LUBRICATION ORDER

13 DECEMBER 1990

*LO 10-3930-643-12

TRUCK, FORKLIFT, DED
PNEUMATIC TIRE, 10,000 LB. CAPACITY
ROUGH TERRAIN, ARTICULATED FRAME STEER
(DRESSER INDUSTRIES MODEL M10A, MHE 236)
(NSN 3930-01-054-3833)

Reference TM 10-3930-643-10, TM 10-3930-643-20 and TM 9-2300-422-23&P

Engine oil/transmission fluids must be sampled at the appropriate intervals as prescribed in TB 43-0210.

Intervals (on-condition or hard time) and the related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all the services prescribed for a particular interval. On-condition (OC) oil sample intervals shall be applied unless changed by the Army Oil Analysis Program (AOAP) laboratory. Change the hard time interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions including longer-than usual operating hours. The hard time interval maybe extended during periods of low activity. If extended, adequate preservation precautions must be taken. Hard time intervals will be applied in the event AOAP laboratory support is not available.

Oil filters shall be serviced/cleaned/changed as applicable, when they are known to be contaminated, or clogged; service is recommended by AOAP laboratory analysis, or at prescribed hardtime intervals.

This LO is for crew(C)) or unit (O) maintenance. Lube intervals (on-condition or hard time) are based on normal operation. Lube more during constant use, and less during inactive periods. Use correct grade of lubricant for seasonal temperature expected.

On the pictures a dash line (-) means lube points on both sides.

Clean parts with dry cleaning solvent (SD), type II, or equivalent. Use cleaning compound solvent (RBC) on powder-fouled parts. Dry before lubricating. DO NOT use fluid or semi-fluid lubricant on SFD lubricated surface. Wipe surface dry.

Before you start your lube service.

ALWAYS	NEVER
a. Clean grease fittings before lubrication.	a. Use wrong type/grade grease.
b. Use the lubrication order as your guide.	b. Use too much lubricant.

Reporting Errors and Recommending Improvements. You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

Approved for public release: distribution is unlimited.

*** This LO supersedes the lubrication instructions contained in LO 10-3930-843-12 dated 12 March 1990.**

TOTAL MAN-HOURS		TOTAL MAN-HOURS	
INTERVAL	MAN-HOURS	INTERVAL	MAN-HOURS
D	0.4	Q	4.0
W	2.5	S	4.5
M	3.5	A	5.0

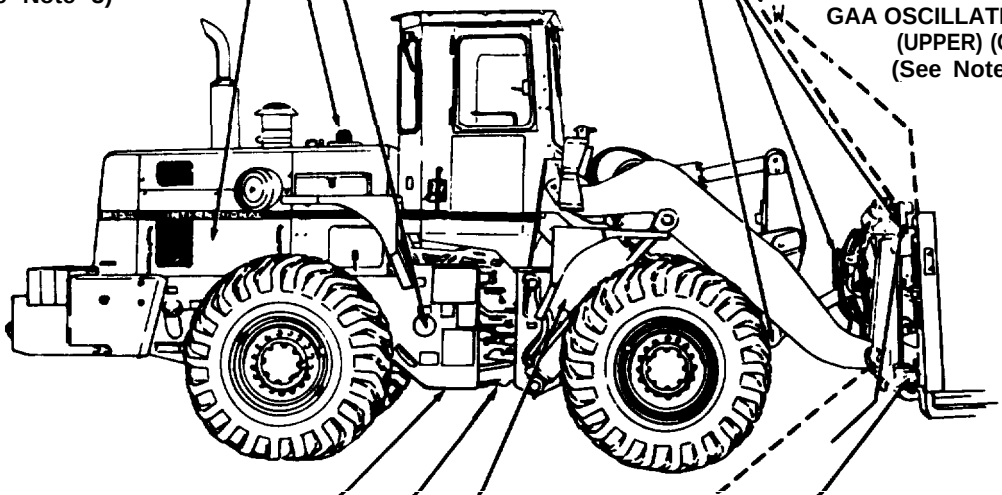
LUBRICANT · INTERVAL

INTERVAL · LUBRICANT

ENGINE CRANKCASE OIL (C) (See Note 1) — OE/HDO — D

TRANSMISSION OIL (C) (See Note 2) — OE/HDO — D

HYDRAULIC RESERVOIR OIL (C) (See Note 3) — OE/HDO — D

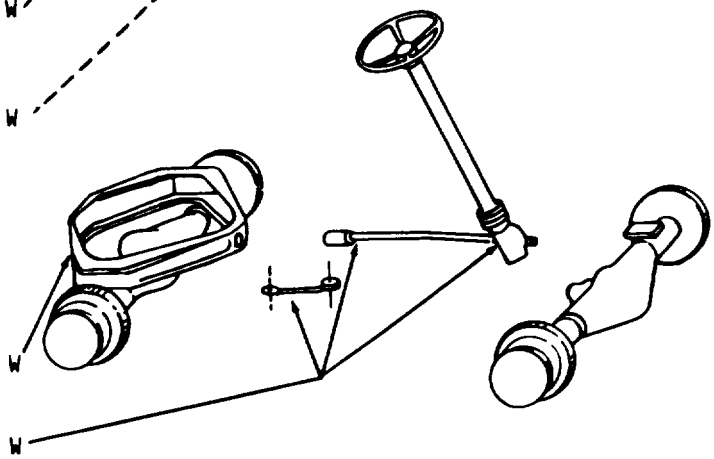


TRANSMISSION OIL (O) (See Note 25) — OE/HDO — OC

ARTICULATE PIVOTS (O) (See Note 4) — GAA — W

SERVICE BRAKE RESERVOIRS (O) (See Note 14) — BFS — W

FORK PIVOTS (O) (See Note 11) — GAA — W



AXLE CRADLE (O) (See Note 12) — GAA — W

DRAG LINK (O) (See Note 13) — GAA — W

W — GAA — FORK LINK (O) (See Note 5)

W — GAA — FORK SIDESHIFT ROLLER (UPPER) (O) (See Note 7)

W — GAA — INNER SIDESHIFT ROLLERS (O) (See Note 8)

W — GAA — OSCILLATING ROLLERS (UPPER) (O) (See Note 9)

W — GAA — OSCILLATING CYLINDER (See Note 6) (O)

W — GAA — FORK SIDESHIFT ROLLER (O) (See Note 10)

LUBRICATION ORDER **LO 10-3930-643-12**

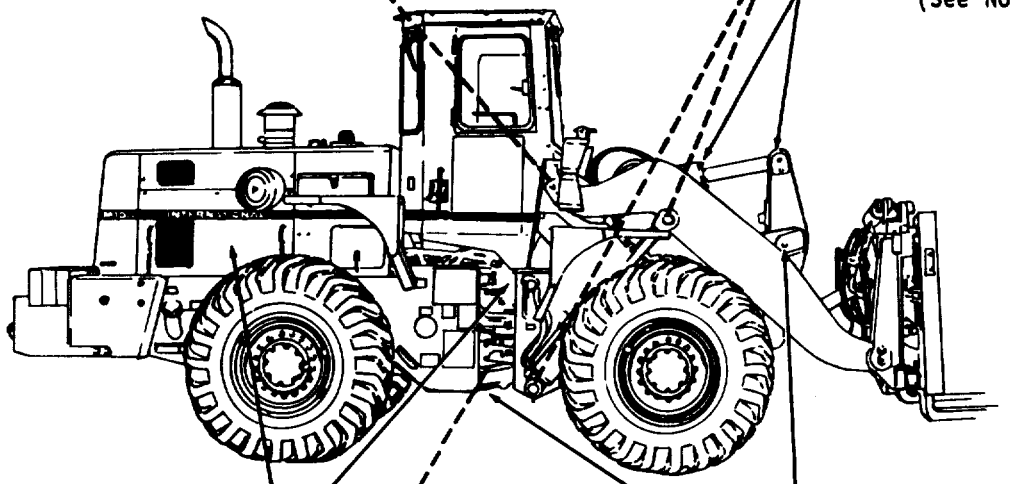
LUBRICANT · INTERVAL

INTERVAL · LUBRICANT

BOOM PIVOTS (O) GAA M
(See Note 15)

M GAA BOOM CYLINDERS (O)
(See Note 19)

M GAA TILT CYLINDER (O)
(See Note 20)



DRIVE SHAFT (O) GAA M
(See Note 16)

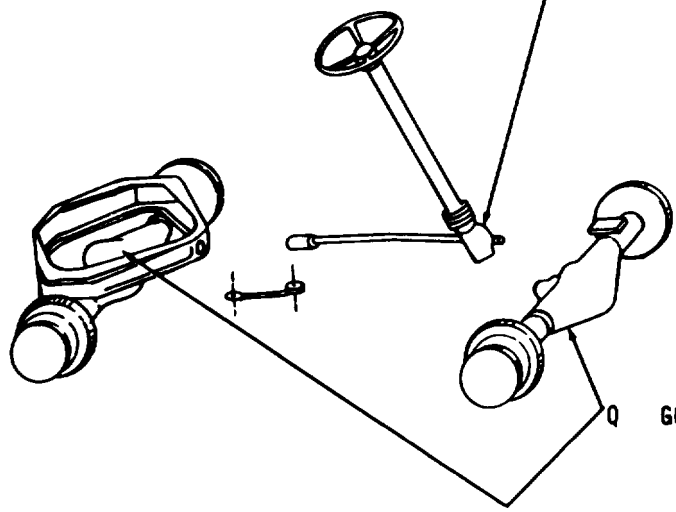
M GAA BELLCRANK PIVOT (O)
(See Note 21)

ENGINE CRANKCASE OIL (O) OE/HDO OC
(see Note 17)

Q GAA SUPPORT BEARING (O)
(See Note 22)

STEERING CYLINDERS (0) GAA M
(See Note 18)

M GO STEERING GEAR(o)
(See Note 23)



Q GO AXLE HOUSING(O)
(See Note 24)

WARNING

HOT OIL HAZARD

Hot oil can cause burns and SERIOUS INJURY. At operating temperature, the hydraulic cylinder is under pressure. Remove filler cap only when engine is stopped and the cap is cool enough to touch. Remove the filler cap slowly to relieve pressure.

LUBRICANT HAZARD

Brake fluid, lubricants, and other chemicals can cause SEVERE INJURY to eyes. If your eyes are affected, flush immediately with cold water and seek medical attention.

WARNING

PERSONNEL SAFETY HAZARD

Stay clear of any and all moving parts of the forklift when the boom and forks are not lowered to the ground. Use extreme caution to prevent SERIOUS INJURY while performing lubrication.

WARNING

EXHAUST GASES CAN BE DEADLY

Exhaust gases can produce symptoms of headache, dizziness and loss of muscular control. DEATH, coma or permanent brain damage can result from severe exposure. You can insure safety by observing the following rules:

- Do not operate engine in enclosed areas unless the area is properly ventilated.
- If you notice exhaust odors or exposure symptoms, IMMEDIATELY VENTILATE the area.
- Remove affected personnel and take the following actions:
  - Expose affected personnel to fresh air.
  - If necessary, administer artificial respiration.
  - Keep affected personnel warm.
  - Do not permit physical exertion.
  - Seek medical attention immediately.

Refer to FM4 21-11, First Aid for Soldiers, for first aid treatments of injured personnel.

WARNING

TOXIC/FLAMMABLE

Dry cleaning solvent (P-D-680), used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Hear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. f you become dizzy while using cleaning solvent, get fresh air immediately.

KEY

LUBRICANT	CAPACITIES	EXPECTED TEMPERATURE			FOR ARCTIC OPERATION REFER TO FM 9-207	INTERVALS
		Above +15°F (Above -9°C)	40°to -15°F (+4°C to -26°C)	+40°F to -65°F (+4°C to -54°C)		
OE/HDO (MIL-L-2104) Lubricating Oil, ICE, Tactical OEA (MIL-L-46167) Lubricating Oil, ICE, Arctic						D=Daily or every 10 service hours W=Weekly or every 50 service hours M=Monthly or every 250 service hours Q=Quarterly or every 500 service hours S=Semi-annually or every 1000 service hours A=Annually or every 2000 service hours
Engine Oil System (With Filter)	22 Qts (83.3L)	OE/HDO-30 (0-238)	OE/HDO-10 (0-237)	OEA (0-183)		
Oil Can Points Towing Pintle	As Req	SEE KEY NOTE 1	SEE KEY NOTE 1 & 2			
Hydraulic System	31 Gal (117.3L)	OE/HDO-10 (0-237)	OE/HDO-10 (0-237)	OEA (0-183)		
Hydraulic Reservoir	14.5 Gal (54.9L)					
Transmission	5 GAL (18.9L)	SEE KEY NOTE 2	SEE KEY NOTE 2			
60 (MIL-L-2105) Lubricating Oil, Gear, Multipurpose Differential						
Front	8 Gal (30.3L)	60-80/90 (0-226)	60-80/90 (0-226)	60-75 (0-186)		
Rear	8 Gal (30.3L)					
Steering Gear	1 Pt (0.5L)	SEE KEY NOTE 3	SEE KEY NOTE 3			
BFS (MIL-B-46176) Brake Fluid, Silicone, Automotive, All Weather, Operational and Preservative Service Brake Reservoirs	As Req	BFS (All Temperatures)				

KEY (CONTINUED)

LUBRICANT	CAPACITIES	EXPECTED TEMPERATURE			INTERVALS
		Above +15°F (Above -9°C)	40° to -15°F (+4°C to -26°C)	+40°F to -65°F (+4°C to -54°C)	
GAA (MIL-G-10924) Grease, Automotive and Artillary		GAA (6-403) ALL TEMPERATURES			FOR ARCTIC OPERATION REFER TO FM 9-207
Fork Pivots	As Req				
Fork Link	As Req				
Fork Side Shift Roller Upper and Lower	As Req				
Inner Side Shift Roller	As Req				
Oscillating Roller Upper and Lower	As Req				
Oscillating Cylinder	As Req				
Axle Cradle	As Req				
Drag Link	As Req				
Tilt Cylinder	As Req				
Boom cylinder	As Req				
Boom Pivot	As Req				
Drive Shaft	As Req				
Steering Cylinder	As Req				
Bellcrank Pivot	As Req				
Support Bearing	As Req				
Control Lever and Linkage Points	As Req				
Articulated Pivots	As Req				

KEY NOTES

NOTE 1- Grade 15W/40 (OE/HDO-15/40) may be used when expected temperatures are above +5°F (-15°C).

NOTE 2- If OEA lubricant is required to meet a prescribed expected temperature range, OEA lubricant is to be used in place of OE/HDO-lO lubricant for all expected temperature ranges where 0E/HD0-10 is specified in the Key.

NOTE 3- Grade 85W-140 (GO-85/l40) may be used when expected temperatures are above +10°F (-12°C). The NATO Code for GO-85/140 is O-228.

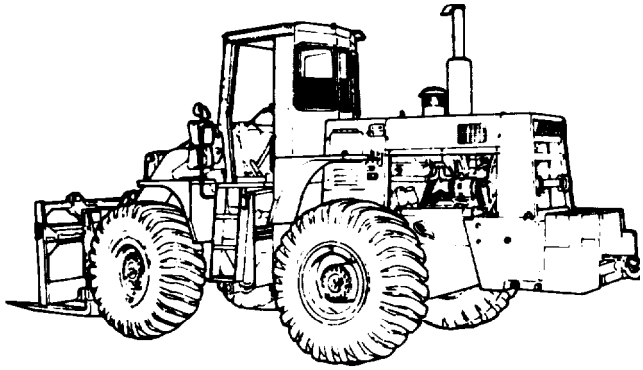
The following conditions will be observed BEFORE performing any lubrication task, unless otherwise specified:

1. Review the Lubrication Order before performing procedure and use it as a guide during procedure.
2. All tasks are two-man procedures. To ensure the safety of the man performing lubrication, the operator will remain at the controls during procedure.
3. Oil and fluid must be at operating temperature before levels are checked. Exercise forklift hydraulic systems to warm fluid.
4. Unless specified by a procedure, forks must be lowered to the ground to ensure that the forklift is immobile.
5. Forklift must be parked on level ground before checking oil or fluid levels. Failure-to do so will result in an incorrect reading.
6. Parking brake must be applied.
7. Transmission must be in neutral.
8. Unless specified by a procedure, engine must be shut off.
9. Disconnect switch must be off.

MODEL DIFFERENCES

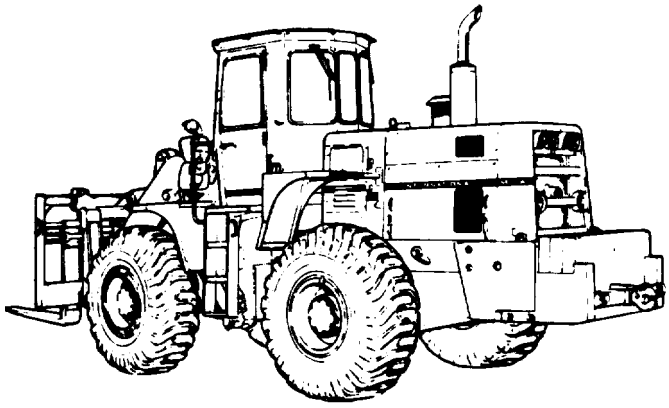
S/N 2000 AND BELOW

1. This model has a three-piece axle. The filler and level-plug is on the axle housing.
2. The model has only one service brake reservoir.
3. See LUBRICATION SPECIFICATIONS for type of brake fluid used.



S/N 2001 AND ABOVE

1. This model has a one-piece axle. The filler and level plug is on the spindle of the axle housing.
2. This model has two service brake reservoirs.
3. See LUBRICATION SPECIFICATIONS for type of brake fluid used.
4. This model has an engine oil sample valve.

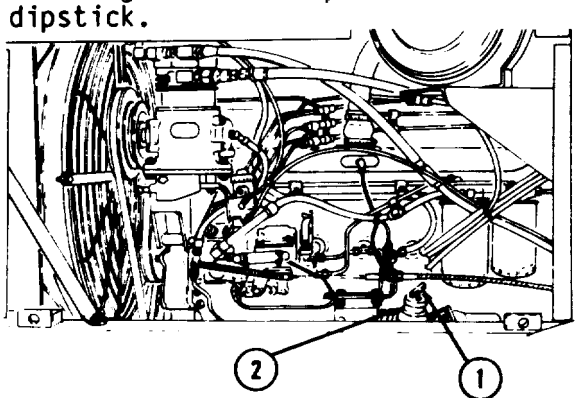


5. This model has a transmission oil sample valve.

6. The cab has windows and a door. The hinges require oi1 occasionally.

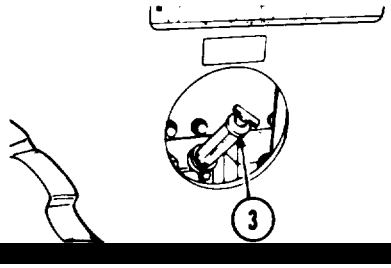
Note 1. ENGINE CRANKCASE

Engine oil must be checked with the engine off and stopped for 10 minutes. This allows all oil to drain back into crankcase. Use dipstick (1) to check the oil level. The level must be between ADO and FULL . If the level is at ADD or lower, add oil using filler pipe (2) to bring the level up to FULL on the dipstick.



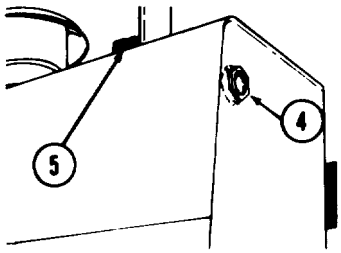
Note 2. TRANSMISSION OIL

Transmission oil must be checked with engine running at low idle, and transmission in neutral and locked. Transmission oil reading on dipstick (3) should indicate between ADD and FULL. If the level is at ADD or lower, add oil using filler pipe, to bring the level up to read FULL on the dipstick.



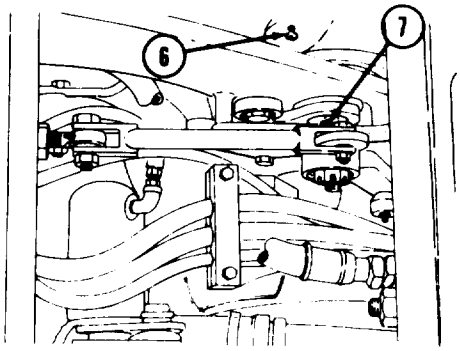
Note 3. HYDRAULIC RESERVOIR

Check fluid level on sight gage (4). The ball must be floating near the top of the gage (4). If not, remove cap and add hydraulic fluid at filler pipe (5).



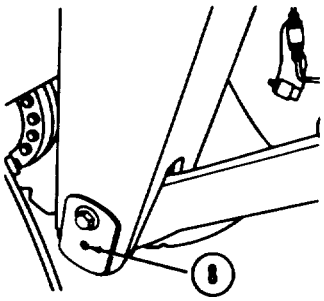
Note 4. ARTICULATED PIVOTS

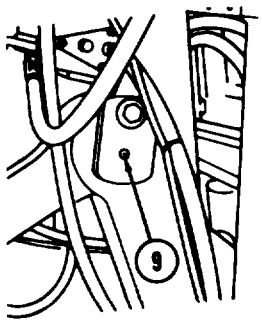
There is an upper and a 1ower fitting (6 and 7) for each pivot. Apply lubricant to each fitting until clean lubricant appears.



Note 5. FORK LINK

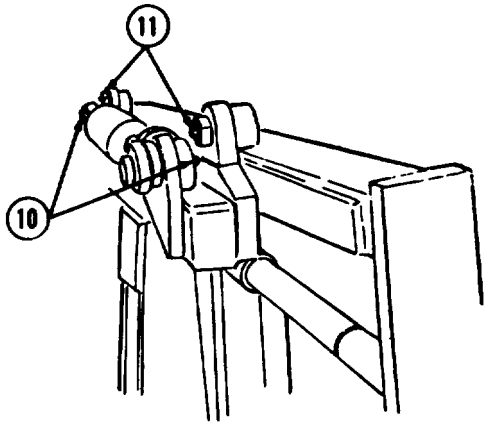
Apply lubricant to both fittings (8 and 9) until clean lubricant appears.





Note. 6. OSCILLATING CYLINDER

Apply lubricant to the fitting (10) at each end of the cylinder until clean lubricant appears.

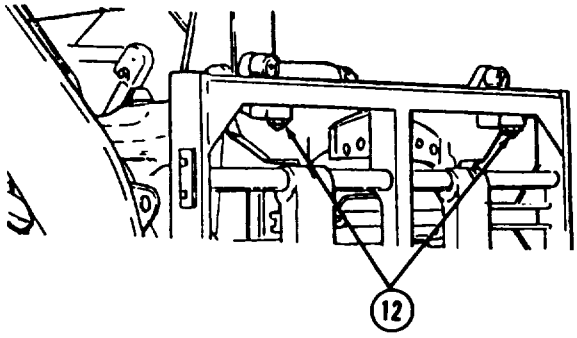


Note 7. FORK SIDESHIFT ROLLER (UPPER)

Apply lubricant to two fittings (11) until clean lubricant appears.

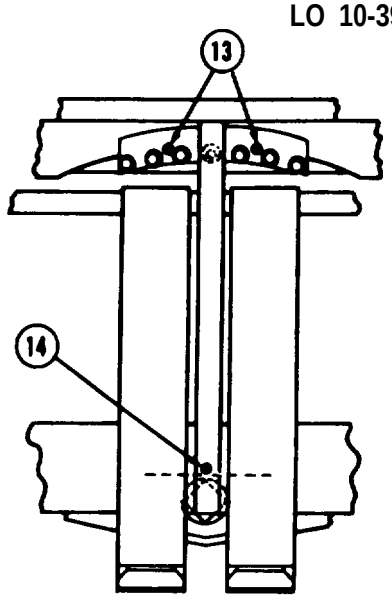
Note 8. INNER SIDESHIFT ROLLERS

Apply lubricant to two fittings (12) until clean lubricant appears.



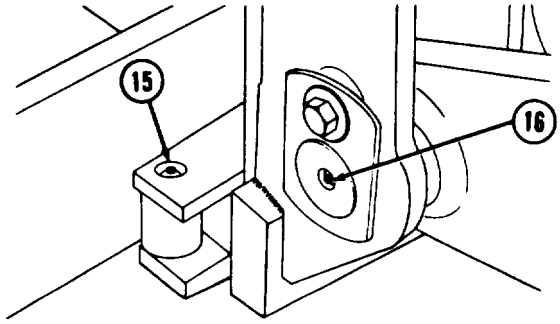
Note 9. OSCILLATING ROLLERS (UPPER AND LOWER)

Apply lubricant to two fittings (13) until clean lubricant appears. Apply lubricant to the lower fitting (14) until clean lubricant appears.



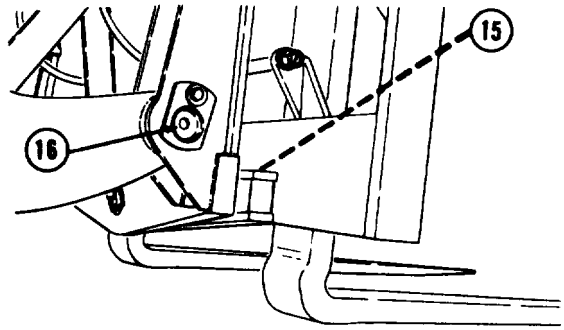
Note 10. FORK SIDESHIFT ROLLER (LOWER)

Apply lubricant to two fittings (15) until clean lubricant appears.



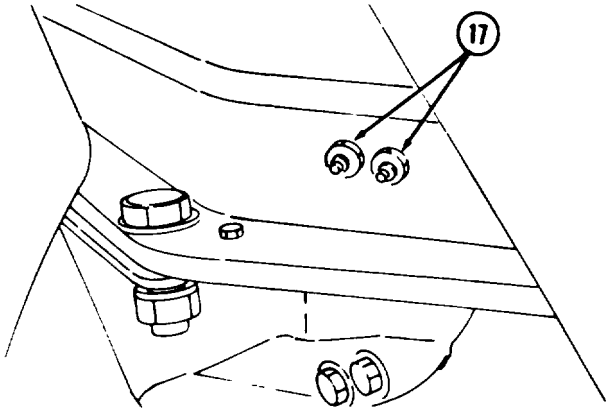
Note 11. FORK PIVOTS

Apply lubricant to two fittings (16) until clean lubricant appears.



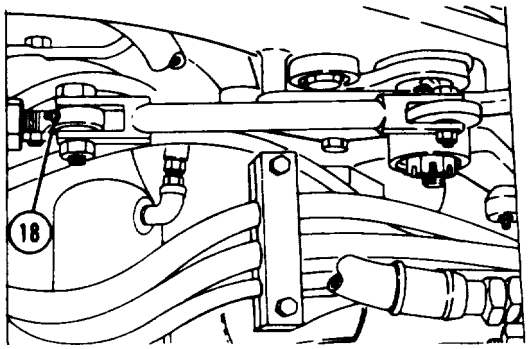
Note 12. AXLE CRADLE

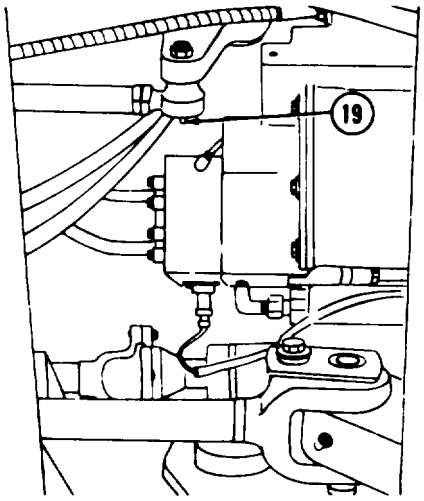
Apply lubricant to two fittings (17) until clean lubricant appears.

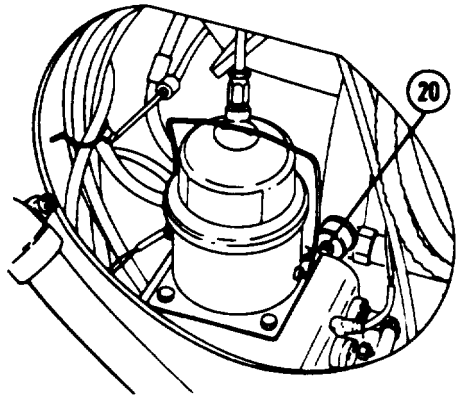


Note 13. DRAG LINK

Apply lubricant to three fittings (18, 19 and 20) until clean lubricant appears.







Note 14. SERVICE BRAKE RESERVOIRS

WARNING

LUBRICANT HAZARD

Brake fluid, lubricants, and other chemicals can cause SEVERE INJURY to eyes. If your eyes are affected, flush immediately with cold water and seek medical attention.

CAUTION

Do not mix brake fluids. Refer to LUBRICATION SPECIFICATIONS. Mixing fluids will damage the system.

NOTE

Cover reservoir when cap or cover is off to insure that oil is not contaminated during procedure.

S/N 2000 AND BELOW

Each brake has Its own pressure converter. The pressure converter hydraulic cylinders are supplied by one remotely mounted brake fluid reservoir. The reservoir is located on the inside front frame on the left side of the forklift.

Remove front left access cover. Remove filler cap (21) and breather assembly from reservoir (22). Remove and discard gasket (23). Visually check the fluid level. If the fluid is below one and one-half inches from the top, fill the reservoir as necessary, using the proper brake fluid.

WARNING

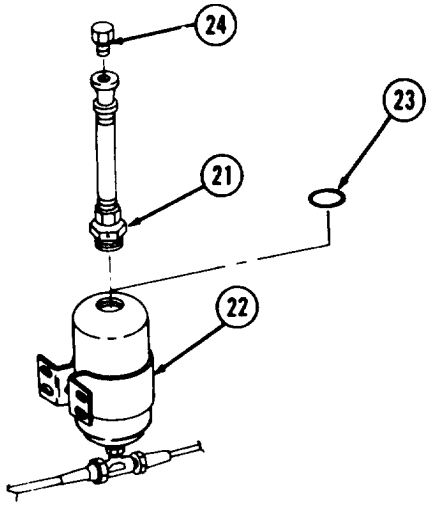
TOXIC/FLAMMABLE

Dry cleaning solvent (P-D-680), used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

Unscrew the breather plug (24) from the breather assembly. Clean with P-D-680.

Screw breather plug (24) into breather assembly. Replace gasket (23) on filler cap (21). Install filler cap and breather assembly into reservoir (22). Install front left access cover.

If fluid level is low, check for and correct leaks at pressure converters, fluid reservoirs, hydraulic lines, and brake calipers. Fluid level may also be low due to air in the hydraulic lines. If so, bleed the lines as described in TM 10-3930-643-20.



WARNING

LUBRICANT HAZARD

Brake fluid, lubricants, and other chemicals can cause SERIOUS INJURY to eyes. If your eyes are affected, flush immediately with cold water and seek medical attention.

Brake fluids DOT 3 Type SAE J 1703 and DOT 4 Type SAE J 1702 are flammable.

CAUTION

Do not mix brake fluids. Refer to LUBRICATION SPECIFICATIONS. Mixing fluids will damage the system.

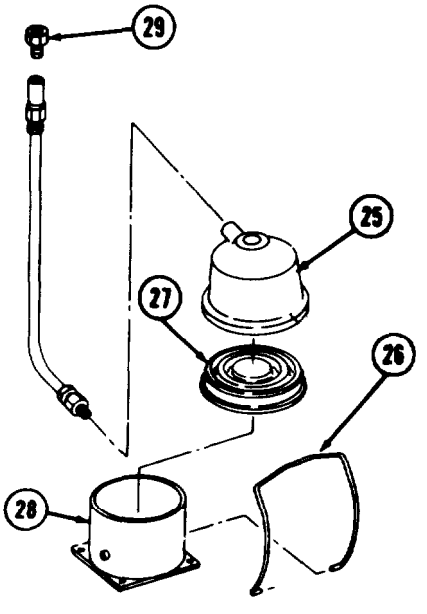
S/N 2001 AND ABOVE

Each brake circuit has its own pressure converter. Each pressure converter hydraulic cylinder is supplied by one remotely mounted brake reservoir. The reservoirs are located on the inside of the front frame, on the left and right sides of the forklift.

NOTE

Right and left reservoirs are checked in the same manner.

Remove the front side access covers. Clean the reservoir cover (25). Swing the lockstrap (26) off the cover (25). Remove the cover and breather assembly. Remove the diaphragm (27). If fluid is below the fluid level line, fill the reservoir (28) as necessary, using silicone base brake fluid. Install the diaphragm (27).



WARNING

TOXIC/FLAMMABLE

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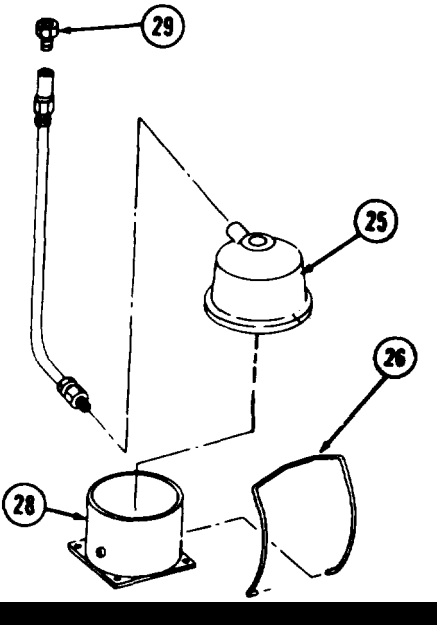
Unscrew breather plug (29) from breather assembly. Clean with P-D-680.

Screw breather plug (29) into breather assembly. Place cover (25) and breather assembly on reservoir (28) and swing lockstrap (26) up to secure.

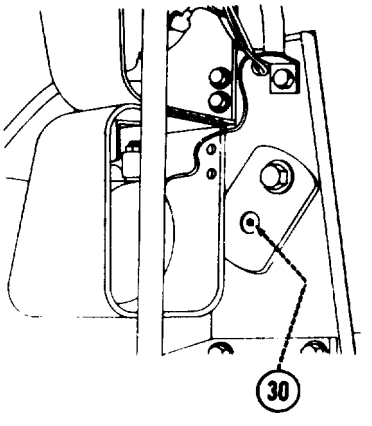


Repeat procedure for the other reservoir. Install front side access covers.

If fluid level is low, check for and correct leaks at pressure converters, fluid reservoirs, lines, and brake calipers. Fluid level may also be low due to air in the hydraulic lines. If so, bleed the lines as described in TM 10-3930-643-20.

Note 15. BOOM PIVOTS

Apply lubricant to two fittings (30) (only one shown) until clean lubricant appears.



Note 16. DRIVE SHAFT (TRANSMISSION TO SUPPORT BEARING)

Fittings are located in the end of the drive shaft in the spider and in the slip tube.

Apply lubricant to both fittings (31) until clean lubricant appears.

NOTE

Perform the following lubrication procedure each quarter.

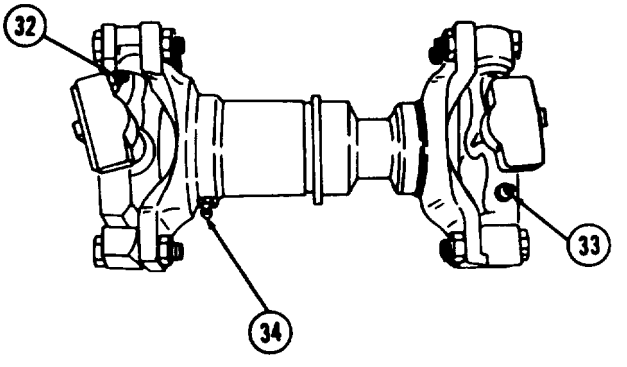
Three drive shafts, two with three fittings, one with two fittings.

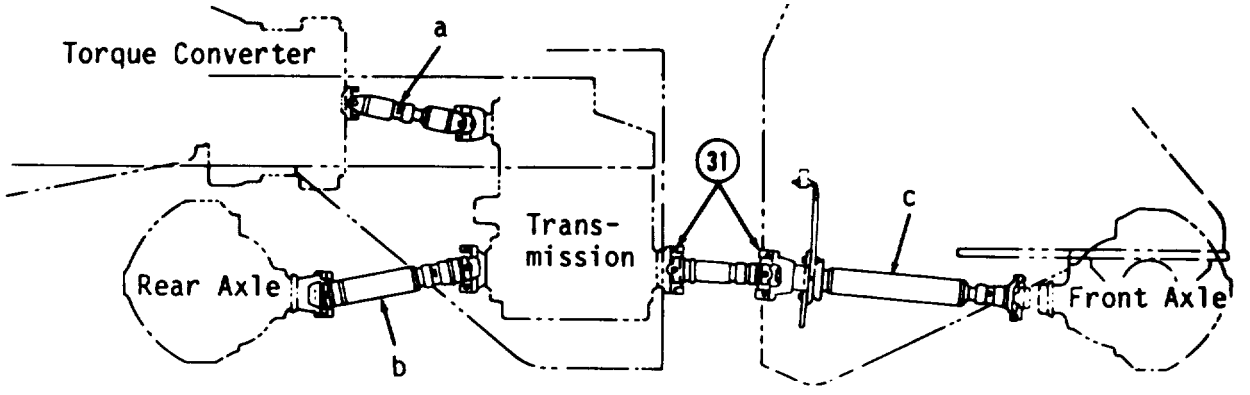
a. The torque converter to transmission drive shaft has a fitting in each spider (32 and 33) and one in the slip tube (34).

b. The transmission to rear axle drive shaft has a fitting in each spider (32 and 33) and one in the slip tube (34).

c. The support bearing to front axle drive shaft has a fitting in the slip tube (34) and one at spider (32).

Apply lubricant to all fittings until clean lubricant appears.

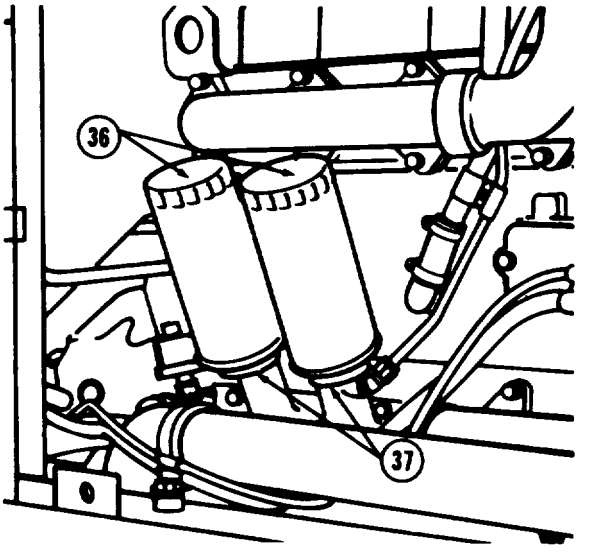


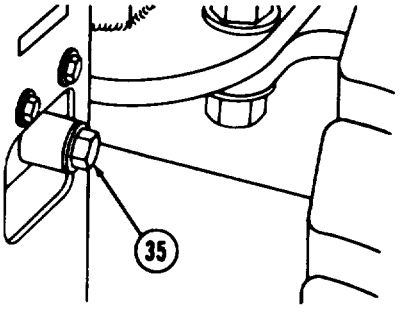


Note 17. ENGINE CRANKCASE AND OIL. FILTERS

Run the engine until warm. After the engine is stopped, allow all the oil to drain back into the crankcase.

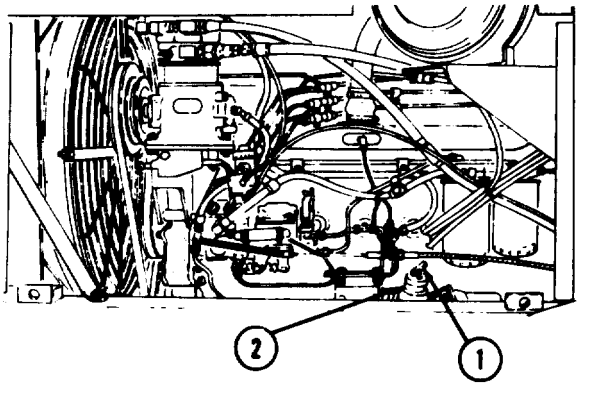
The crankcase capacity is 22 quarts. Place a suitable container under the drain plug (35). After all oil is completely drained, install drain plug (35). Remove the two oil filters (36) and discard. Clean the filter bases (37). Apply a thin coat of clean oil to the gasket on the base of the new filters.





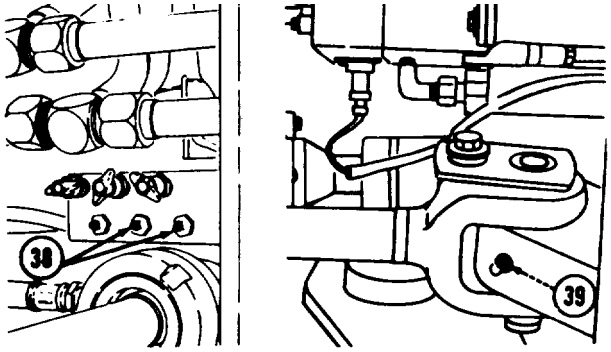
Install the new filters (36), turning by hand clockwise until the gsket contacts the header. Then turn by hand 1/2 to 3/4 turn more.

Remove dipstick (1) and add oil using filler pipe (2).



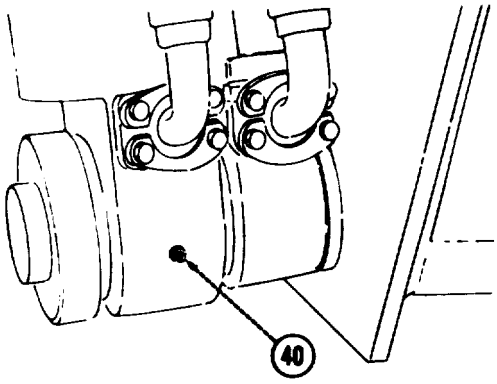
Note 18. STEERING CYLINDERS

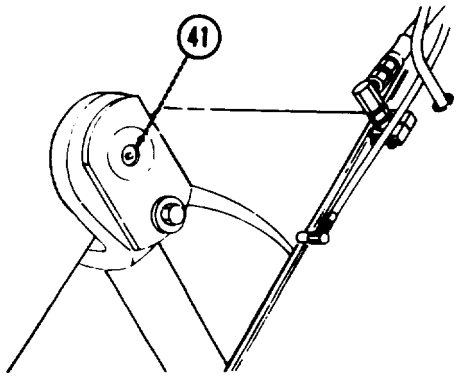
Apply lubricant to the two remote mounted fittings (38) and the two rod end fittings (39) (only one shown) until clean lubricant appears.



Note 19. BOOM CYLINDERS

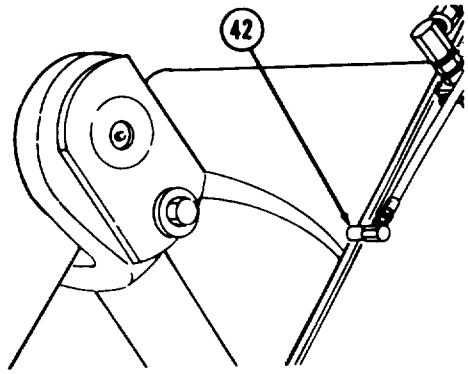
Apply lubricant to two fittings (40) (only one shown) and two fittings (41) (only one shown) until clean lubricant appears.

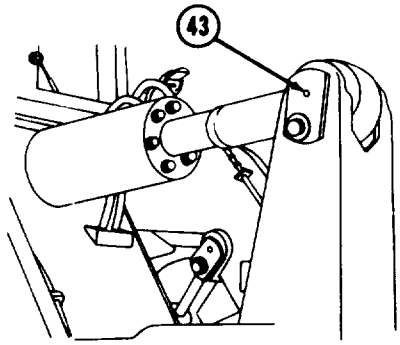




Note 20. TILT CYLINDER

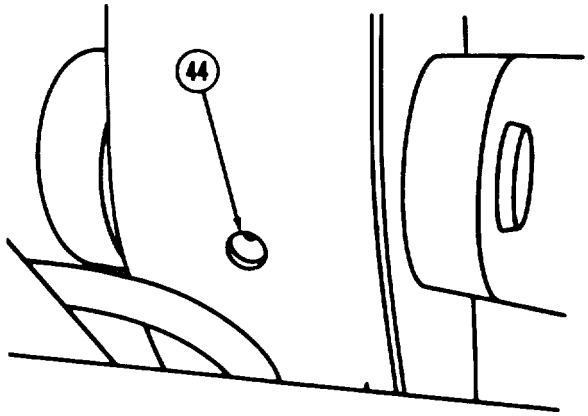
Apply lubricant to two fittings (42 and 43) until clean lubricant appears.





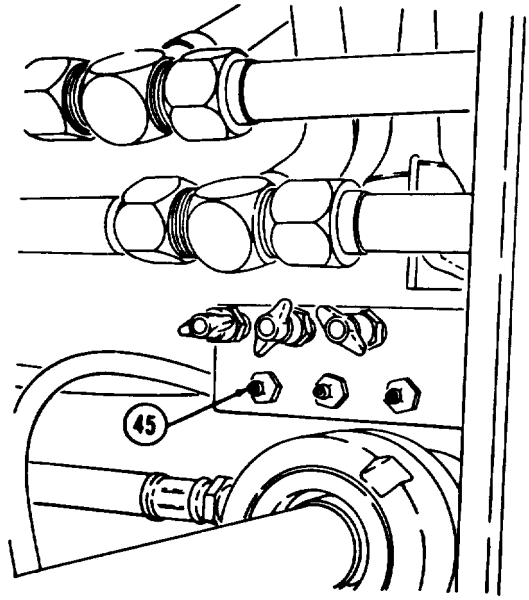
Note 21. BELLCRANK PIVOT

Apply lubricant to the fitting (44) until clean lubricant appears.



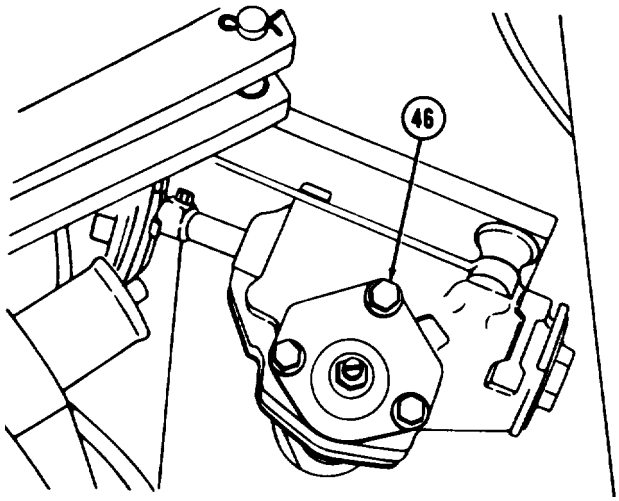
Note 22. SUPPORT BEARING

Apply lubricant to the remote fitting (45) until clean lubricant appears.



Note 23. STEERING GEAR

Check the lubricant level by removing the top bolt (46). If the lubricant is below the bolt hole, add lubricant through the hole as necessary.



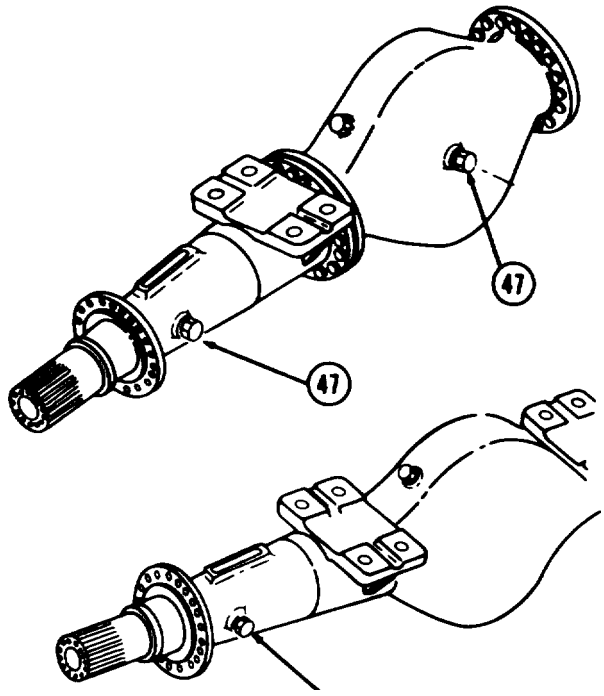
Note 24. AXLEL LUBRICANT

NOTE

Front and rear axles are checked in the same manner.

Remove the filler and level plug (47 or 48). If the lubricant is below the level hole, fill as necessary to bring level up to the bottom of the hole.

Install the filler and level plug.



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Note 25. TRANSMISSION AND FILTER

The transmission oil capacity is 5 gallons. Place a suitable container under the drainplug. After all oil is drained, clean and install drain plug. Remove transmission/torque converter oil filter and discard. Clean the filter base. AppIy a thin coat of clean oil to the gasket on the base of new filter and install filter.

By Order of the Secretary of the Army:

CARL E. VUONO
General United States Army
Chief of Staff

Official:

THOMAS F. SIKORA
Brigadier General, United States Army
The Adjutant General

Distribution

To be distributed in accordance with DA Form 12–25-E. Block 5500, Operator, Unit maintenance requirements for LO 10-3930-643-12.

Copy of this lubrication order will remain with the equipment at all tires; instructions contained herein are mandatory.

PIN: 067706/000