



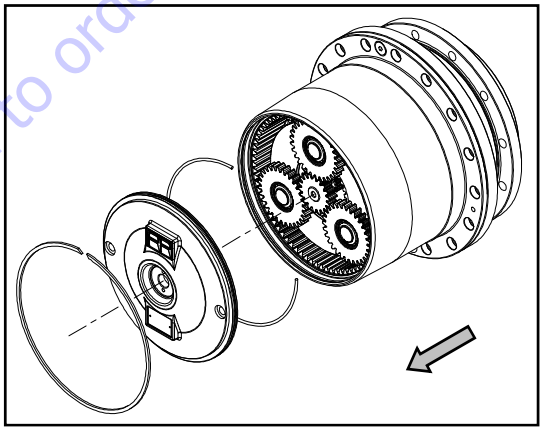
2. Release the screws to disassemble the motor flange taking care not to damage the O-Ring.



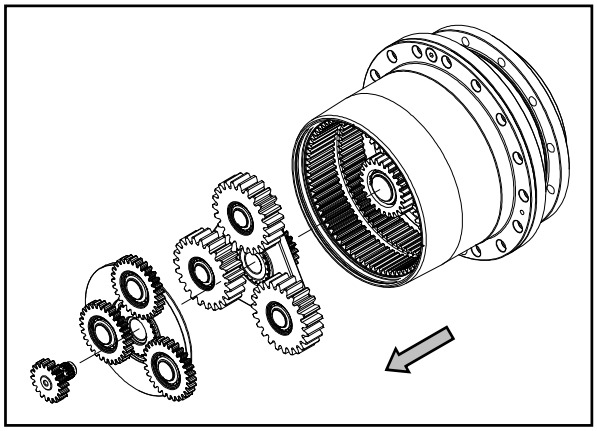
3. Release the screws from the release cover and pull the pin out.



4. Remove the BR250 ring and pull the cover out avoiding to damage the O-Ring.



5. Pull the reduction gears out.



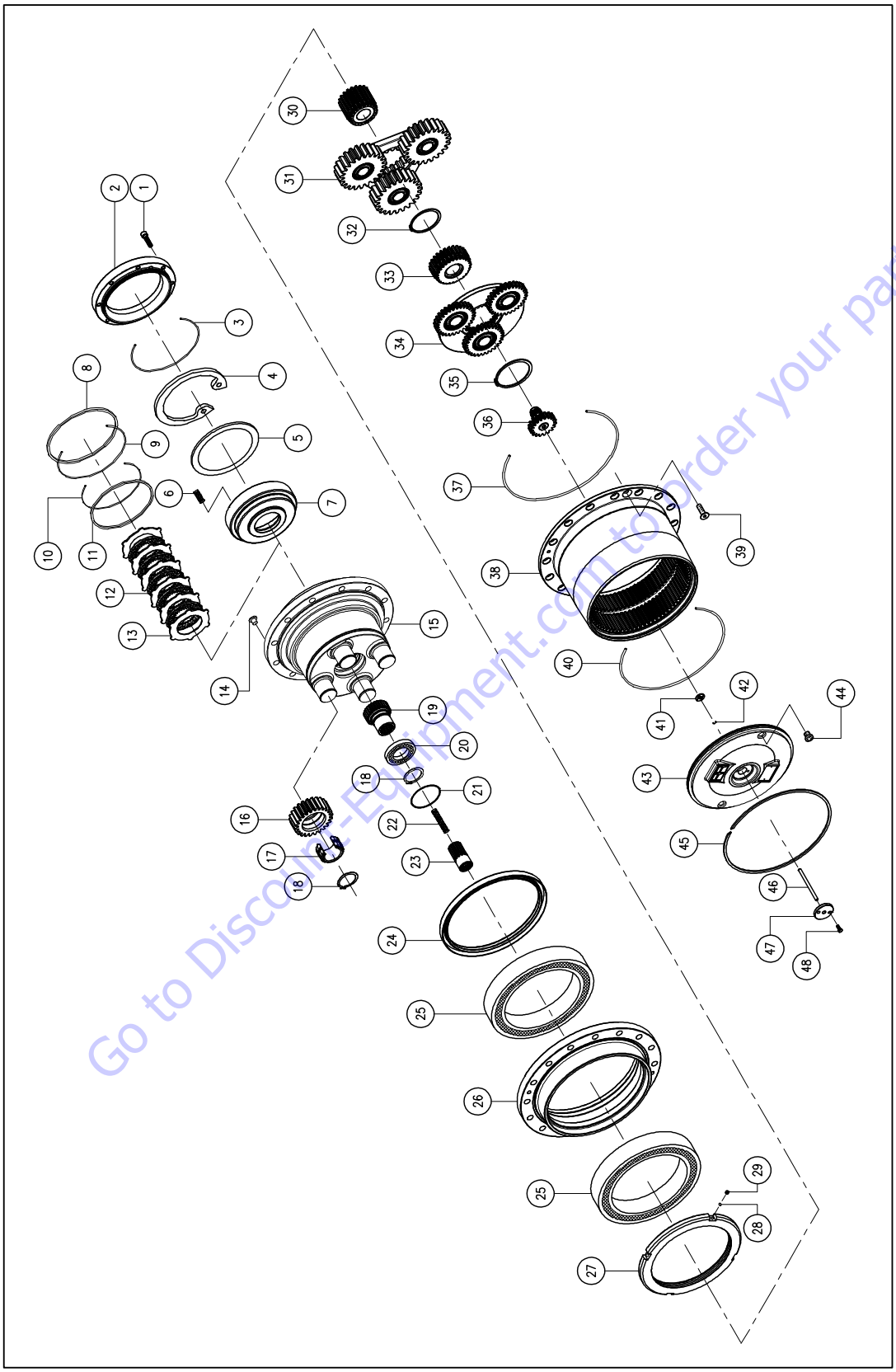
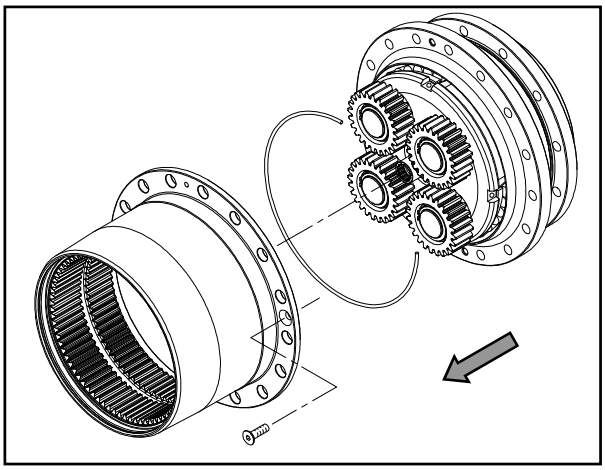


Figure 3-44. Reggiana Riduttori Hub - Sheet 1 of 2

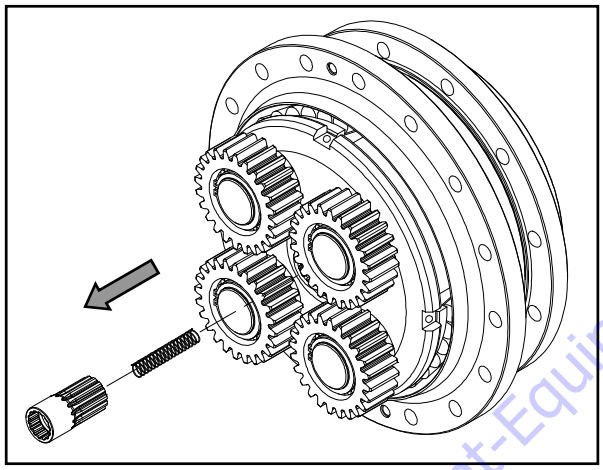
1. Screw
2. Motor Support
3. O-ring
4. Inner Retention Ring
5. Brake Spring Spacer
6. Brake Spring
7. Brake Piston
8. Parbak
9. O-ring
10. O-ring
11. Parbak
12. Sintered Brake Disc
13. Iron Brake Disc
14. Plastic Plug
15. Spindle
16. Planet Wheel
17. Bearing
18. Outer Retention Ring
19. Input Shaft
20. Input Shaft Bearing
21. Ring
22. Disengagement Spring
23. Disengagement Shaft
24. Spindle Oil Seal
25. Tapered Roller Bearing
26. Bearing Support
27. Ring Nut
28. Sphere
29. Screw
30. Pinion
31. Reduction Gears
32. Outer Retention Ring
33. Pinion
34. Reduction Gears
35. Outer Retention Ring
36. Pinion
37. O-ring
38. Crown Gear
39. Crown Gear Screw
40. O-ring
41. Support Tablet
42. O-ring
43. Cover
44. Steel Plug
45. Cover Retaining Ring
46. Disengagement Stud
47. Disengagement Cap
48. Disengagement Screw

Figure 3-45. Reggiana Riduttori Hub - Sheet 2 of 2

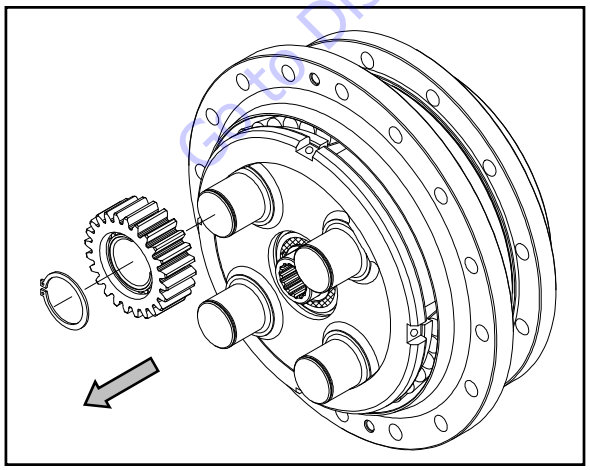
6. Loosen the M10x25 flathead socket screws and remove the planetary ring without damaging the O-Ring.



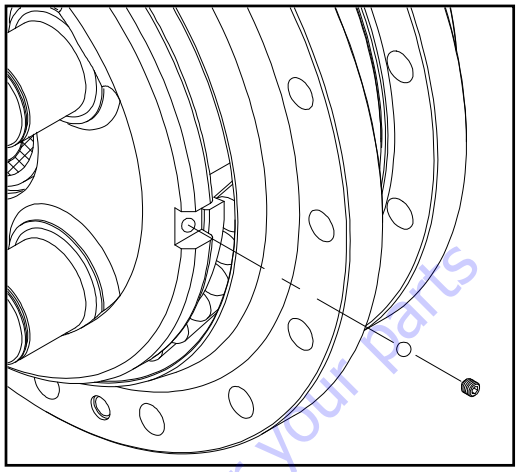
7. Remove the release joint together with the spring.



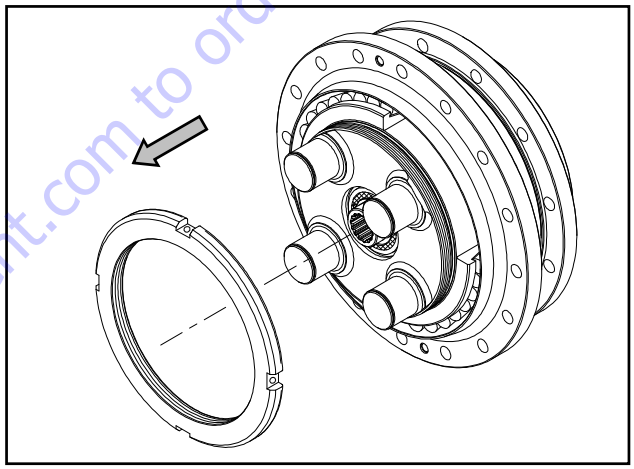
8. Disassemble the Ø40 outer snap rings and using an extractor remove the planetary gears from the spindle pins.



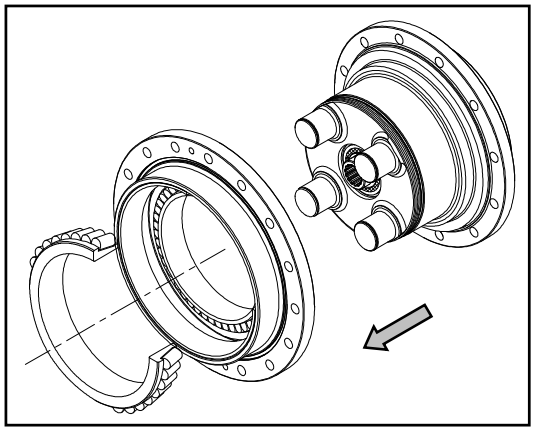
9. Loosen the M6x6 socket headless screws and also remove the 3/16" balls.



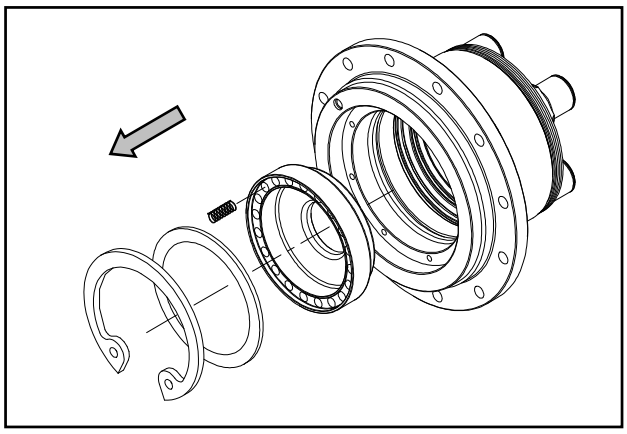
10. Loosen the ring nut using the special wrench.



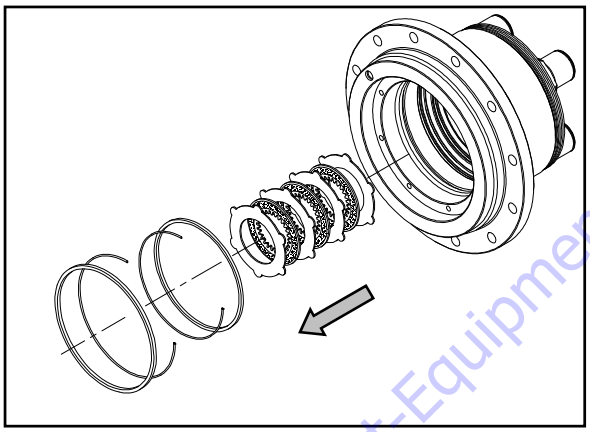
11. Remove the hub support together with the roller bearing inner track.



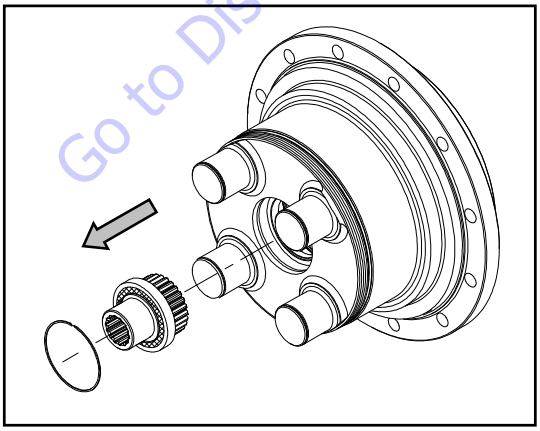
12. Disassemble the Ø160 inner snap ring and pull the spring holder spacer out. Remove the springs and using a compressed air jet in the brake control hole pull the piston out of the spindle.



13. Remove the brake discs and seals.



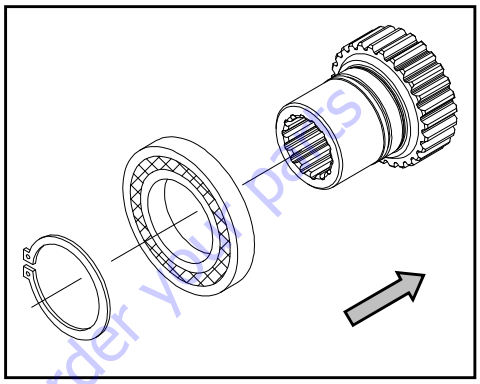
14. Fit the ball bearing into the input shaft and lock it with a Ø40 outer snap ring. Then mount the motor shaft in the spindle and lock with a BR68 ring. Lubricate the bearing.



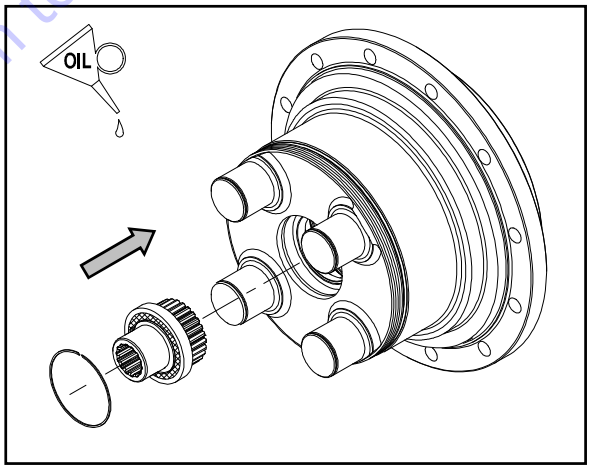
Assembly

1. Make sure all the component parts of the wheel gear are devoid of burrs, machining residues and that they are correctly washed.

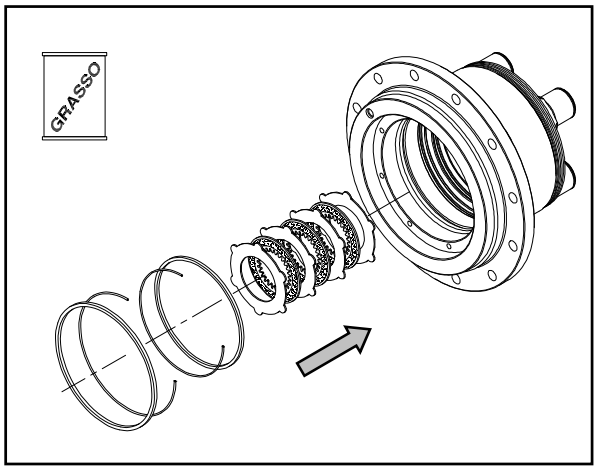
2. Fit the ball bearing in the input shaft and lock with a Ø40 outer snap ring.



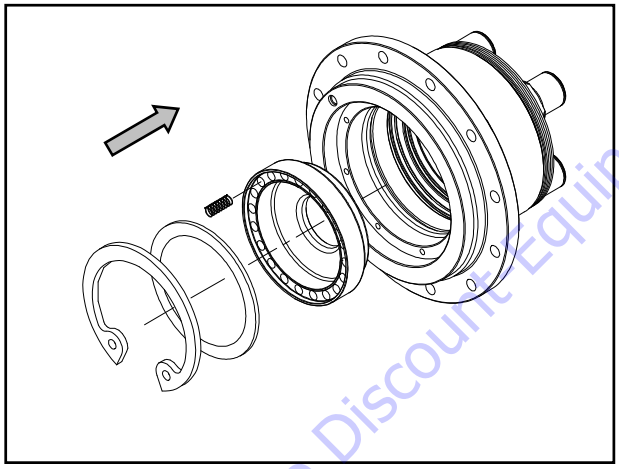
3. Mount the motor shaft in the spindle and lock with BR68 ring. Lubricate the bearing.



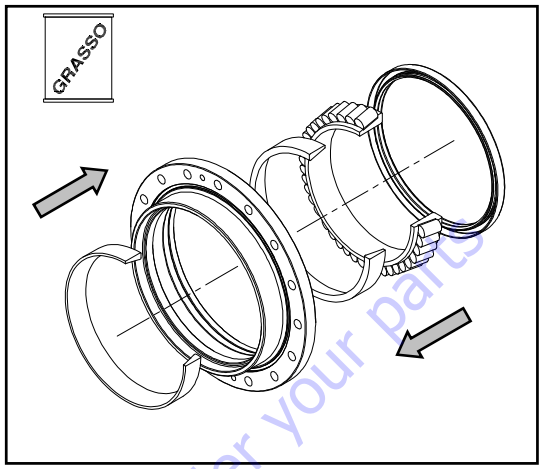
4. Fit the brake sealing rings O-Ring and PARBAK (lubricated with grease) in the respective spindle seats. Place the brake discs making sure to centre them on the spindle and on the input shaft.



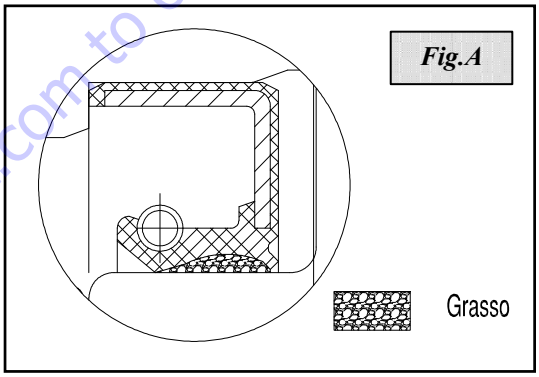
5. Insert the brake piston and place the springs into the piston holes. Close the brake fitting the spring holder plate, then lock with the Ø160 inner snap ring. Check the brake leakage, if any, as well as the static torque and minimum opening pressure.



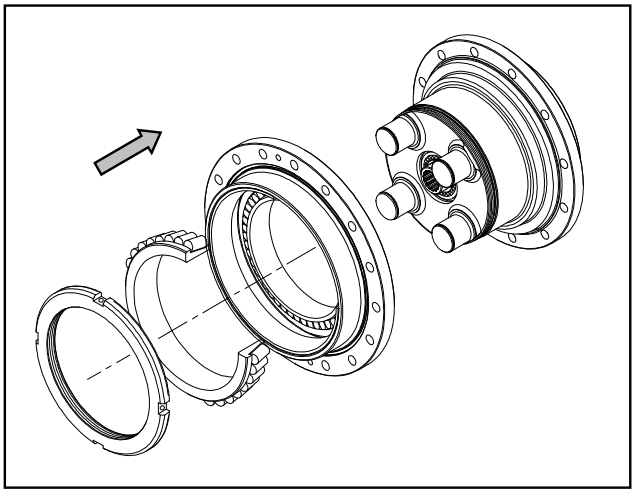
6. Prepare the hub support, mounting on it the two roller bearing outer tracks. Place the first roller bearing inner track.



7. Fit the oil seal lubricated with grease onto the support with the special spacer mounting (see figure A).

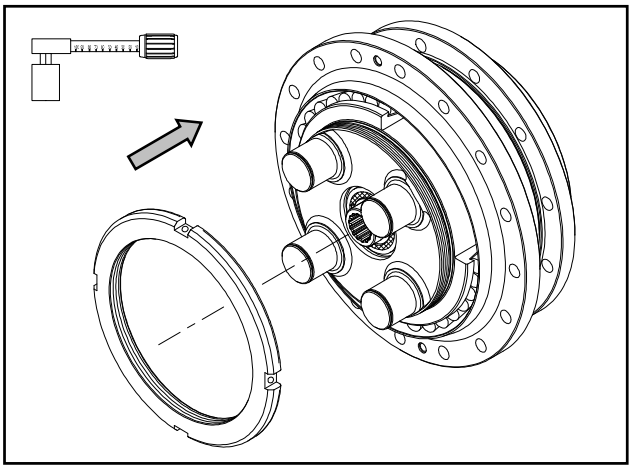


8. Place the hub support already assembled on the spindle making sure that the first roller bearing inner track goes correctly against it; then fit the second roller bearing inner track by means of the spacer mounting. Tighten the ring nut.

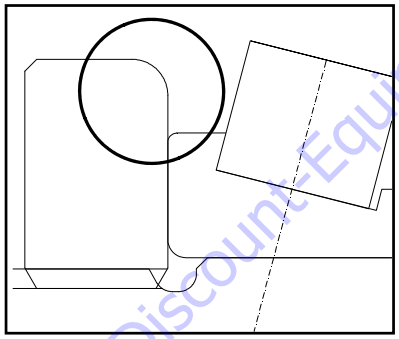


9. Now check the unit roll torque and proceed in the following order:

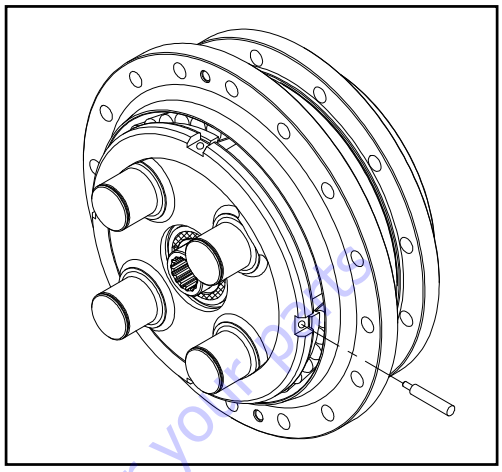
10. 7.) By keeping the spindle locked, apply a setting preload by tightening the ring nut at 40daNm, turn completely the hub support twice using the special wrench to recover any bearing cage misalignments. Release and tighten the ring nut at the final torque of 30daNm (alternate tightening and some setting turns). Check the roll torque with seal which must be within 1÷1,5 daNm.



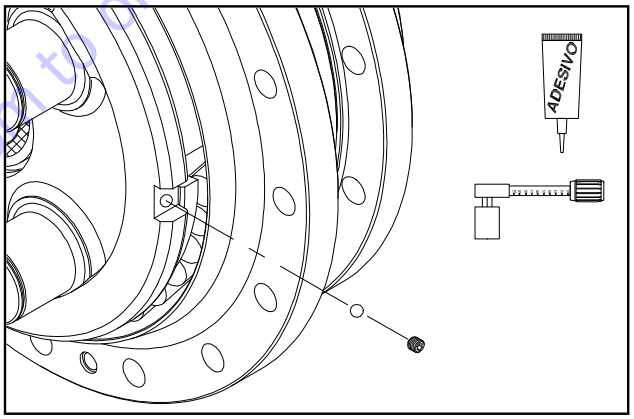
NOTE: *Place the ring nut with its convex part facing the roller bearing as shown below.*



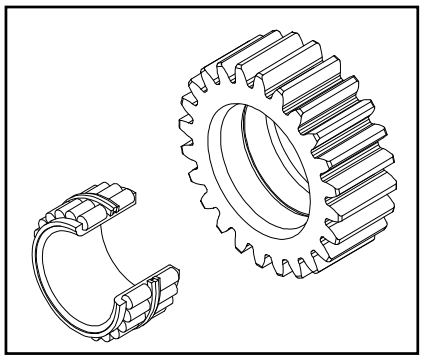
11. Using the special tool and hammer make four dents on the spindle thread by the M6 holes of the ring nut.

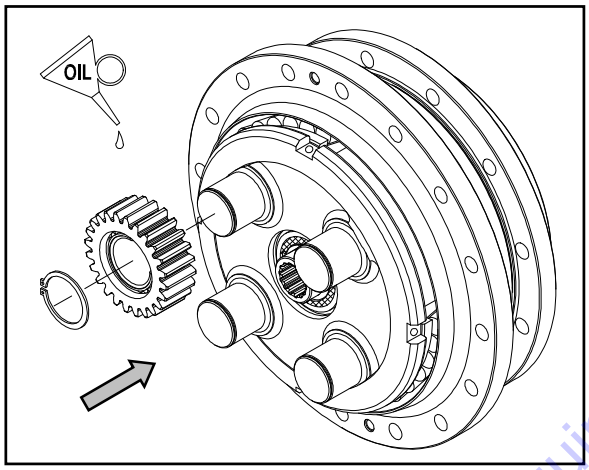


12. Fit the 4 3/16" balls and tighten with LOCTITE 243 the 4 M6x6 socket headless screws at the torque of 1daNm.

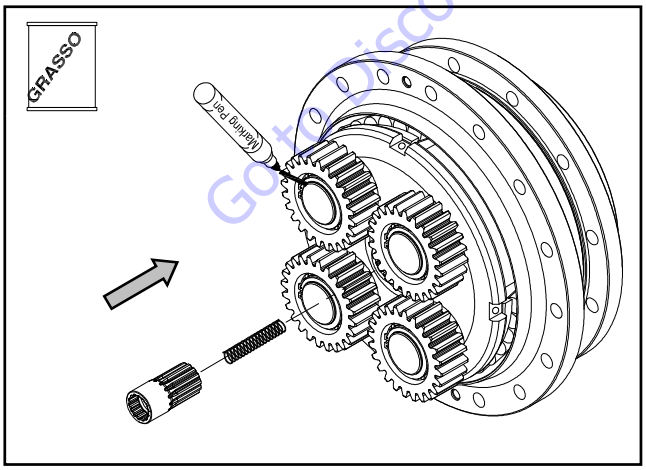


13. Fit the bearings onto the 3rd stage planetary gears and using a spacer mounting mount everything on the spindle pins. Lock with a ÿ40 outer snap ring. Lubricate the bearings.

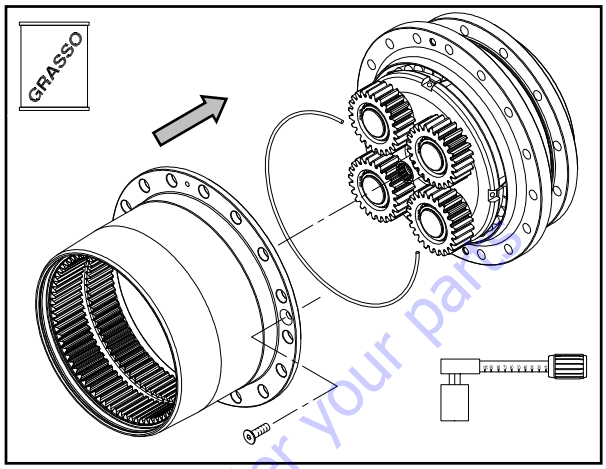




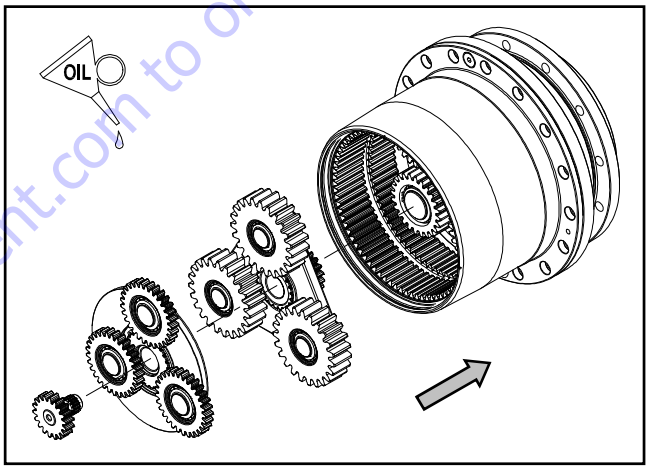
14. Using a marking pen, make a mark between the snap ring and the bearing. Fit the greased spring and the release joint. Use grease to fit the O-Ring 2-275 in the hub support seat.



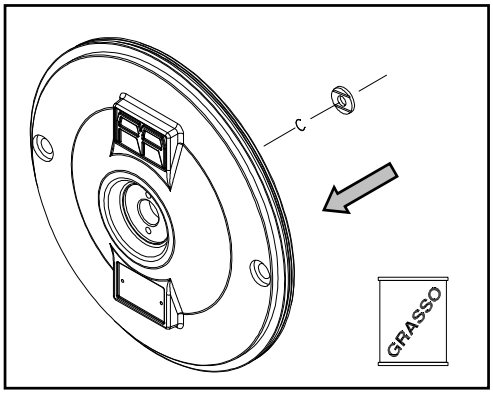
15. Place the hub onto the support making the two holes coincide for tightening the M10x25 flathead socket screws at the torque of 5daNm.



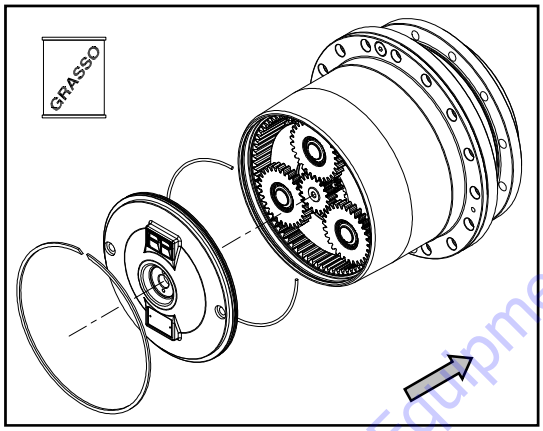
16. Fit the reduction gears and the pinion in the unit.



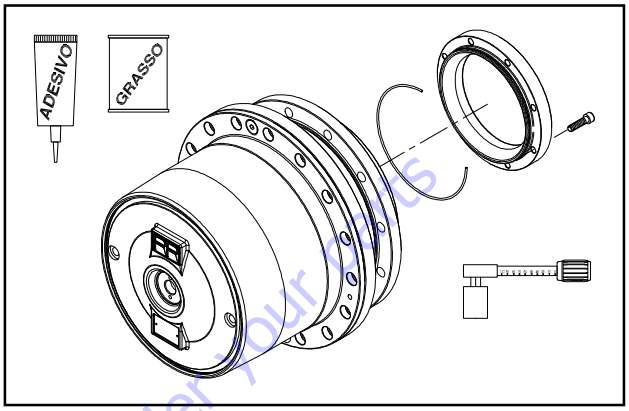
17. Prepare the closing cover fitting the O-ring 5-582 suitably greased and lock it with the shimming ring. Lubricate the bearings.



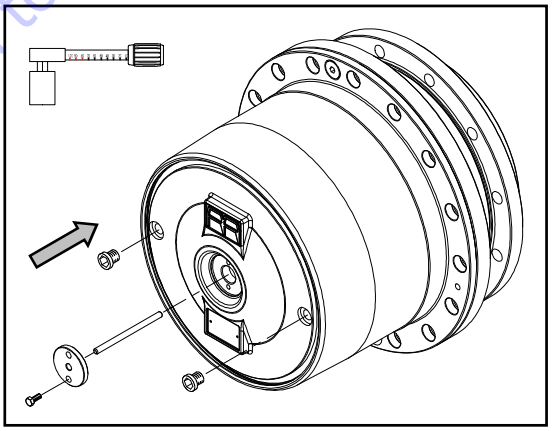
18. Fit the O-Ring 2-177 suitably greased, mount the cover locking it with the BR250 ring.

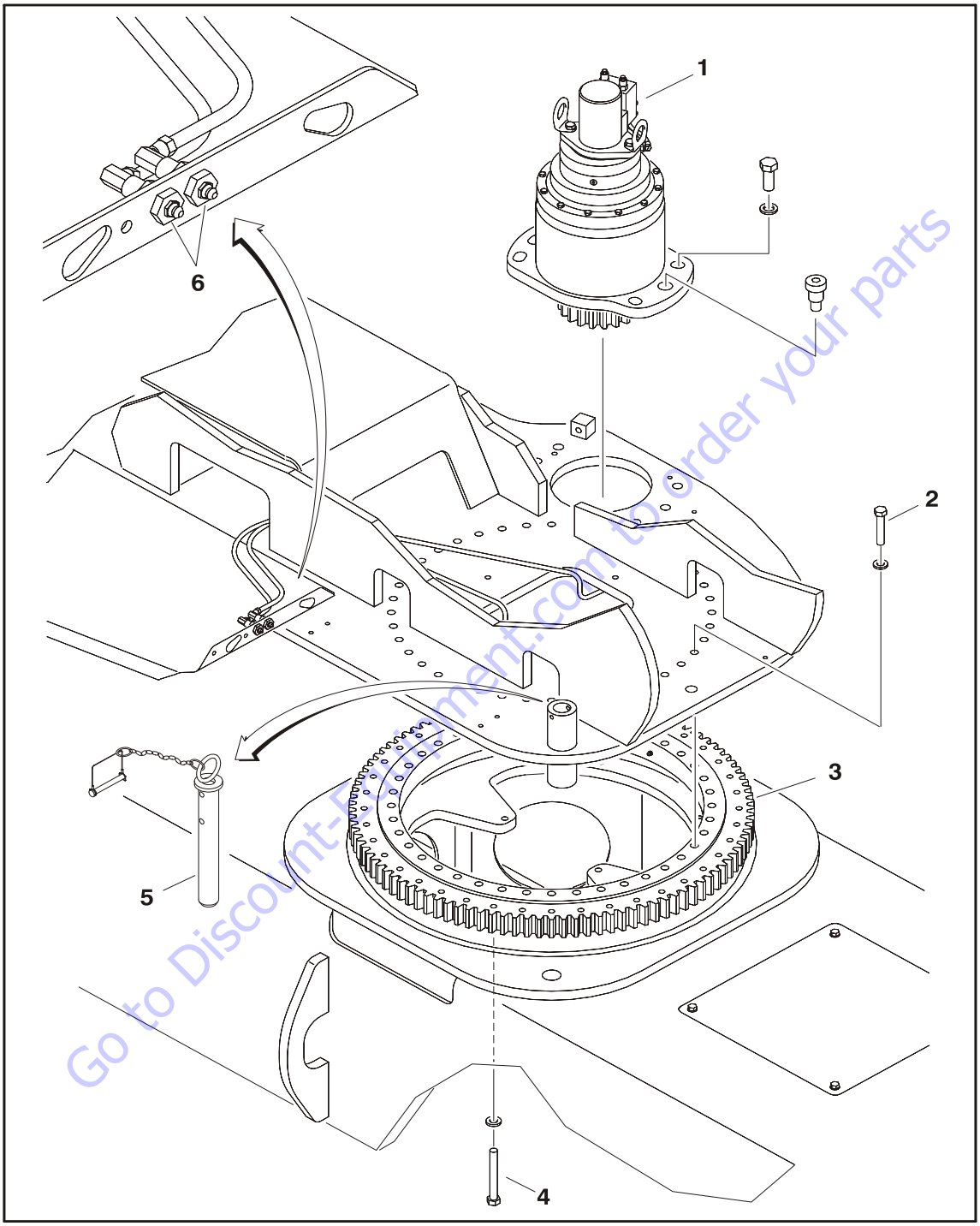


19. Fit the O-Ring 2-163 suitably greased, onto the motor coupling flange S-D LC/KC. Mount the flange on the spindle with 6 M8x25 socket cap screws at the torque of 2.4daNm with LOCTITE 243 Insert the pin and carry out the rotation test according to PGQ-22 standard.



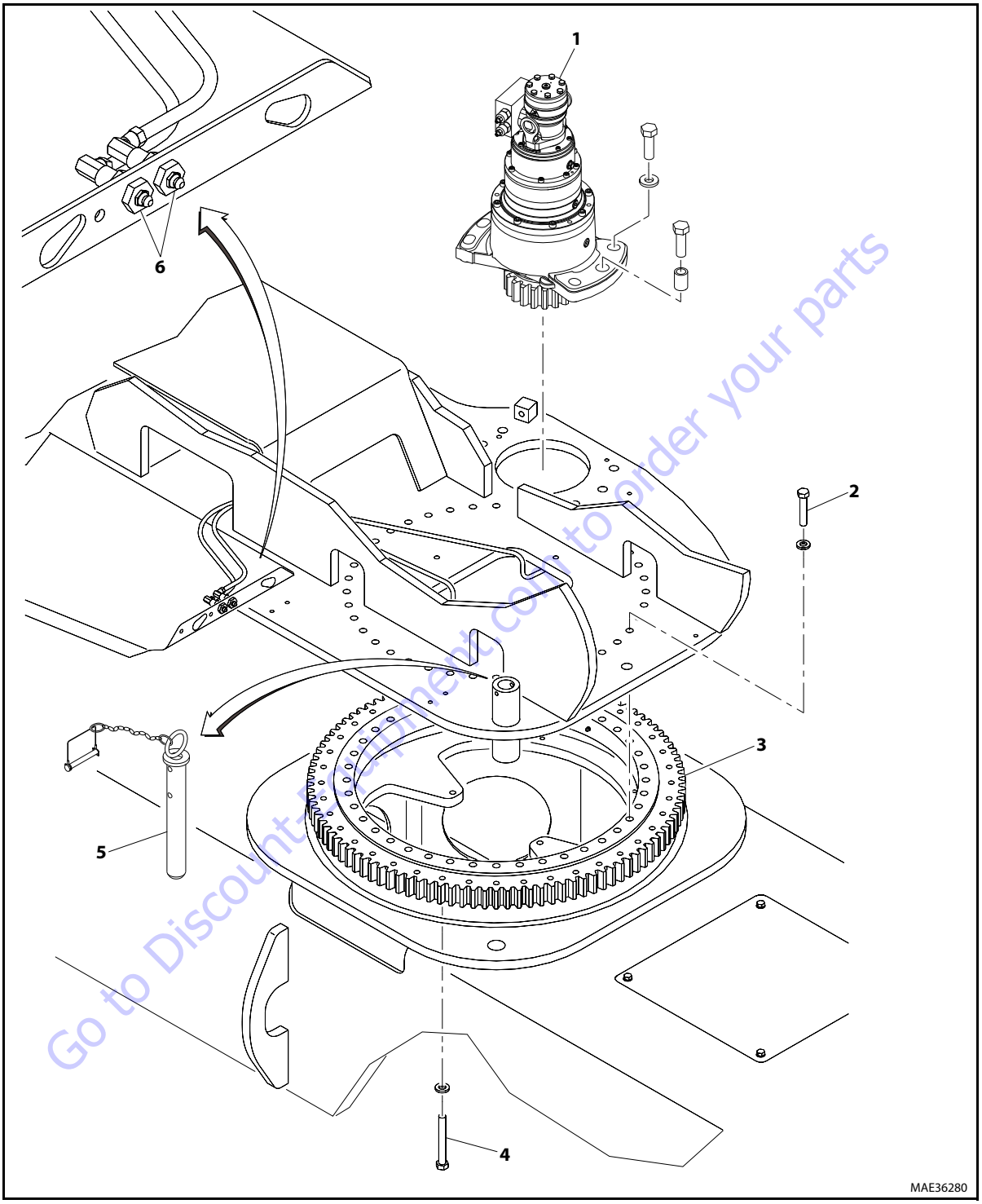
20. Mount the release cover fastening it with 2 M6x20 hexagonal screws at the torque of 1daNm. Mount the 1/4"GAS plugs on the cover at the torque of 1daNm.





1. Swing Drive
2. Inner Race Bearing Bolt
3. Swing Bearing
4. Outer Race Bearing Bolt
5. Turntable Lock Pin
6. Remote Bearing Lubrication Fittings

Figure 3-46. Swing System (SN 0300201016 through 0300254466, SN B300002238 to Present)



1. Swing Drive
2. Inner Race Bearing Bolt
3. Swing Bearing
4. Outer Race Bearing Bolt
5. Turntable Lock Pin
6. Remote Bearing Lubrication Fittings

Figure 3-47. Swing System (SN 0300254467 to Present)

3.17 SWING DRIVE

Roll and Leak Testing

Torque-Hub units should always be roll and leak tested before disassembly and after assembly to make sure that the unit's gears, bearings and seals are working properly. The following information briefly outlines what to look for when performing these tests.

NOTE: *The brake must be released before performing the roll test. This can be accomplished by either pressure testing using the Brake Leak Test procedure below or by tightening the 12 bolts into the piston through the end plate (See Brake Disassembly Procedure)*

NOTE: *Bolts must be removed while performing brake release test*

Roll Test

The purpose of the roll test is to determine if the unit's gears are rotating freely and properly. You should be able to rotate the gears in your unit by applying constant force to the roll checker. If you feel more drag in the gears only at certain points, then the gears are not rolling freely and should be examined for improper installation or defects. Some gear packages roll with more difficulty than others. Do not be concerned if the gears in your unit seem to roll hard as long as they roll with consistency.

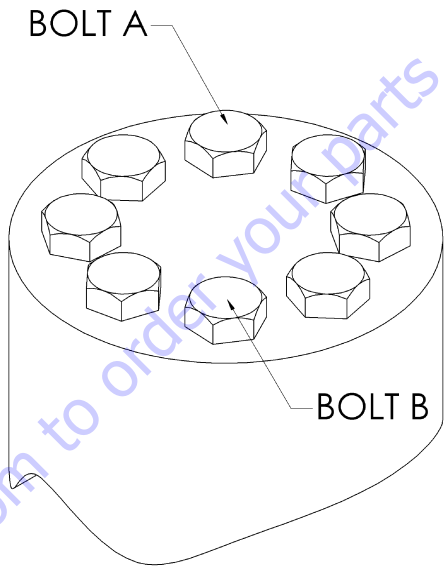
LEAK TEST (MAIN UNIT)

The purpose of a leak test is to make sure the unit is air tight. You can tell if your unit has a leak if the pressure gauge reading on your air checker starts to fall after the unit has been pressurized and allowed to equalize. Leaks will most likely occur at the pipe plugs, the main seal or wherever o-rings or gaskets are located. The exact location of a leak can usually be detected by brushing a soap and water solution around the main seal and where the o-rings or gaskets meet on the exterior of the unit, then checking for air bubbles. If a leak is detected in a seal, o-ring or gasket, the part must be replaced, and the unit rechecked. Leak test at 10 psi (0.7 bar) for 20 minutes.

Tightening and Torquing Bolts

If an air impact wrench is used to tighten bolts, extreme care should be taken to ensure that the bolts are not tightened beyond their specified torque.

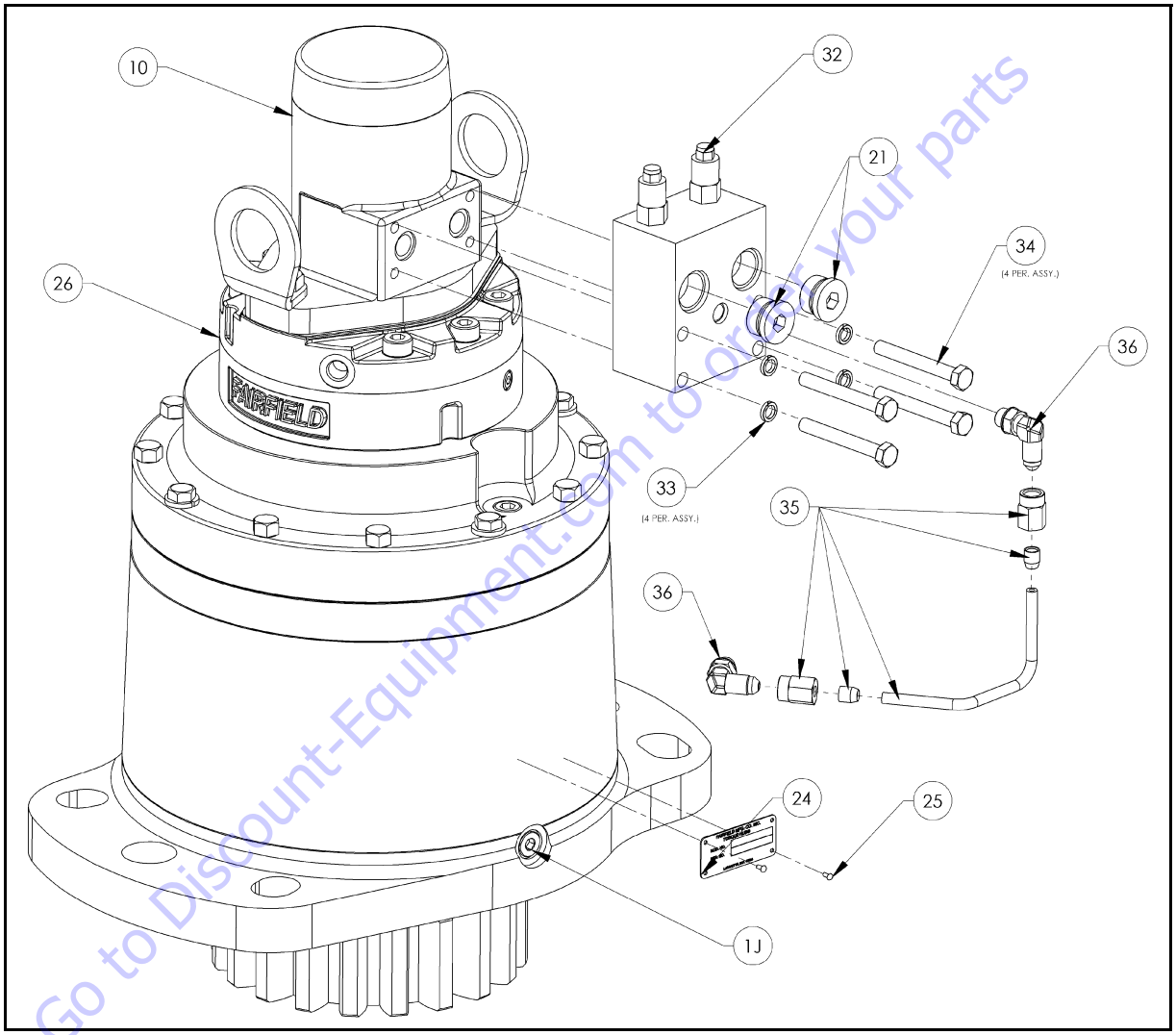
The following steps describe how to tighten and torque bolts or socket head cap screws in a bolt circle.



1. Tighten (but do not torque) bolt “A" until snug.
2. Go to the opposite side of the bolt circle and tighten bolt °B" until equally snug.
3. Crisscross around the bolt circle and tighten remaining bolts.
4. Now use a torque wrench to apply the specified torque to bolt "A".
5. Using the same sequence, crisscross around the bolt circle and apply an equal torque to the remaining bolts.

Motor Control Valve Disassembly

1. Place unit on bench with the motor end up.
2. Remove O-ring Plug (1J) and drain the oil from the gear-box.
3. Remove Hydraulic Tubing Assembly (35) by loosening fittings on both ends of tube with a wrench.
4. Using a wrench, loosen jam nuts on Elbow Fittings (36) and remove fittings from Brake (26) and Motor Control Valve (32).
5. Remove O-ring Plugs (21) from Motor Control Valve (32).
6. Remove Motor Control Valve (32) from Motor (10) by removing the four Bolts (34) and washers (33).

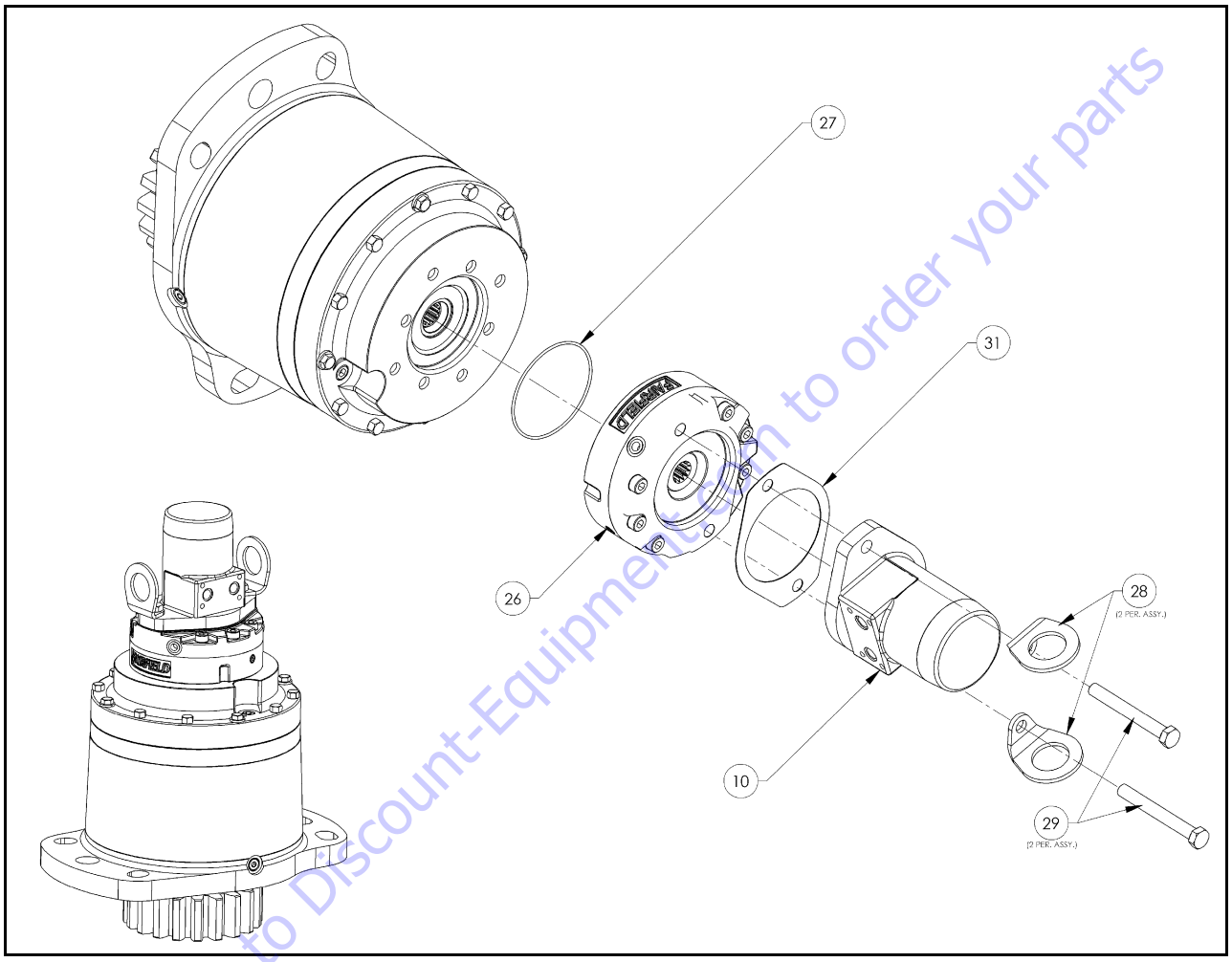


1J. O-Ring Plug
10. Hydraulic Motor
21. Plug
24. ID Plate
25. Drive Screw
26. Hydraulic Brake
32. Motor Control Valve
33. Lockwasher
34. Hex Bolt
35. Hydraulic Tubing
36. Elbow

Figure 3-48. Swing Drive - Motor Control Valve Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present)

Motor and Brake Disassembly

1. With unit resting on bench with Motor (10) end up, loosen Hex Bolts (29) and remove Lift Lugs (28) from the Motor (10).
2. Pull Motor (10) straight up and remove Motor (10) from Brake (26).
3. Remove Gasket (31) from between Brake (26) and Motor (10).
4. Remove Brake (26) from Main Torque-Hub Assembly and dump oil out of Brake (26).
5. Remove O-ring (27) from between Motor (10) and Brake (26).

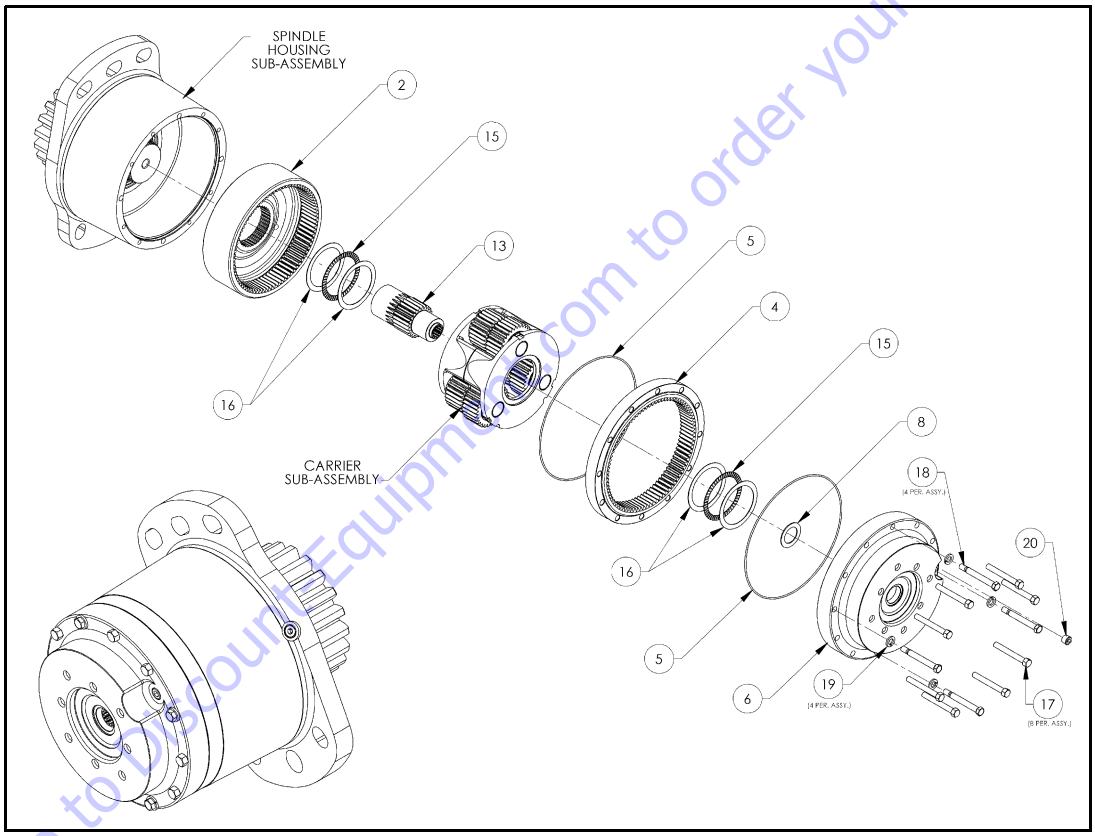


10. Hydraulic Motor
26. Hydraulic Brake
27. O-Ring
28. Lift Lug
29. Bolt
31. Gasket

Figure 3-49. Swing Drive - Motor and Brake Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present)

Main Disassembly

1. With the unit resting on the Output Shaft (Pinion) (1A), remove the eight Bolts (17), four Shoulder Bolts (18) and four Lock Washers (19) from the Input Cover (6).
2. Thread either 1/2-13 UNC eye bolts or motor mounting Bolts (29) into threaded holes in Input Cover (6) and pull Input Cover (6) off on the main assembly.
3. Remove O-ring (5) from between Input Cover (6) and Ring Gear (4).
4. Remove Thrust Washer (8) from end of Sun Gear (13).
5. Remove Sun Gear (13).
6. Remove Thrust Washers (16) and Thrust Bearing (15) from between Input Cover (6) and Carrier (3A) Subassembly.
7. Remove Ring Gear (4) from Housing (1G).
8. Remove O-ring (5) from between Ring Gear (4) and Housing (1G).
9. Remove Carrier (3A) Subassembly.
10. Remove Thrust Washers (16) and Thrust Bearing (15) from between Carrier (3A) Subassembly and Internal Gear (2).
11. Remove Internal Gear (2).



2. Internal Gear
4. Ring Gear
5. O-Ring
6. Input Cover
8. Hex Bolt
13. Sun Gear
15. Thrust Bearing
16. Thrust Washer
17. Hex Bolt
18. Shoulder Bolt
19. Lockwasher
20. Pipe Plug

Figure 3-50. Swing Drive - Main Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present)

Hub-Shaft Disassembly

1. Using retaining ring pliers, remove Retaining Ring (1I) from groove in Output Shaft (1A) and discard.

⚠ WARNING

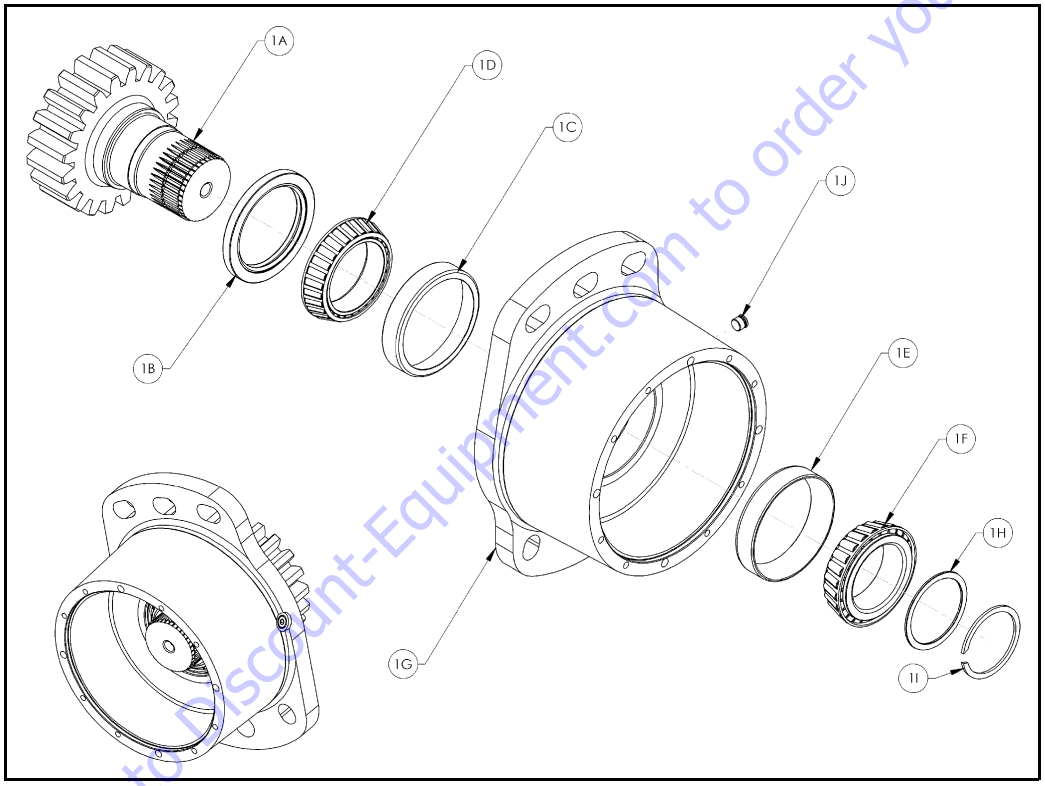
EYE PROTECTION SHOULD BE WORN DURING THIS PROCEDURE.

2. Remove Thrust Washer (1H).
3. While supporting the Housing (1G) on the Output Shaft (1A) end, press the Output Shaft (1A) out of the Housing (1G).

NOTE: *The Lip Seal (1B) may or may not be pressed out of the Housing (1G) by the Bearing Cone (1D) during this step.*

4. Remove the Bearing Cone (1F) from the Housing (1G).
5. Invert the Housing (1G) and remove the Lip Seal (1B) if not already removed when Output Shaft (1A) was pressed out of Housing (1G).
6. Remove the Bearing Cone (1D).
7. Bearing Cups (1C & 1E) will remain in Housing (1G).

NOTE: *If bearing replacement is necessary, the Bearing Cups (1C & 1E) can be removed with a slide hammer puller or driven out with a punch.*



1A. Output Shaft
1B. Lip Seal
1C. Tapered Bearing Cup
1D. Tapered Bearing Cone
1E. Tapered Bearing Cup
1F. Tapered Bearing Cone
1G. Housing
1H. Thrust Washer
1I. Retaining Ring
1J. O-Ring Plug

Figure 3-51. Swing Drive - Hub Shaft Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present)

Carrier Disassembly

1. Using a 3/16" (5 mm) punch drive the Roll Pin (3G) which holds the Planet Shaft (3E) in the Carrier (3A) down into the Planet Shaft (3E) until it bottoms.

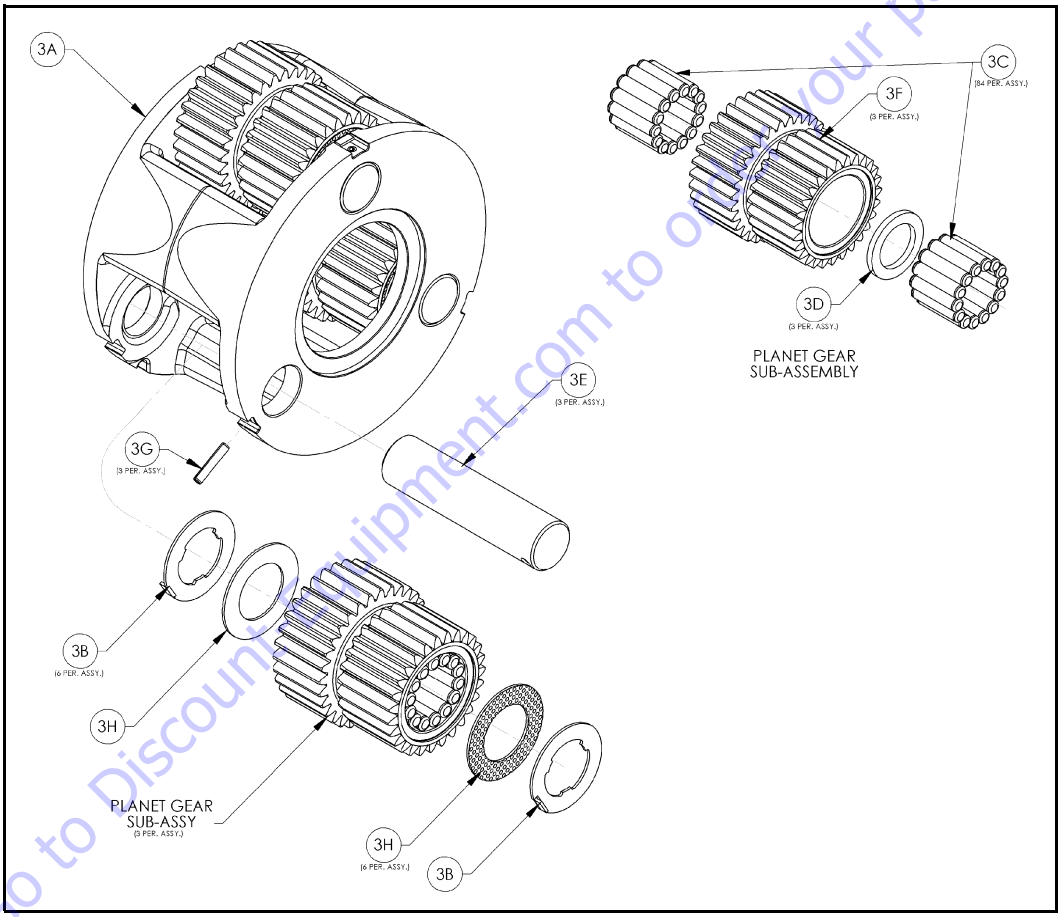
NOTE: *Make sure that the Roll Pin has bottomed. Otherwise, damage to the carrier could occur when the Planet Shaft is removed.*

2. Remove the Planet Shaft (3E) from the Carrier (3A). Use a small punch to remove the Roll Pin (3G) from the Planet Shaft (3E).

3. Slide the Planet Gear (3F), two Ball-Indented Thrust Washers (3H) and the two Thrust Washers (3B) out of the Carrier (3A).

4. Remove both rows of Needle Bearings (3C) and the Spacer (3D) from the bore of the Planet Gear (3F).

5. Repeat Steps 1 thru 4 for the remaining two Cluster Gears(3F).



3A. Carrier
3B. Tanged Thrust Washer
3C. Needle Bearing
3D. Thrust Washer
3E. Planet Shaft
3F. Cluster Gear
3G. Roll Pin
3H. Ball Indented Washer

Figure 3-52. Swing Drive - Carrier Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present)

Hub-Shaft Sub-Assembly

NOTE: *Refer to Figure 3-51., Swing Drive - Hub Shaft Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present).*

1. Press Bearing Cone (1D) onto Shaft (1A).
2. Press Bearing Cup (1C) into Housing (1G), take care to insure cup starts square with bore of Hub (1G).
3. Place Bearing Cone (1D) in Bearing Cup (1C) in Housing 1G).
4. Press or tap Seal (1B) into the counterbore of Housing (1G) to the point where it becomes flush with the Housing (1G) face. Care should be taken to insure Seal (1B) is being correctly installed (smooth face up).
5. Invert Hub (1G) and press Bearing Cup (1E) into counterbore of Housing (1G).
6. Carefully lower Housing (1G) onto the Output Shaft (1A).
7. Start the Bearing Cone (1F) onto the Output Shaft (1A).
8. Press or tap the Bearing Cone (1F) onto the Output Shaft (1A) until it is seated in the Bearing Cup (1E).
9. Install Bearing Spacer (1H) onto Output Shaft (1A) and against Bearing Cone (1F).
10. Install Retaining Ring (1I) into the groove in the Output Shaft (1A). This Retaining Ring (1I) should never be reused in a repair or rebuild.

⚠ WARNING

EYE PROTECTION SHOULD BE WORN DURING THIS PROCEDURE.

11. Tap the Retaining Ring (1I) with a soft metal punch to ensure that the Retaining Ring (1I) is completely seated in the groove of the Output Shaft (1A).

⚠ WARNING

EYE PROTECTION SHOULD BE WORN DURING THIS PROCEDURE.

12. Install O-ring Plug (1J) and torque 23 to 24 ft-lbs.(32 - 33.5 Nm).

Carrier Sub-Assembly

NOTE: *Refer to Figure 3-52., Swing Drive - Carrier Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present).*

1. Apply a liberal coat of grease to the bore of Cluster Gear (3F). This will enable the Needle Rollers (3C) to be held in place during assembly.
2. Install the first row of 14 Needle Rollers (3C) into the bore of Cluster Gear (3F).
3. Insert Spacer (3D) into bore of Cluster Gear (3F) on top of the Needle Rollers (3C).
4. Place second row of Needle Rollers (3C) into bore of Cluster Gear (3F) against Spacer (3D) and remove Planet Shaft (3E).
5. Place Carrier (3A) into tool fixture so that one of the roll pin holes is straight up.
6. Start Planet Shaft (3E) through the hole in Carrier (3A). Using ample grease to hold it in position, slide one Thrust Washer (3B) over the Planet Shaft (3E) with the tang resting in the cast slot of the Carrier (3A). Place Ball-Indented Thrust Washer (3H) on the Planet Shaft (3E) with the indents against the first washer.
7. With large end of Cluster Gear (3F) facing the roll pin hole in the carrier, place the cluster gear into position in Carrier (3A) and push Planet Shaft (3E) through the Cluster Gear (3F) without going all the way through.
8. Slide the second Thrust Washer (3E) between the Cluster Gear (3F) and the Carrier (3A) with the tang of the washer located in the cast slot of the Carrier (3A). Slide ball-indented Thrust Washer (3H) onto the end of the Planet Shaft with the indents against the second thrust Washer. Finish sliding the Planet Shaft (3E) through the Thrust Washers (3H) & (3B) and into the Carrier (3A).
9. Position the non-chamfered side on the Planet Shaft (3E) roll pin hole so that it is in line with the hole in the Carrier (3A) using a 1/8" (3 mm) diameter punch.
10. After using a 3/16" (5 mm) punch to align the two roll pin holes. Drive the Roll Pin (3G) through Carrier (3A) and into the Planet Shaft (3E) until the Roll Pin (3G) is flush with the bottom of the cast tang slot in the Carrier (3A). Use a 1/4" (6 mm) pin punch to make sure the Roll Pin (3G) is flush in the slot.
11. Repeat Steps 1 thru 10 for the remaining two Cluster Gears(3F).

Main Assembly

NOTE: *Refer to Figure 3-50., Swing Drive - Main Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present).*

1. With the Hub Shaft Sub-Assembly resting on the Shaft (1A) install Internal Gear (2). The spline of the Internal Gear (2) bore will mesh with the spline of the Output Shaft (1A).
2. Inspect the location of the Internal Gear (2) on the Output Shaft (1A). The portion of the Output Shaft (1A), which does not have full spline, should protrude through the Internal Gear (2) bore.
3. Install two Thrust Washers (15) and one Thrust Bearing (16) on the portion of Output Shaft (1A) which protrudes through Internal Gear (2).
4. Center the Input Gear (13) on the end of the Output Shaft (1A) opposite the gear with the large diameter down.
5. Place O-ring (5) into Hub counter-bore. Use grease to hold O-ring in place.

⚠ WARNING

BEWARE OF SHARP EDGES OF THE COUNTER BORE WHILE SEATING THIS O-RING.

6. Also at this time locate and mark the four counter reamed holes in the face of the Hub (1G). This is for identification later in the assembly.
7. Place Carrier (3A) Subassembly on bench with the large end of Cluster Gears (3F) up with one at the 12 o clock position. Find the punch marked tooth on each gear at the large end and locate at 12 o'clock (straight up) from each planet pin. Marked tooth will be located just under the Carrier on upper two gears. Check the timing through the slots in the carrier.
8. With large shoulder side of Ring Gear (4) facing down, place Ring Gear (4) over (into mesh with) large end of gears. Be sure that punch marks remain in correct location during Ring Gear (4) installation. The side of the Ring Gear (4) with an "X" or punch mark stamped on it should be up.
9. While holding Ring Gear (4) and Cluster Gears (3F) in mesh, place small end of Cluster Gears (3F) into mesh with the Internal Gear (2) and Input Gear (13). On the Ring Gear (4) locate the hole marked "X", or punch marked, over one of the marked counter-bored holes (Step 5) in Hub (1G). Check timing through the slots in the carrier. Rotate carrier in assembly to check for freedom of rotation.

NOTE: ***NOTE:*** *If gears do not mesh easily or Carrier Assembly does not rotate freely, then remove the Carrier and Ring Gear and check the Cluster Gear timing*

10. Install Thrust Washer (15)/Thrust Bearing (16) set into the counter-bore in the face of the carrier. Use grease to hold in place.
11. Place O-ring (5) into Cover (6) counter-bore. Use grease to hold O-Ring in place.

⚠ WARNING

CAUTION: BEWARE OF SHARP EDGES OF THE COUNTER-BORE WHILE SEATING THIS O-RING.

12. Using sufficient grease to hold in place, install Thrust Washer (8) into the counter-bore of the interface of the Cover (6).
13. The Cover (6) is now installed, taking care to correctly align Pipe Plug hole (20) with those in the Hub (1J). Check timing sheet.
14. Locate the 4 counter-bored holes in Hub (1G) [marked in Step 5] and install 4 Shoulder Bolts (18) with Lockwashers (19). Start the shoulder bolts by hand.
15. Install Grade 8 Bolts (17) with Lockwashers (19) into remaining holes.
16. Torque Shoulder Bolts (18) 43 to 47 ft.-lbs. (60 to 65 Nm) and Grade 8 Bolts (17) to 43 to 47 ft.-lbs. (60 to 65 Nm). Roll and leak test the assembly.
17. With gearbox standing on the pinion end fill gearbox with GEAROIL 80W90, to bottom of plug hole in cover at Pipe Plug (20).
18. Install Pipe Plug (20) into Cover (6) using thread sealant.

Motor and Brake Assembly

NOTE: *Refer to Figure 3-49., Swing Drive - Motor and Brake Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present).*

1. Place O-ring (27) onto end of Brake (26) and locate brake into pilot of cover.
2. Place Gasket (31) onto the brake face and line up the holes.
3. Place Motor (10) into Brake pilot against the Gasket (31).
4. Assemble Lift Lugs (28) onto Hex Bolts (29). Assemble Hex Bolts (29) with Lift Lugs through the Motor (10) and Brake (26) against the motor flange. Torque to 35 ft-lbs.
5. Fill Brake (26) with 2.7 oz. (80cc) of BRAKOILVG32 (DTE24).

Motor Control Valve Assembly

NOTE: *Refer to Figure 3-48., Swing Drive - Motor Control Valve Disassembly (SN 0300201016 through 0300254466, SN B300002238 to Present).*

1. Lay assembly down with motor ports facing up. Remove the two plastic plugs in the motor ports, being careful not to loose the O-ring in each port. Assemble the Motor control Valve (32) onto the Motor (10) with Bolt (34) and Lock Washers (33). Torque Bolts (33) 23 to 27 ft-lbs. (32 to 38 Nm).

NOTE: *Be sure to align the holes in the control valve with the motor ports.*

2. Install Elbow Fittings (36) into Brake (26) and torque 13 to 15 ft-lbs. (18 to 21 Nm).
3. Install Elbow Fittings (36) into Motor Control Valve (32) and torque to 13 to 15 ft-lbs. (18 to 21 Nm).
4. Assemble Tube (35) into Elbow Fittings (36) and torque 13 to 15 ft-lbs. (18 to 21 Nm).
5. Install O-ring Plugs (21) into Motor Control Valve (32) and torque 30 to 31 ft-lbs. (42 to 43 Nm).
6. Pressure test brake, tube and control valve connections by applying 3000 psi (207 bar) pressure to the brake bleed port and holding for 1 minute. Check for leaks at the control-valve-motor interface and the tube connections. Release pressure.
7. Place I.D. Plate (24) onto Housing (1G) with two Drive Screws (25). I.D. Plate (24) is to be inline with O-ring Plug (1J) as shown on assembly print.

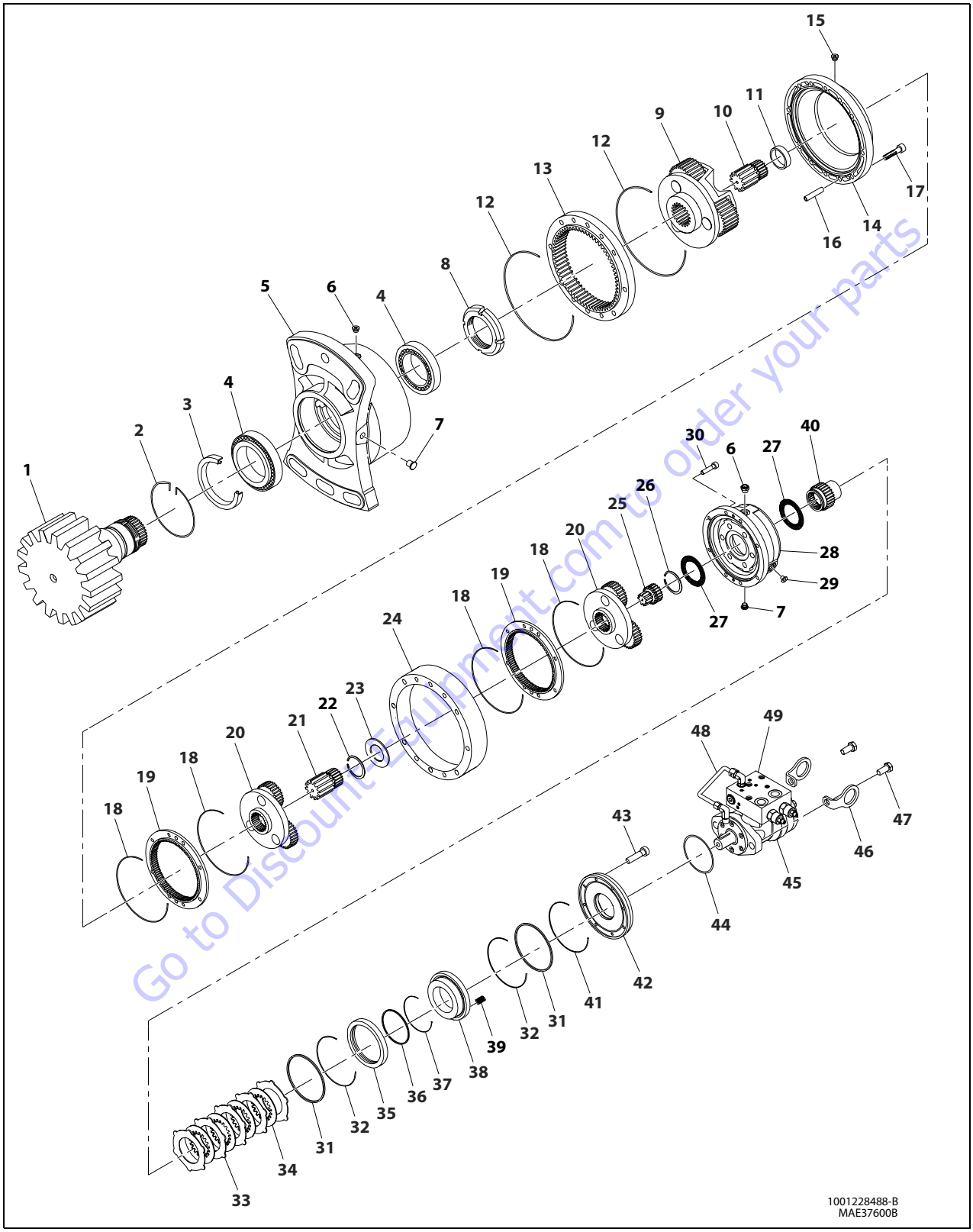


Figure 3-53. Swing Motor (SN 0300254467 to Present)- Sheet 1 of 2

1. Shaft
2. Ring
3. Oil Seal
4. Bearing
5. Support
6. O-ring Plug
7. O- ring Plug
8. Nut Ring
9. Reduction Gear
10. Pinion
11. Spacer
12. O-Ring
13. Planetory Gear
14. Spacer
15. O-Ring Plug
16. Spring
17. Capscrew
18. O-ring
19. Planetory Ring
20. Reduction Gear
21. Pinion
22. Ring
23. Spacer
24. Spacer
25. Pinion
26. Ring
27. Washer
28. Brake Housing
29. Plug
30. Capscrew
31. Seal
32. O-Ring
33. Steel Disc
34. Disc
35. Disc
36. Seal
37. O-ring
38. Piston Brake
39. Spring Brake
40. Shaft Input
41. O-ring
42. Cover
43. Screw
44. O-ring
45. Motor
46. Lung Lifting
47. Capscrew
48. Brake valve adapter
49. Valve

Figure 3-54. Swing Motor (SN 0300254467 to Present)- Sheet 2 of 2

3.18 SWING BRAKE

Pre-Installation Checks

MECHANICAL

Check, That in the handling prior to assembly, the mounting features and other parts of the brake are undamaged. Ensure that the shaft to which the brake is mounted are clean and free from burrs and swellings.

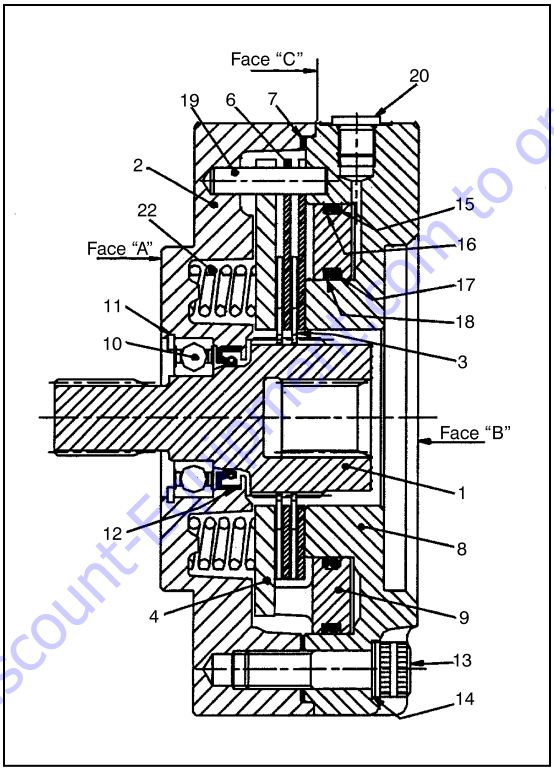
HYDRAULIC/MECHANICAL

To check brake release, connect an appropriate hydraulic pressure supply set to the required level up to a maximum of 3000 psi (200bar) and check that brake shaft (1) is free to rotate.

Remove hydraulic supply from brake, checking to ensure that the friction plates (3 & 6) have engaged thus preventing rotation of brake shaft (1)

NOTICE

RELEASE PRESSURE DURING BENCH TESTING SHOULD BE LIMITED TO 2000 PSI (138 BAR) UNLESS BRAKE IS FULLY INSTALLED USING 2-OFF 1/2" UNC MOUNTING BOLTS IN THE THROUGH (MOUNTING) HOLES.



1. Brake Shaft
2. Housing
3. Inner Friction Plate
4. Pressure Plate
5. Gasket
6. Outer Plate
7. Gasket
8. Cylinder
9. Piston
10. Deep Groove Ball Bearing
11. Internal Retaining Ring
12. Rotary Shaft Seal
13. Socket Head Cap Screw
14. Shakeproof Washer
15. O-Ring
16. Backing Ring
17. O-Ring
18. Backing Ring
19. Dowel Pin
20. Hexagon Plug
21. Plastic Plug

21A. Socket Pressure Plug

22. Spring (Natural)
23. Spring (Blue)

Figure 3-55. Swing Brake

Installation

Position 1-off gasket (5) over male pilot on brake housing (4).
Locate brake shaft (1) and secure brake in position using 2-off 1/2" UNC mounting bolts in the through mounting (fixing) holes provided.
Connect hydraulic pressure supply to brake pressure inlet port. Ensure that the hydraulic pressure is set to the required level up to a maximum of 3000 psi (200 bar) and check that the brake disengages and re-engages correctly.

Maintenance

The brake is required to be kept in good working order and must be included in the planned maintenance program for the equipment to which the brake is installed.
This must include torque testing together with inspection and replacement of the working parts such as friction plates (3 & 6) and, springs (22 & 23). The frequency of inspection depends on the duty demanded of the brake.

Disassembly

To remove brake from its installed position, reverse procedure previously described in the installation instructions.
Place the complete brake assembly on a clean, dry work bench.

Remove external gasket (5) as necessary.

NOTE: *Refer to Diagrams for the following.*

1. Supporting brake face "A", remove the six socket head cap screws and washers (items 13 & 14) in equal increments to ensure the spring pressure within the brake is reduced gradually and evenly.
   Alternatively, if press is available, the cylinder housing (8) can be restrained on face "B" while removing the six socket head cap screws and washers (13 & 14).
   The brake assembly can now be fully dismantled and parts examined.
2. Remove cylinder housing (8) and piston (9) subassembly and dismantle if required, removing O-ring seals (15 & 17) and backing rings (16 & 18) as necessary.
3. Remove gasket (7) from housing (2).
4. Remove friction plates (3 & 6) and pressure plate (4).
5. Remove 2-off dowel pins (19).
6. Remove springs (8). Take note of quantity and orientation of springs.
7. Should it be necessary to replace ball bearing (10) or shaft seal (12), reverse remainder of brake sub-assembly, supporting on face "c" of housing (2).
8. Remove internal retaining ring (11).
9. Using arbor press or similar to break Loctite seal, remove brake shaft (1) from housing (2) and lay aside.
10. Reverse housing (2) and press out ball bearing (10). Shaft seal (12) can also be removed if necessary.

Examination

All components can now be examined and inspected, paying particular attention to the following.

1. Inspect friction plates (3 & 6) and friction surface on pressure plate (4) for wear or damage.
2. Examine friction plates (3) and brake shaft (1) for wear or damage to splines.
3. Examine input and output splines of brake shaft (1) for wear or damage.
4. Examine compression springs (22 & 23) for damage or fatigue.
5. Check ball bearing (10) for axial float or wear.
6. Examine O-ring seals (15 & 17) and backing rings (16 & 18) for damage.
7. Obtain replacement parts as required.

Assembly

Clean all parts thoroughly.
Reverse procedure previously outlined in Dismantling instructions taking particular care with.

   a. Assembly of shaft seal (12).
   b. Assembly of bearing (10).
   c. Quantity and orientation of springs (8).
   d. Assembly sequence of friction plates (3 & 6).

1. Lightly lubricate rotary shaft seal (12) and assemble to housing (2) taking care not to damage seal lip.

2. Apply ring of Loctite 641 or equivalent adhesive to full circumference of housing (2) bearing recess adjacent to shoulder.
   Apply complete coverage of Loctite 641 to outside diameter of bearing (10) and assemble fully in housing (2), retaining with internal retaining ring (11). Remove excess adhesive with clean cloth.
   Press shaft (1) through bearing (10), ensuring bearing inner ring is adequately supported.
3. Assemble correct quantity of springs (8) in orientation required. Refer to (See Figure 3-56.) and (See Figure 3-57.).

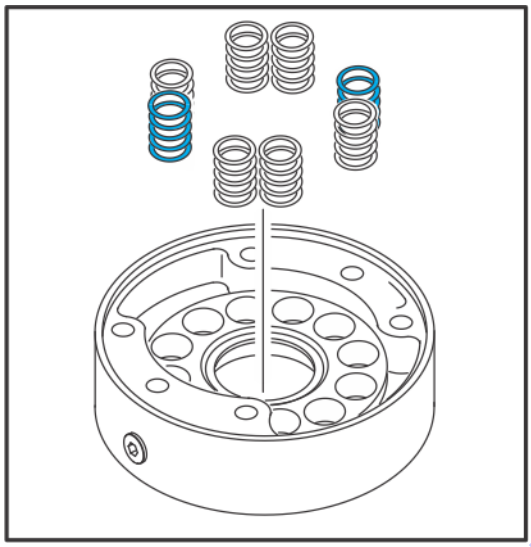


Figure 3-56. Swing Brake 8 Spring Orientation

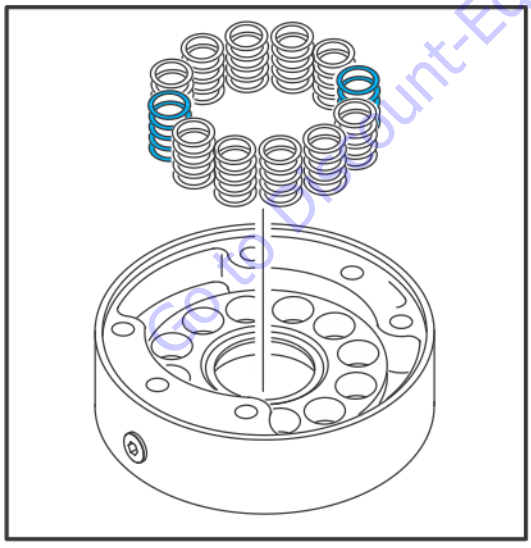
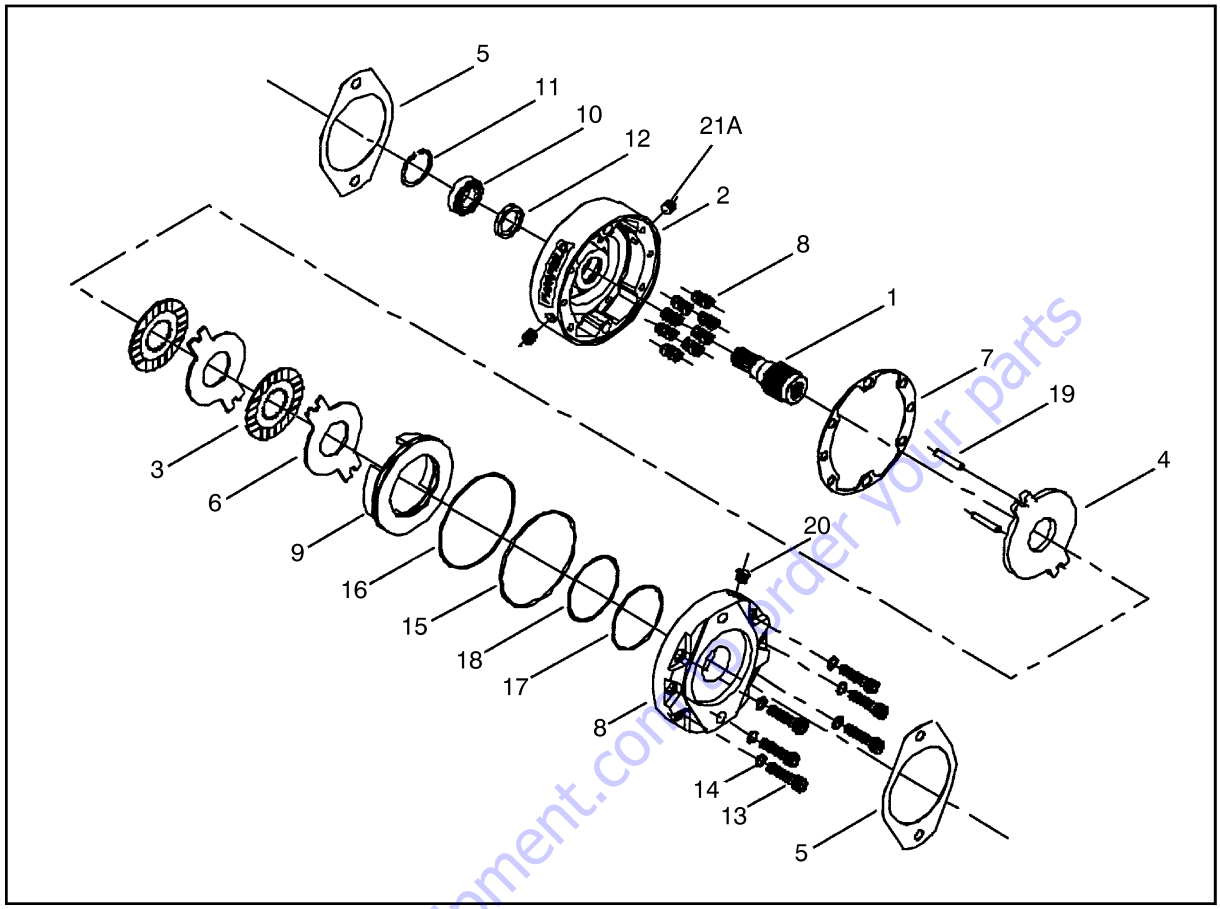


Figure 3-57. Swing Brake 12 Spring Orientation

4. Lubricate O-ring seals (15 & 17) with Molykote 55M (or equivalent) silicone grease and assemble together with backing rings (16 & 18) to piston (9). To ensure correct brake operation, it is important that the backing rings are assembled opposite ti the pressurized side of piston (9).
5. Correctly orientate piston (9) aligning spaces with the two dowel pin holes and, assemble into cylinder housing (2) taking care not to damage seals and carefully lay aside.
6. Loctite 2-off pins (19) in housing (2) followed by pressure plate (4) and friction plates i.e. an inner (3) followed by an outer (6) in correct sequence.
7. Position gasket (7) in correct orientation.
8. Align two holes in cylinder with dowel pins (19) and assemble piston & cylinder sub-assembly to remainder of brake securing with 6-off socket head cap screws and washers (13 & 14). Torque to 55ft/lbs. (75 Nm).

NOTE: *The use of a suitable press (hydraulic or arbor) Pressing down on cylinder end face "B" will ease assembly of the socket head cap screws (13).*



1. Brake Shaft
2. Housing
3. Inner Friction Plate
4. Pressure Plate
5. Gasket
6. Outer Plate
7. Gasket
8. Cylinder
9. Piston
10. Deep Groove Ball Bearing
11. Internal Retaining Ring
12. Rotary Shaft Seal
13. Socket Head Cap Screw
14. Shakeproof Washer
15. O-Ring
16. Backing Ring
17. O-Ring
18. Backing Ring
19. Dowel Pin
20. Hexagon Plug
21. Plastic Plug

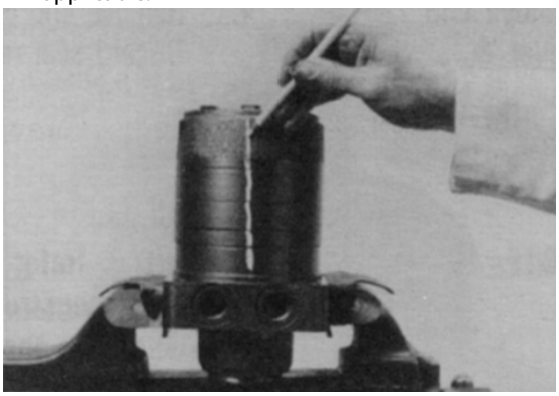
21A. Socket Pressure Plug

Figure 3-58. Swing Brake Assembly

3.19 SWING MOTOR

Disassembly and inspection

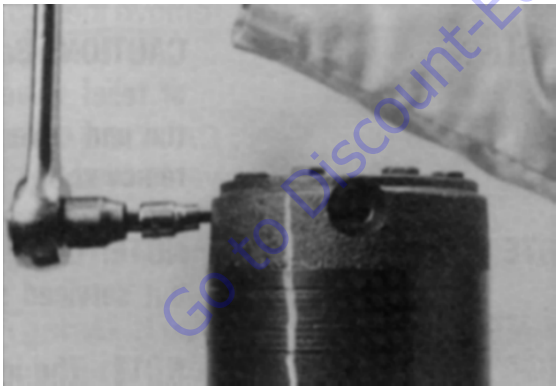
1. Place the Torqlink™ in a soft jawed vice, with coupling shaft (12) pointed down and the vise jaws clamping firmly on the sides of the housing (18) mounting flange or port bosses. Remove manifold port O-Rings (18A) if applicable.

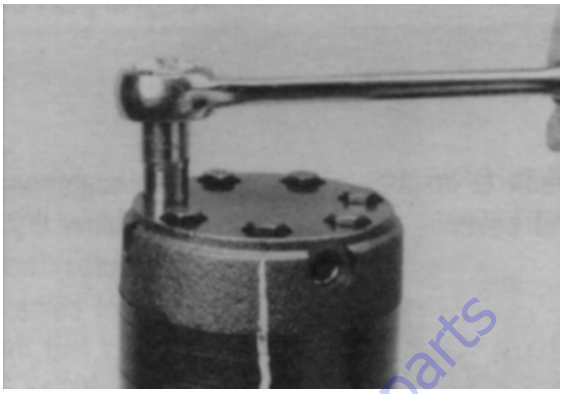


⚠ WARNING

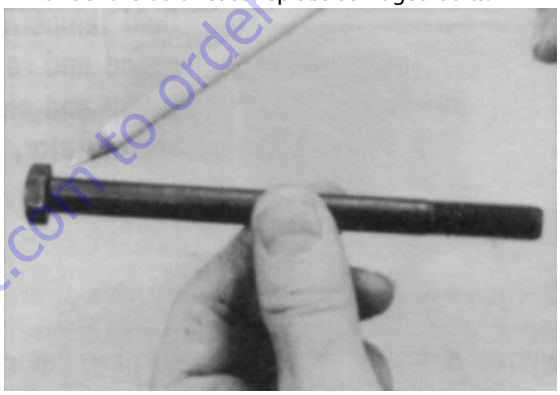
IFTHETORQLINK™ IS NOT FIRMLY HELD IN THE VISE, IT COULD BE DISLODGED DURINGTHE SERVICE PROCEDURES, CAUSING INJURY.

2. Scribe an alignment mark down and across the Torqlink™ components from end cover (2) to housing (18) to facilitate reassembly orientation where required. Loosen two shuttle or relief valve plugs (21) for disassembly later if included in end cover. 3/16 or 3/8 inch Allen wrench or 1 inch hex socket required.

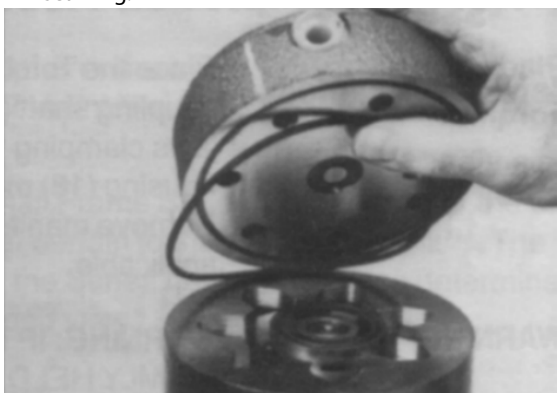




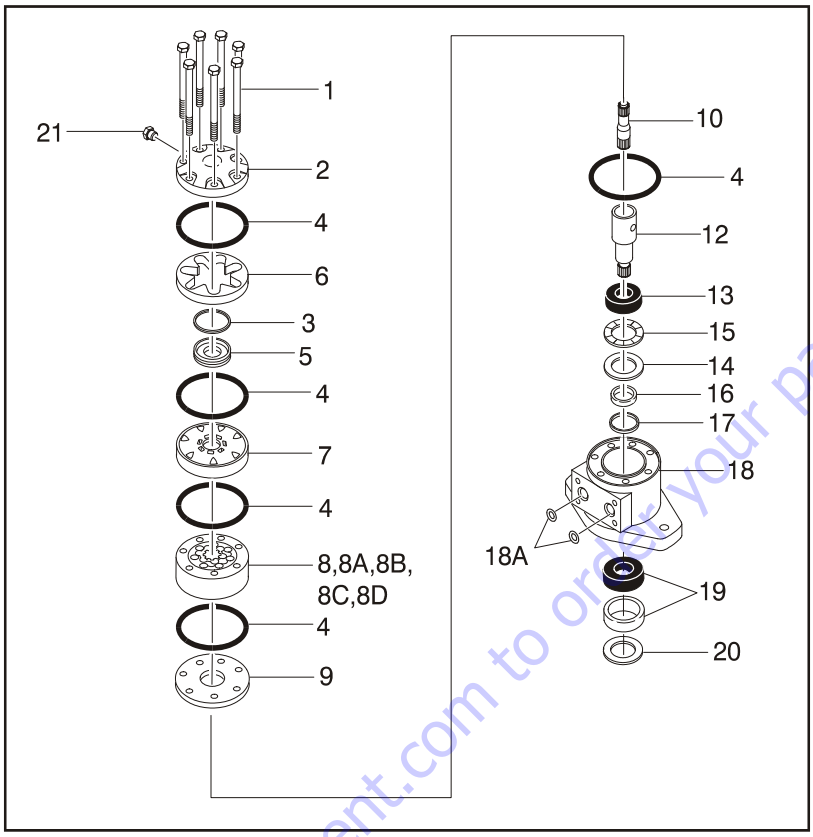
3. Remove the five, six, or seven special ring head bolts (1) using an appropriate 1/2 or 9/16 inch size socket. Inspect bolts for damaged threads, or sealing rings, under the bolt head. Replace damaged bolts.



4. Remove end cover assembly (2) and seal ring (4). Discard seal ring.



NOTE: *Refer to the appropriate "alternate cover construction" on the exploded view to determine the end cover construction being serviced.*



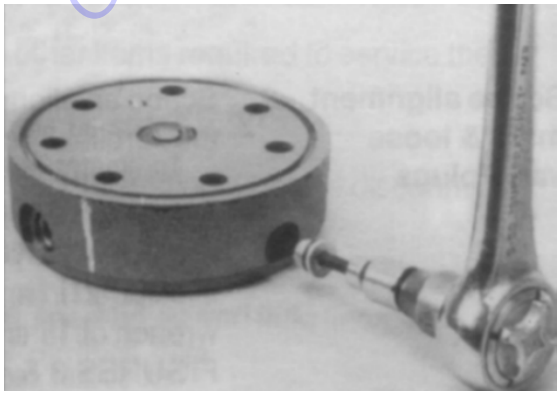
1. Special Bolts
2. End Cover
3. Seal Ring-Commutator
4. Seal Ring
5. Commutator Ring
6. Commutator Ring
7. Manifold
8. Rotor Set

8A. Rotor
8B. Stator or Stator Vane
8C. Vane
8D. Stator Half
9. Wear Plate
10. Drive Link
11. Not Used
12. Coupling Shaft
13. Bearing/Bushing, Inner
14. Thrust Washer
15. Thrust Bearing
16. Seal
17. Backup Washer
18. Housing

18A. O-Ring
19. Bearing/Bushing, Outer
20. Dirt & Water Seal
21. Plug

Figure 3-59. Swing Drive Motor

5. If the end cover (2) is equipped with shuttle valve components, remove the two previously loosened plugs (21).

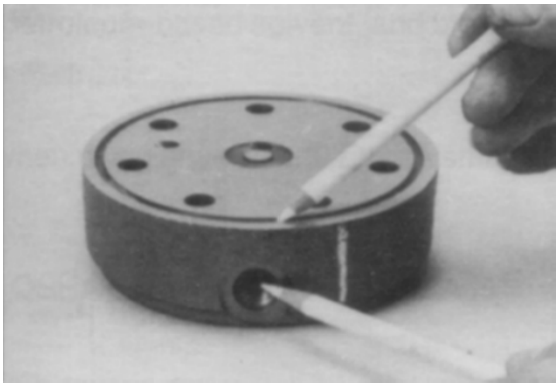


NOTICE

BE READY TO CATCH THE SHUTTLE VALVE OR RELIEF VALVE COMPONENTS THAT WILL FALL OUT OF THE END COVER VALVE CAVITY WHEN THE PLUGS ARE REMOVED.

NOTE: *The insert and if included the orifice plug in the end cover (2) must not be removed as they are serviced as an integral part of the end cover.*

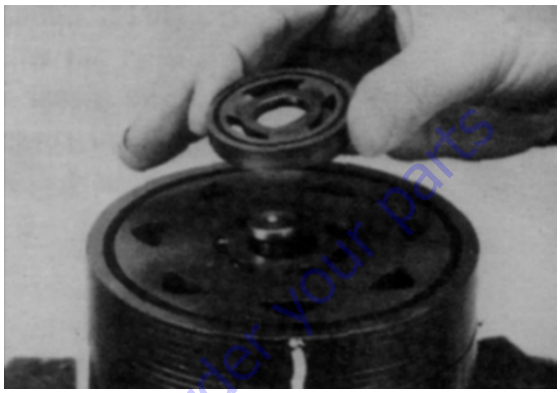
6. Thoroughly wash end cover (2) in proper solvent and blow dry. Be sure the end cover valve apertures, including the internal orifice plug, are free of contamination. Inspect end cover for cracks and the bolt head recesses for good bolt head sealing surfaces. Replace end cover as necessary.

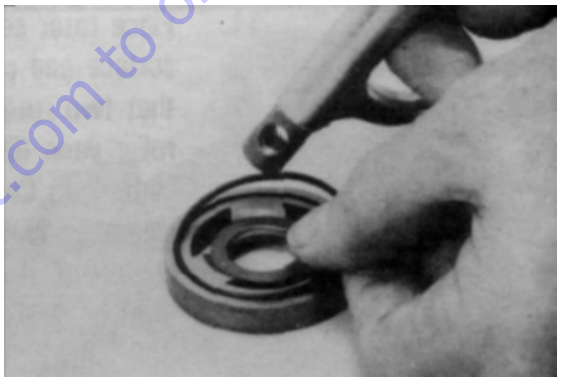


NOTE: *A polished pattern (not scratches) on the cover from rotation of the commutator (5) is normal. Discoloration would indicate excess fluid temperature, thermal shock, or excess speed and require system investigation for cause and close inspection of end cover, commutator, manifold, and rotor set.*

7. Remove commutator ring (6). Inspect commutator ring for cracks, or burrs.

8. Remove commutator (5) and seal ring (3) Remove seal ring from commutator, using an air hose to blow air into ring groove until seal ring is lifted out and discard seal ring. Inspect commutator for cracks or burrs, wear, scoring, spalling or brinelling. If any of these conditions exist, replace commutator and commutator ring as a matched set.

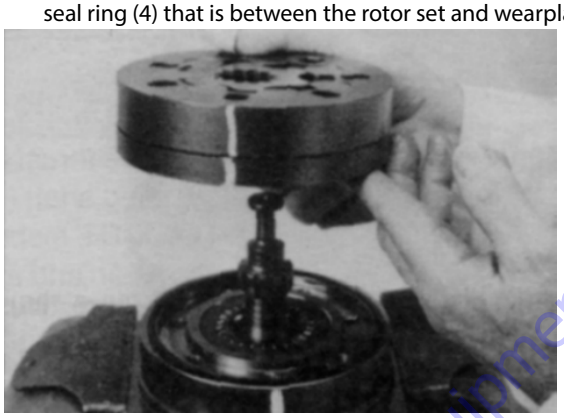




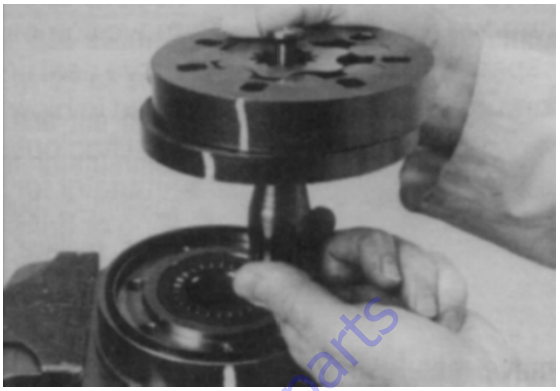
9. Remove manifold (7) and inspect for cracks surface scoring, brinelling or spalling. Replace manifold if any of these conditions exist. A polished pattern on the ground surface from commutator or rotor rotation is normal. Remove and discard the seal rings (4) that are on both sides of the manifold.

NOTE: *The manifold is constructed of plates bonded together to form an integral component not subject to further disassembly for service. Compare configuration of both sides oft hem an if old to ensure that same surface is reassembled against the rotor set.*

10. Remove rotor set (8) and warplane (9), together to retain the rotor set in its assembled form, maintaining the same rotor vane (8C) to stator (8B) contact surfaces. The drive link (10) may come away from the coupling shaft (12) with the rotor set, and wearplate.You may have to shift the rotor set on the warplane to work the drive link out of the rotor (8A) and warplane. Inspect the rotor set in its assembled form for nicks, scoring, or spalling on any surface and for broken or worn splines. If the rotor set component requires replacement, the complete rotor set must be replaced as it is a matched set. Inspect the warplane for cracks, brinelling, or scoring. Discard seal ring (4) that is between the rotor set and wearplate.



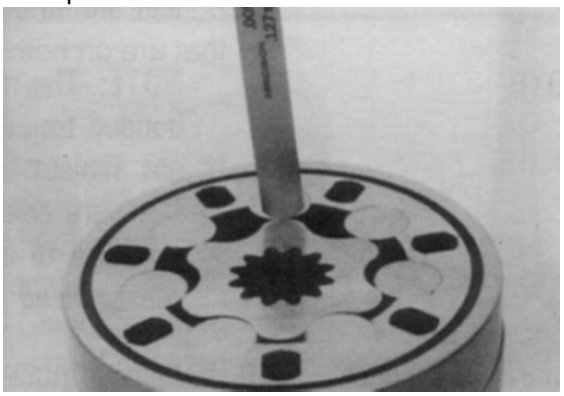
NOTE: *The rotor set (8) components may become disassembled during service procedures. Marking the surface of the rotor and stator that is facing UP with etching ink or grease pencil before removal from Torqlink™ will ensure correct reassembly of rotor into stator and rotor set intoTorqlink™.Marking all rotor components and mating spline components for exact repositioning at assembly will ensure maximum wear life and performance of rotor set andTorqlink™.*



NOTE: *Series TG Torqlinks™ may have a rotor set with two stator halves (8B) with a seal ring (4) between them and two sets of seven vanes (8C). Discard seal ring only if stator halves become disassembled during the service procedures.*

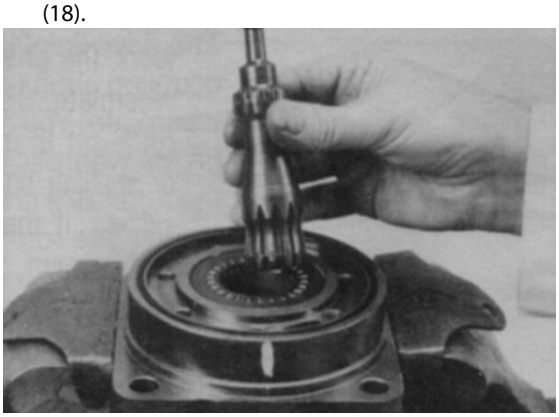
NOTE: *A polished pattern on the wear plate from rotor rotation is normal.*

11. Place rotor set (8) and wear plate (9) on a flat surface and center rotor (8A) in stator (8B) such that two rotor lobes (180 degrees apart) and a roller vane (8C) centerline are on the same stator centerline. Check the rotor lobe to roller vane clearance with a feeler gage at this common centerline. If there is more than 0.005 inches (0.13 mm) of clearance, replace rotor set.



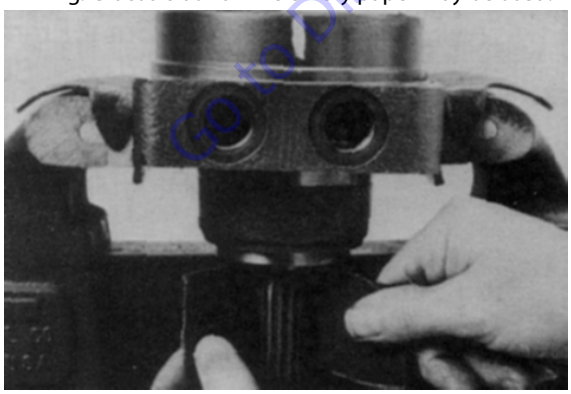
NOTE: *If rotor set (8) has two stator halves (8B & 8D) and two sets of seven vanes (8C & 8E) as shown in the alternate construction TG rotor set assembly view, check the rotor lobe to roller vane clearance at both ends of rotor.*

12. Remove drive link (10) from coupling shaft (12) if it was not removed with rotor set and wear plate. Inspect drive link for cracks and worn or damaged splines. No perceptible lash (play) should be noted between mating spline parts. Remove and discard seal ring (4) from housing (18).

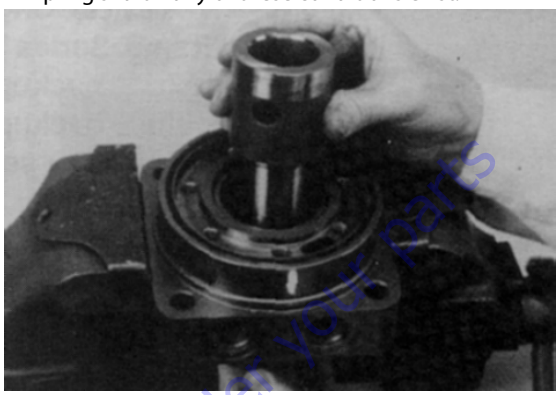


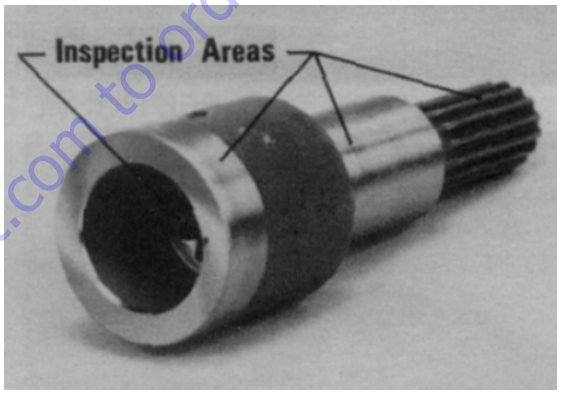
13. Remove thrust bearing (11) from top of coupling shaft (12). Inspect for wear, brinelling, corrosion and a full complement of retained rollers.

14. Check exposed portion of coupling shaft (12) to be sure you have removed all signs of rust and corrosion which might prevent its withdrawal through the seal and bearing. Crocus cloth or fine emery paper may be used.



15. Remove coupling shaft (12), by pushing on the output end of shaft. Inspect coupling shaft bearing and seal surfaces for spalling, nicks, grooves, severe wear or corrosion and discoloration. Inspect for damaged or worn internal and external splines or keyway. Replace coupling shaft if any of these conditions exist.





NOTE: *Minor shaft wear in seal area is permissible. If wear exceeds 0.020 inches (0.51 mm) diametrically, replace coupling shaft.*

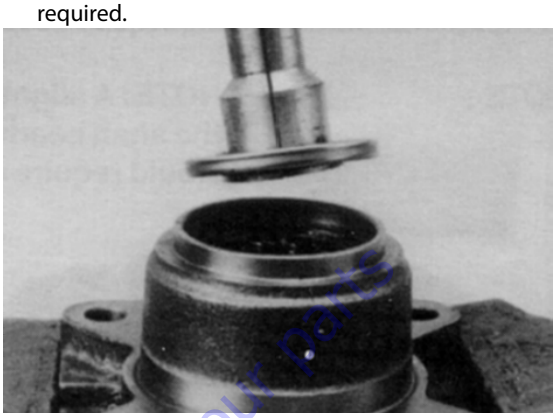
NOTE: *A slight "polish" is permissible in the shaft bearing areas. Anything more would require coupling shaft replacement.*

16. Remove and discard seal ring (4) from housing (18).

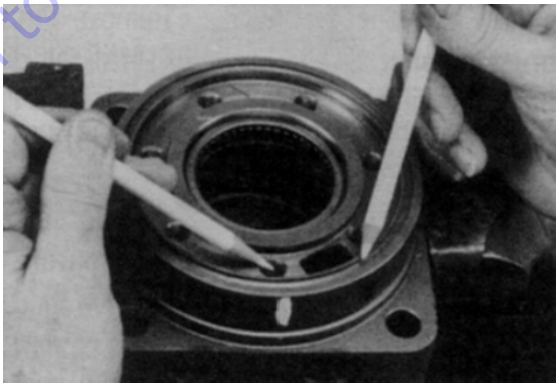
17. Remove thrust bearing (15) and thrust washer (14) Inspect for wear, brinelling, corrosion and a full complement of retained rollers.

18. Remove seal (16) and back up washer (17) from Small Frame, housing (18). Discard both.

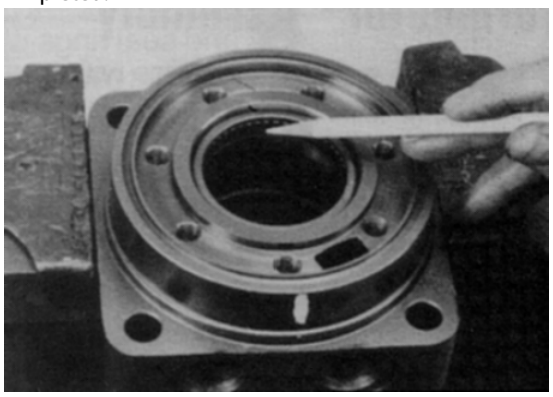
19. Remove housing (18) from vise, invert it and remove and discard seal (20). A blind hole bearing or seal puller is required.

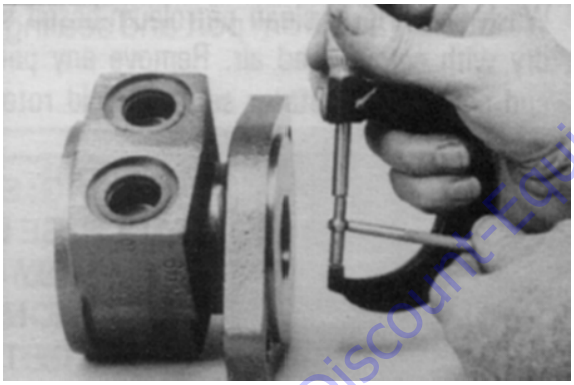


20. Inspect housing (18) assembly for cracks, the machined surfaces for nicks, burrs, brinelling or corrosion. Remove burrs that can be removed without changing dimensional characteristics. Inspect tapped holes for thread damage. If the housing is defective in these areas, discard the housing assembly.

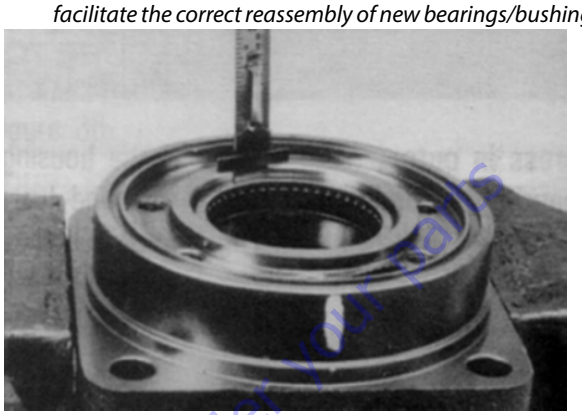


21. If the housing (18) assembly has passed inspection to this point, inspect the housing bearings/bushings (19) and (13) and if they are captured in the housing cavity the two thrust washers (14) and thrust bearing (15). The bearing rollers must be firmly retained in the bearing cages, but must rotate and orbit freely. All rollers and thrust washers must be free of brinelling and corrosion. The bushing (19) or (13) to coupling shaft diameter clearance must not exceed 0.010 inch (0.025 mm). A bearing, bushing, or thrust washer that does not pass inspection must be replaced. If the housing has passed this inspection the disassembly of the Torqlink™ is completed.

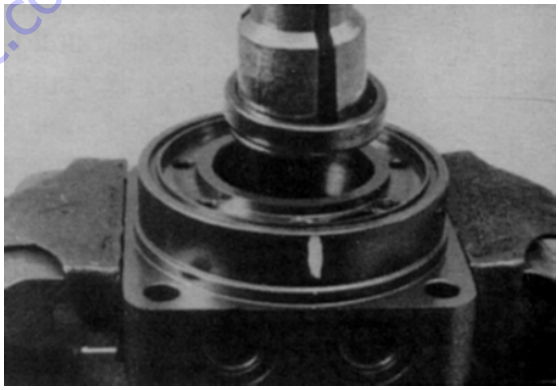


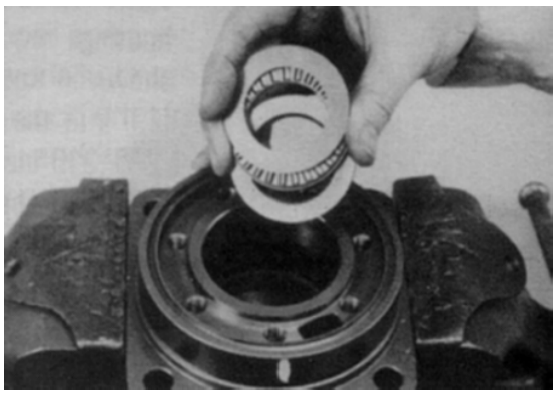


NOTE: *The depth or location of bearing/bushing (13) in relation to the housing wear plate surface and the depth or location of bearing/bushing (19) in relation to the beginning of bearing/bushing counter bore should be measured and noted before removing the bearings/ bushings. This will facilitate the correct reassembly of new bearings/bushings.*



22. If the bearings, bushing or thrust washers must be replaced use a suitable size bearing puller to remove bearing/bushings (19) and (13) from housing (18) without damaging the housing. Remove thrust washers (14) and thrust bearing (15) if they were previously retained in the housing by bearing (13).





Assembly

Replace all seals and seal rings with new ones each time you reassemble the Torqlink™ unit. Lubricate all seals and seal rings with SAE 10W40 oil or clean grease before assembly.

NOTE: *Individual seals and seal rings as well as a complete seal kit are available. The parts should be available through most OEM parts distributors or Parker approved Torqlink™ distributors. (Contact your local dealer for availability).*

NOTE: *Unless otherwise indicated, do not oil or grease parts before assembly.*

Wash all parts in clean petroleum-based solvents before assembly. Blow them dry with compressed air. Remove any paint chips from mating surfaces of the end cover, commutator set, manifold rotor set, wear plate and housing and from port and sealing areas.

⚠ DANGER

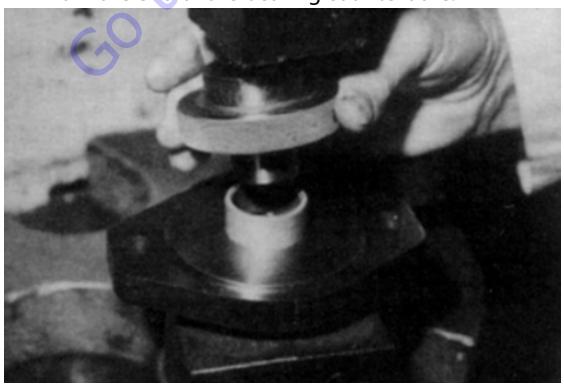
SINCE THEY ARE FLAMMABLE, BE EXTREMELY CAREFUL WHEN USING ANY SOLVENT. EVEN A SMALL EXPLOSION OR FIRE COULD CAUSE INJURY OR DEATH.

⚠ WARNING

WEAR EYE PROTECTION AND BE SURE TO COMPLY WITH OSHA OR OTHER MAXIMUM AIR PRESSURE REQUIREMENTS.

1. If the housing (18) bearing components were removed for replacement, thoroughly coat and pack a **new** outer bearing/bushing (19) with clean corrosion resistant grease recommended in the material section. Press the new bearing/bushing into the counterbore at the mounting flange end of the housing, using the appropriate sized bearing mandrel, which will control the bearing/ bushing depth.

   Torqlink™ housings require the use of bearing mandrel to press bearing/ bushing (19) into the housing to a required depth of 0.151/0.161 inches (3.84/4.09 mm) from the end of the bearing counterbore.



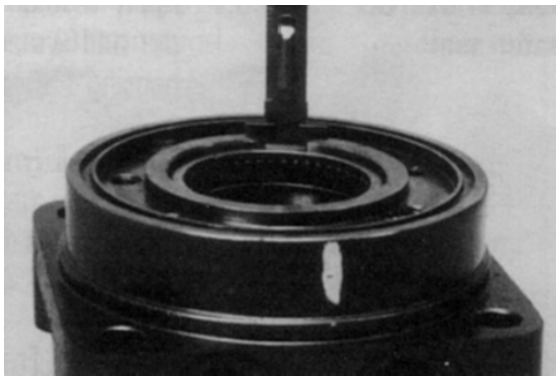
NOTE: *Bearing mandrel must be pressed against the lettered end of bearing shell. Take care that the housing bore is square with the press base and the bearing/bushing is not cocked when pressing a bearing/bushing into the housing.*

NOTICE

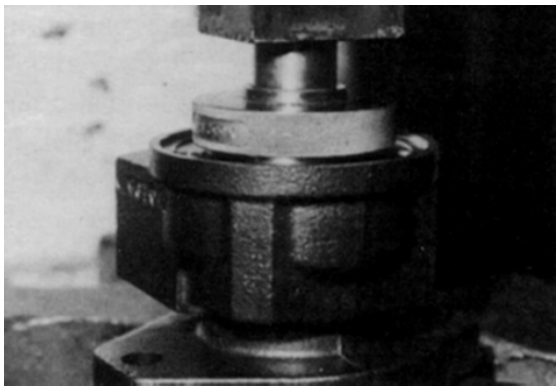
IF THE BEARING MANDREL SPECIFIED IN THE "TOOLS AND MATERIALS REQUIRED FOR SERVICING" SECTION IS NOT AVAILABLE AND ALTERNATE METHODS ARE USED TO PRESS IN BEARING/BUSHING (13) AND (19) THE BEARING/BUSHING DEPTHS SPECIFIED MUST BE ACHIEVED TO INSURE ADEQUATE BEARING SUPPORT AND CORRECT RELATIONSHIP TO ADJACENT COMPONENTS WHEN ASSEMBLED.

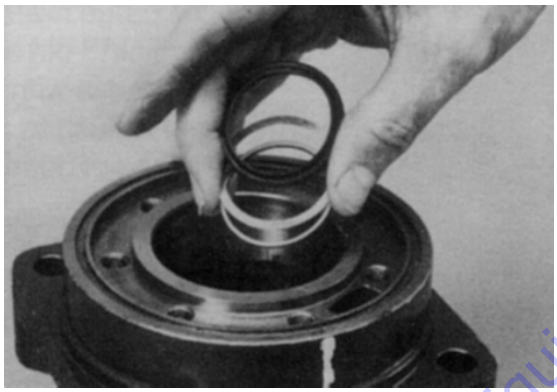
NOTICE

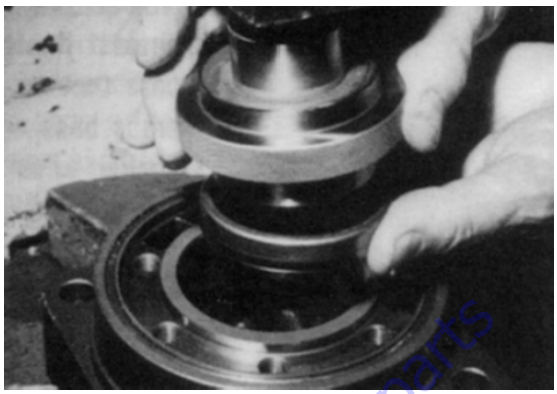
BECAUSE THE BEARING/BUSHINGS (13) AND (19) HAVE A PRESS FIT INTO THE HOUSING THEY MUST BE DISCARDED WHEN REMOVED. THEY MUST NOT BE REUSED.



2. The Torqlink™ inner housing bearing/bushing (13) can now be pressed into its counterbore in housing (18) flush to 0.03 inch (.76 mm) below the housing wear plate contact face. Use the opposite end of the bearing mandrel that was used to press in the outer bearing/ bushing (19).

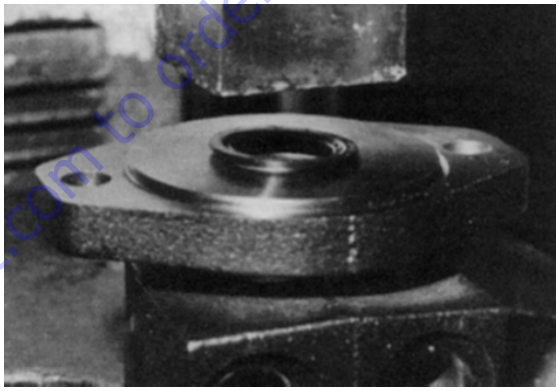


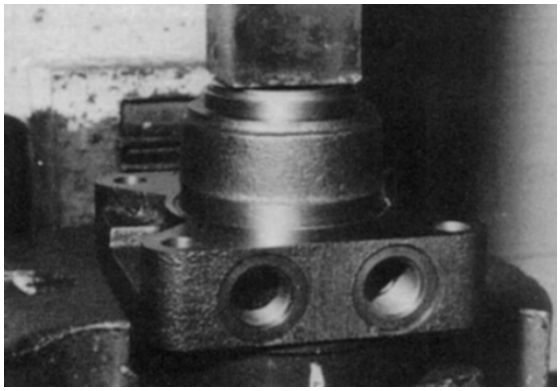




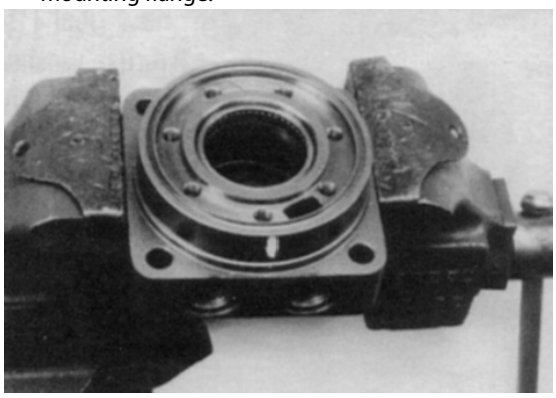
3. Press a **new** dirt and water seal (20) into the housing (18) outer bearing counterbore.

The Torqlink™ dirt and water seal (20) must be pressed in until its' flange is flush against the housing.

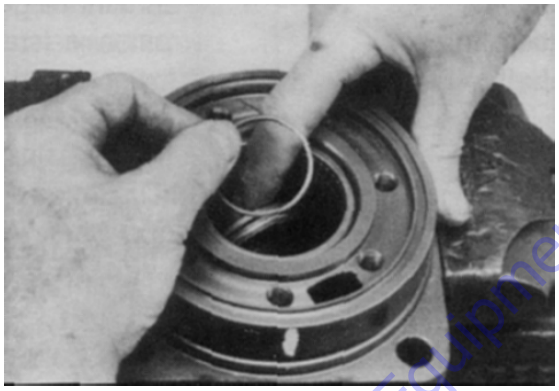




4. Place housing (18) assembly into a soft jawed vise with the coupling shaft bore down, clamping against the mounting flange.



5. On the Torqlinks™ assemble a **new** backup washer (17) and **new** seal (16) with the seal lip facing toward the inside of Torqlink™, into their respective counterbores in housing (18) if they were not assembled in procedure 2.



NOTICE

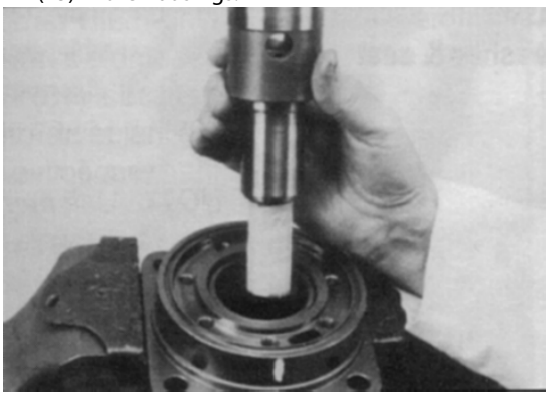
ORIGINAL DESIGN LARGE FRAME, TF & TG TORQLINKS™ THAT DO NOT HAVE BACKUP WASHER (25) WHEN DISASSEMBLED MUST BE ASSEMBLED WITH A NEW BACKUP WASHER (17), NEW BACKUP WASHER (25), AND NEW SEAL (16).

6. Assemble thrust washer (14) then thrust bearing (15) that was removed from the Torqlink™.

NOTE: *Torqlinks™ require one thrust washer (14) with thrust bearing (15).The coupling shaft will be seated directly against the thrust*

7. Apply masking tape around splines or keyway on shaft (12) to prevent damage to seal.

8. Be sure that a generous amount of clean corrosion resistant grease has been applied to the lower (outer) housing bearing/bushing (19). Install the coupling shaft (12) into housing (18), seating it against the thrust bearing (15) in the housings.



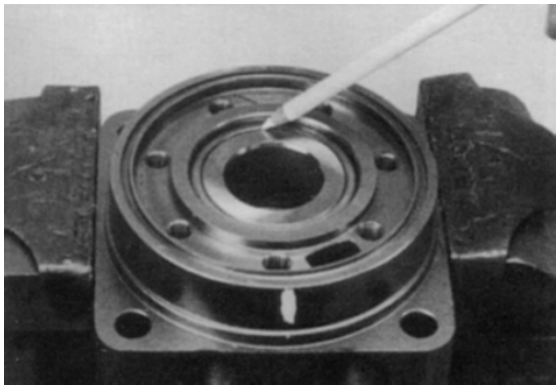
NOTICE

THE OUTER BEARING (19) IS NOT LUBRICATED BY THE SYSTEM'S HYDRAULIC FLUID. BE SURE IT IS THOROUGHLY PACKED WITH THE RECOMMENDED GREASE, PARKER GEAR GREASE SPECIFICATION #045236, E/M LUBRICANT #K-70M.

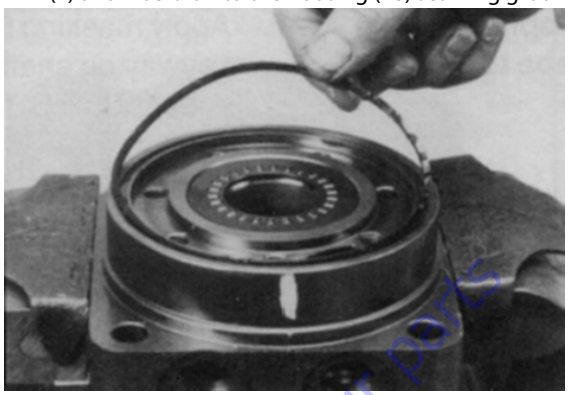
NOTE: *Mobil Mobilith SHC ® 460*

NOTE: *A 102Tube (PN 406010) is included in each seal kit.*

NOTE: *The coupling shaft (12) will be flush or just below the housing wear plate surface on Torqlinks™ when properly seated. The coupling shaft must rotate smoothly on the thrust bearing package.*

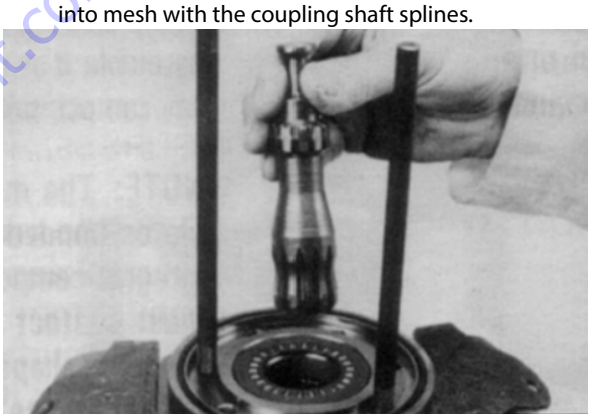


9. Apply a small amount of clean grease to a **new** seal ring (4) and insert it into the housing (18) seal ring groove.



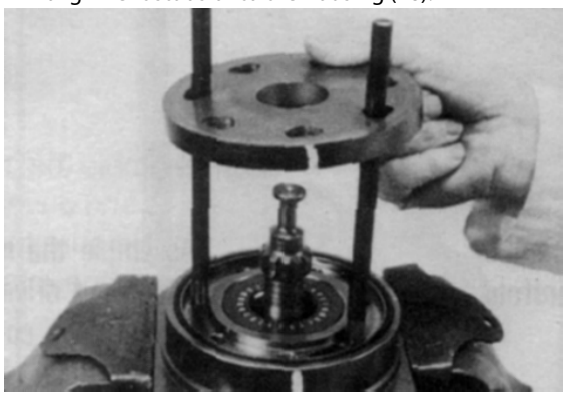
NOTE: *One or two alignment studs screwed finger tight into housing (18) bolt holes, approximately 180 degrees apart, will facilitate the assembly and alignment of components as required in the following procedures.The studs can be made by cutting off the heads of either 3/8-24 UNF 2A or 5/16-24 UNF 2A bolts as required that are over 0.5 inch (12.7 mm) longer than the bolts (1) used in the Torqlink™.*

10. Install drive link (10) the long splined end down into the coupling shaft (12) and engage the drive link splines into mesh with the coupling shaft splines.

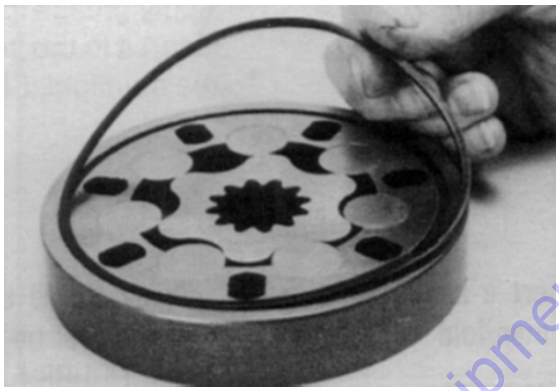


NOTE: *Use any alignment marks put on the coupling shaft and drive link before disassembly to assemble the drive link splines in their original position in the mating coupling shaft splines.*

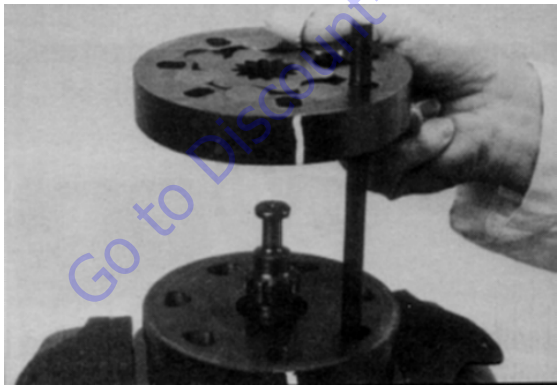
11. Assemble wear plate (9) over the drive link (10) and alignment studs onto the housing (18).



12. Apply a small amount of clean grease to a new seal ring (4) and assemble it into the seal ring groove on the wear plate side of the rotor set stator (8B).



13. Install the assembled rotor set (8) onto wear plate (9) with rotor (8A) counterbore and seal ring side down and the splines into mesh with the drive link splines.

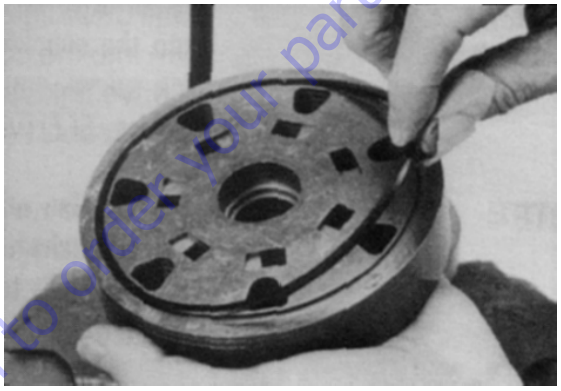


NOTE: *It may be necessary to turn one alignment stud out of the housing (18) temporarily to assemble rotor set (8) or manifold (7) over the drive link.*

NOTE: *If necessary, go to the appropriate, "Rotor Set Component Assembly Procedure."*

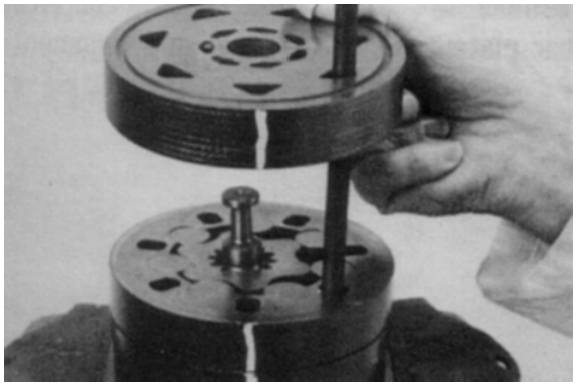
NOTE: *The rotor set rotor counterbore side must be down against wear plate for drive link clearance and to maintain the original rotor-drive link spline contact. A rotor set without a counterbore and that was not etched before disassembly can be reinstalled using the drive link spline pattern on the rotor splines if apparent, to determine which side was down.The rotor set seal ring groove faces toward the wear plate (9).*

14. Apply clean grease to a **new** seal ring (4) and assemble it in the seal ring groove in the rotor set contact side of manifold (7).

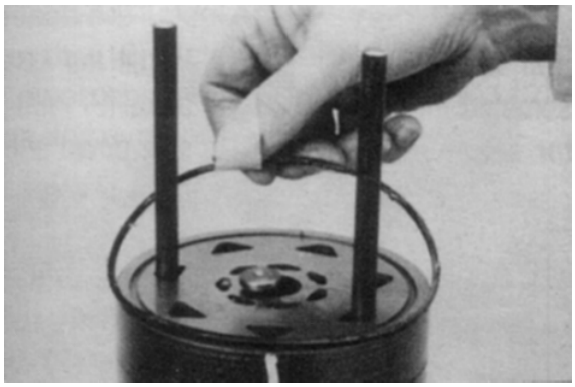


NOTE: *The manifold (7) is made up of several plates bonded together permanently to form an integral component.The manifold surface that must contact the rotor set has it's series of irregular shaped cavities on the largest circumference or circle around the inside diameter.The polished impression left on the manifold by the rotor set is another indication of which surface must contact the rotor set.*

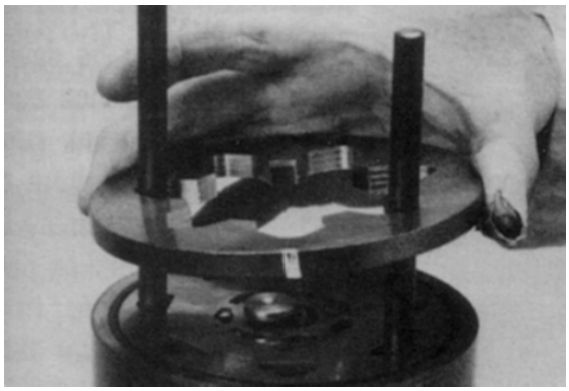
15. Assemble the manifold (7) over the alignment studs and drive link (10) and onto the rotor set. Be sure the correct manifold surface is against the rotor set.



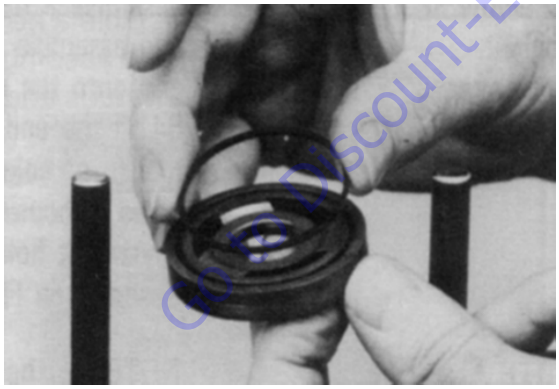
16. Apply grease to a **new** seal ring (4) and insert it in the seal ring groove exposed on the manifold.

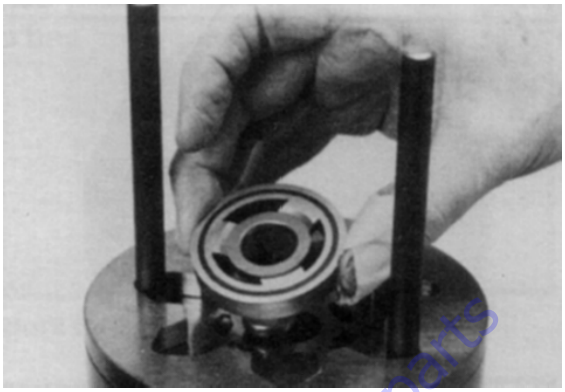


17. Assemble the commutator ring (6) over alignment studs onto the manifold.



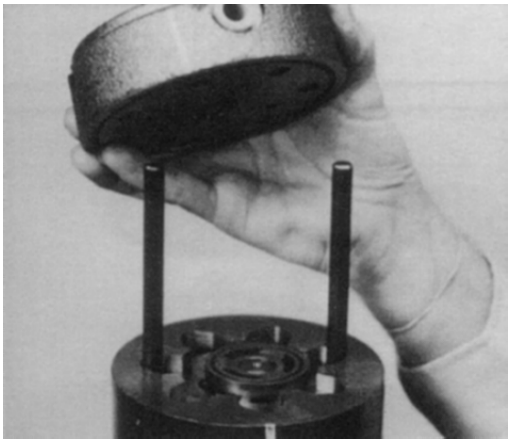
18. Assemble a **new** seal ring (3) flat side up, into commutator (5) and assemble commutator over the end of drive link (10) onto manifold (7) with seal ring side up.

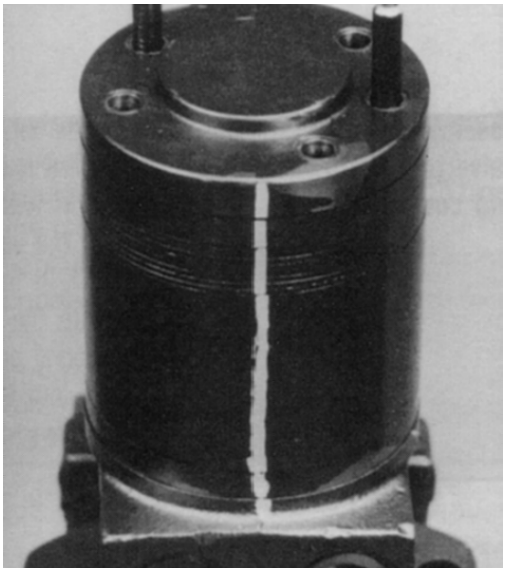




19. If shuttle valve components items #21, were removed from the end cover (2) turn a plug (21), loosely into one end of the valve cavity in the end cover. A 3/16 inch Allen wrench is required.

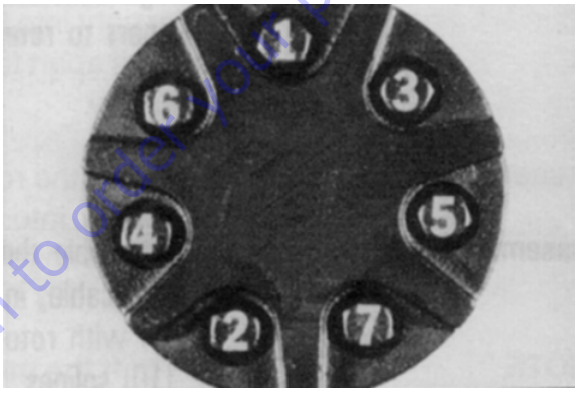
20. Assemble a **new** seal ring (4) into end cover (2) and assemble end cover over the alignment studs and onto the commutator set. If the end cover has only 5 bolt holes be sure the cover holes are aligned with the 5 threaded holes in housing (18).The correct 5 bolt end cover bolt hole relationship to housing port bosses.





NOTE: *If the end cover has a valve (24) or has five bolt holes, use the line you previously scribed on the cover to radially align the end cover into its original position.*

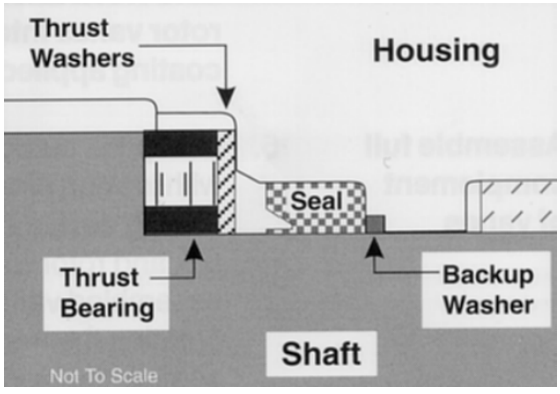
21. Assemble the 5 or 7 special bolts (1) and screw in finger tight. Remove and replace the two alignment studs with bolts after the other bolts are in place. Alternately and progressively tighten the bolts to pull the end cover and other components into place with a final torque of 22-26 ft. lbs. 45-55 ft. lbs.(61-75 N m) for the seven 3/8-24 threaded bolts.



NOTE: *The special bolts required for use with the relief or shuttle valve (24) end cover assembly (2) are longer than the bolts required with standard and cover assembly. Refer to the individual service parts lists or parts list charts for correct service part number if replacement is required.*

22. Torque the two shuttle valve plug assemblies (21) in end cover assembly to 9-12 ft. lbs. (12-16 Nm) if cover is so equipped.

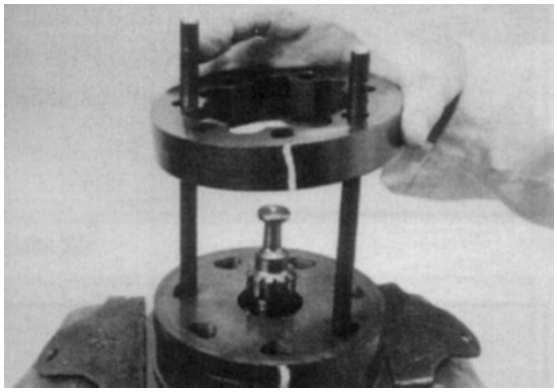
Torque the two relief valve plug assemblies (21) in end cover assembly to 45-55 ft. lbs.(61-75 Nm) if cover is so equipped.



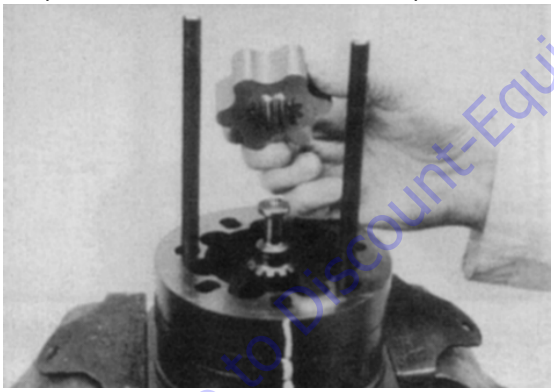
One Piece Stator Construction

A disassembled rotor (8A) stator (8B) and vanes (8C) that cannot be readily assembled by hand can be assembled by the following procedures.

1. Place stator (8B) onto wear plate (9) with seal ring (4) side down, after following Torqlink™ assembly procedures 1 through 13. Be sure the seal ring is in place.

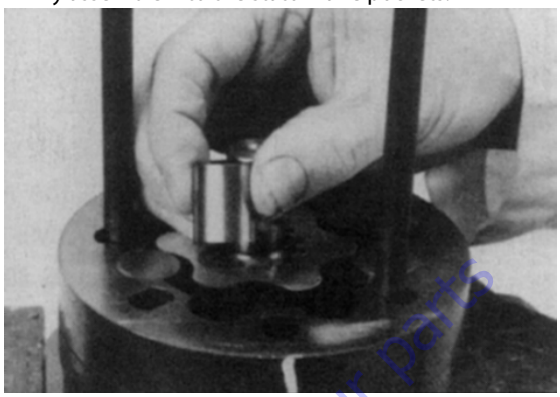


2. If assembly alignment studs are not being utilized, align stator bolt holes with wear plate and housing bolt holes and turn two bolts (1) finger tight into bolt holes approximately 180 degrees apart to retain stator and wear plate stationary.
3. Assemble the rotor (8A), counterbore down if applicable, into stator (8B), and onto wear plate (9) with rotor splines into mesh with drive link (10) splines.



NOTE: *If the manifold side of the rotor was etched during Torqlink disassembly, this side should be up. If the rotor is not etched and does not have a counterbore, use the drive link spline contact pattern apparent on the rotor splines to determine the rotor side that must be against the wear plate.*

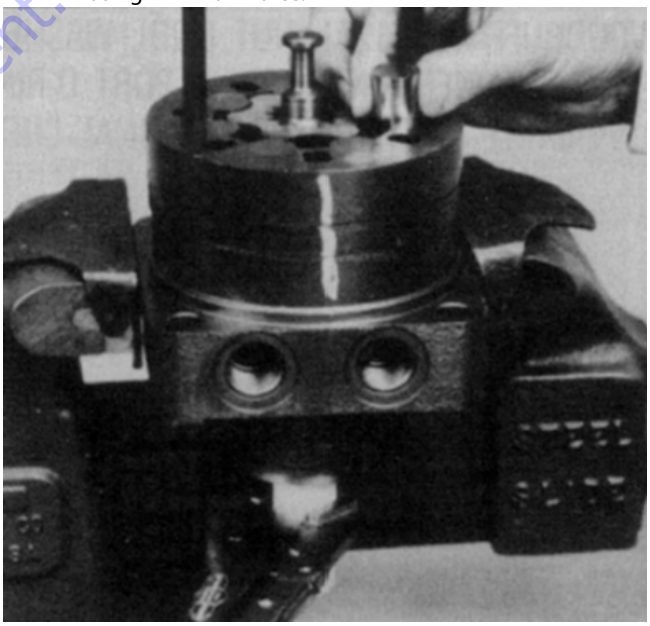
4. Assemble six vanes (8C), or as many vanes that will readily assemble into the stator vane pockets.



NOTICE

EXCESSIVE FORCE USED TO PUSH THE ROTOR VANES INTO PLACE COULD SHEAR OFF THE COATING APPLIED TO THE STATOR VANE POCKETS.

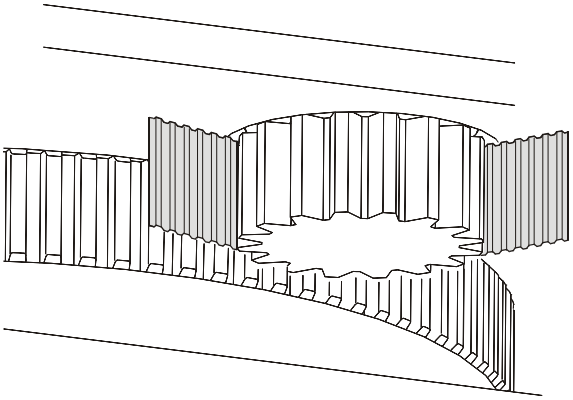
5. Grasp the output end of coupling shaft (12) with locking pliers or other appropriate turning device and rotate coupling shaft, drive link and rotor to seat the rotor and the assembled vanes (8C) into stator (8B), creating the necessary clearance to assemble the seventh or full complement of seven vanes. Assemble the seven vanes using minimum force.



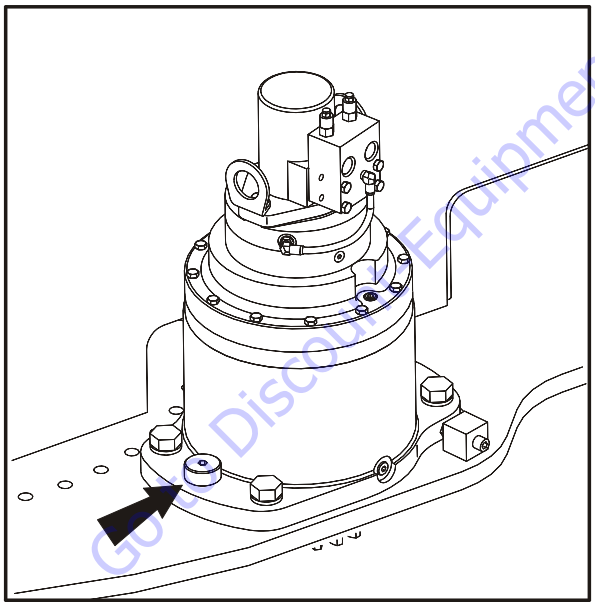
6. Remove the two assembled bolts (1) if used to retain stator and wear plate.
7. Tighten the jam nut (shown below) with JLG Threadlocker PN 0100019.

3.20 PROCEDURE FOR SETTING GEAR BACKLASH

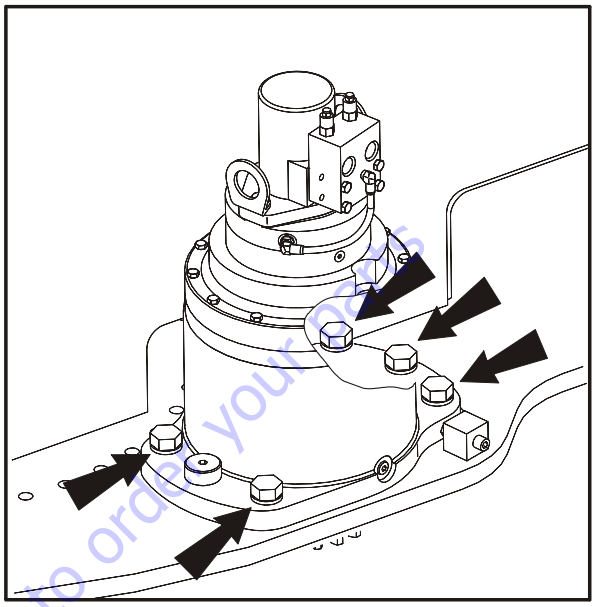
1. Set backlash to 0.010" to 0.015" using the following procedure.
2. Place shim (JLG PN 4071041) between pinion and bearing on the bearing high spot. The bearing high spot should be stamped with an "X" on the surface below the teeth and marked with yellow paint in the tooth space.



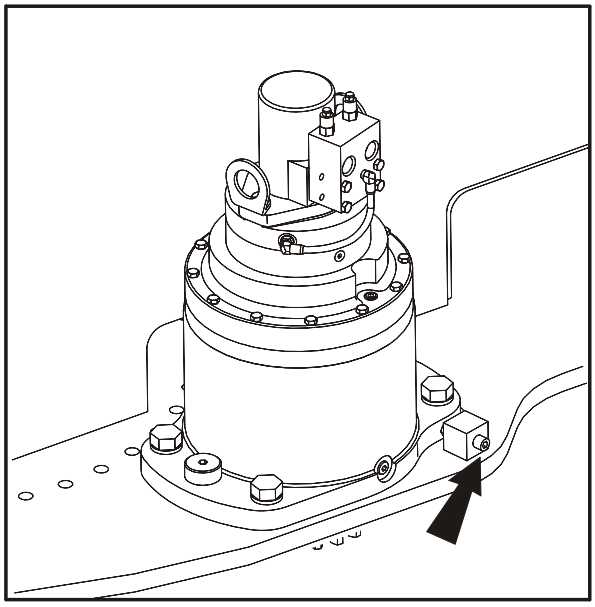
3. Torque the shoulder screw (shown below) to 660 foot-pounds (896 Nm) with JLG Threadlocker PN 0100019.



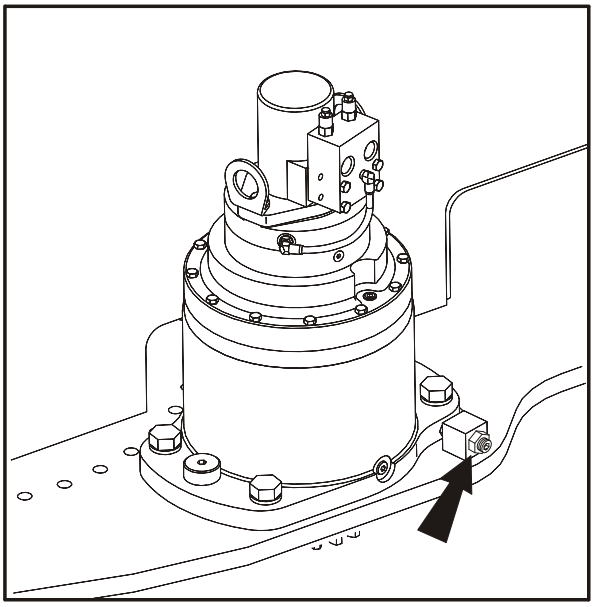
4. Remove the turntable lock pin.
5. Pre-torque the capscrews (shown below) to 90 ft-lbs (122 Nm) with JLG Threadlocker PN 0100019.



6. Tighten the setscrew (shown below) until the pinion is completely snug against the shim and bearing and then back off the setscrew.

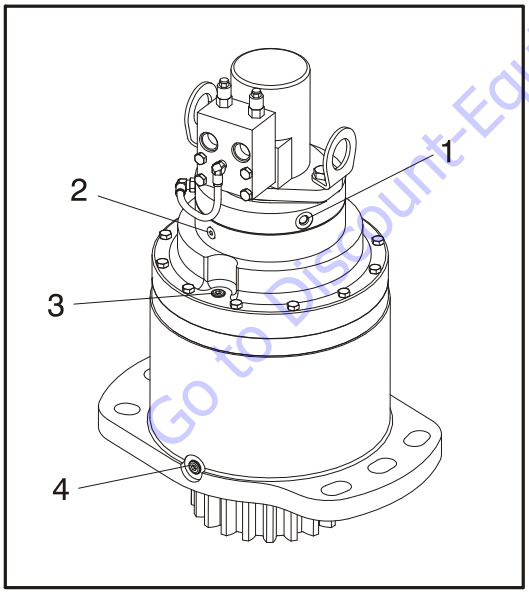


7. Torque the setscrew to 50 foot-pounds (68 Nm).



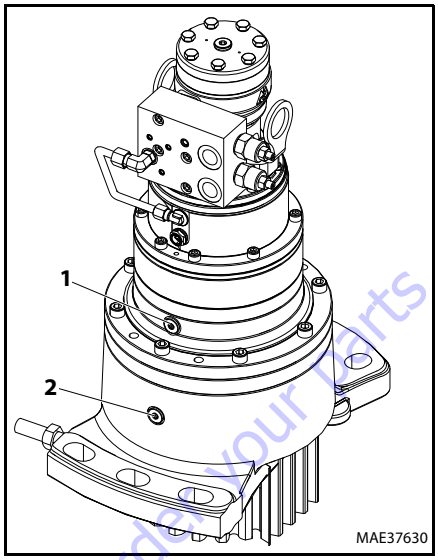
8. Torque the capscrews shown in step 5 to 660 foot-pounds (896 Nm).
9. Remove shim and discard.

3.21 SWING DRIVE LUBRICATION



1 Brake Bleed Port
2 Brake Fill Port
3 Gearbox Fill Port
4 Gearbox Drain Port

Figure 3-60. Swing Drive Ports (SN 0300201016 through 0300254466, SN B300002238 to Present)



1 Gearbox Fill Port
2 Gearbox Drain Port

Figure 3-61. Swing Drive Ports (SN0300254467 to Present)

The Swing Gearbox is to be filled with 79 ounces (2.3 L) of API Service Classification GL-5 Extreme Pressure Gear Lube. Fill to cover the ring gear.

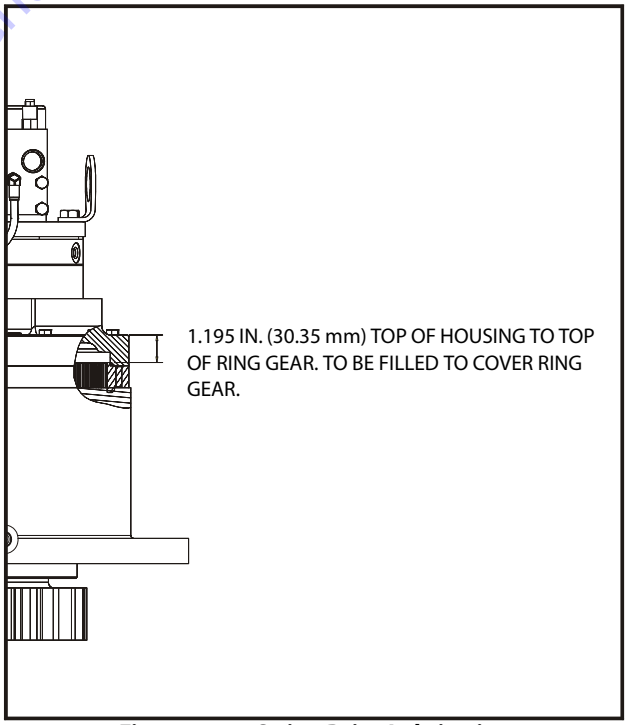


Figure 3-62. Swing Drive Lubrication

The Swing Brake is to be filled half full, 2.7 ounces (80 ml), with DTE24 oil.

3.22 SWING BEARING

Turntable Bearing Mounting Bolt Condition Check

NOTICE

THE SWING BEARING IS ONE OF THE MOST CRITICAL POINTS ON AN AERIAL LIFT. IT IS HERE THAT THE STRESSES OF LIFTING ARE CONCENTRATED, AT THE CENTER OF ROTATION. BECAUSE OF THIS, PROPER MAINTENANCE OF THE SWING BEARING BOLTS IS A MUST FOR SAFE OPERATION.

NOTE: *This check is designed to replace the existing bearing bolt torque checks on JLG Lifts in service. This check must be performed after the first 50 hours of machine operation and every 600 hours of machine operation thereafter. If during this check any bolts are found to be missing or loose, replace missing or loose bolts with new bolts and torque to the value specified in the torque chart, after applying JLG Threadlocker PN 0100019 to the bolt threads. After replacing and retorquing bolt or bolts recheck all existing bolts for looseness.*

1. Check the frame to bearing attach bolts as follows:
   a. Fully elevate the main boom. (See Figure 3-63.)
   b. At the position indicated on Figure 3-63., try to insert a 0.0015 feeler gauge between the bolt and hardened washer at the arrow indicated position.
   c. Ensure that the 0.0015" feeler gauge will not penetrate under the bolt head to the bolt shank.
   d. Swing the turntable 90 degrees, and check some selected bolts at the new position.
   e. Continue rotating the turntable at 90 degrees intervals until a sampling of bolts have been checked in all quadrants.
2. Check the turntable to bearing Attach bolts as follows:
   a. Elevate the fully retracted main boom to full elevation.
   b. At the position indicated on Figure 3-65. try to insert the 0.0015" feeler gauge between the bolt head and hardened washer at the arrow indicated position.
   c. Lower the boom to horizontal and fully extend the boom.
   d. At the position indicated on Figure 3-64., try and insert the 0.0015" feeler gauge between the bolt head and hardened washer at the arrow indicated position.

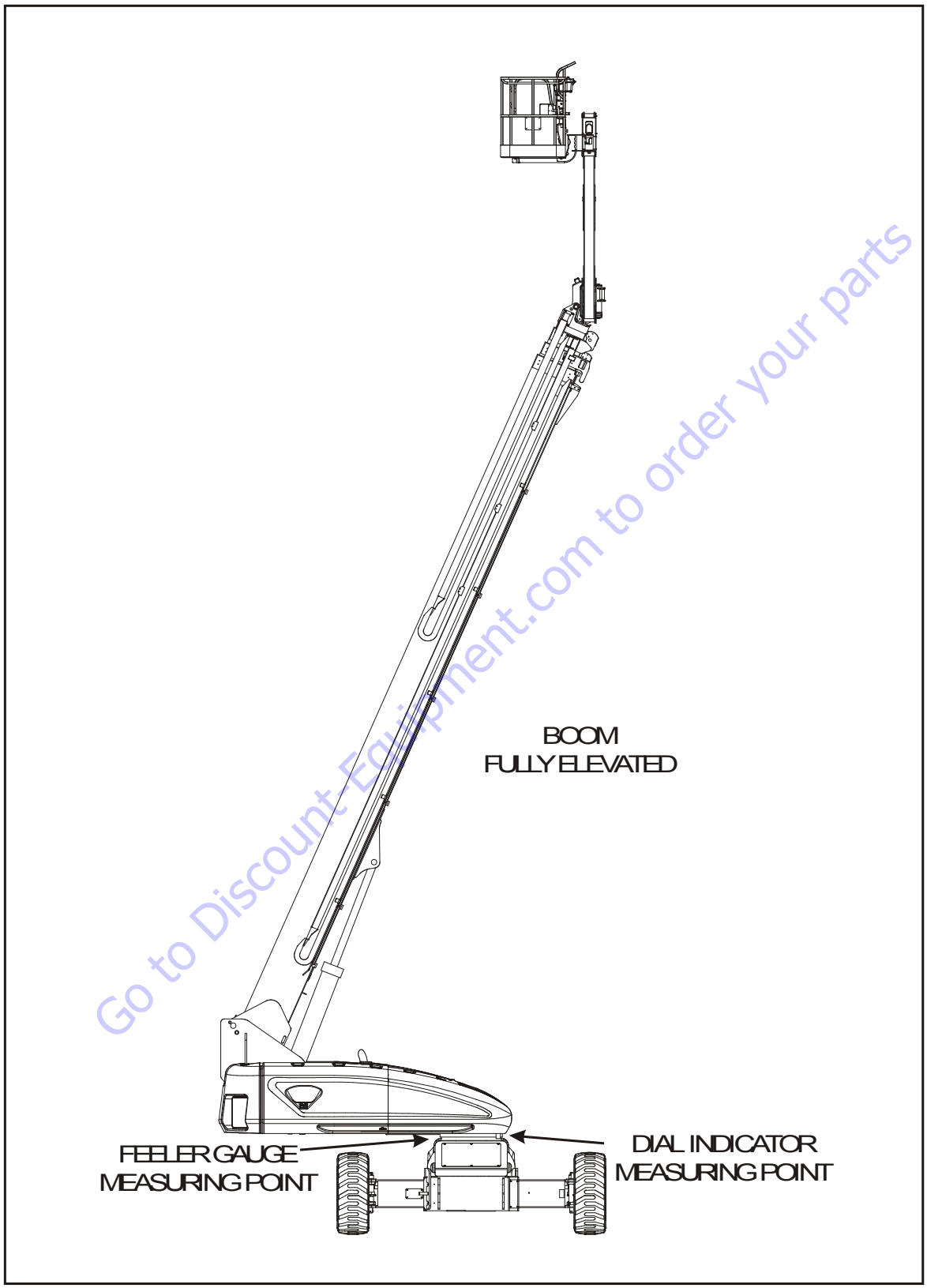


Figure 3-63. Swing Bearing Tolerance Boom Placement - Sheet 1 of 2

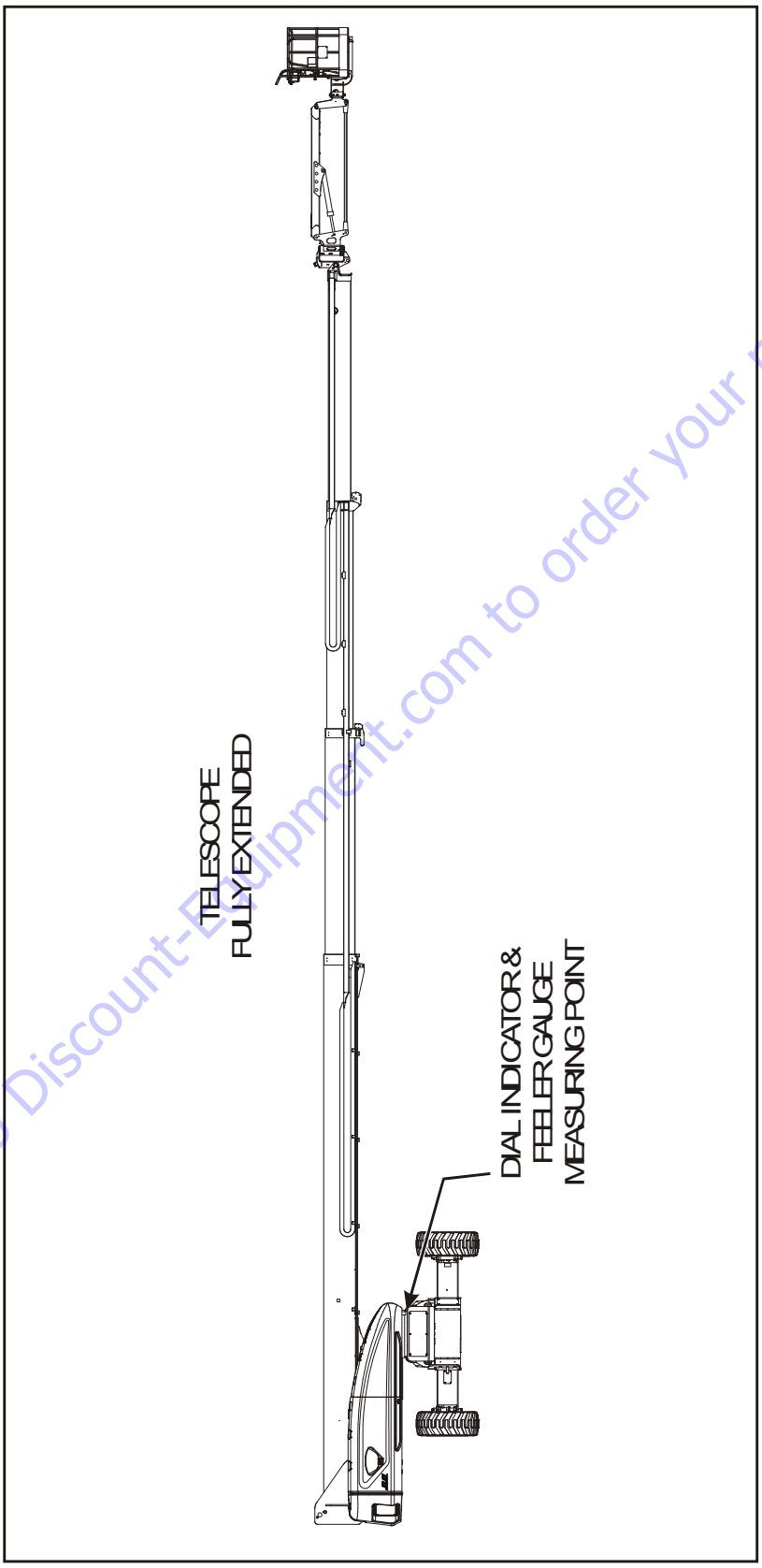


Figure 3-64. Swing Bearing Tolerance Boom Placement - Sheet 2 of 2

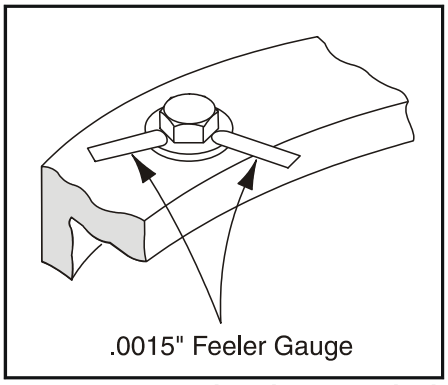
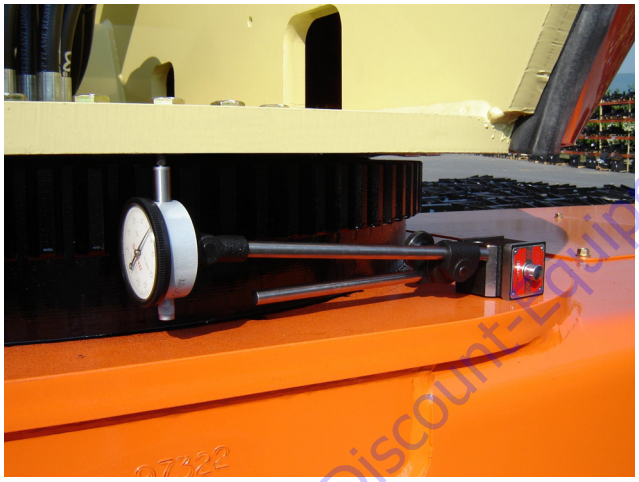


Figure 3-65. Swing Bolt Feeler Gauge Check

Wear Tolerance

1. From the underside of the machine, at rear center, with the main boom fully elevated and fully retracted, as shown in Figure 3-63., Swing Bearing Tolerance Boom Placement - Sheet 1 of 2, set up a magnetic base dial indicator as shown below and set the indicator to 0 (zero).



2. Next, position the main boom fully extended and horizontal as shown in Figure 3-64., Swing Bearing Tolerance Boom Placement - Sheet 2 of 2. Read the measurement recorded on the dial indicator gauge.
3. If the measurement is greater than 0.094 in. (2.387 mm), the swing bearing should be replaced.
4. If the measurement is less than 0.094 in. (2.387 mm), and any of the following conditions exist, the bearing should be removed, disassembled, and inspected for the following:
   a. Metal particles in the grease.
   b. Increased drive power required.
   c. Noise.
   d. Rough rotation.
5. If bearing inspection shows no defects, reassemble and return to service.

Swing Bearing Removal

1. From Ground Control station, operate the boom adequately to provide access to frame opening to rotary coupling.

⚠ DANGER

NEVER WORK BENEATH THE BOOM WITHOUT FIRST ENGAGING BOOM SAFETY PROP OR PROVIDING ADEQUATE OVERHEAD SLING SUPPORT AND/OR BLOCKING.

2. Attach an adequate support sling to the boom and draw all slack from sling. Prop or block the boom if feasible.

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINANTS INTO THE SYSTEM.

3. Tag and disconnect the hydraulic lines from the fittings on the top of the rotary coupling. Use a suitable container to retain any residual hydraulic fluid. Immediately cap lines and ports.

NOTICE

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINANTS INTO THE SYSTEM.

4. From inside turntable, remove mounting hardware which attach rotary coupling retaining yoke brackets to turntable.

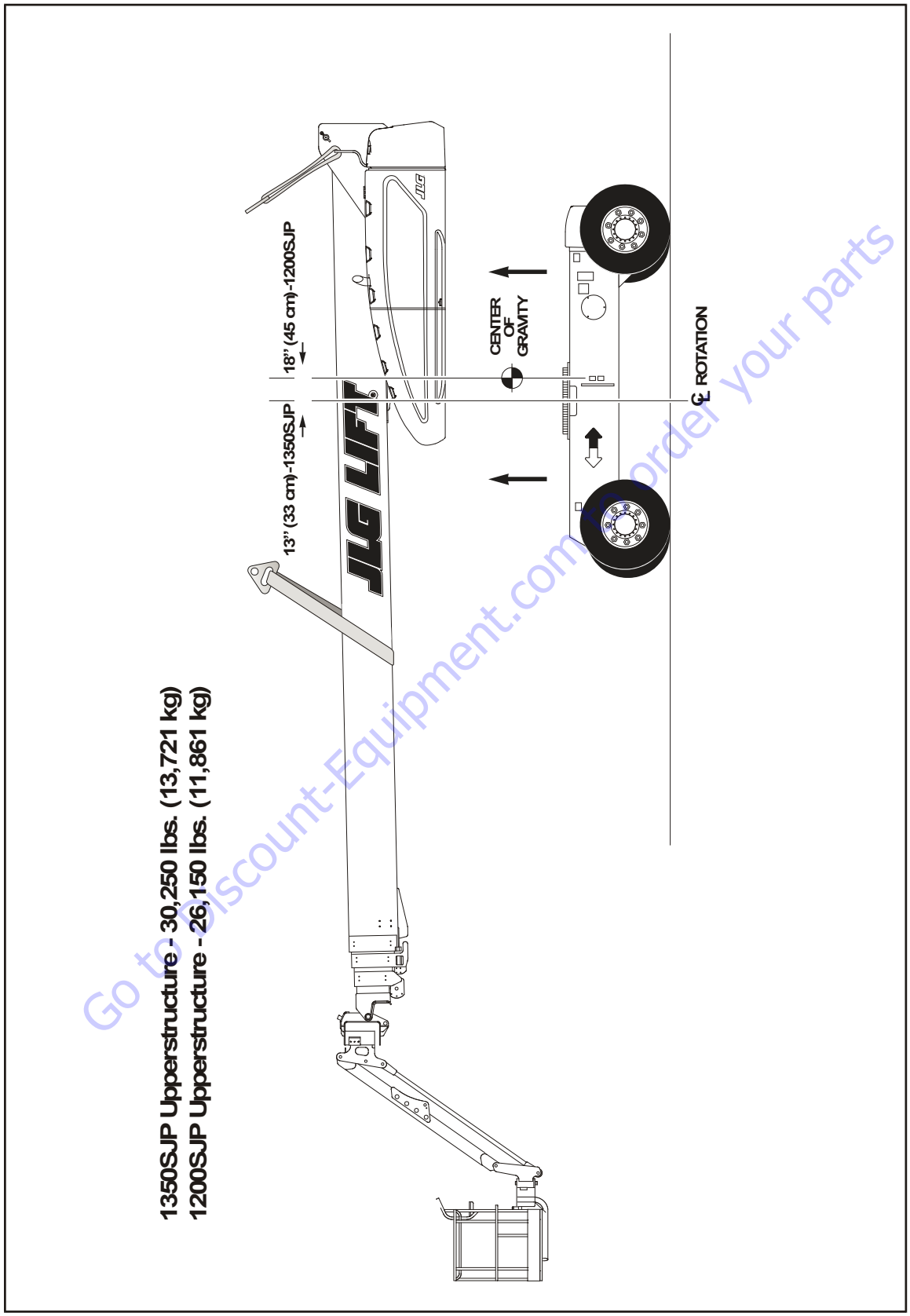
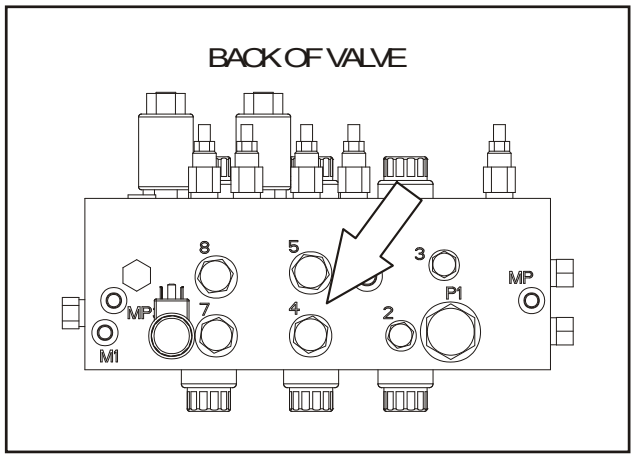


Figure 3-66. Swing Bearing Removal

5. At the rear of the main valve, remove the lift hose from port #4. Immediately cap the line and port.



6. Attach suitable overhead lifting equipment to the machine. Refer to Figure 3-66., Swing Bearing Removal.

7. Use a suitable tool to scribe a line on the inner race of the swing bearing and on the underside of the turntable. This will aid in aligning the bearing upon installation. Remove the bolts and washers which attach the turntable to the bearing inner race. Discard the bolts.

8. Use the lifting equipment to carefully lift the complete turntable assembly from the bearing. Ensure that no damage occurs to the turntable, bearing or frame-mounted components.

9. Carefully place the turntable on a suitably supported trestle.

NOTE: *The swing bearing weighs approximately 300 lbs. (136 kg).*

10. Use a suitable tool to scribe a line on the outer race of the swing bearing and the frame. This line will aid in aligning the bearing upon installation. Remove the bolts and washers which attach the outer race of the bearing to the frame. Discard the bolts. Use suitable lifting equipment to remove the bearing from the frame, then move the bearing to a clean, suitably supported work area.

Swing Bearing Installation

NOTE: *The swing bearing weighs approximately 300 lbs. (136 kg).*

1. Using suitable lifting equipment, carefully lower the swing bearing into position on the frame. Ensure the scribed line of the outer race of the bearing aligns with the scribed line on the frame. If a new swing bearing is used, ensure that the spot with minimum gear backlash (marked with yellow paint) is towards the centerline of the swing drive (as close as the bolt pattern will allow).

NOTICE

JLG INDUSTRIES RECOMMENDS THAT ALL REMOVED BEARING BOLTS BE DISCARDED AND REPLACED WITH NEW BOLTS. SINCE THE SWING BEARING IS THE ONLY STRUCTURAL LINK BETWEEN THE FRAME AND TURNTABLE, IT IS IMPERATIVE THAT SUCH REPLACEMENT HARDWARE MEETS JLG SPECIFICATIONS. USE OF GENUINE JLG HARDWARE IS HIGHLY RECOMMENDED.

2. Apply a light coating of Loctite #271 to the new bearing bolts, and loosely install the bolts and washers through the frame and outer race of bearing.

NOTICE

IF COMPRESSED AIR OR ELECTRICALLY OPERATED IMPACT WRENCH IS USED FOR TIGHTENING THE BEARING ATTACHMENT BOLTS, THE TORQUE SETTING ACCURACY OF THE TOOL SHOULD BE CHECKED PRIOR TO USE.

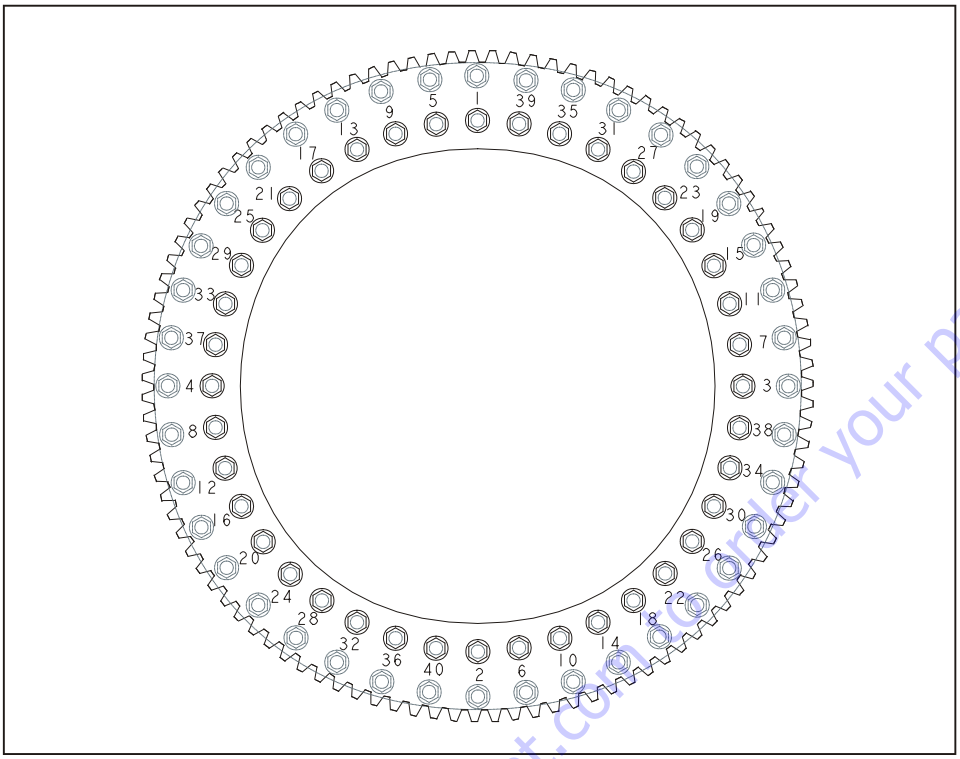
3. Refer to the Torque Sequence diagram as shown in Figure 3-67., Swing Bearing Torque Sequence. Spray a light coat of Safety Solvent 13 on the new bearing bolts. Then apply a light coating of JLG Threadlocker PN 0100019 to the new bearing bolts, and install the bolts and washers through the frame and outer race of the bearing. Tighten the bolts to an initial torque of 190 ft. lbs. (258 Nm) w/Loctite.
4. Remove the lifting equipment from the bearing.
5. Using suitable lifting equipment, carefully position the turntable assembly above the machine frame.
6. Carefully lower the turntable onto the swing bearing, ensuring that the scribed line of the inner race of the bearing aligns with scribed line on the turntable. If a new swing bearing is used, ensure that the filler plug fitting is at 90 degrees from the fore and aft center line of the turntable.
7. Spray a light coat of Safety Solvent 13 on the new bearing bolts. Then apply a light coating of JLG Threadlocker PN 0100019 to the new bearing bolts, and install the bolts and washers through the turntable and inner race of the bearing.
8. Following the Torque Sequence diagram shown in Figure 3-67., Swing Bearing Torque Sequence, tighten the bolts to a torque of 190 ft. lbs. (258 Nm) w/Loctite.
9. Connect the hydraulic lines to the rotary coupling as tagged prior to removal.
10. Install the rotary coupling retaining yoke brackets, apply a light coating of JLG Threadlocker 0100011 to the attaching bolts and secure the yoke to the turntable with the mounting hardware.
11. Connect the hydraulic line disconnected during removal back to port #4 on the back of the main hydraulic valve.
12. Remove the lifting equipment.
13. At ground control station, use boom lift control to lower boom to stowed position.
14. Using all applicable safety precautions, activate the hydraulic system and check the swing system for proper and safe operation.

Swing Bearing Torque Values

1. Outer Race - 190 ft. lbs. (258 Nm) w/Loctite.
2. Inner Race - 190 ft. lbs. (258 Nm) w/Loctite.
3. See Swing Bearing Torquing Sequence.

⚠ WARNING

CHECK THE INNER AND OUTER SWING BEARING BOLTS FOR MISSING OR LOOSENESS AFTER FIRST 50 HOURS OF OPERATION, AND EVERY 600 HOURS THEREAFTER.



NOTE: *Swing Bearing Torque Sequence is typical for both inner and outer races.*

Figure 3-67. Swing Bearing Torque Sequence

3.23 SWING SPEED PROPORTIONING

Swing Speed Proportioning uses the boom length and angle sensors to improve the comfort, speed and control of the turntable swing function. Turntable swing speed is increased as the distance of the platform to the center of rotation is decreased. This results in approximately constant platform speeds regardless of boom position. Swing speed proportioning is disabled with any envelope sensors failure. Disabling of swing speed proportioning will default to the slowest swing speed setting.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

3.24 CHASSIS TILT INDICATOR SYSTEM

The Chassis Tilt Indicator System measures the turntable angle with respect to level ground. The tilt sensor (which is an integral part of the ground module) has two settings; 5.0 and 8.0 degrees. The smaller angle is used for the purpose of warning the operator by means of the chassis tilt light in the platform display panel. Additionally when used in conjunction with the Beyond Transport - Drive Speed Cutback System, the tilt sensor will cause an alarm to sound, and automatically put all functions in the creep speed mode. With the exception of the speed cutback, this is a warning system only. The machine will continue to function. The operator is responsible to prevent the machine from attaining an unstable position. The 8.0 degree angle is used exclusively for the purpose of automatically shifting the drive motors to the maximum displacement position (slow speed). The control system responds to indicated angle readings 0.5 degrees smaller than the required angles to account for calibration and sensor variation.

NOTE: *For more detailed information concerning system adjustment and operation, refer to Section 6 - JLG Control System.*

3.25 ROTARY COUPLING

Use the following procedure to for installing the seal kit.

1. Remove snap ring (7) from end.
2. Remove thrust ring (3) from same end.
3. Remove center body (1) from housing (3).
4. Cut off old seals (2,3,5).
5. Assemble lip seals (2) in direction shown in Figure 3-68., Rotary Coupling Seal Installation.
6. Reassemble O-ring (4).
7. Heat cap seals (5) in hydraulic oil for 5 minutes at 300° F (149° C).
8. Assemble cap seals over O-rings
9. Reinsert center body into housing (lube with hydraulic oil).
10. Replace thrust ring and snap ring.

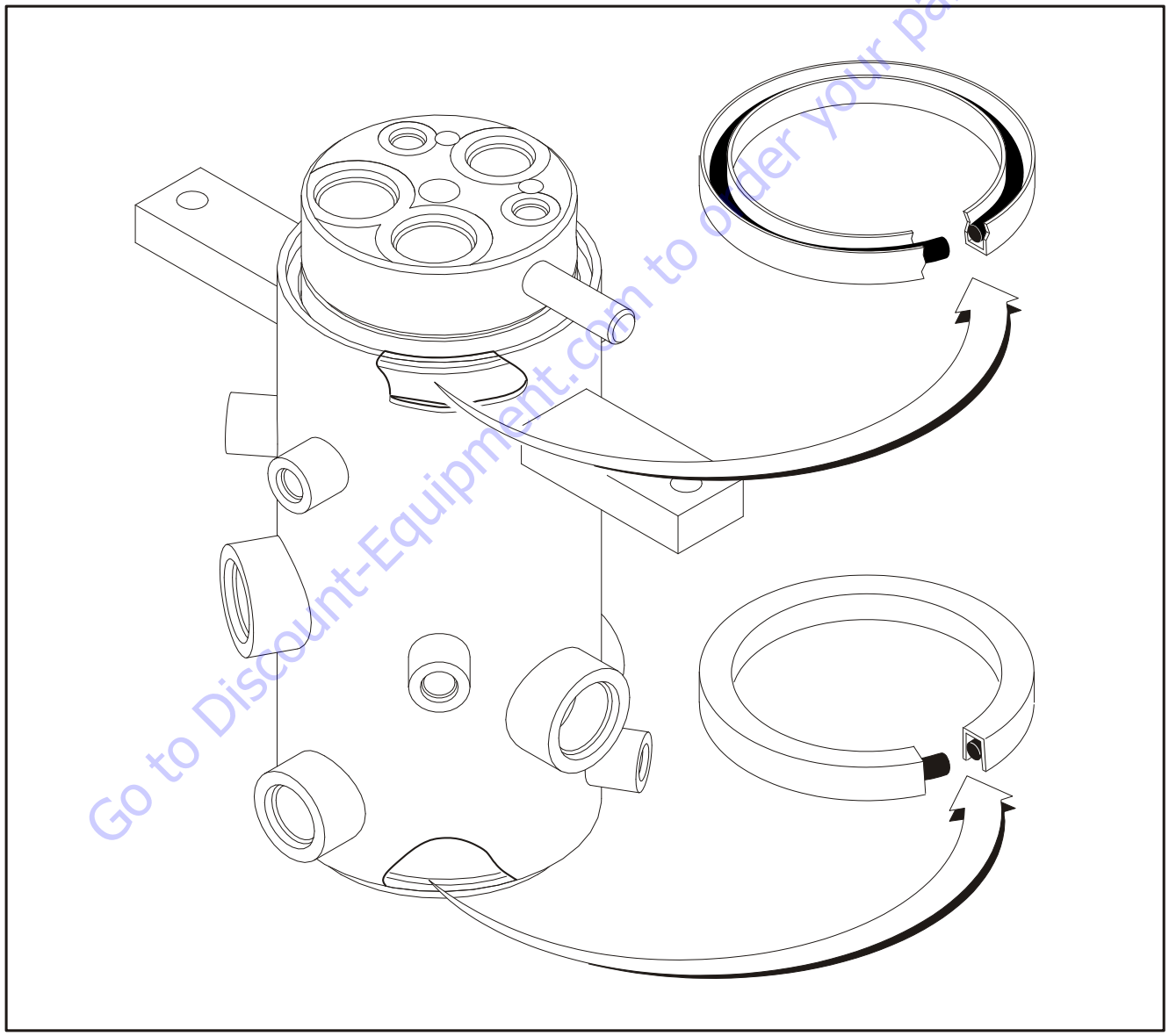
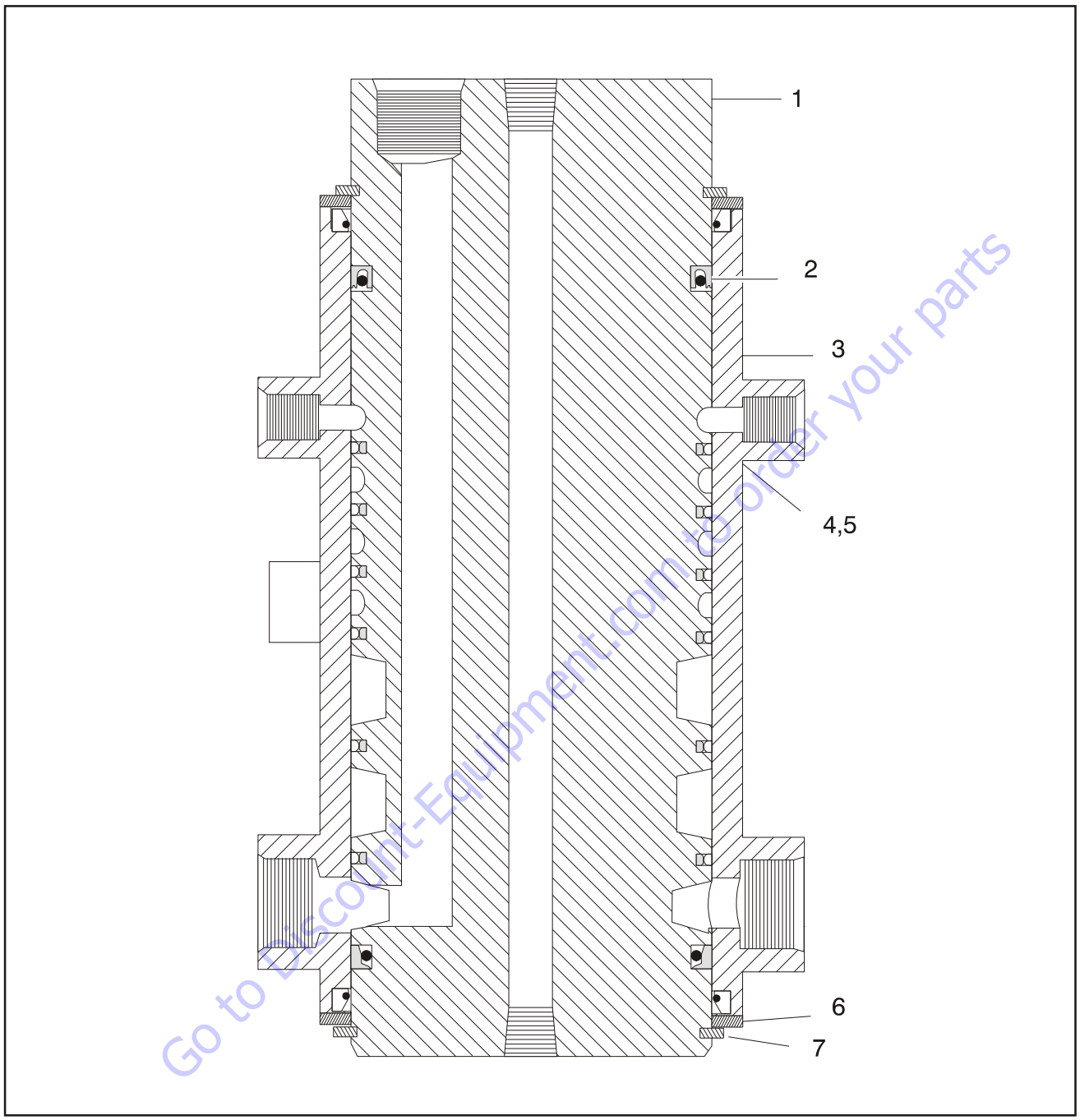
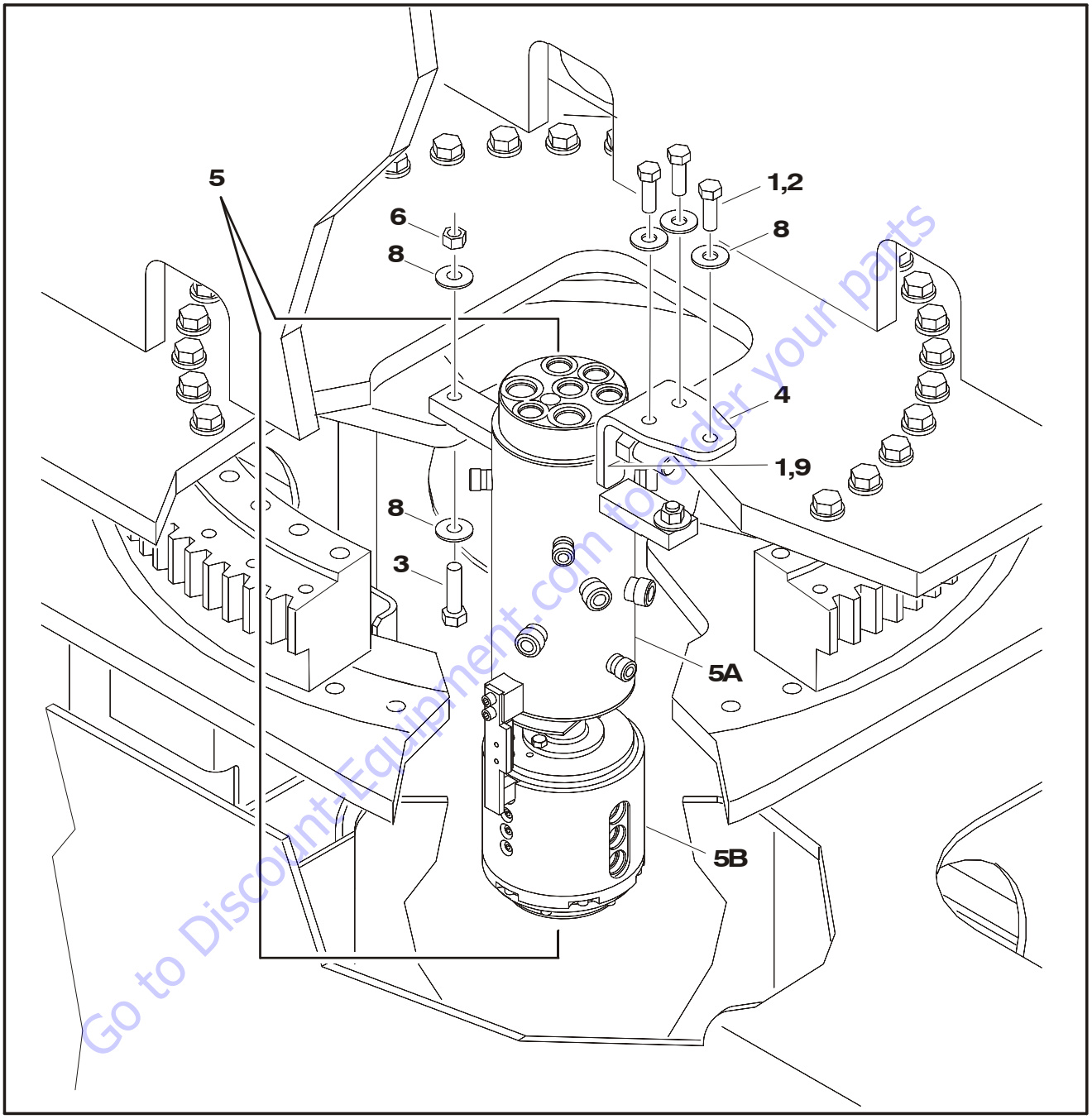


Figure 3-68. Rotary Coupling Seal Installation



1. Center Body
2. Seal
3. Housing
4. O-ring
5. Seal
6. Thrust Ring
7. Snap Ring

Figure 3-69. Rotary Coupling Cutaway



1. JLG Threadlocker PN 0100011
2. Bolt
3. Bolt
4. Swivel Bracket
5. Rotary Coupling & Collector Ring Assembly

5A. Rotary Coupling
5B. Rotary Circuit Contactor
6. Locknut
7. Not Used
8. Flatwasher
9. Nut

Figure 3-70. Rotary Coupling Installation

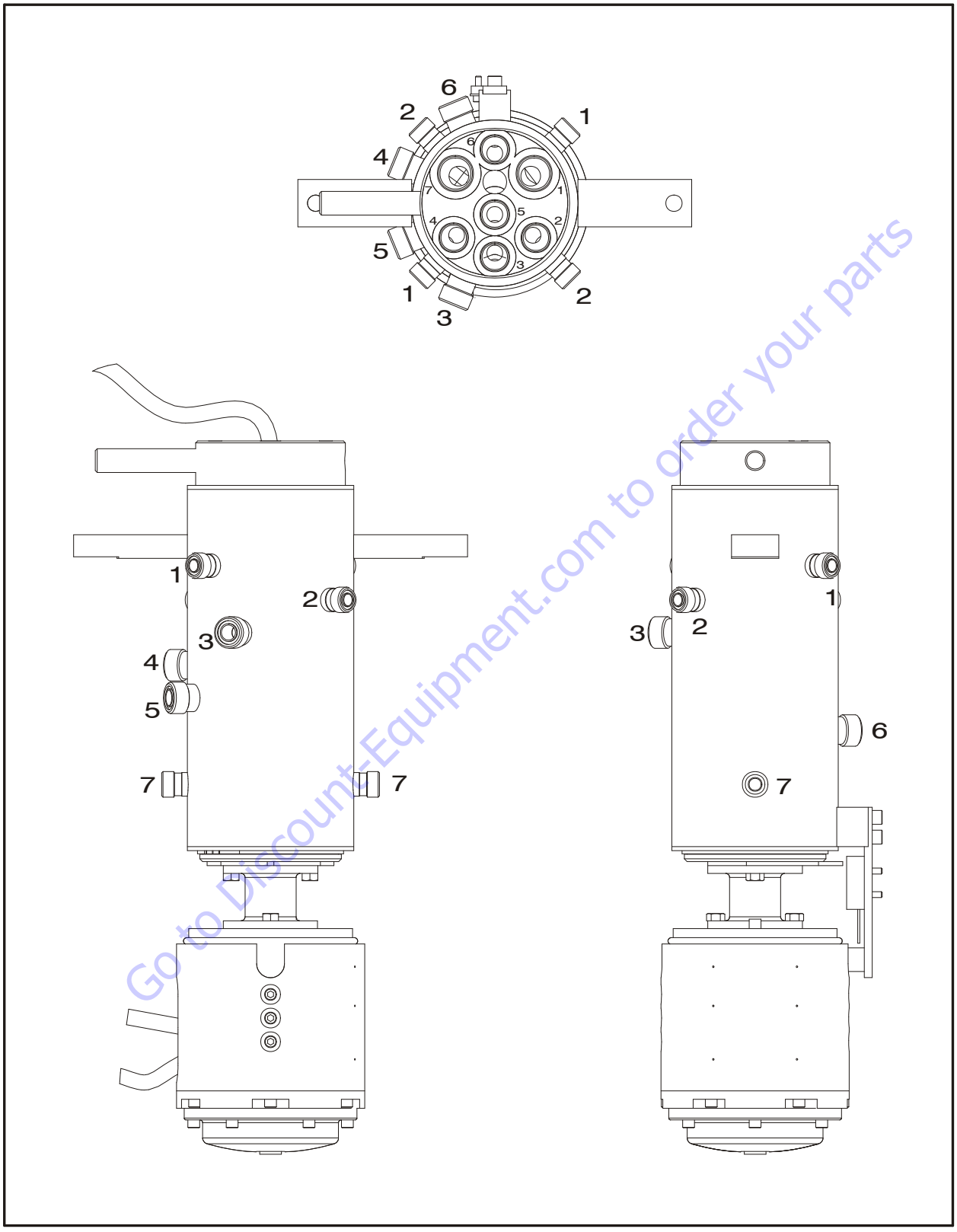


Figure 3-71. Rotary Coupling Port Location

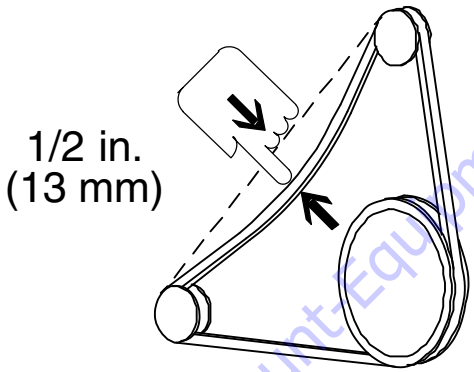
Table 3-7. Coupling Port Information Table

Port No.	Outlets	Port Size	Description	Operating Pressure PSI (Bar)	Proof Pressure PSI (Bar)
1	2	-12	Steer/Axle Extend (Tank)	250 (17)	375 (26)
2	2	-10	Steer/Axle Extend (Pressure)	3000 (207)	4500 (310)
3	1	-10	Drive A	3000 (207)	4500 (310)
4	1	-10	Drive B	3000 (207)	4500 (310)
5	1	-10	Drive A	3000 (207)	4500 (310)
6	1	-10	Drive B	3000 (207)	4500 (310)
7	2	-12	Case Drain	250 (17)	375 (26)

3.26 GENERATOR

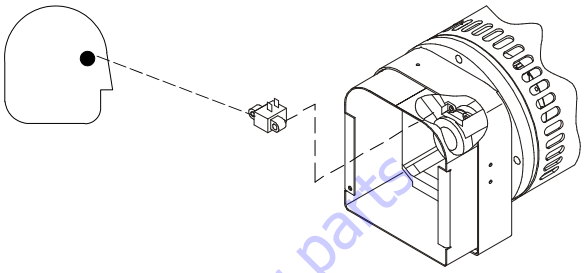
Every 250 hours

Every 250 hours of operation, check the drive belt for proper tension.

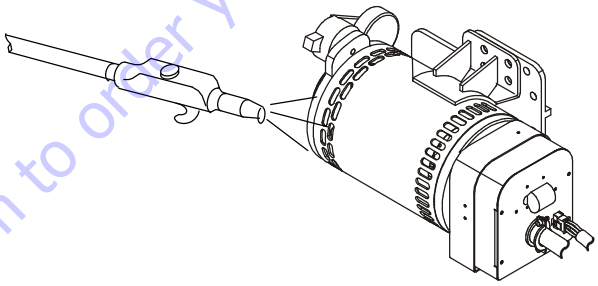


Every 500 hours

Every 500 hours of operation, service the generator brushes and slip rings. Hostile environments may require more frequent service.



Every 500 hours of service, blow out the inside of the generator. If operating in a hostile environment, clean monthly.

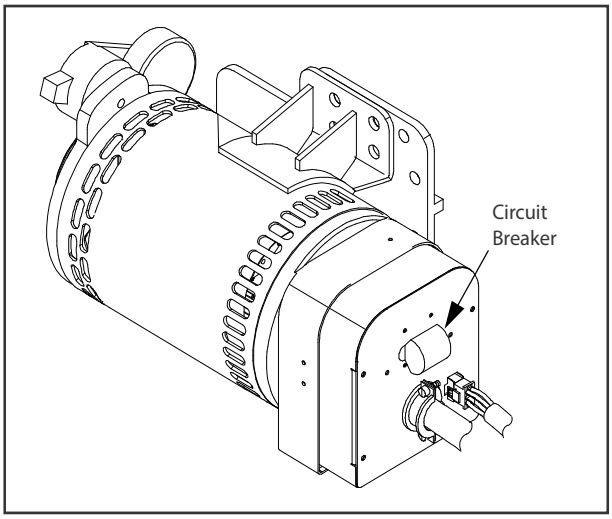


Overload Protection

⚠ CAUTION

STOP THE ENGINE WHENEVER CHECKING OR INSPECTING THE CIRCUIT BREAKER.

The circuit breaker protects the generator windings from overload. If the circuit breaker opens, generator output stops. If the circuit breaker continues to open, check for faulty equipment connected to the platform receptacles.



Inspecting Brushes, Replacing Brushes, and Cleaning Slip Rings

Refer to Figure 3-72., Inspecting Generator Brushes, Replacing Brushes, and Cleaning Slip Rings.

INSPECTING BRUSH POSITION

Inspect brush alignment with slip rings. View alignment through the air vents in the stator barrel. The brushes must ride completely on the slip rings.

INSPECTING BRUSHES

Remove the end panel. Inspect the wires. Remove the brush holder assembly. Pull the brushes from the holders.

Replace the brushes if damaged, or if the brush is at or near minimum length.

CLEANING SLIP RINGS

Visually inspect the slip rings. Under normal use, the rings turn dark brown.

If the slip rings are corroded or their surface is uneven, remove the belt to turn the shaft by hand for cleaning.

Clean the rings with 220 grit emery paper. Remove as little material as possible. If the rings are deeply pitted and do not clean up, consult generator factory service.

Reinstall the belt, brush holder assembly, and end panel.

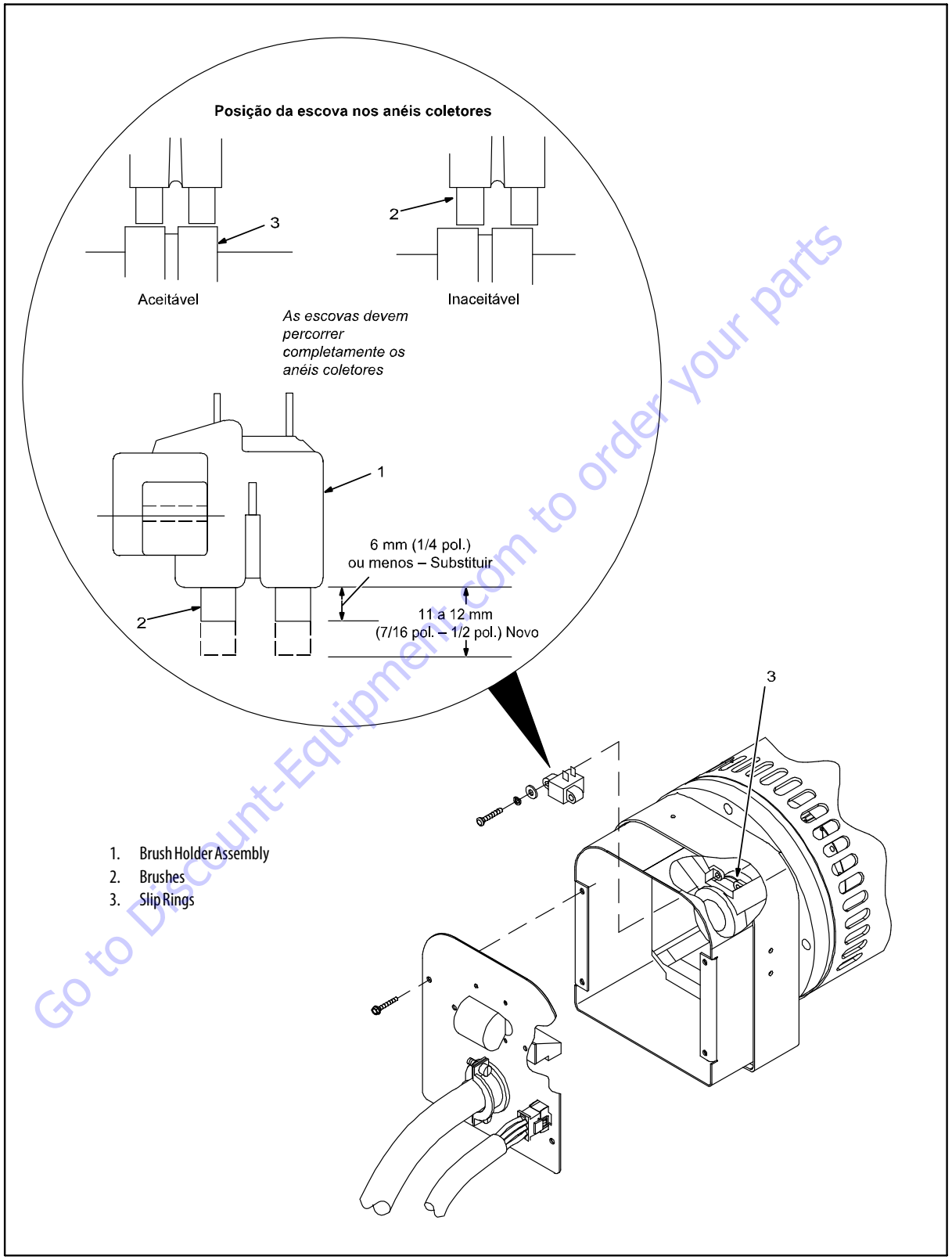
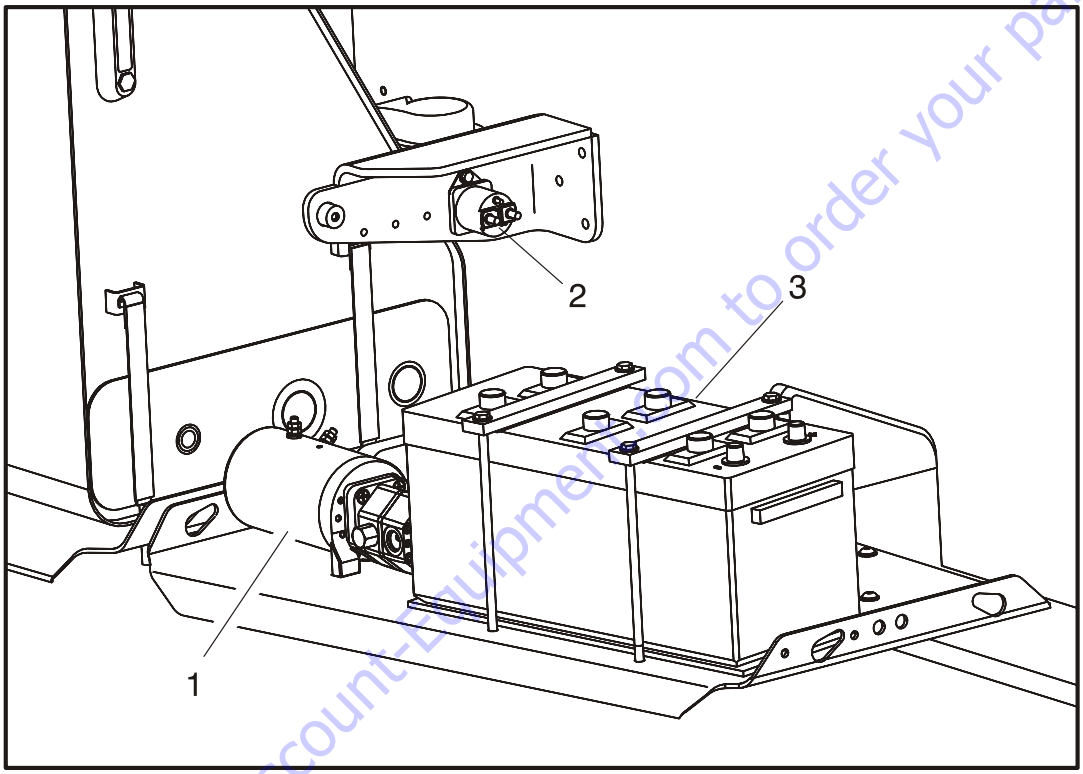


Figure 3-72. Inspecting Generator Brushes, Replacing Brushes, and Cleaning Slip Rings

3.27 AUXILIARY POWER SYSTEM

The auxiliary power system is intended as a secondary means of moving the boom in the event of primary power loss. This system uses an electric motor/pump unit powered by a 12V battery capable of operating all functions except drive, controlled arc, controlled boom angle, and envelope tracking. During lift up or down functions, no other functions are permitted and during lift up functions, automatic platform leveling is not active. To reduce the demand on the battery and therefore extend the run time of the system, the auxiliary power functionality differs from the primary power functionality. The auxiliary power lift down function supplies pilot pressure to the lift cylinder allowing gravity to lower the boom. The system redirects discharge oil from the lift cylinder to retract the telescope cylinder. When the boom is retracted to the transport length, the telescope in valve is dropped out and lift down is operated alone allowing the platform to reach the ground. This not only greatly reduces the power required for these functions but also lowers the boom within the envelope regardless of starting position. Envelope control and moment control remain active during the auxiliary power function.



1. Auxiliary Pump
2. Power Relay
3. Battery

Figure 3-73. Auxiliary Pump Installation

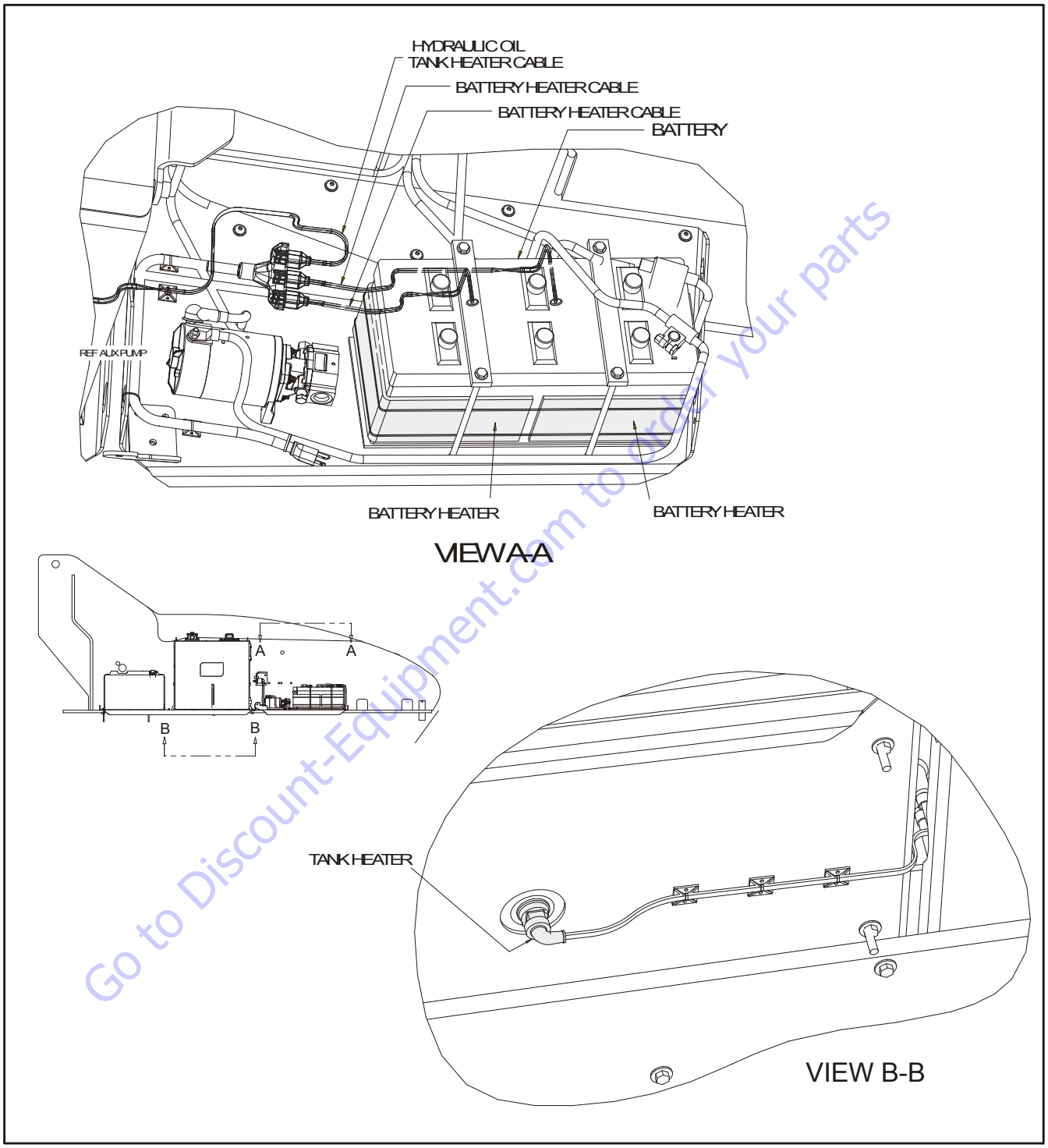


Figure 3-74. Cold Weather Package

3.28 COLD WEATHER PACKAGE

As an option, a cold weather package is available to allow the machine to be operated in lower temperatures. The package consists of battery heaters, a hydraulic tank heater, Exxon Univis hydraulic oil, and diesel fuel conditioner. See Figure 3-74., Cold Weather Package.

3.29 ENGINE

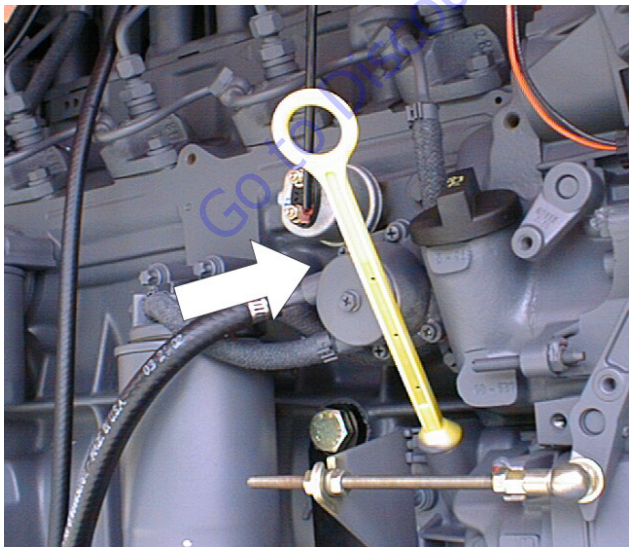
NOTE: *Refer to the engine manufacturer's manual for detailed operating and maintenance instructions.*

Glow Plugs

If the glow plug option is enabled in the JLG Control System, the glow plug and indicator lamp will be energized when the Power/Emergency Stop switch is pulled on if the ambient air temperature is less than 50° F (10° C) and the engine coolant temperature is less than 140° F (60° C). This determination will occur one second after the Power/Emergency Stop switch has been pulled on. The lamp and glow plugs will remain energized for the period of time specified by the setting in the JLG Control System. Engine start shall be disabled during this period. On Deutz engines, the glow plugs will continue (post glow) after the engine has started for three times the machine digit setting.

Checking Oil Level

1. Switch the engine off before checking oil level.
2. Make sure the machine and engine are level.
3. Remove the oil dipstick.
4. Wipe the dipstick with non-fibrous, clean cloth.
5. Insert the dipstick to the stop and remove again.



Check the oil level, and if necessary, top the oil level up to the MAX mark with an approved grade and type of oil as outlined in the engine manufacturer's operator's manual. Refer to Figure 3-75., Deutz Engine Dipstick.

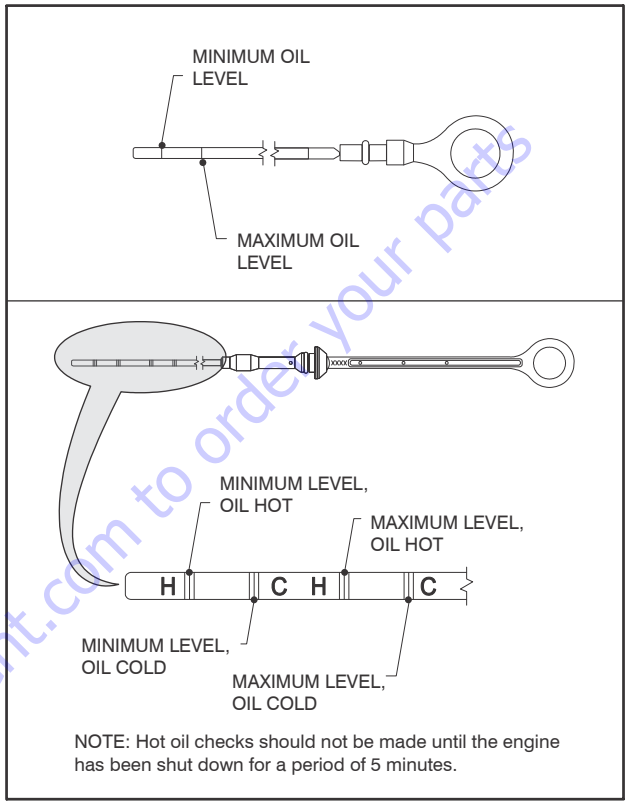


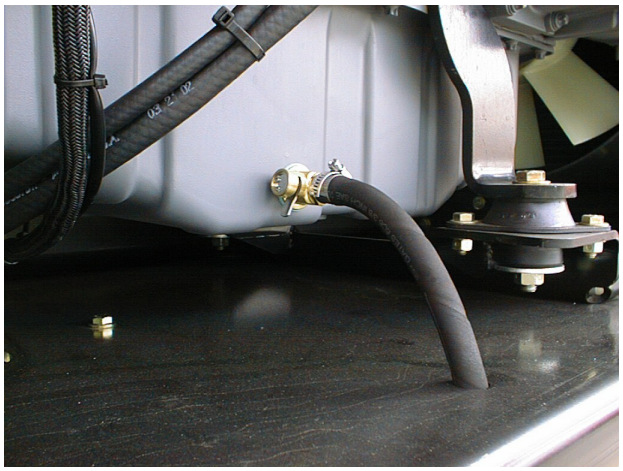
Figure 3-75. Deutz Engine Dipstick

6. Replace the dipstick making sure that it is fully seated in the dipstick tube to seal off the crankcase.

Changing Engine Oil

1. Allow the engine to warm up. The engine oil should reach approximately 176° F (80° C).
2. Make sure the machine and engine are level.
3. Switch off the engine.
4. Place an oil tray under the engine.

5. Open the oil drain valve.



⚠ WARNING

WHEN DRAINING HOT ENGINE OIL THERE IS A RISK OF SCALDING.

NOTICE

DO NOT LET USED OIL RUN INTO THE SOIL; COLLECT THE USED OIL IN A CONTAINER SUITABLE FOR DISPOSAL OR RECYCLING. DISPOSE OF THE USED ENGINE OIL IN ACCORDANCE WITH ENVIRONMENTAL REGULATIONS.

6. Drain the oil.
7. Close the oil drain valve.
8. Pour in new engine oil. Refer to Section 1 for capacity and refer to Figure 3-76., Engine Oil Viscosity for the proper grade.

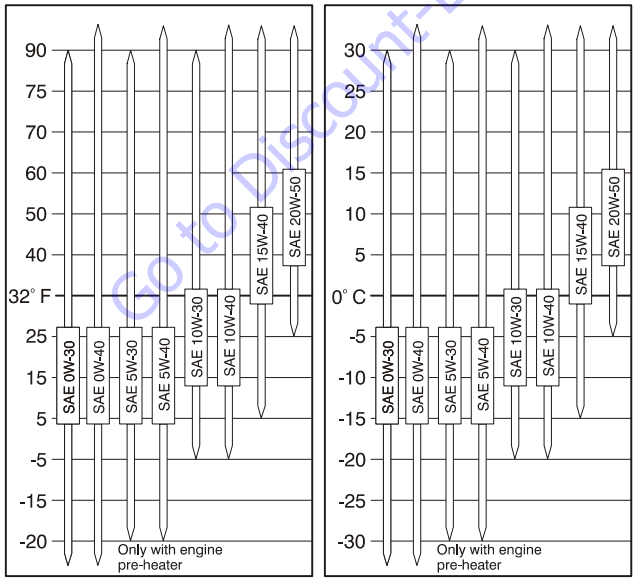
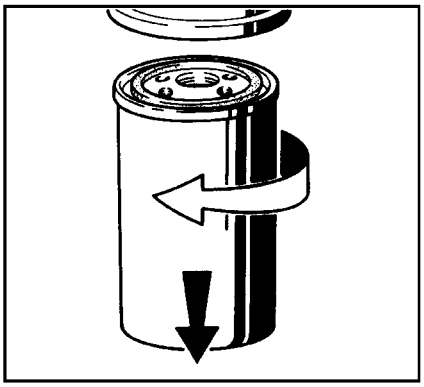


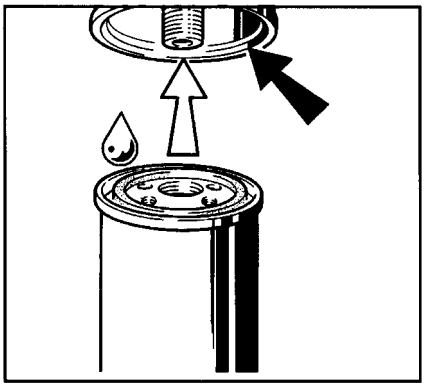
Figure 3-76. Engine Oil Viscosity

Changing the Oil Filter

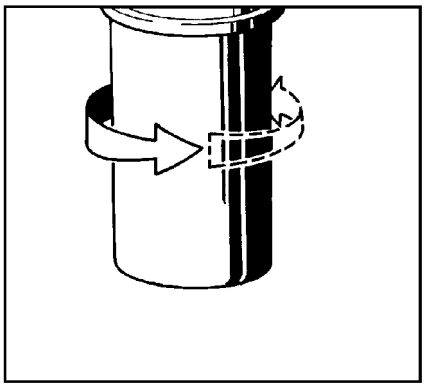
1. Wipe the area around the filter to clean any dirt from the area.
2. Using a suitable oil filter removal tool, loosen the lube oil filter cartridge and spin off.



3. Catch any escaping oil.
4. Clean any dirt from the filter carrier sealing surface.
5. Lightly oil the rubber gasket on the new oil filter.

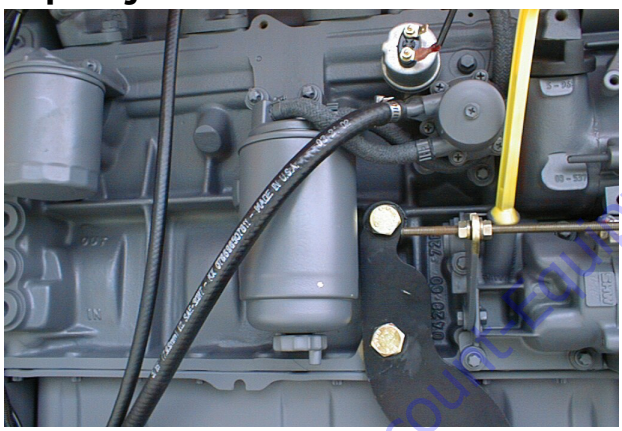


6. Manually screw in the new filter until the gasket is flush.



7. Tighten the filter another half-turn.
8. Check the oil level.
9. Check the oil pressure.
10. Check the oil filter cartridge and make sure there are no leaks.

Replacing the Fuel Filter

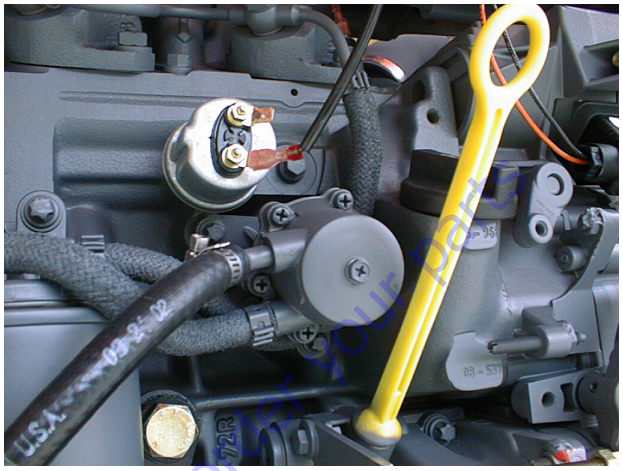


⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

1. Wipe the area around the filter to clean any dirt from the area.
2. Undo the fuel filter cartridge and spin off.
3. Catch any escaping fuel.
4. Clean any dirt from the filter carrier sealing surface.
5. Apply a light film of oil or diesel fuel to the rubber gasket of the new filter cartridge.
6. Manually screw in the new filter until the gasket is flush.
7. Tighten the fuel filter cartridge with a final half-turn.
8. Open the fuel shut-off valve.
9. Check for leaks.

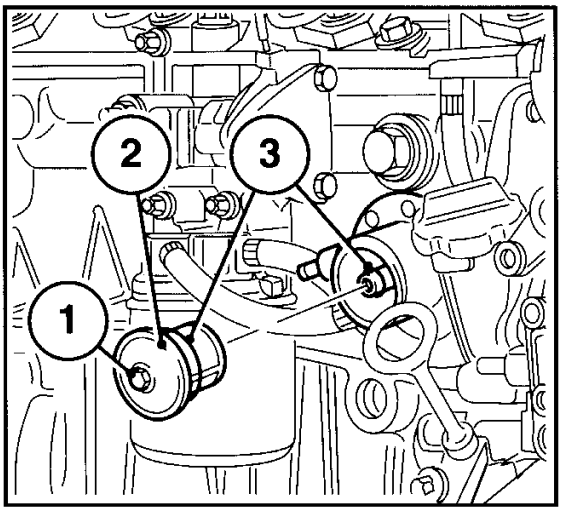
Cleaning the Fuel Strainer



⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

1. Unscrew the hexagonal nut (1).



2. Remove the fuel strainer cover (2).
3. Clean the fuel strainer with diesel fuel, replace if necessary.
4. Place the seal (3) in position.
5. Install the fuel strainer cover (2) in position and tighten the hexagonal screw (1).
6. Check for leaks.

3.30 DEUTZ ENGINE - TD2.9L4

NOTE: *Refer to engine manufacturer's manual for detailed operating and maintenance instructions. Limited engine maintenance items are presented here for convenience but detailed engine maintenance items and schedule are included in the engine manufacturer's manual.*

Glow Plugs

If the glow plug option is enabled in the JLG Control System, the glow plug and indicator lamp will be energized when the Power/Emergency Stop switch is pulled on if the ambient air temperature is less than 50° F (10° C) and the engine coolant temperature is less than 140° F (60° C). This determination will occur one second after the Power/Emergency Stop switch has been pulled on. The lamp and glow plugs will remain enegized for the period of time specified by the setting in the JLG Control System. Engine start shall be disabled during this period. On Deutz engines, the glow plugs will continue (post glow) after the engine has started for three times the machine digit setting.

Check Oil Level

1. Make sure machine and engine are level and switch engine OFF before checking oil level.
2. Remove oil dipstick and wipe with clean cloth.
3. Insert dipstick to the stop and remove again.
4. Check oil level. Top oil level as shown in figure below with an approved grade and type of oil outlined in engine manufacturer's operator's manual.

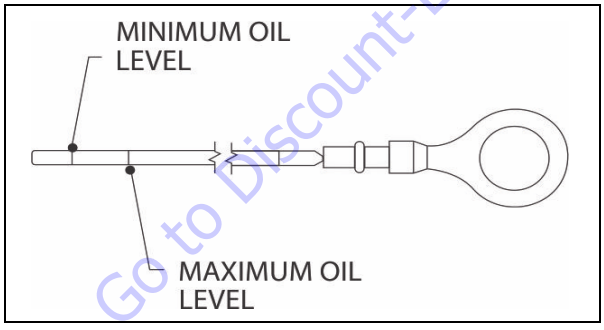


Figure 3-77. Deutz Engine Dipstick

5. Replace dipstick until fully seated.

Replacing Engine Oil

1. Allow engine to warm up. Engine oil should reach approximately 176° F (80° C).
2. Make sure machine and engine are level.
3. Switch off engine.
4. Place oil tray under engine.

⚠ CAUTION

HOT ENGINE OIL CAN CAUSE BURNS. AVOID CONTACT WITH HOT OIL WHEN DRAINING.

NOTICE

COLLECT USED OIL IN A CONTAINER SUITABLE FOR DISPOSAL OR RECYCLING. DISPOSE OF USED ENGINE OIL IN ACCORDANCE WITH ENVIRONMENTAL REGULATIONS.

5. Open oil drain valve and drain oil.
6. Close oil drain valve.
7. Pour in new engine oil. Refer to Section 1 for capacity and Figure 3-78., Engine Oil Viscosity.

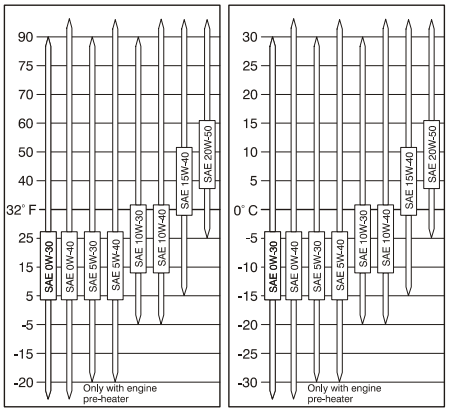


Figure 3-78. Engine Oil Viscosity

Replacing the Oil Filter

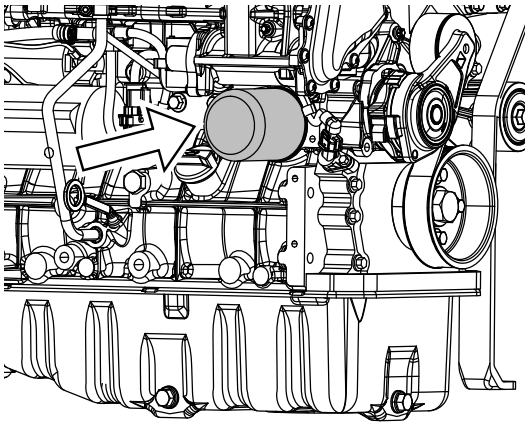
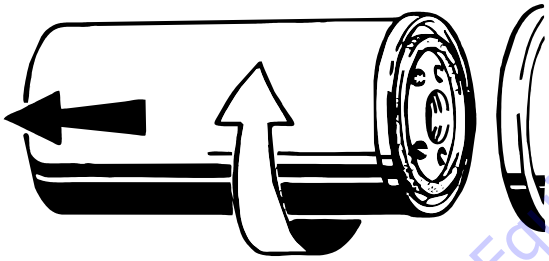
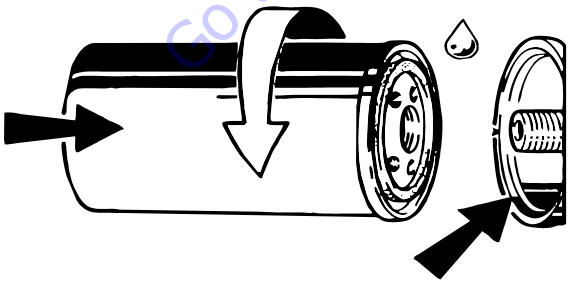


Figure 3-79. Location of the oil filter

1. Wipe area around filter to clean any dirt from area.
2. Using a suitable oil filter removal tool, loosen lube oil filter element and spin off.



3. Catch any escaping oil.
4. Clean any dirt from filter carrier sealing surface.
5. Lightly coat new oil filter rubber gasket with clean oil.
6. Screw in new filter by hand until gasket is flush.
7. Hand-tighten filter another half-turn.



8. Check oil level.
9. Check oil pressure.
10. Check oil filter cartridge for leaks.

Replacing the Primary Fuel Filters

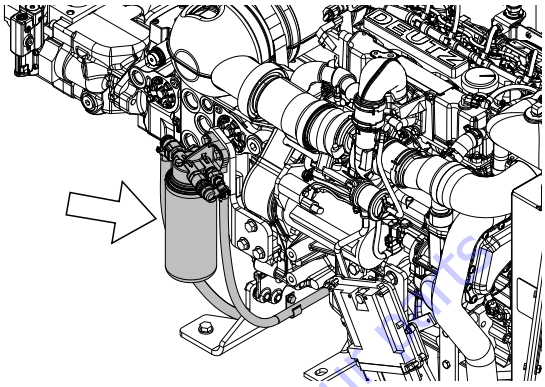
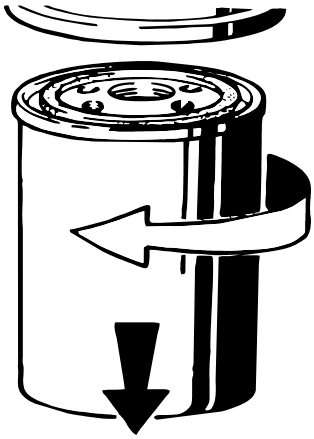


Figure 3-80. Location of the Primary Fuel Filter

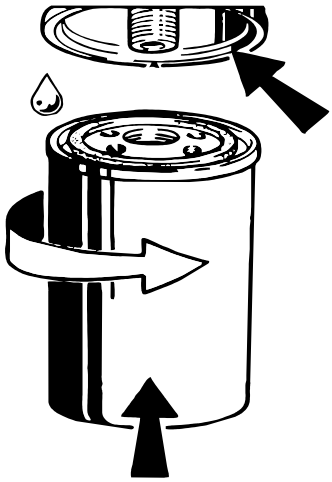
⚠ WARNING

FUEL IS FLAMMABLE AND CAN CAUSE DEATH OR SERIOUS INJURY. MAKE SURE NO OPEN FLAMES OR SPARKS ARE IN THE AREA WHEN WORKING ON FUEL SYSTEM. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEMS.

1. Wipe area around filter to clean any dirt from area.
2. Fuel supply from the fuel tank may need to be blocked to prevent flow from the fuel tank.
3. Remove fuel filter cartridge.
4. Catch any escaping fuel.



5. Clean dirt from filter carrier sealing surface.
6. Apply light film of oil or diesel fuel to rubber gasket of new filter cartridge.
7. Screw in new filter by hand until gasket is flush. Hand-tighten filter another 3/4 turn.



8. Check for leaks.

Replacing the Fuel Pre-Filter

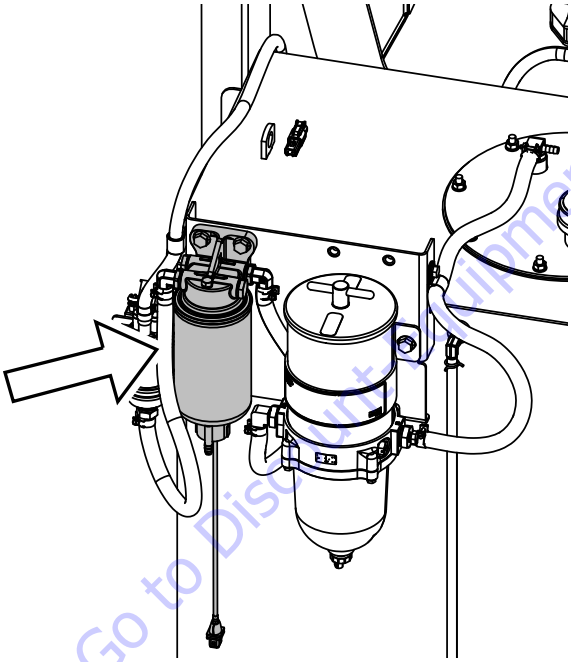
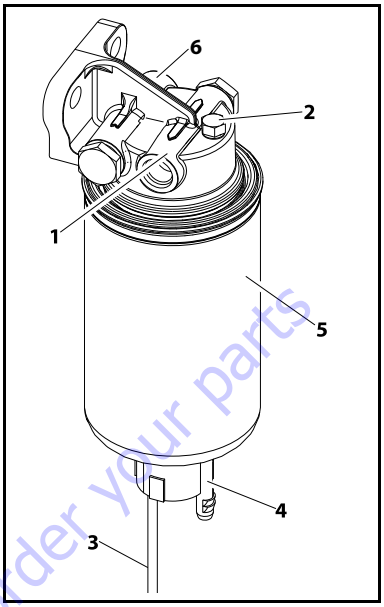


Figure 3-81. Location of Fuel Pre-Filter

NOTE: *Refer Figure 3-82., Components of Fuel Pre-Filters.*



1. Fuel Supply Flow to the Pump
2. Venting Screw
3. Electrical Connection for Water Level Sensor
4. Drain Plug
5. Filter Element
6. Fuel Inlet from the Fuel Tank

Figure 3-82. Components of Fuel Pre-Filter

⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

1. Switch off the engine.
2. Fuel supply from the fuel tank may need to be blocked to prevent fuel flow from the tank.
3. Place suitable collecting container under drain plug.
4. Disconnect electrical connections from water sensor.
5. Loosen drain plug and drain liquid.
6. Remove filter element.
7. Catch any escaping fuel.
8. Clean any dirt of the sealing surfaces of the new filter element and opposite side of filter head.
9. Wet the sealing surfaces of new filter element slightly with fuel.
10. Install new filter onto the filter head in clockwise direction. Torque to 12.5-13.3 ft. lbs. (17-18 Nm).
11. Install the drain plug and tighten to torque 1-1.4 ft. lbs. (1.3-1.9 Nm).
12. Connect electrical connection to water sensor.
13. Check for leaks after starting engine.

Water in Fuel Sensing System (Optional)

The Water in Fuel Sensing System detects when there is an excessive amount of water in the fuel and sets a DTC code in the JLG Control System to alert the operator and/or service technician.

When Water in Fuel condition occurs, the machine will respond in the following way:

- The engine will shut down automatically.
- The JLG Control System will set DTC 4375 - Water in Fuel.
- An alarm will sound from the active control station (ground or platform).
- If in platform mode, the Low Fuel Indicator will flash.
- Engine Restart will be permitted after the machine senses the Water in Fuel condition, but will only run for 2 minutes and the engine will shut down again. This restart process will continue until the Water in Fuel condition is corrected.

Draining Water

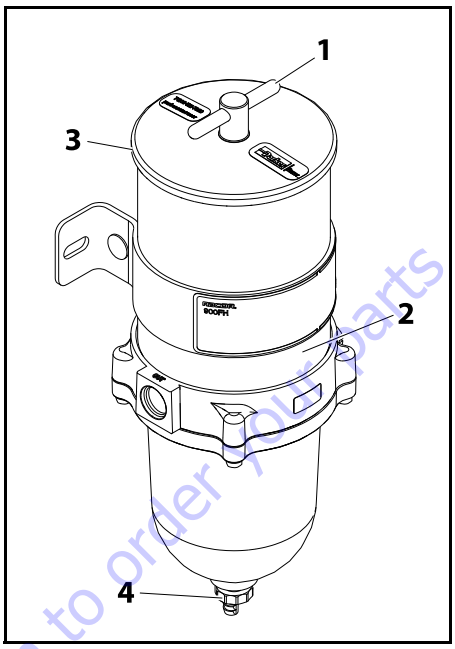
Frequency of water draining is determined by the contamination level of the fuel. Inspect or drain the collection bowl of water daily or as necessary. The collection bowl must be drained before contaminants reach the top of the turbine or when the Water Detection Module (optional) indicates it's time to drain water.

PRESSURE APPLICATIONS / INSTALLATIONS:

1. Open the drain plug on the bottom of the bowl to evacuate water and contaminants with a suitable collection container in place.
2. Close the drain after all the water and contaminants have been evacuated.

NOTE: *Do not leave the drain open too long as it may completely drain the entire filter assembly of water and fuel.*

Auxiliary Fuel Filter



1. T-handle
2. Filter Element
3. Lid
4. Drain Plug

Figure 3-83. Components of Auxiliary Fuel Filter

⚠ WARNING

WHEN WORKING ON THE FUEL SYSTEM, MAKE SURE THERE ARE NO OPEN FLAMES OR SPARKS IN THE AREA. DO NOT SMOKE WHEN WORKING ON THE FUEL SYSTEM.

ELEMENT REPLACEMENT

Frequency of element replacement is determined by the contamination level of the fuel. Replace the elements every 500 hours, if power loss is noticed or annually, which ever comes first.

1. Switch off the engine.
2. Fuel supply from the fuel tank may need to be blocked to prevent fuel flow from the tank.
3. Wipe the area around the filter to clean any dirt from the area.
4. Remove the T-handle and lid.
5. Remove the element by holding the bail handles and slowly pulling upward with a twisting motion. Dispose of properly.
6. Replace old lid gasket and T-handle O-ring with new seals (supplied with new element). Lubricate both seals with motor oil or diesel fuel before installation.
7. Refer to Priming of auxiliary fuel filter or fill the unit with clean fuel, then replace the lid and T-handle then tighten snugly by hand only.

NOTE: *Do not use any tool for removal and installation of T-handle.*

PRIMING OF AUXILIARY FUEL FILTER

1. Remove the T-handle and lid from the top of the filter assembly.
2. Fill the filter assembly with clean fuel.
3. Lubricate lid gasket and T-handle O-ring with clean fuel or motor oil.
4. Replace the lid and T-handle and tighten snugly by hand only.

NOTE: *Do not use any tool for removal and installation of T-handle.*

5. Start engine and check for fuel system leaks.
6. Correct as necessary with engine off and pressure relieved from filter assembly.

DRAINING WATER

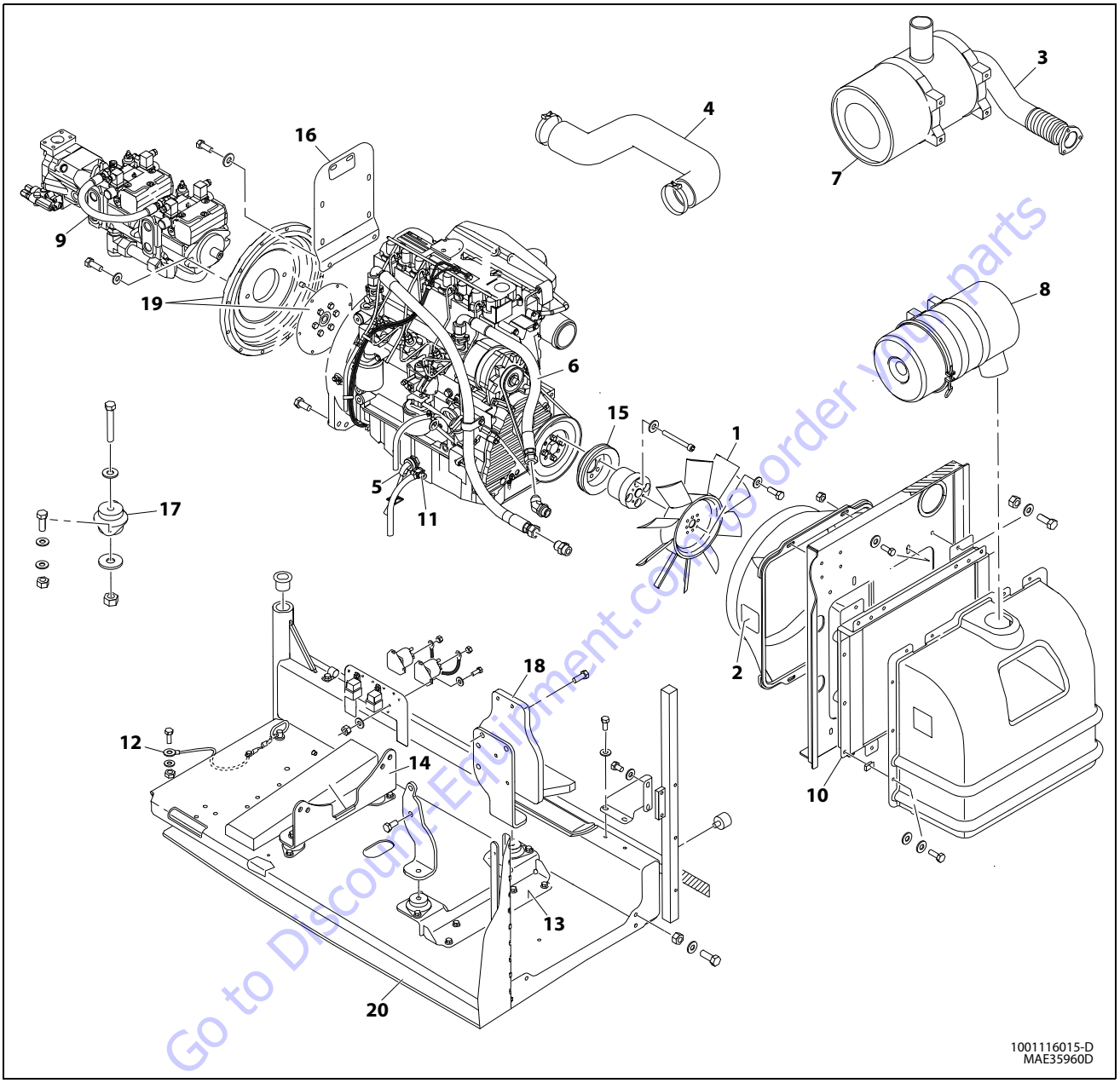
Frequency of water draining is determined by the contamination level of the fuel. Inspect or drain the collection bowl of water daily or as necessary. The collection bowl must be drained before contaminants reach the top of the turbine or when the Water Detection Module (optional) indicates it's time to drain water.

PRESSURE APPLICATIONS / INSTALLATIONS:

1. Open the self-venting drain plug on the bottom of the bowl to evacuate water and contaminants with a sui able collection container in place. Head pressure will push any water and contaminants out of the drain while keeping the filter primed.
2. Close the drain after all the water and contaminants have been evacuated.
3. If necessary, follow priming of auxiliary fuel filter.

NOTE: *Do not leave the drain open too long as it may completely drain the entire filter assembly of water and fuel.*

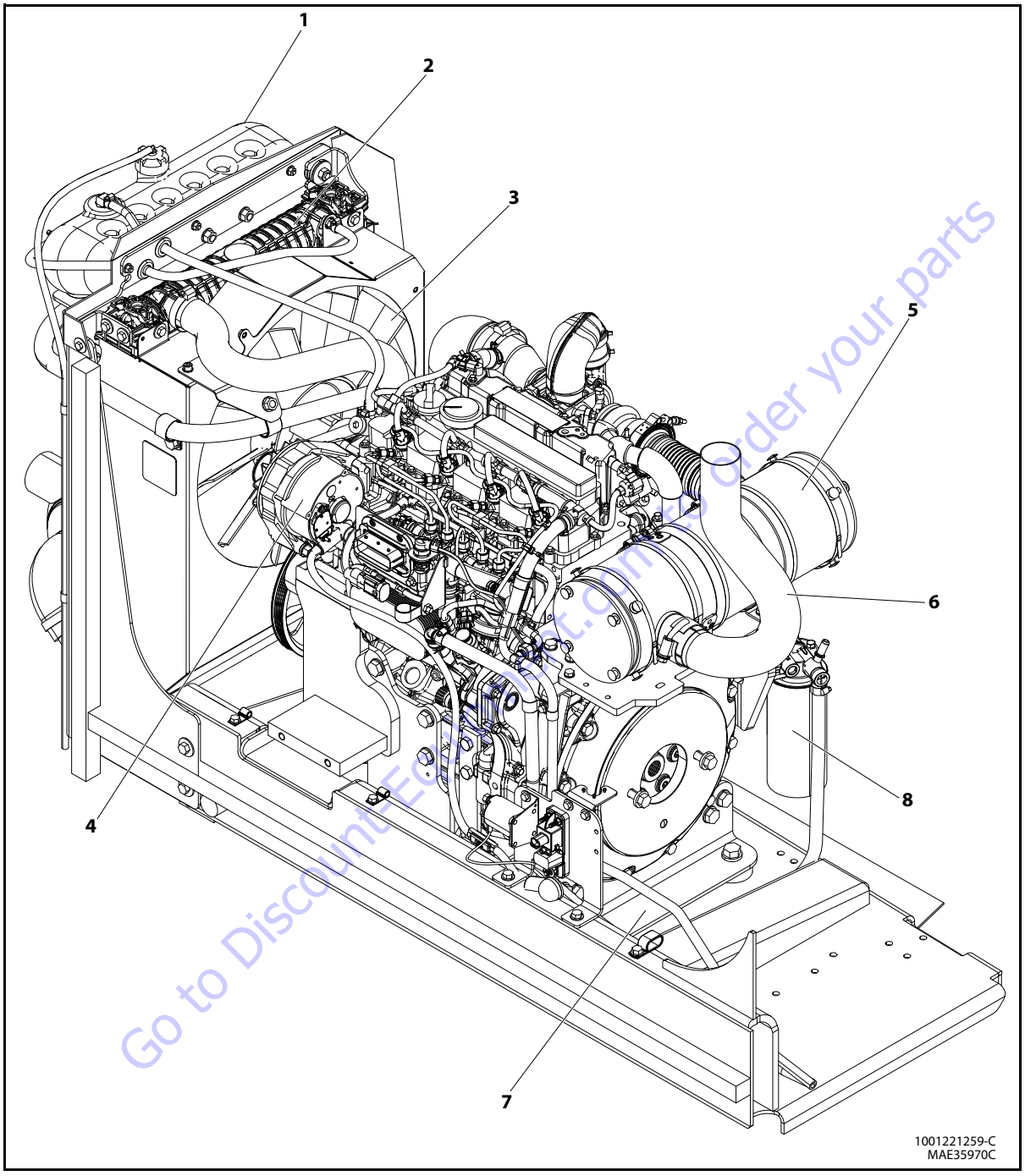
3.31 DEUTZ TD2011 ENGINE



1. Fan
2. Rod
3. Exhaust
4. Air Intake
5. Heater
6. Oil Cooler
7. Muffler
8. Air Cleaner Assembly
9. Pump Assembly
10. Cooler
11. Oil Drain
12. Lanyard
13. Front Engine Mounting Plate
14. Rear Engine Mounting Plate
15. Pulley
16. Muffler Bracket
17. Motor Mount
18. Generator Mount
19. Pump Coupling Kit
20. Engine Tray

Figure 3-84. Detuz TD2011 L040 Engine Installation

3.32 DEUTZ 2.9 L4 (GUO III) ENGINE



1. Surge Tank
2. Radiator
3. Fan
4. Alternator
5. Muffler
6. Exhaust Tail Pipe
7. Engine Mount
8. Fuel Filter

Figure 3-85. Detuz 2.9 L4 (GUO III) Engine Installation - Sheet 1 of 2