

28 JULY 1993

**LO 5-2420-224-12**

**TRACTOR, WHEELED, 4 X 4 DED SMALL EMPLACEMENT  
EXCAVATOR (SEE)**

**(NSN 2420-01-160-2754) (EIC:EDL)**

**AND**

**TRACTOR, WHEELED, 4 X 4 DED HIGH MOBILITY  
MATERIAL HANDLER (HMMH)**

**(NSN 2420-01-205-8636)**

Reference: TM 5-2420-224-10 and TM 5-2420-224-20

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 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 may be 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.

Level of maintenance. The lowest level of maintenance authorized to lubricate a point is indicated by one of the following symbols as appropriate: Operator/Crew (C), and Unit Maintenance (0).

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, US Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

**TOTAL MAN-HOURS**

**INTERVAL      MAN-HOURS**

|   |     |
|---|-----|
| D | 0.4 |
| M | 3.5 |
| Q | 4.0 |
| S | 4.5 |
| A | 5.0 |

**WARNING**

Death or serious injury could result from repeated or prolonged breathing or skin contact of drycleaning solvent SD, type II, P-D-680, Use in well-ventilated area. Do not use near open flame or in excessive heat.

Clean fittings before lubricating. Clean parts with drycleaning solvent (SD), type II or equivalent. Dry before lubricating

**NOTE**

Dotted arrow points indicate lubrication on both sides of the equipment.

### KEY

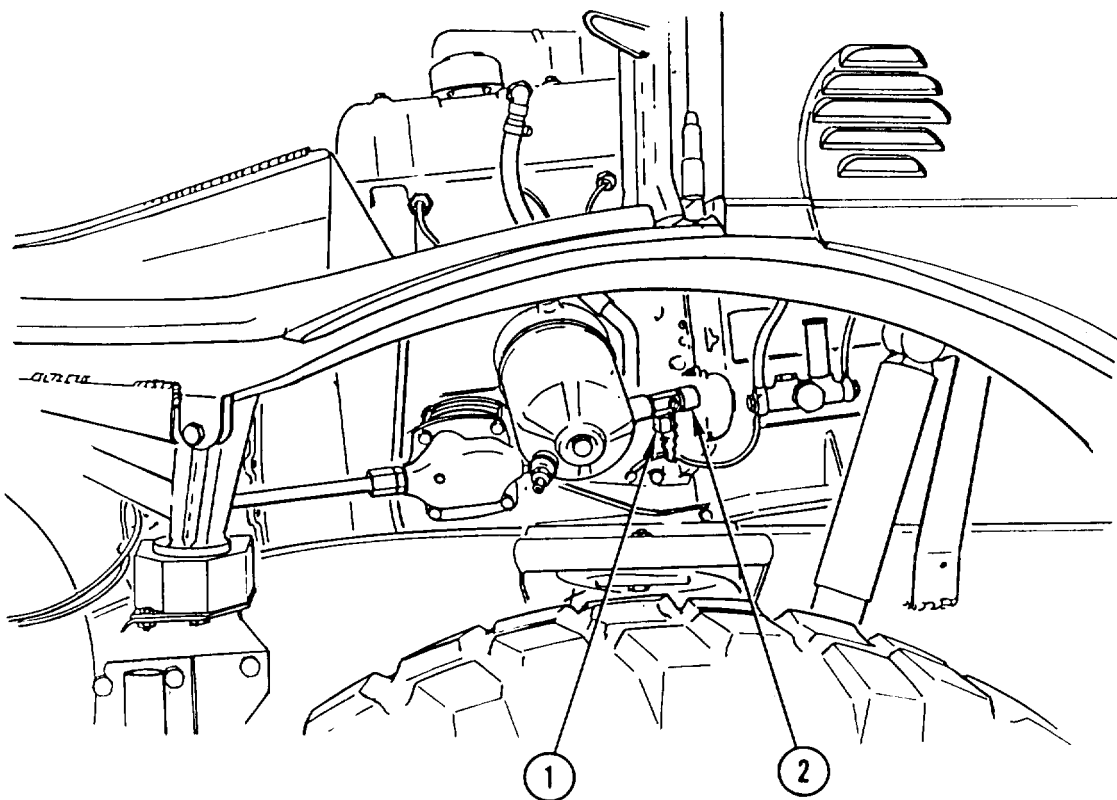
| LUBRICANTS                                      |   | CAPACITIES                                  | EXPECTED TEMPERATURES      |                                 |                                  | INTERVALS   |
|---|---|---|----------------------------|---------------------------------|----------------------------------|---|
|   |   |   | Above +32°F<br>(Above 0°C) | +40° to -10°F<br>(+4° to -26°C) | 0° to -65°F<br>(-17° to -53°C)   |   |
| OE/HDO<br>(MIL-L-2104)                          | LUBRICATING OIL, Internal Combustion Engine, Tactical Service | As Required                                 | OE/HDO 15W40               | OE/HDO-10                       | OEA                              | D - Daily/<br>10 hours<br><br>M - Monthly/<br>50 hours<br><br>Q - Quarterly/<br>250 hours<br><br>S - Semiannually/<br>500 hours<br><br>A - Annually/<br>1000 hours<br><br>OC - On-condition |
| OEA<br>(MIL-L-46167)                            | LUBRICATING OIL, Internal Combustion Engine, Arctic           | As Required                                 |                            |                                 |                                  |   |
|   | Engine Crankcase  | Max 11.6 qt (11.0 l)<br>Min 8.4 qt (8.0 l)  | OE/HDO-10                  | OE/HDO-10                       | OEA                              |   |
|   | Engine Oil Filter   | 1.05 qt (1.0 l)                             |                            |                                 |                                  |   |
|   | Hydraulic System  | Front 44 qt (41.6 l)<br>Rear 84 qt (79.4 l) |                            |                                 |                                  |   |
|   | Power Steering Reservoir                                      | 3 qt (2.8 l)                                |                            |                                 |                                  |   |
|   | Front Suspension Lockout System (HMMH)                        | 1 qt (0.94 l)                               |                            |                                 |                                  |   |
| GO<br>(MIL-L-2105)                              | Transmission  | 7 qt (6.6 l)                                | GO-80/90                   | GO-80/90                        | GO-75                            |   |
|   | Front and Rear Axle Hub Drives                                | 0.25 qt ea (0.23 l)                         |                            |                                 |                                  |   |
|   | Front and Rear Differentials                                  | 2.4 qt (2.25 l)                             |                            |                                 |                                  |   |
| (MIL-B-46176)                                   | Hydraulic Brake System  | 0.8 qt (0.75 l)                             | ALL TEMPERATURES           |                                 |                                  |   |
|   | Hydraulic Clutch System                                       | 0.2 qt (0.19 l)                             |                            |                                 |                                  |   |
| PL<br>(Medium MIL-L-3150)<br>(Special VV-L-800) | LUBRICATING OIL, General Purpose                              | As Required                                 | PL-M<br>(Medium)           | PL-S<br>(Special)               | PL-S<br>(Special)                |   |
| GAA<br>(MIL-G-10924)                            | GREASE, Automotive and Artillery                              | As Required                                 | ALL TEMPERATURES           |                                 |                                  |   |
| SD-Type II<br>(P-D-680)                         | SOLVENT, Drycleaning  | As Required                                 | ALL TEMPERATURES           |                                 |                                  |   |
| Inhibited Heavy Duty<br>(MIL-A-46153)           | Radiator System Coolant Antifreeze                            | 24 qt (23 l)                                |                            |                                 | Above -40°F<br>(Above -40°C)     |   |
| Arctic Type<br>(MIL-A-11755)                    | Radiator System Antifreeze                                    | 24 qt (23 l)                                |                            |                                 | -40° to -85°F<br>(-40° to -65°C) |   |
| Alcohol - Ethyl, Methanol, or Denatured         | Brake Compressed Air Antifreeze Unit                          | 0.2 qt (0.19 l)                             | ALL TEMPERATURES           |                                 |                                  |   |

For Arctic operation refer to TM 9-207

## OIL ANALYSIS PROGRAM SAMPLING PROCEDURES

The engine oil sampling valve is located on the end of the oil filter located on the right side of the engine. When a lubrication note specifies that an oil sample must be taken, use the following procedures:

- A Ensure that oil to be sampled is at its normal operating temperature (TM 5-2420-224-10).
- B Open valve (1) and pump approximately two ounces of oil into suitable container, by pumping plunger (2). Discard this oil. This will remove waste impurities from oil filter.
- C Place sample bottle (TB 43-0210) under valve (1) and fill sample bottle to approximately 1/2 in. (1.3 cm) below neck of bottle. Close valve (1) and check for leaks.
- D Send oil sample to AOAP laboratory.



DAILY NOTES:

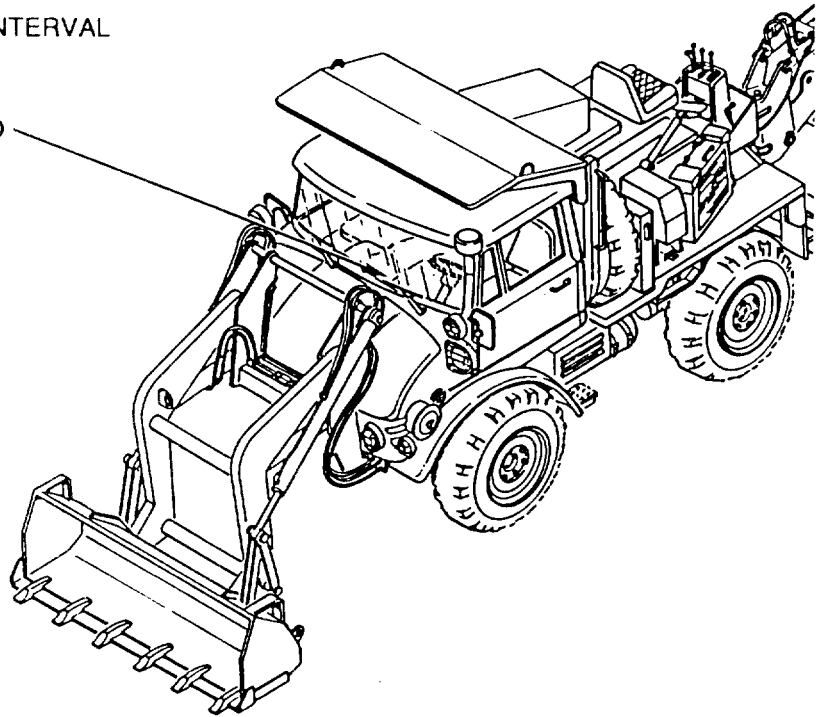
This page shows what to check or lubricate each day the SEE is operated or driven.

LUBRICANT • INTERVAL

Engine  
Crankcase  
Oil (SEE/HMMH)  
(See Note 1)(C)

OE/HDO

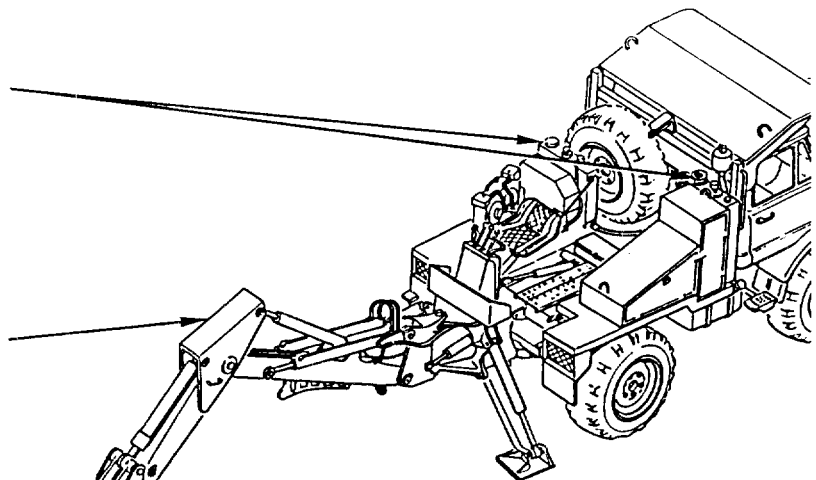
D



Hydraulic Tanks,  
Front and Rear  
(SEE/HMMH)  
(See Note 2)(C)

OE/HDO

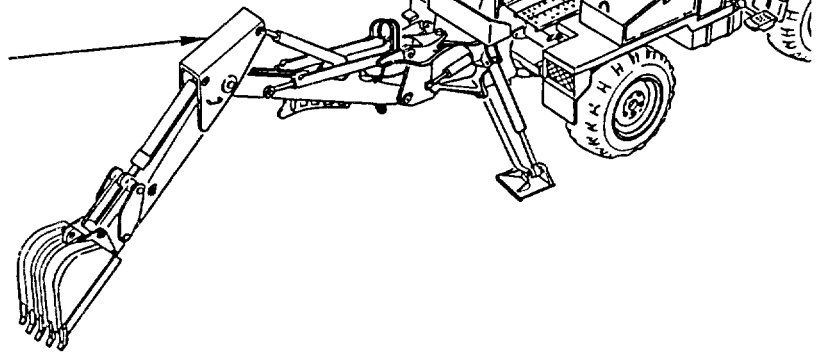
D



Backhoe (SEE)  
(See Note 3)(C)

GAA

D



DAILY NOTES (CONTINUED):

This page shows what to check or lubricate each day the HMMH is operated or driven.

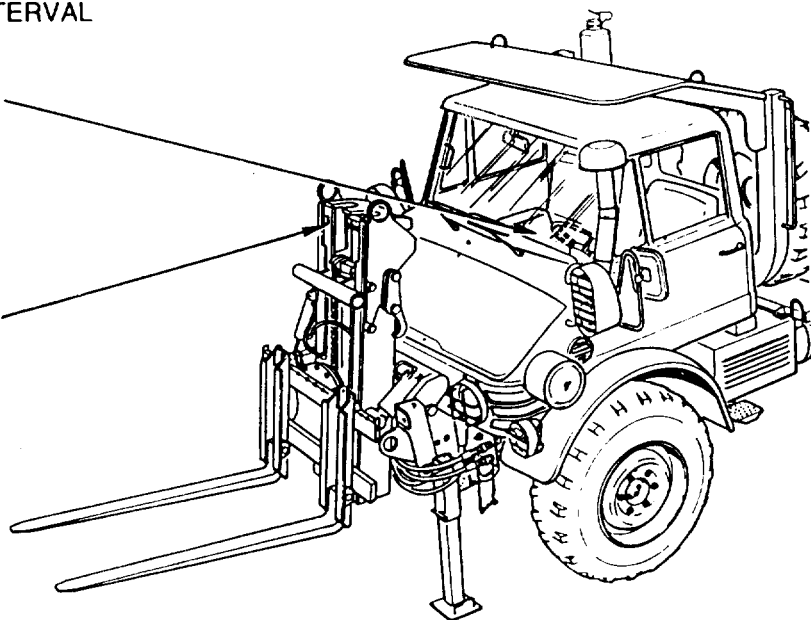
LUBRICANT • INTERVAL

Engine  
Crankcase Oil  
(SEE/HMMH)  
(See Note 1)(C)

OE/HDO D

Forklift (HMMH)  
(See Note 4)(C)

GAA, OE/HDO D

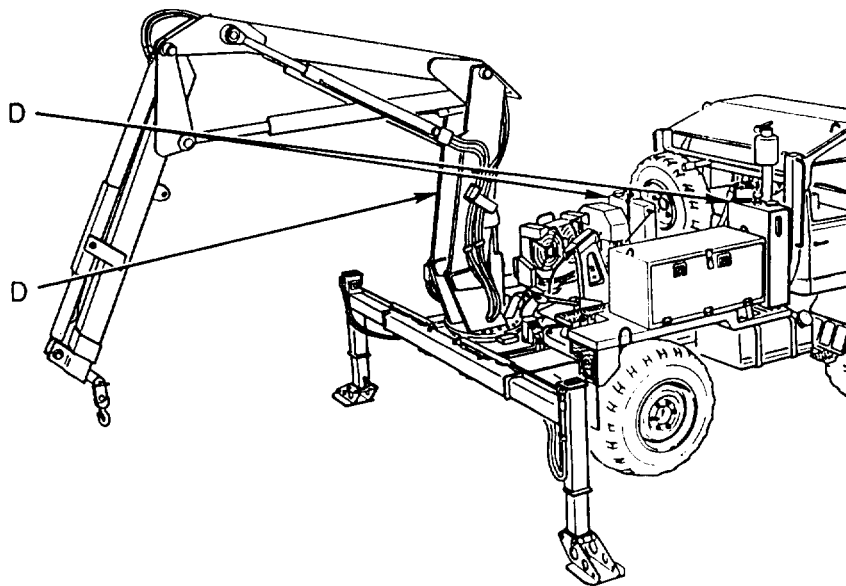


Hydraulic Tanks,  
Front and Rear  
(SEE/HMMH)  
(See Note 2)(C)

OE/HDO D

Crane (HMMH)  
(See Note 5)(C)

GAA D

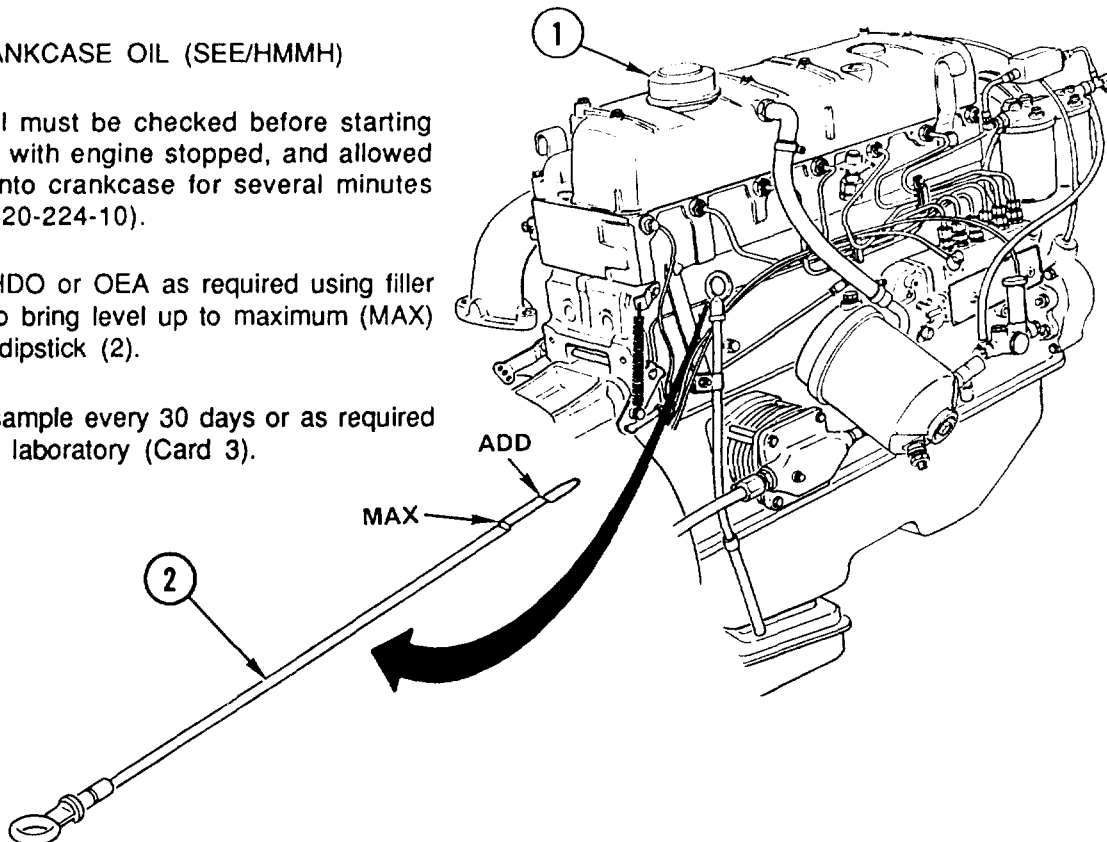


DAILY NOTES (CONTINUED):

Note 1

ENGINE CRANKCASE OIL (SEE/HMMH)

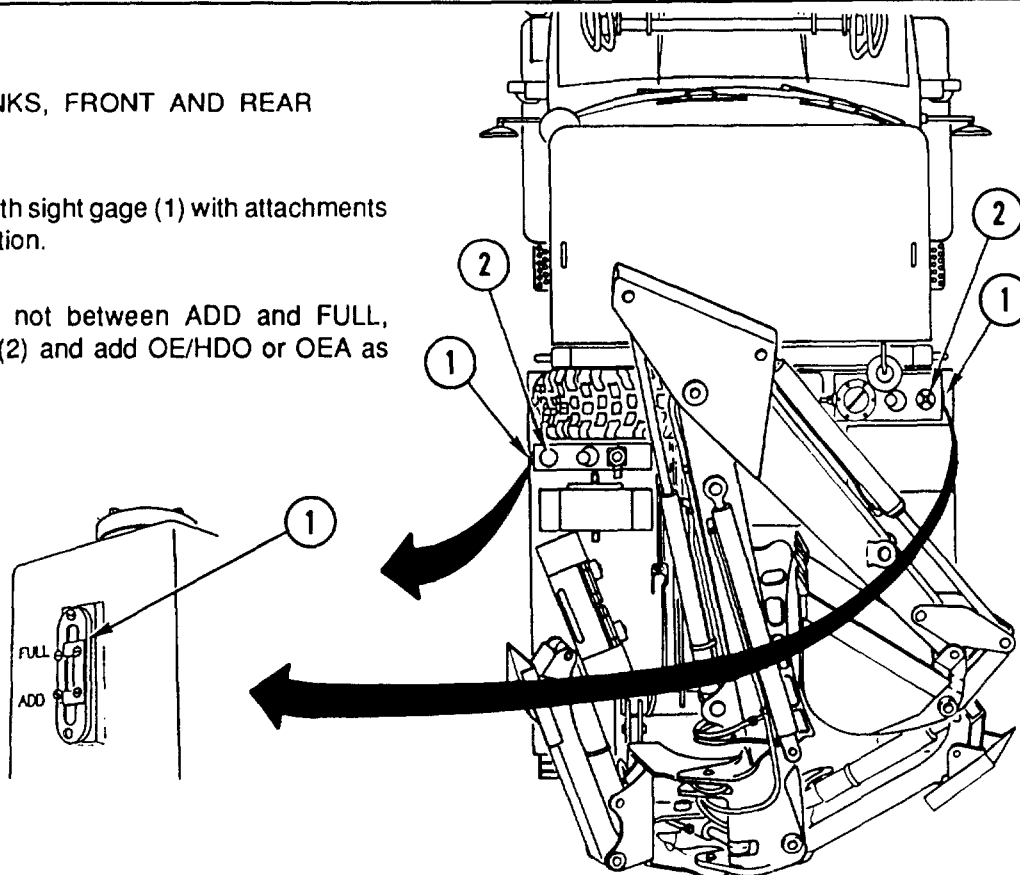
- A Engine oil must be checked before starting engine or with engine stopped, and allowed to drain into crankcase for several minutes (TM 5-2420-224-10).
- B Add OE/HDO or OEA as required using filler pipe (1) to bring level up to maximum (MAX) mark on dipstick (2).
- C Take oil sample every 30 days or as required by AOAP laboratory (Card 3).



Note 2

HYDRAULIC TANKS, FRONT AND REAR (SEE/HMMH)

- A Check level with sight gage (1) with attachments in travel position.
- B If oil level is not between ADD and FULL, unscrew cap (2) and add OE/HDO or OEA as required.



DAILY NOTES (CONTINUED):

Note 3

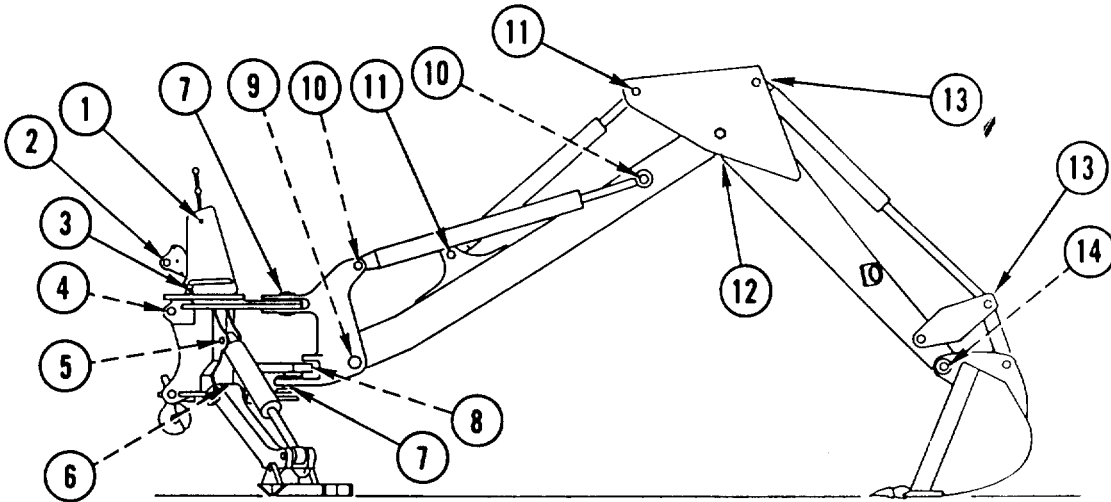
BACKHOE (SEE)

Lubricate 35 fittings on backhoe with GAA every 10 hours for normal operation. If backhoe is operated in mud or water, reduce lubrication intervals to every 5 hours.

LOCATION

NUMBER OF POINTS

- |                            |   |
|----------------------------|---|
| 1. CONTROL LEVER           | 5 |
| 2. TILT CYLINDER PIN       | 1 |
| 3. FOOT SWING PEDALS       | 4 |
| 4. BACKHOE MOUNTING PINS   | 2 |
| 5. STABILIZER CYLINDERS    | 2 |
| 6. SWING CYLINDER TRUNNION | 4 |
| 7. TOWER SWING PINS        | 2 |
| 8. SWING CYLINDER YOKE     | 2 |
| 9. BOOM PIVOT PINS         | 2 |
| 10. BOOM CYLINDER          | 4 |
| 11. CROWD CYLINDER         | 2 |
| 12. DIPPER ARM PIVOT       | 1 |
| 13. BUCKET CYLINDER        | 2 |
| 14. BUCKET PIVOT PIN       | 2 |

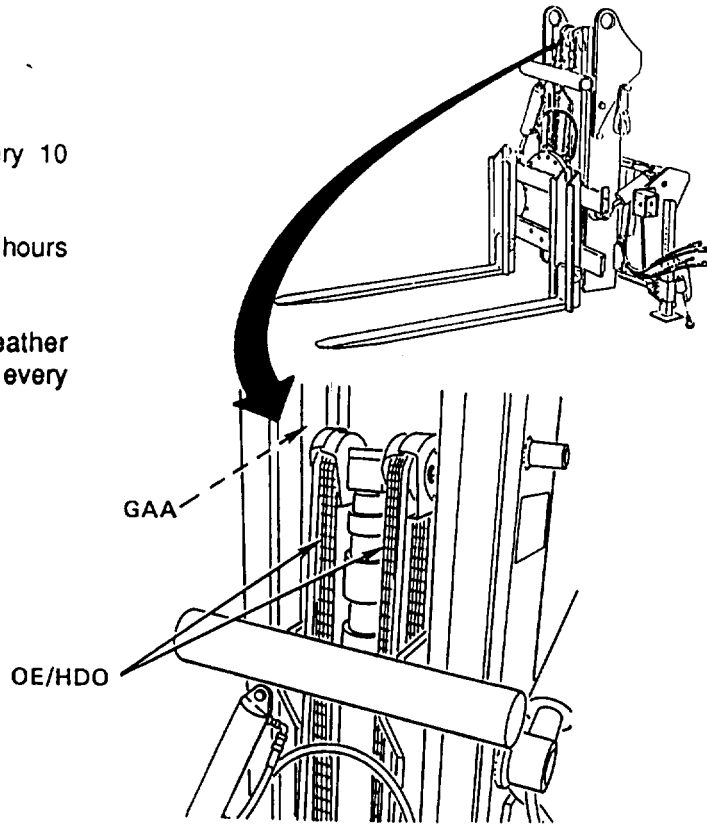


DAILY NOTES (CONTINUED):

Note 4

FORKLIFT (HMMH)

- A Lubricate mast channels on forklift every 10 hours with GAA.
- B Lubricate mast chains on forklift every 10 hours with OE/HDO.
- C If forklift is operated under severe weather conditions, reduce lubrication intervals to every 5 hours.

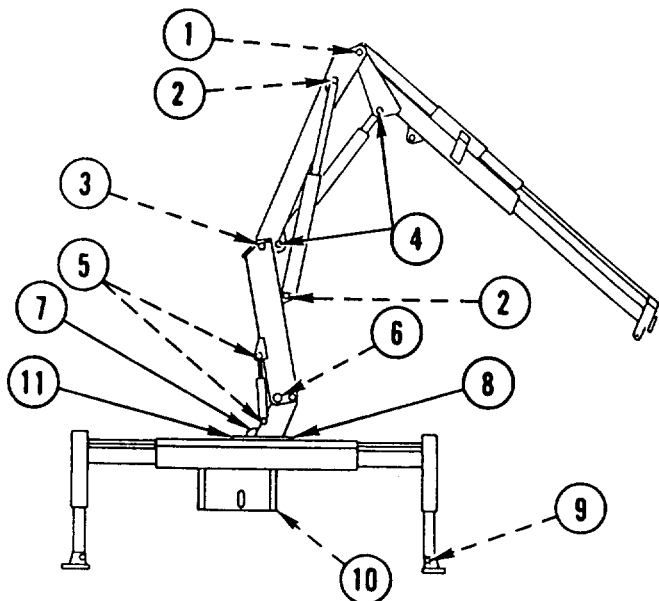


Note 5

CRANE (HMMH)

Lubricate 23 fittings on crane with GAA every 10 hours for normal operation. If crane is operated under severe weather conditions, reduce lubrication intervals to every 5 hours.

| LOCATION                  | NUMBER OF POINTS |
|---------------------------|------------------|
| 1. INNER/OUTER BOOM HINGE | 2                |
| 2. INNER BOOM CYLINDER    | 4                |
| 3. MAST/INNER BOOM HINGE  | 2                |
| 4. OUTER BOOM CYLINDER    | 2                |
| 5. TILT CYLINDER          | 4                |
| 6. TILT PIVOT             | 2                |
| 7. TILT ARM               | 1                |
| 8. GEAR BEARING           | 1                |
| 9. OUTRIGGER PADS         | 2                |
| 10. BASE PIVOT            | 2                |
| 11. ROTATION LOCK         | 1                |





**MONTHLY NOTES:**

This page shows what to check or lubricate each month the SEE/HMMH is operated or driven.

**LUBRICANT • INTERVAL**

Brake Reservoir  
(SEE/HMMH)  
(See Note 6)(C)

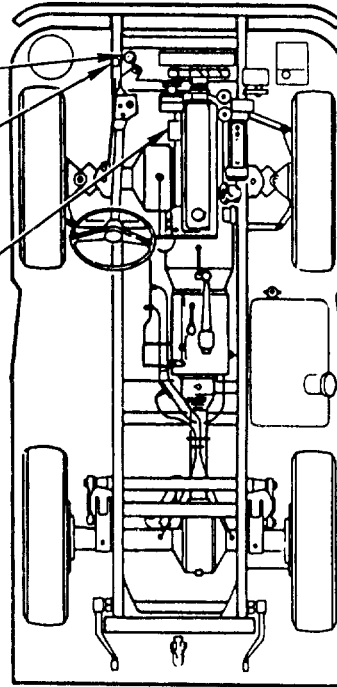
MIL-B-46176 M

Clutch Reservoir  
(SEE/HMMH)  
(See Note 7)(C)

MIL-B-46176 M

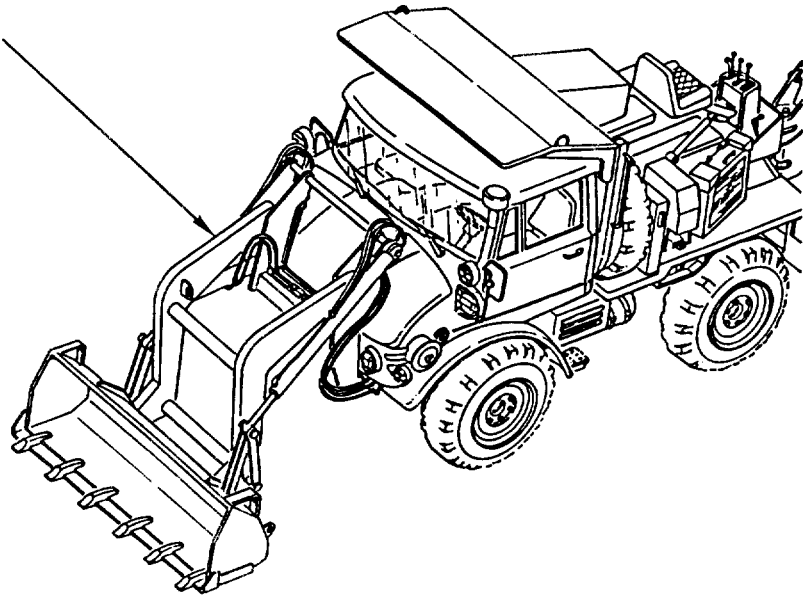
Steering  
System Oil  
(SEE/HMMH)  
(See Note 8)(C)

OE/HDO M



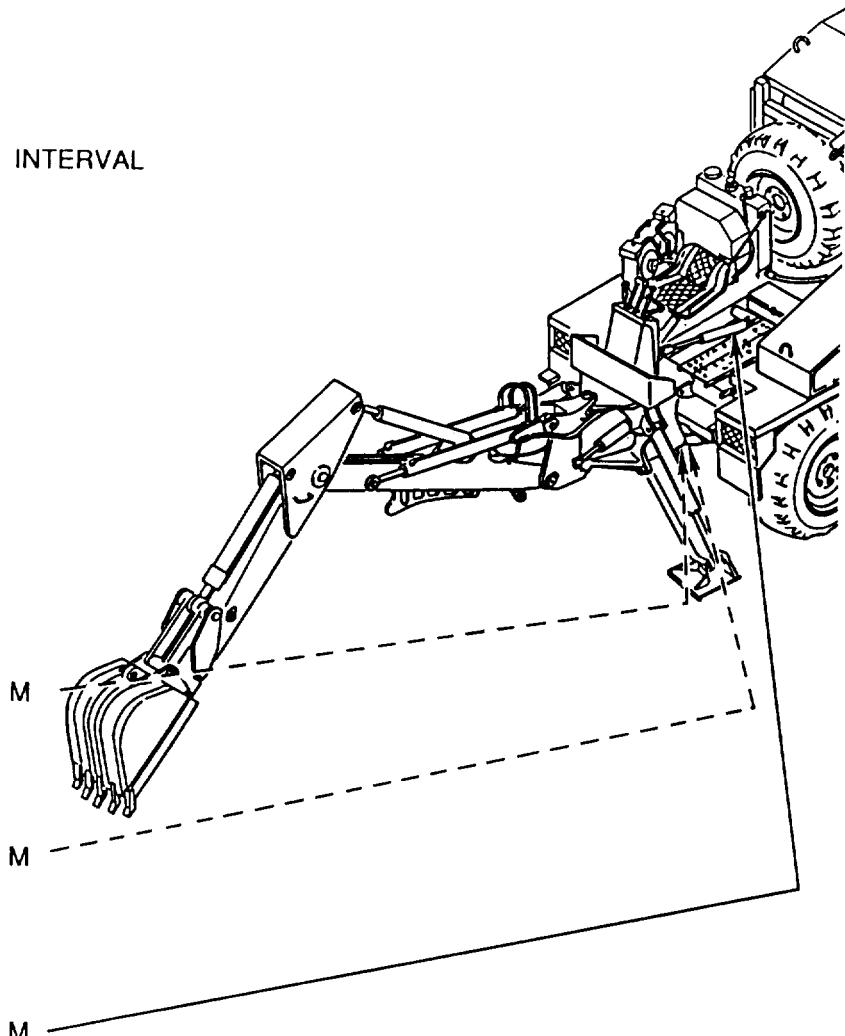
Front  
Loader (SEE)  
(See Note 9)(C)

GAA M



MONTHLY NOTES (CONTINUED):

LUBRICANT • INTERVAL



Rear Implement  
Lock Cylinders  
(SEE/HMMH)  
(See Note 10)(C)

GAA

M

Rear Implement  
Lock Latches  
(SEE/HMMH)  
(See Note 11)(C)

GAA

M

Rear Implement  
Tilt Cylinder  
(SEE/HMMH)  
(See Note 12)(C)

GAA

M

MONTHLY NOTES (CONTINUED):

Note 6

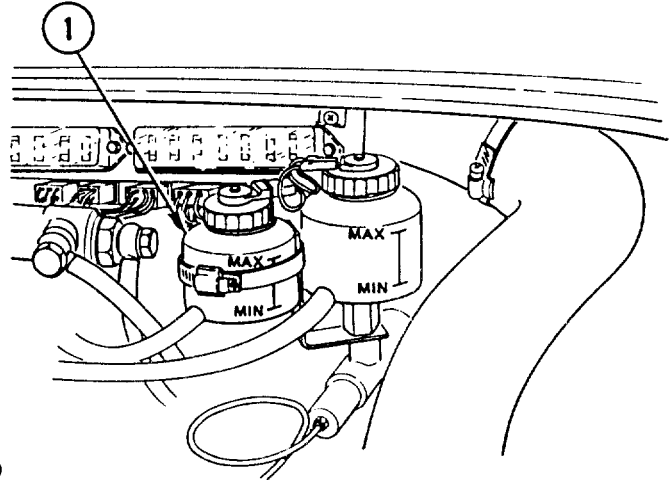
BRAKE RESERVOIR (SEE/HMMH)

- A Fluid level must be at maximum (MAX) level mark with vehicle on level ground.

**CAUTION**

Use only MIL-B-46176 Silicon Base Brake Fluid. Do not mix with other fluids.

- B With new brake pads, fluid level must not drop below minimum (MIN) mark while driving. If reservoir (1) is low, add MIL-B-46176 as required.



Note 7

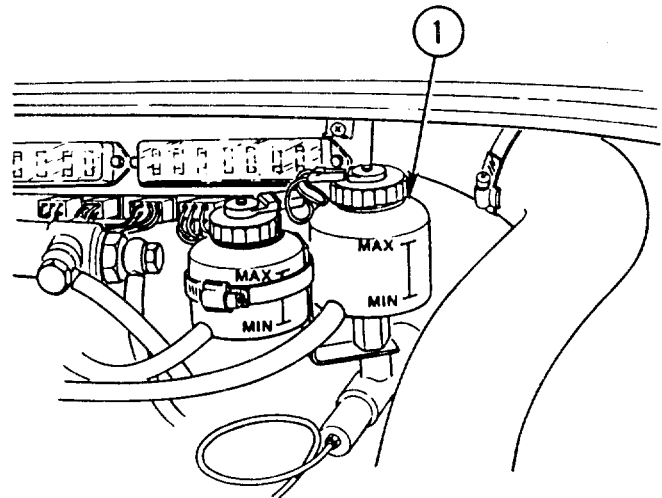
CLUTCH RESERVOIR (SEE/HMMH)

- A Fluid level should be at maximum (MAX) with clutch pedal released.

**CAUTION**

Use only MIL-B-46176 Silicon Base Brake Fluid. Do not mix with other fluids.

- B If reservoir (1) is low, add MIL-B-46176 as required.

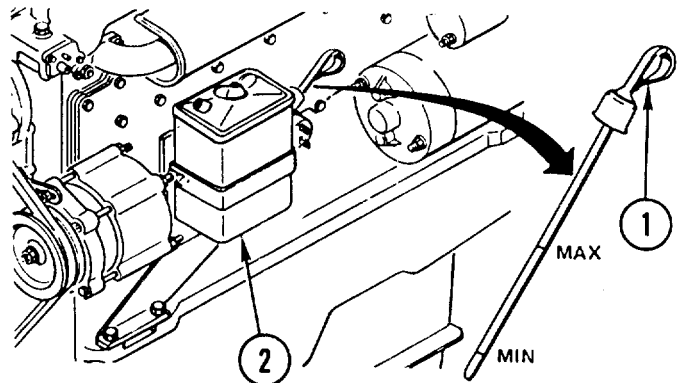


Note 8

STEERING SYSTEM OIL (SEE/HMMH)

- A Steering oil should be between minimum (MIN) and maximum (MAX) marks on dipstick (1) with engine running.

- B If reservoir (2) is low, add OE/HDO or OEA as required.

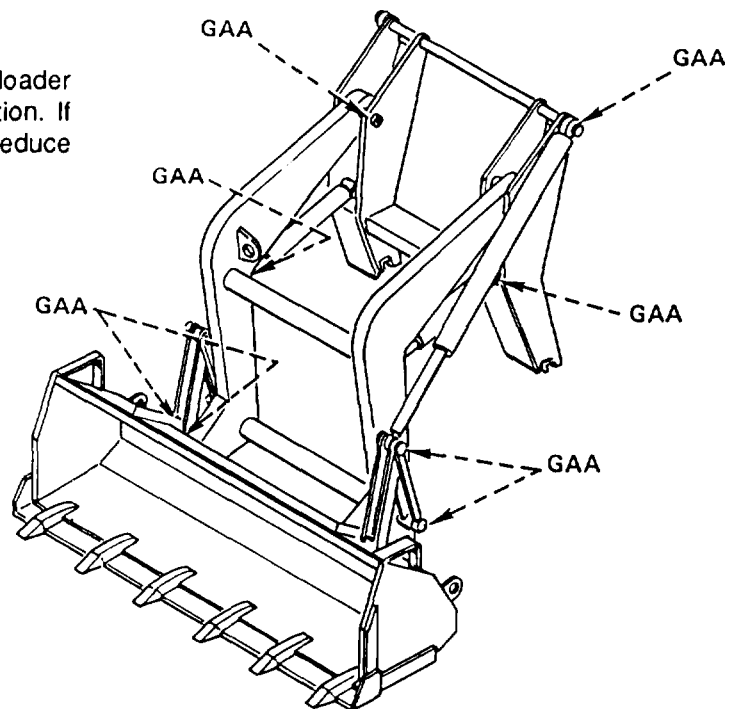


MONTHLY NOTES (CONTINUED):

Note 9

FRONT LOADER (SEE)

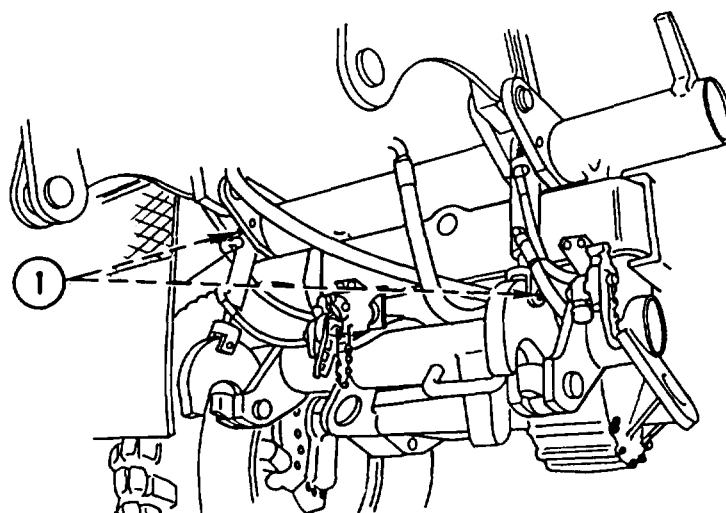
Lubricate eight fittings on each side of front loader with GAA every 10 hours for normal operation. If front loader is operated in mud or water, reduce lubrication intervals to every 5 hours.



Note 10

REAR IMPLEMENT LOCK  
CYLINDERS (SEE/HMMH)

Lubricate four fittings with GAA on left and right  
rear implement lock cylinders (1).

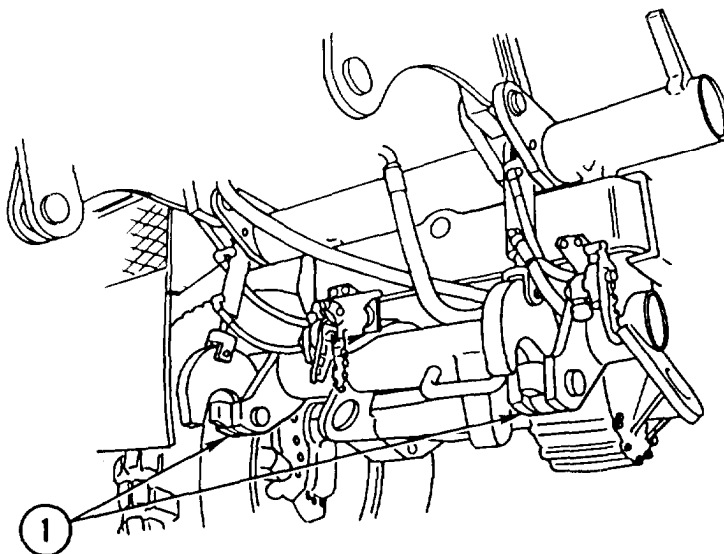


MONTHLY NOTES (CONTINUED):

Note 11

REAR IMPLEMENT LOCK LATCHES (SEE/HMMH)

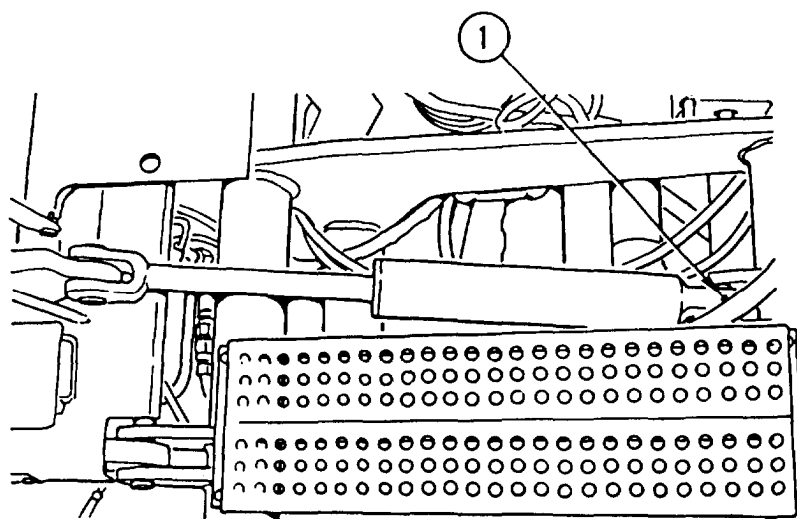
Lubricate two fittings with GAA on left and right rear implement lock latches (1).



Note 12

REAR IMPLEMENT TILT CYLINDER (SEE/HMMH)

Lubricate one fitting with GAA at forward end of rear implement tilt cylinder (1).



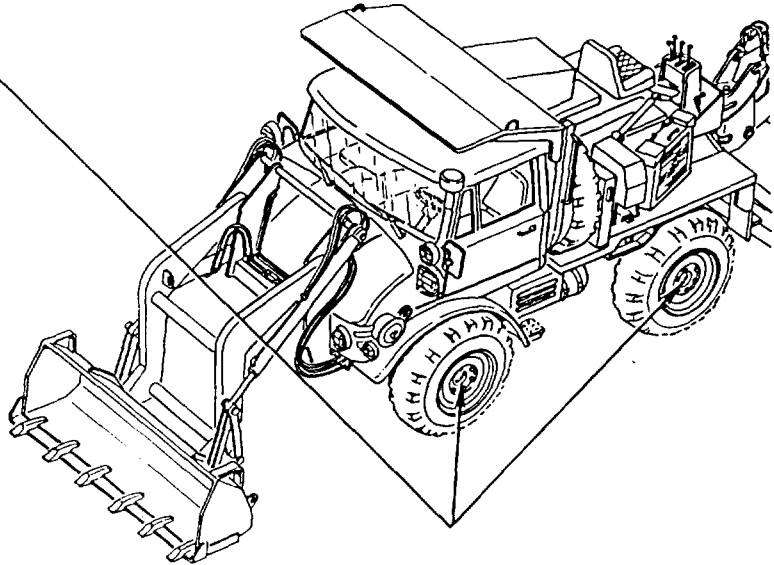
QUARTERLY NOTES:

LUBRICANT • INTERVAL

Axle Drive and  
Wheel Hub  
Reduction of  
Front and  
Rear Axle  
(SEE/HMMH)  
(See Note 13)(O)

GO

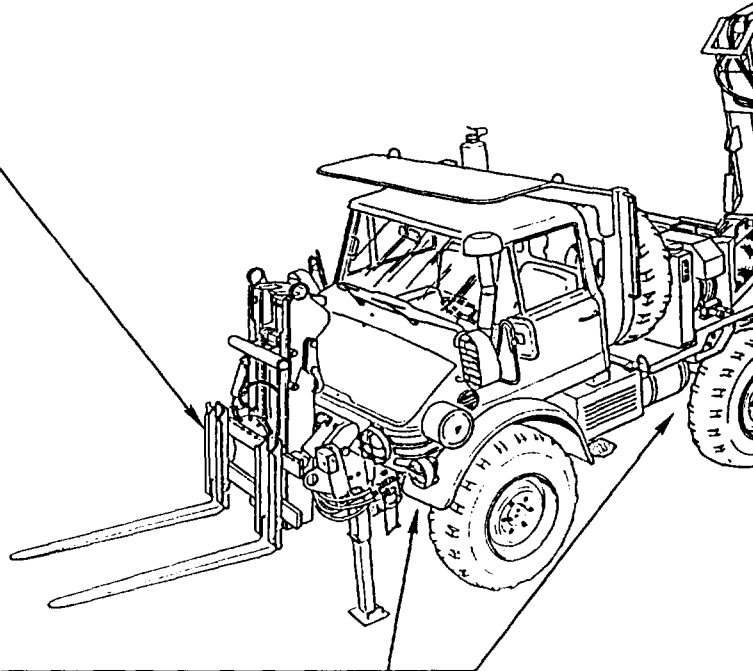
Q



Forklift (HMMH)  
(See Note 14)(O)

GAA

Q



Front and Rear  
Differentials  
(SEE/HMMH)  
(See Note 15)(O)

GO

Q

QUARTERLY NOTES (CONTINUED):

LUBRICANT • INTERVAL

King Pins  
(SEE/HMMH)  
(See Note 16)(O)

GAA

Q

Transmission  
(SEE/HMMH)  
(See Note 17)(O)

GO

Q

Front and Rear  
Thrust Ball Joint  
(SEE/HMMH)  
(See Note 18)(O)

GAA

Q

Hand Brake  
Lever  
(SEE/HMMH)  
(See Note 19)(O)

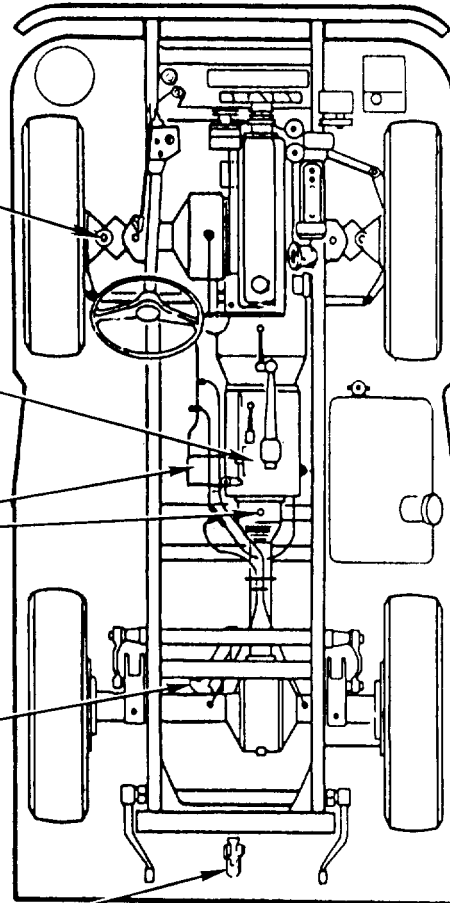
GAA

Q

Pintle Hook  
(SEE/HMMH)  
(See Note 20)(O)

GAA

Q



QUARTERLY NOTES (CONTINUED):

Note 13

AXLE DRIVE AND WHEEL HUB REDUCTION OF FRONT AND REAR AXLE (SEE/HMMH)

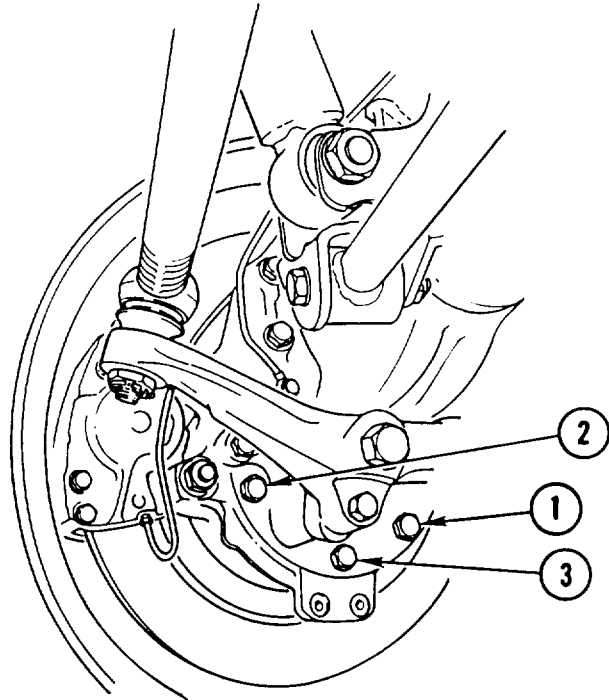
Remove inspection plug (1) in each axle and check oil level. Oil should be level with the bottom of the oil inspection hole. Add GO-80/90 or GO-75 as required.

**WARNING**

Place vehicle in two-wheel drive before checking oil level. Oil is under pressure when in four-wheel drive position and could cause serious injury to eyes when removing inspection plug.

AXLE-WHEEL HUB DRIVE  
(DISC BRAKE)

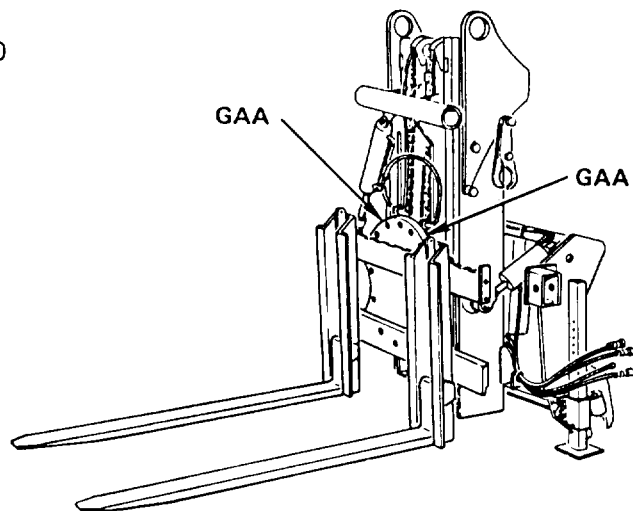
1. CHECK PLUG (REAR)
2. FILL PLUG (FORWARD)
3. DRAIN PLUG (BOTTOM)



Note 14

FORKLIFT (HMMH)

Lubricate two fittings on rotator bearing every 300 hours with GAA.





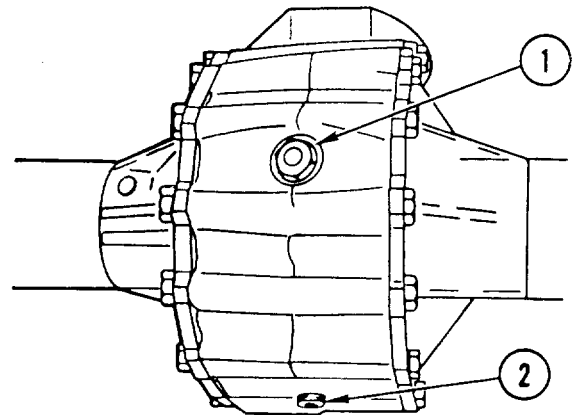
QUARTERLY NOTES (CONTINUED):  
Note 15

FRONT AND REAR DIFFERENTIALS  
(SEE/HMMH)

Remove inspection plug (1) in each differential and check oil level. Oil should be level with the bottom of the oil inspection hole. Add GO-90 or GO-75 as required.

**WARNING**

Place vehicle in two-wheel drive before checking oil level. Oil is under pressure when in four-wheel drive position and could cause serious injury to eyes when removing inspection plug.



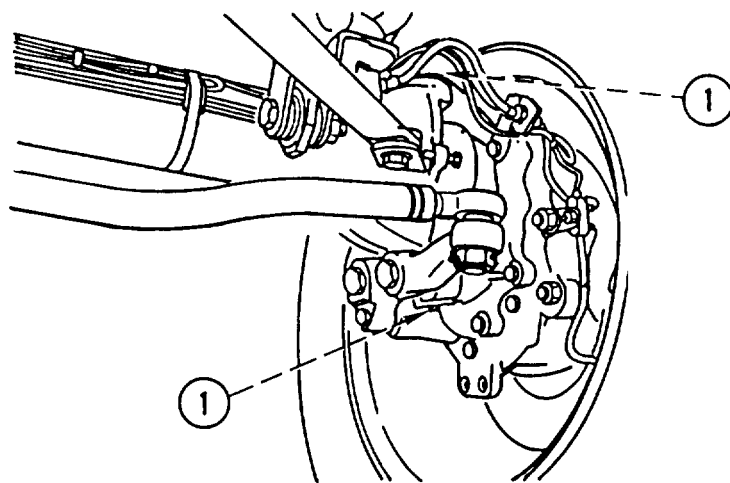
AXLE DRIVE

1. FILL AND CHECK PLUG
2. DRAIN PLUG

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Note 16  
KING PINS (SEE/HMMH)

Lubricate four king pins (1) with GAA.

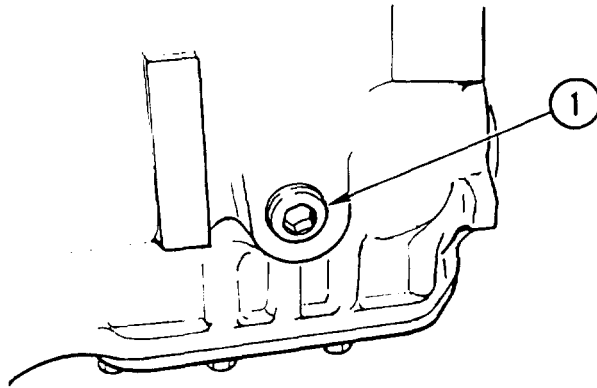


QUARTERLY NOTES (CONTINUED):

Note 17

TRANSMISSION (SEE/HMMH)

Check transmission oil level by removing fill plug (1). Oil should be level with the bottom of the oil inspection hole. Add GO-80/90 or GO-75 as required.



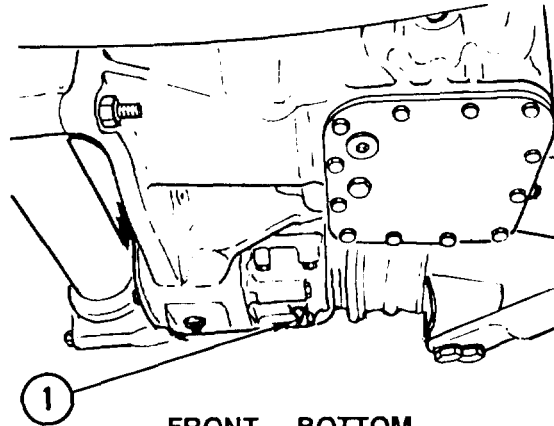
Note 18

**CAUTION**

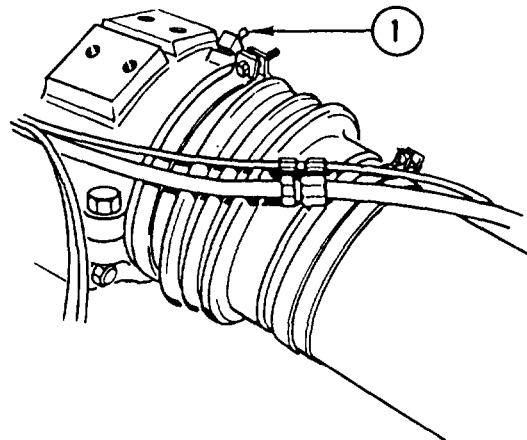
Damage to protective rubber bellows will occur if over-lubricated.

FRONT AND REAR THRUST BALL JOINT (SEE/HMMH)

Lubricate ball joints (1) with five shots of GAA from a standard hand-held grease gun.



FRONT - BOTTOM

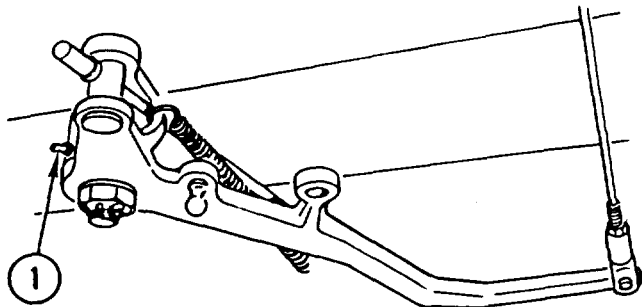


REAR

Note 19

HAND BRAKE LEVER (SEE/HMMH)

Lubricate hand brake lever fitting (1) above rear axle with GAA.

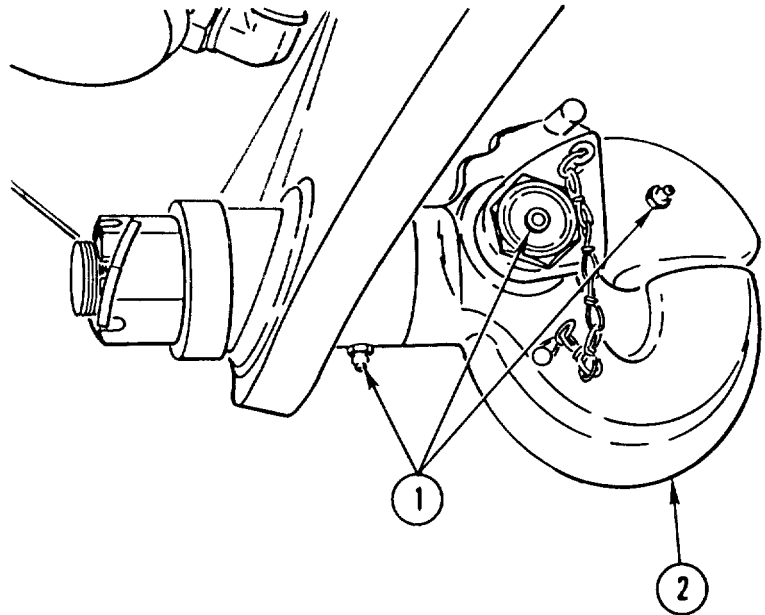


QUARTERLY NOTES (CONTINUED):

Note 20

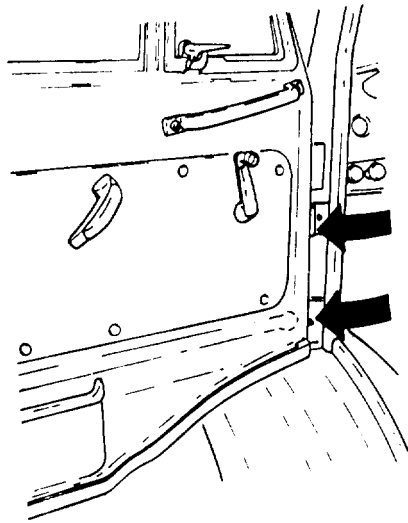
PINTLE HOOK (SEE/HMMH)

Lubricate three fittings (1) on pintle hook (2) with GAA.

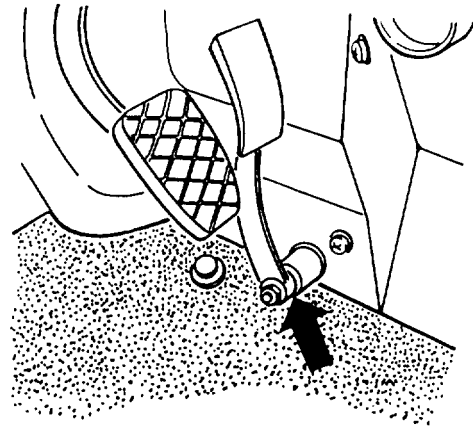


QUARTERLY NOTES (CONTINUED):  
OIL CAN POINTS

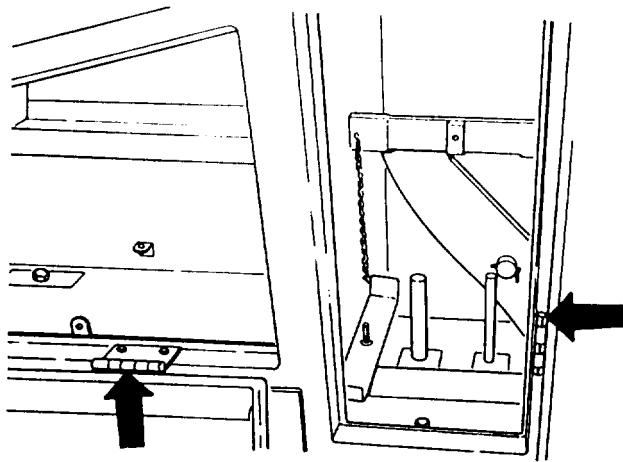
Lubricate with PL-M or PL-S



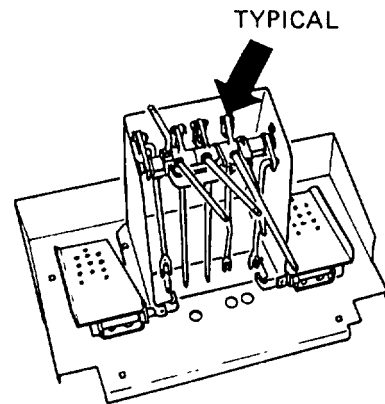
DOOR HINGES



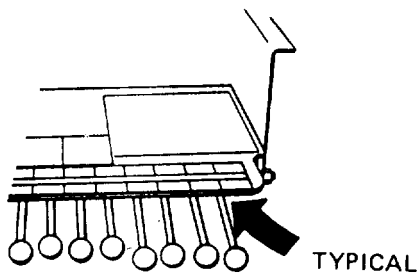
ACCELERATOR PEDAL



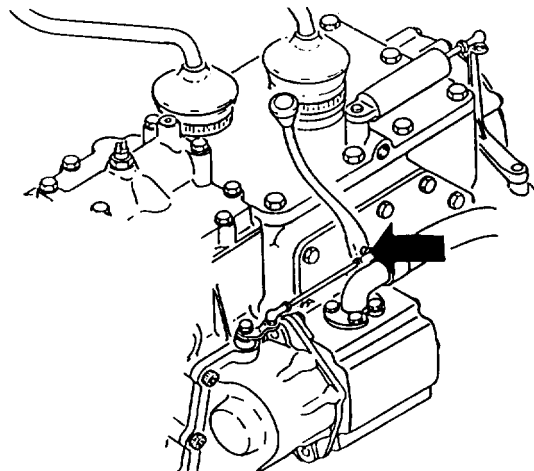
TOOL BOX HINGES



BACKHOE LINKAGES



CRANE LINKAGES



PTO LINKAGES

SEMIANNUAL NOTES:

LUBRICANT • INTERVAL

Forklift Fork  
Hinges  
(HMMH)  
(See Note 21)(O)

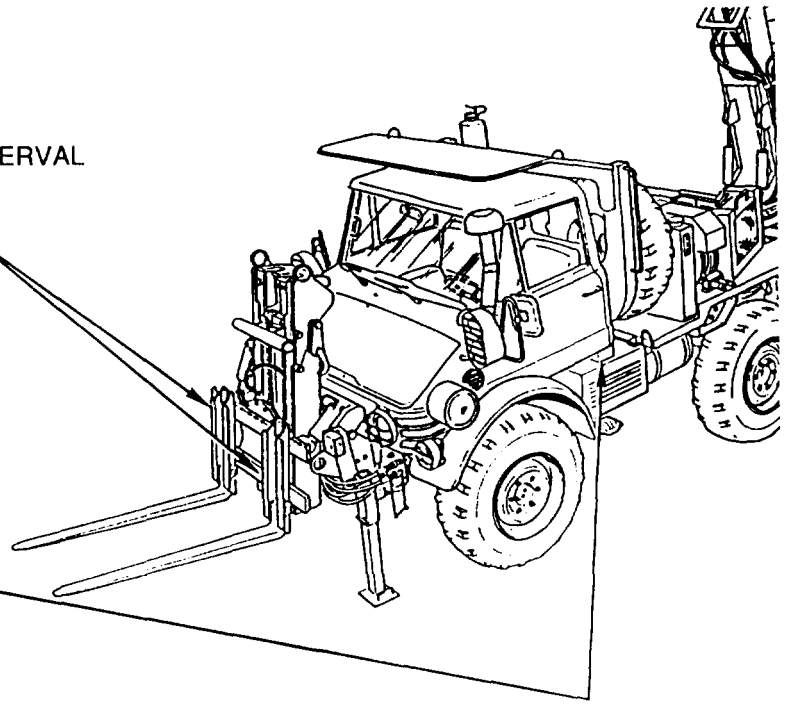
GAA

S

Front Suspension  
Lockout System  
(HMMH)  
(See Note 22)(O)

OE/HDO

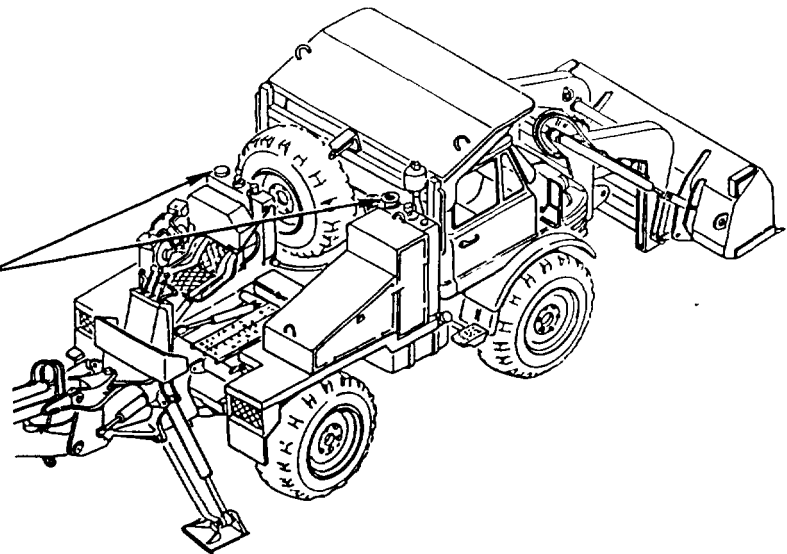
S



Hydraulic Tanks,  
Front and Rear  
(SEE/HMMH)  
(See Note 23)(O)

OE/HDO

S



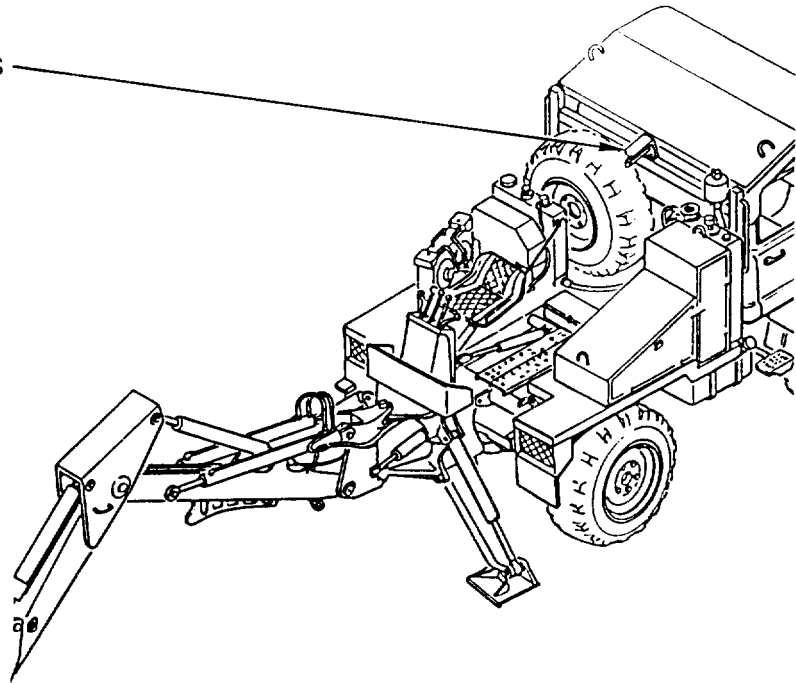
SEMIANNUAL NOTES (CONTINUED):

LUBRICANT • INTERVAL

Implement Travel  
Lock Pin (SEE)  
(See Note 24)(C)

GAA

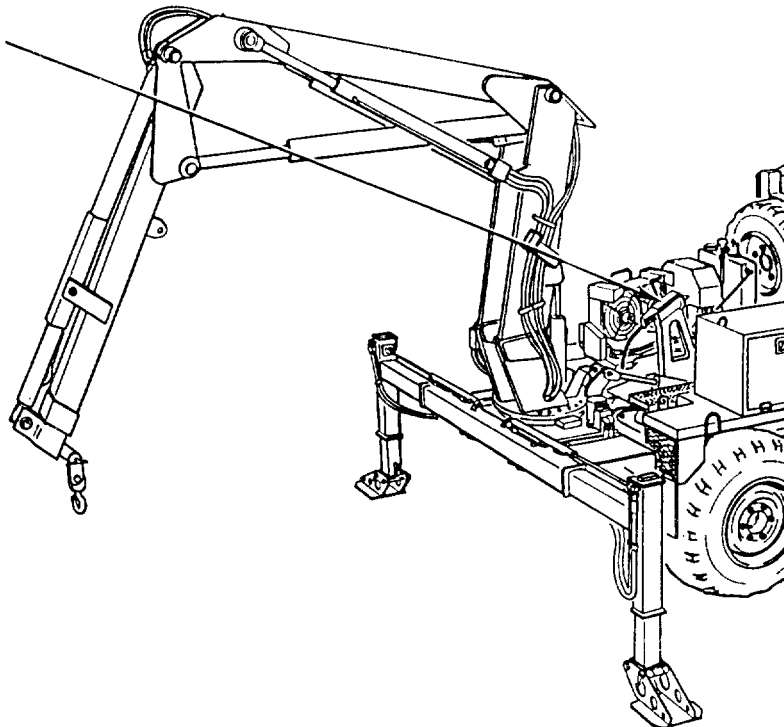
S



Implement Travel  
Lock Pin (HMMH)  
(See Note 25)(C)

GAA

S

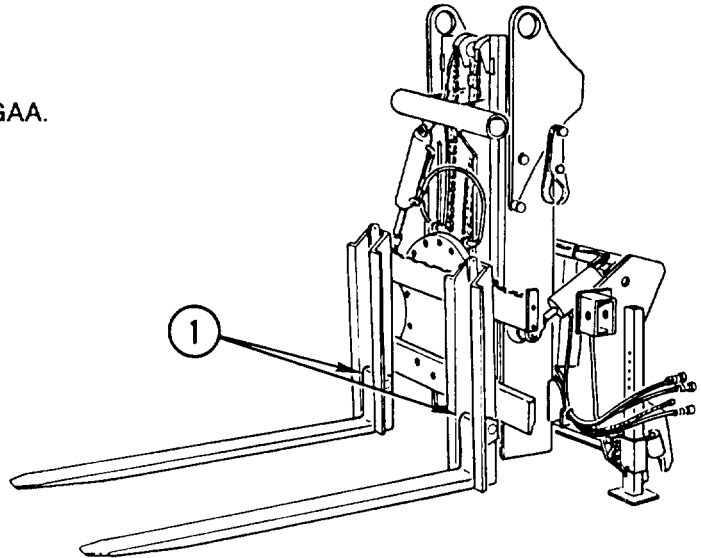


SEMIANNUAL NOTES (CONTINUED):

Note 21

FORKLIFT FORK HINGES (HMMH)

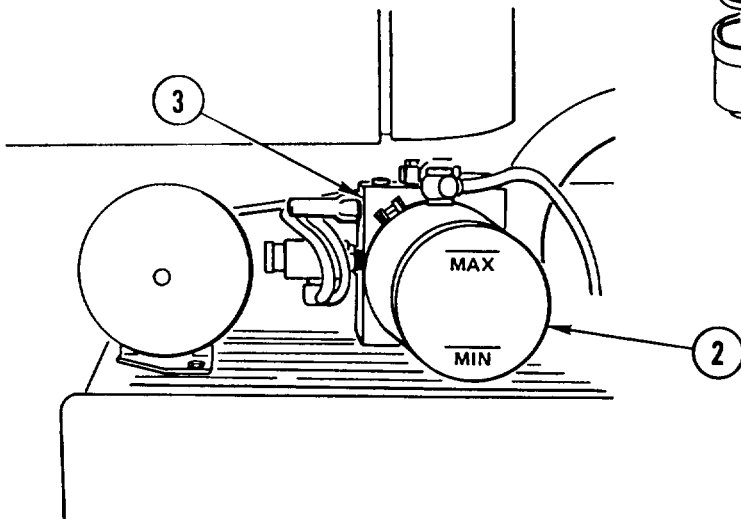
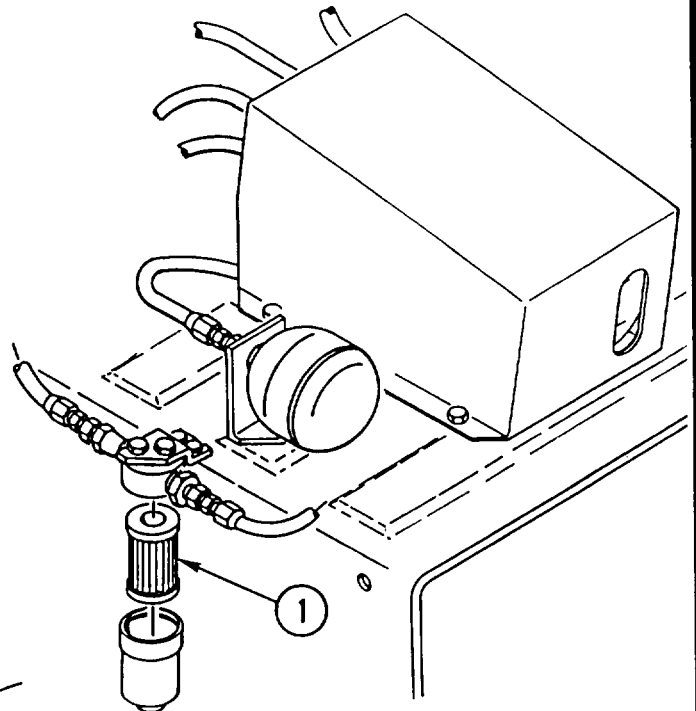
Lubricate forklift fork hinge points (1) with GAA.



Note 22

FRONT SUSPENSION LOCKOUT SYSTEM (HMMH)

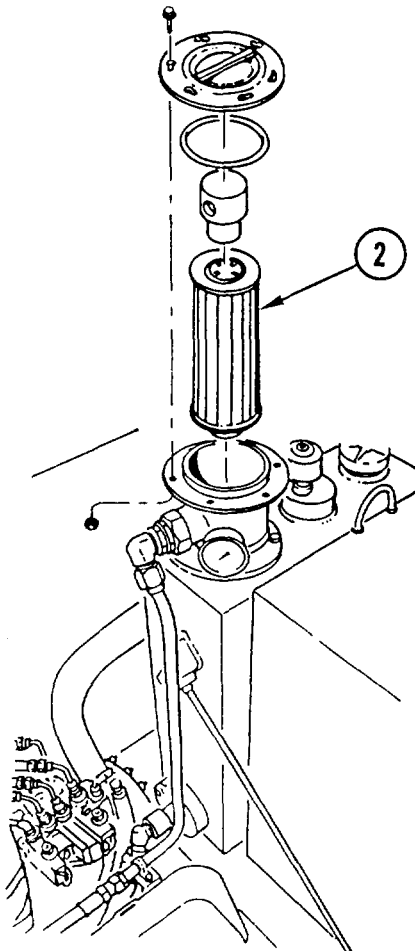
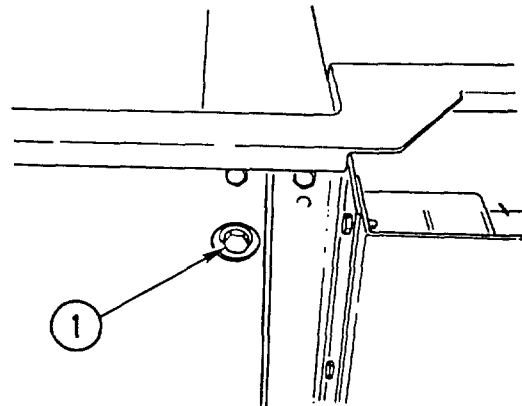
- A Remove and replace oil filter (1) (TM 5-2420-224-20).
- B Remove reservoir (2) from manifold (3) and drain oil (TM 5-2420-224-20).
- C Install reservoir (2) to manifold (3) and service with OE/HDO or OEA. Oil should be at the MAX mark on reservoir (TM 5-2420-224-20).



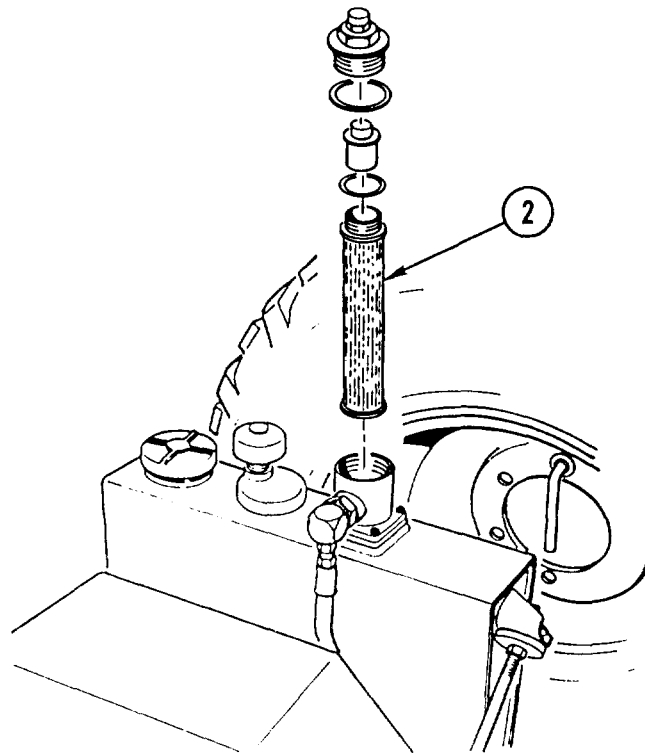
SEMIANNUAL NOTES (CONTINUED):  
Note 23

HYDRAULIC TANKS, FRONT AND REAR  
(SEE/HMMH)

- A Place suitable container under drain plug (1) and drain oil. Install drain plug.
- B Replace hydraulic filter (2) at top of tank (TM 5-2420-224-20).
- C Fill hydraulic tank with OE/HDO or OEA with implements in travel position.
- D Check sight gage to ensure proper oil level is achieved. (See Note 2.)



REAR



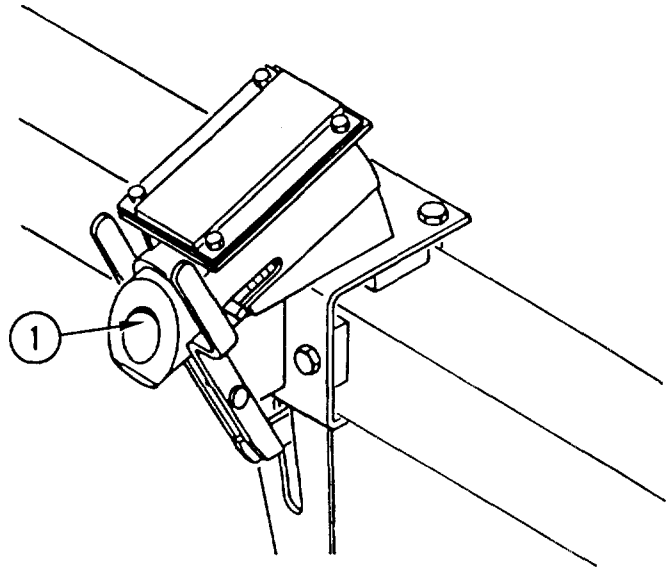
FRONT



SEMIANNUAL NOTES (CONTINUED):  
Note 24

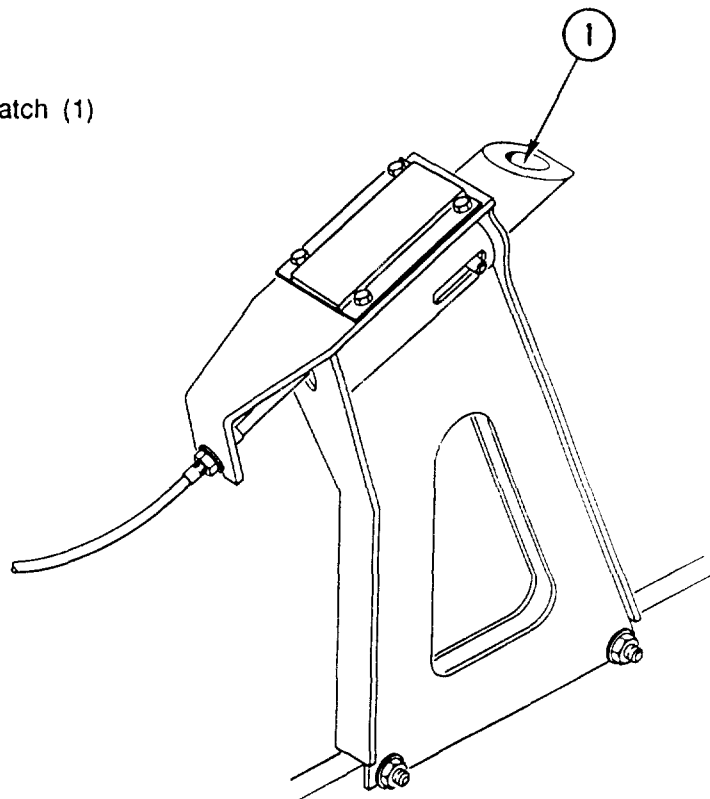
IMPLEMENT TRAVEL LOCK PIN  
(SEE)

Lubricate one fitting on implement latch (1)  
with GAA.



Note 25  
IMPLEMENT TRAVEL LOCK PIN  
(HMMH)

Lubricate one fitting on implement latch (1)  
with GAA.



ANNUAL NOTES:

LUBRICANT • INTERVAL

Steering System Oil  
(SEE/HMMH)  
(See Note 26)(O)

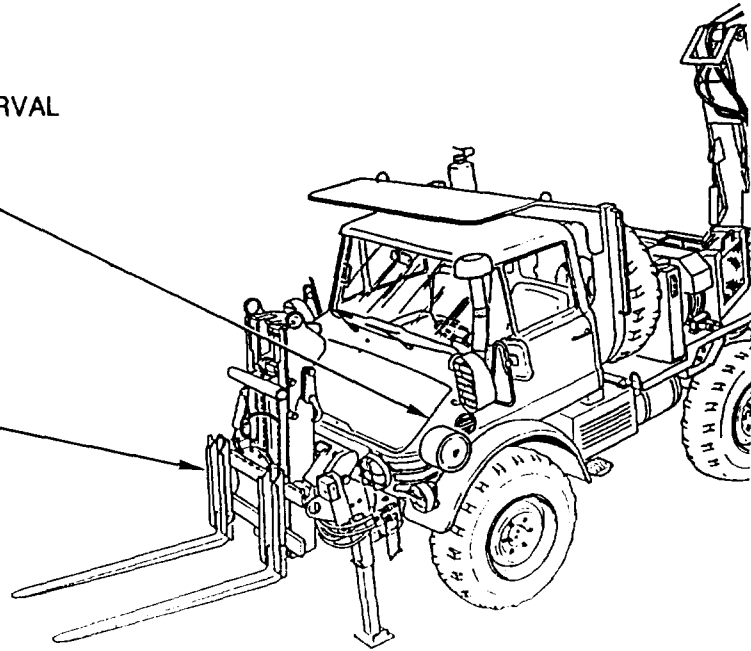
OE/HDO

A

Forklift (HMMH)  
(See Note 27)(O)

GAA

A



Front and Rear Axle  
Wheel Hub  
Drives  
(SEE/HMMH)  
(See Note 28)(O)

GO

A

Clutch Release Shaft  
(SEE/HMMH)  
(See Note 29)(O)

GAA

A

Transmission Oil  
(SEE/HMMH)  
(See Note 30)(O)

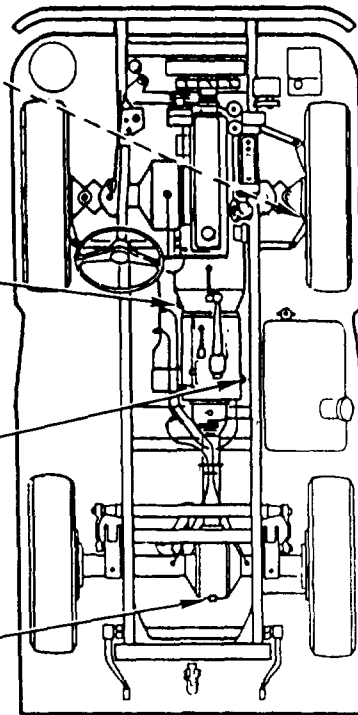
GO

A

Differential Oil  
Filler Plug/Oil  
Drain Plug  
(SEE/HMMH)  
(See Note 31)(O)

GO

A



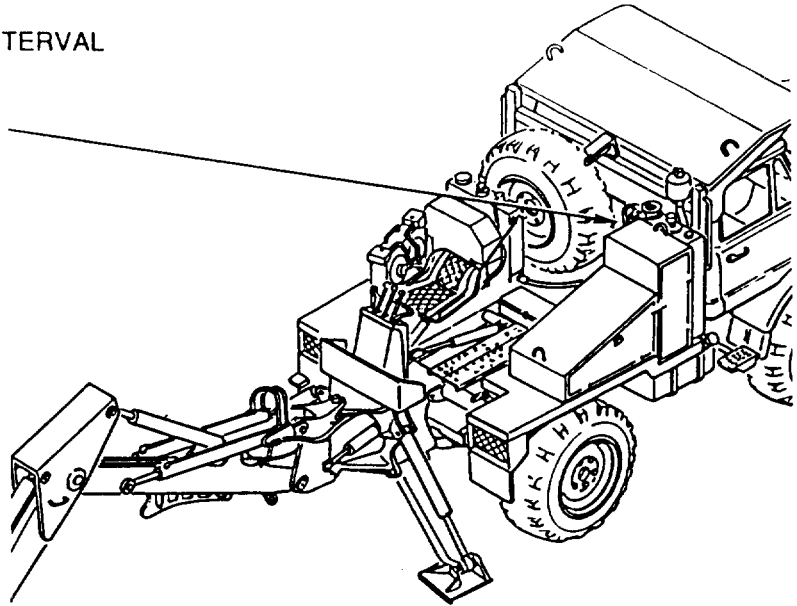
ANNUAL NOTES (CONTINUED):

LUBRICANT • INTERVAL

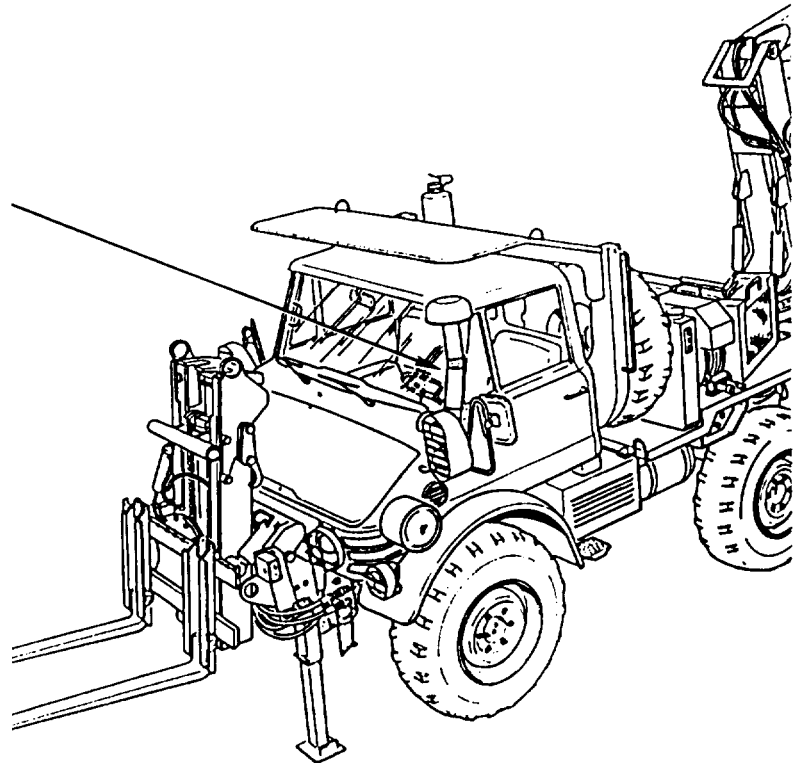
Boom and  
Bucket Control  
Lever Linkage  
(SEE/HMMH)  
(See Note 32)(O)

GAA

A



A

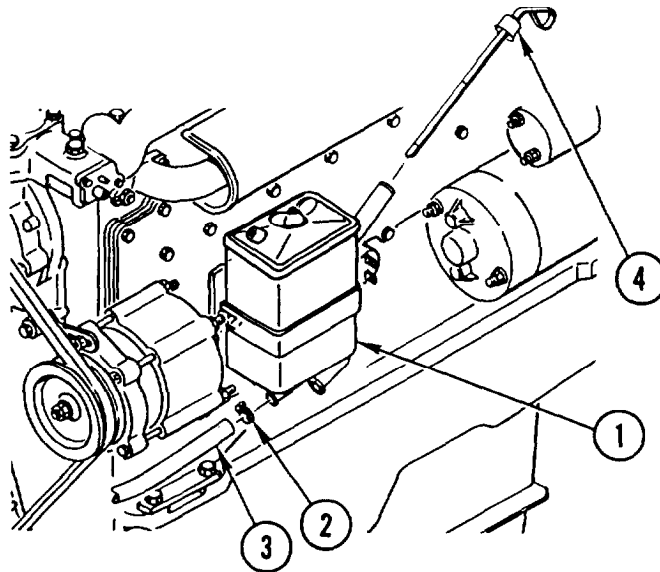


ANNUAL NOTES (CONTINUED):

Note 26

STEERING SYSTEM OIL (SEE/HMMH)

- A Tilt cab (TM 5-2420-224-20).
- B Place suitable container under steering system reservoir (1). Remove clamp (2) and hose (3) and drain oil. Fill reservoir (1) with OE/HDO or OEA to maximum (MAX) mark on dipstick (4) with engine running.



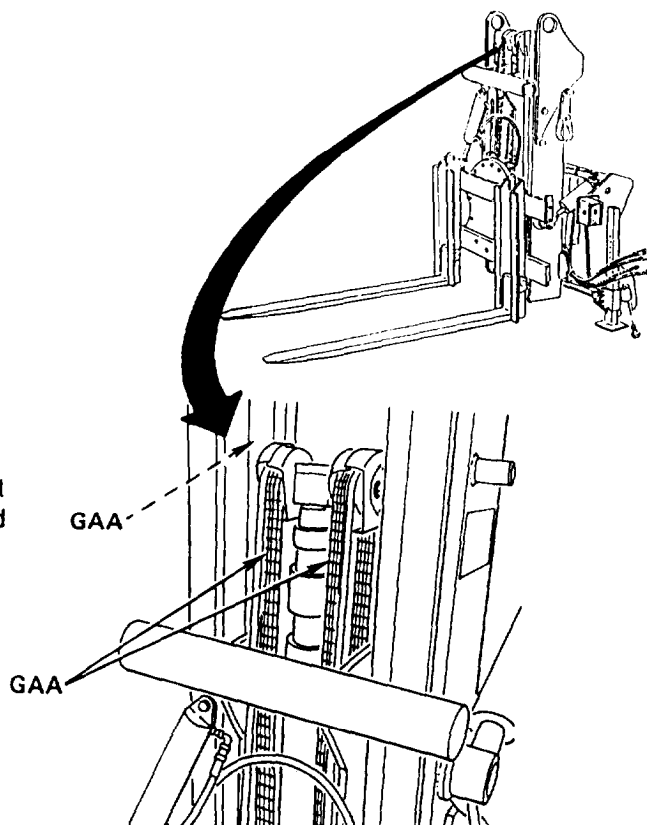
Note 27

FORKLIFT (HMMH)

**WARNING**

Death or serious injury could result from repeated or prolonged breathing or skin contact of drycleaning solvent SD, type II, P-D-680. Use in well-ventilated area. Do not use near open flame or in excessive heat.

Remove old grease from mast channel and mast chain with drycleaning solvent (SD, type II) and apply thin coating of GAA.



ANNUAL NOTES (CONTINUED):

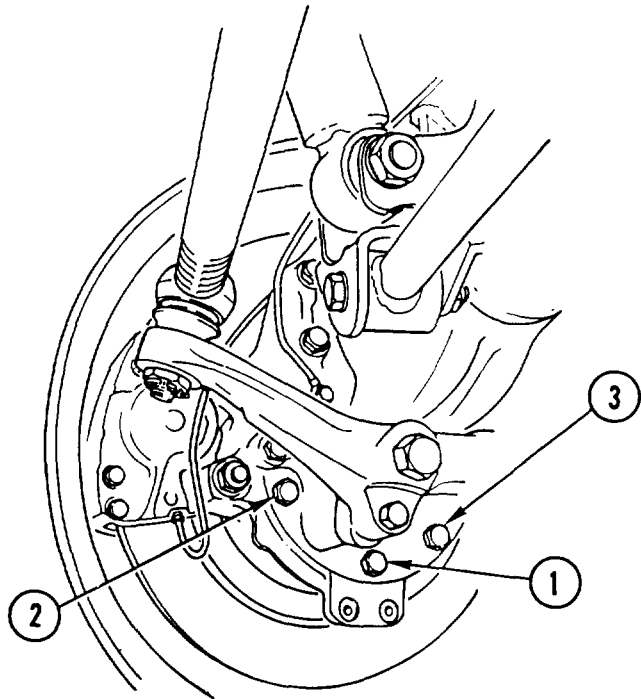
Note 28

FRONT AND REAR AXLE WHEEL HUB DRIVES  
(SEE/HMMH)

Place suitable container under drain plug (1) and drain oil. Install drain plug (1) and remove fill plug (2) and check plug (3). Fill axle with GO-80/90 or GO-75 thru fill plug (2). Oil level should be level with bottom of the inspection hole (3). Install fill plug (2) and check plug (3).

AXLE-WHEEL HUB DRIVE  
(DISC BRAKE)

1. DRAIN PLUG (BOTTOM)
2. FILL PLUG (FORWARD)
3. CHECK PLUG (REAR)



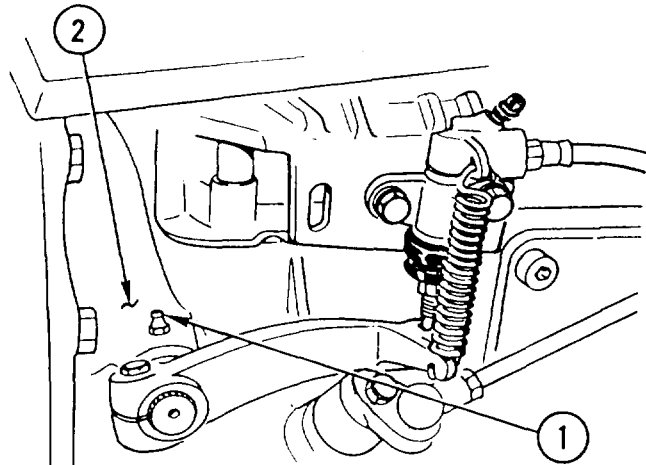
Note 29

CLUTCH RELEASE SHAFT  
(SEE/HMMH)

**CAUTION**

Damage can occur to clutch assembly if over-lubricated.

Apply two shots of GAA from standard hand-held grease gun to fitting (1) on clutch housing (2).

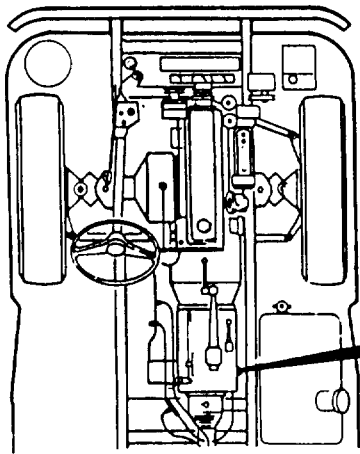
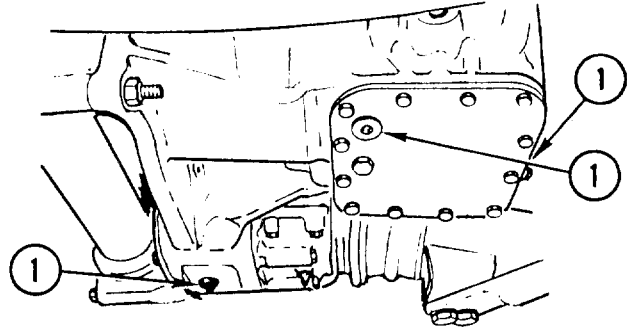


ANNUAL NOTES (CONTINUED):

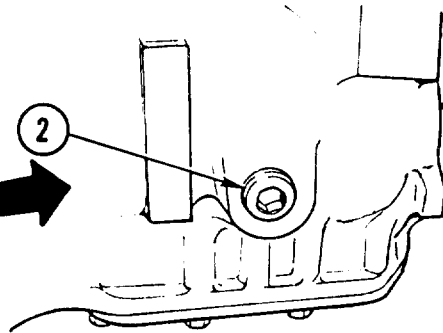
Note 30

TRANSMISSION OIL (SEE/HMMH)

- A Vehicle must be parked on level surface.
- B All implements must be in transport position.
- C Place suitable container under transmission drain plugs (1) and drain oil. Install drain plugs (1) and remove fill plug (2). Fill transmission with GO-80/90 or GO-75 to bottom of fill plug (2) port and install fill plug (2).



BOTTOM

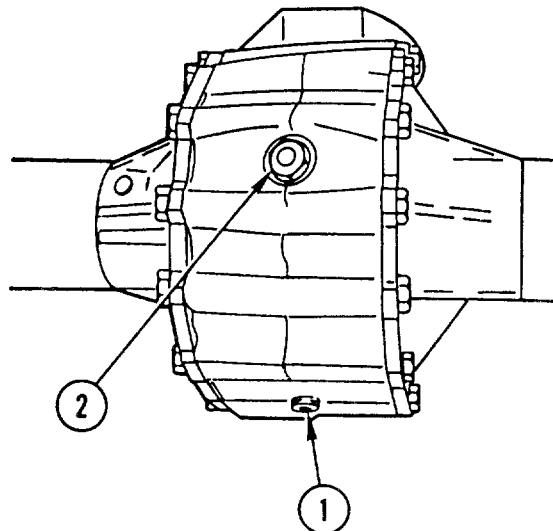


SIDE

Note 31

DIFFERENTIAL OIL FILLER  
PLUG/OIL DRAIN PLUG (SEE/HMMH)

Place suitable container under differential. Remove drain plug (1) and drain oil. Install drain plug (1) and remove fill plug (2). Fill differential with GO-80/90 or GO-75 thru fill port (2). Oil level should be level with bottom of fill port (2). Install fill plug (2).

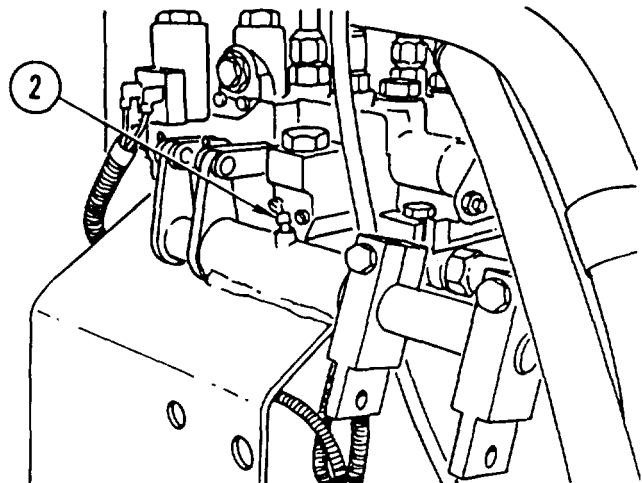
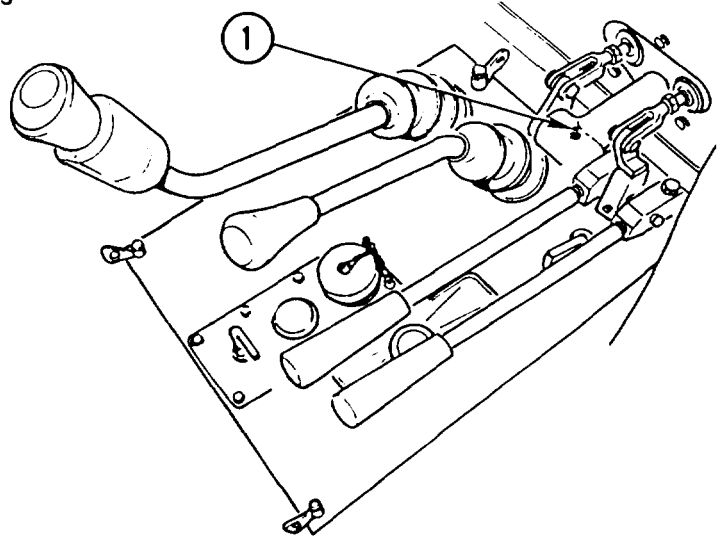


ANNUAL NOTES (CONTINUED):

Note 32

BOOM AND BUCKET CONTROL LEVER LINKAGE  
(SEE/HMMH)

- A Lubricate one fitting with GAA inside cab at boom and bucket control lever linkage (1).
- B Lubricate one fitting with GAA outside cab at boom and bucket control lever linkage (2).



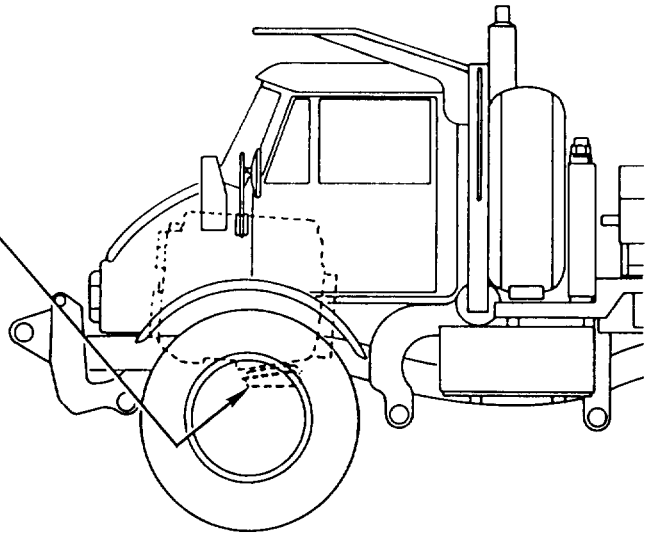
ON-CONDITION NOTES:

LUBRICANT • INTERVAL

Engine Oil Drain  
(SEE/HMMH)  
(See Note 33)(O)

OE/HDO

OC





ON-CONDITION NOTES (CONTINUED):

Note 33

ENGINE OIL DRAIN (SEE/HMMH)

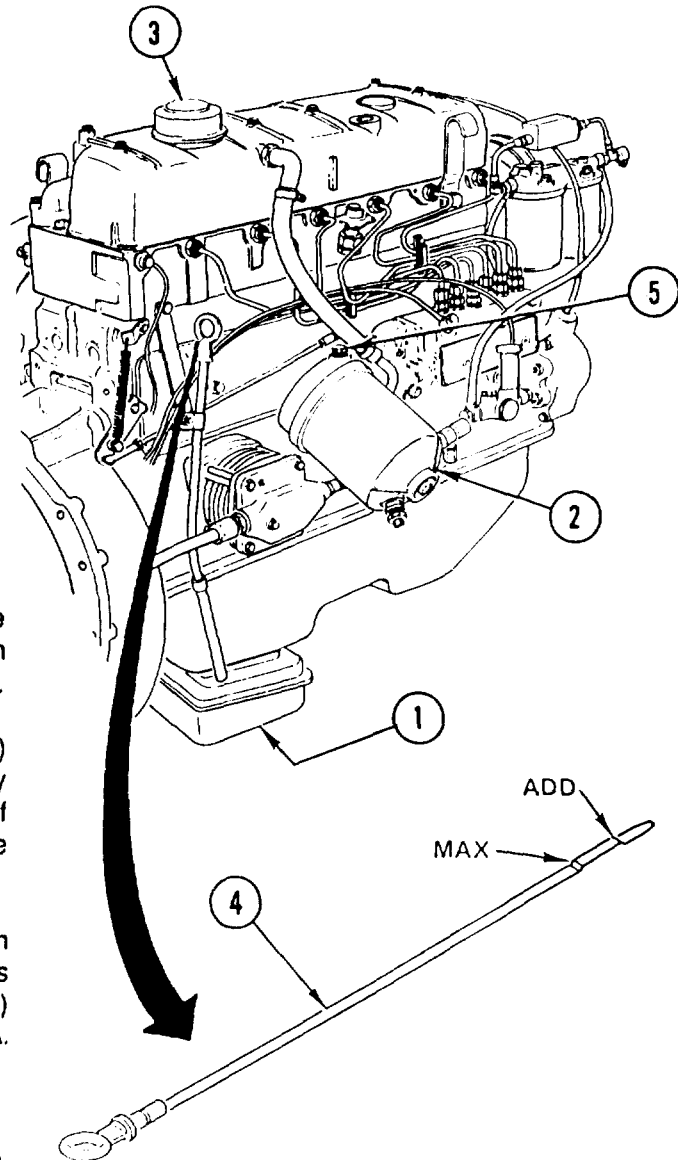
**WARNING**

Hot oil causes burns and serious injury. Use care when checking or draining hot oil.

**NOTE**

Drain oil when notified by Army Oil Analysis Program (AOAP) laboratory. Unless otherwise notified by AOAP, engine oil must be changed quarterly.

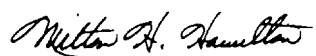
- A Remove inside engine hood (TM 5-2420-224-20).
- B Run engine until warm; stop engine. Place suitable container under engine. Remove drain plug (1) and drain oil. Install drain plug (1).
- C Remove and discard oil filter element (2) (TM 5-2420-224-20). Clean filter base. Apply thin coating of clean oil to gasket on base of new filter element (2) and install on engine (TM 5-2420-224-20).
- D Remove filler cap (3) and fill engine with OE/HDO or OEA until dipstick (4) indicates maximum (MAX) level. Remove filler plug (5) and fill filter bowl/canister with OE/HDO or OEA.
- E Start engine and check for oil leaks.
- F Check oil level after engine has been shut down.



By Order of the Secretary of the Army:

GORDON R. SULLIVAN  
*General, United States Army*  
*Chief of Staff*

Official:



MILTON H. HAMILTON  
*Administrative Assistant to the*  
*Secretary of the Army*

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# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

| To change     | To                 | Multiply by | To change          | To            | Multiply by |
|---------------|--------------------|-------------|--------------------|---------------|-------------|
| inches        | centimeters        | 2.540       | ounce-inches       | newton-meters | .007062     |
| feet          | meters             | .305        | centimeters        | inches        | .394        |
| yards         | meters             | .914        | meters             | feet          | 3.280       |
| miles         | kilometers         | 1.609       | meters             | yards         | 1.094       |
| square inches | square centimeters | 6.451       | kilometers         | miles         | .621        |
| square feet   | square meters      | .093        | square centimeters | square inches | .155        |
| square yards  | square meters      | .836        | square meters      | square feet   | 10.764      |
| square miles  | square kilometers  | 2.590       | square meters      | square yards  | 1.196       |
| acres         | square hectometers | .405        | square kilometers  | square miles  | .386        |
| cubic feet    | cubic meters       | .028        | square hectometers | acres         | 2.471       |
| cubic yards   | cubic meters       | .765        | cubic meters       | cubic feet    | 35.315      |
| fluid ounces  | milliliters        | 29.573      | cubic meters       | cubic yards   | 1.308       |
| pints         | liters             | .473        | milliliters        | fluid ounces  | .034        |
| quarts        | liters             | .946        | liters             | pints         | 2.113       |
| gallons       | liters             | 3.785       | liters             | quarts        | 1.057       |
| ounces        | grams              | 28.349      | liters             | gallons       | .264        |
| pounds        | kilograms          | .454        | grams              | ounces        | .035        |
| short tons    | metric tons        | .907        | kilograms          | pounds        | 2.205       |
| pound-feet    | newton-meters      | 1.356       | metric tons        | short tons    | 1.102       |
| pound-inches  | newton-meters      | .11296      |                    |               |             |

## Temperature (Exact)

°F Fahrenheit temperature      5/9 (after subtracting 32)      Celsius temperature      °C

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