

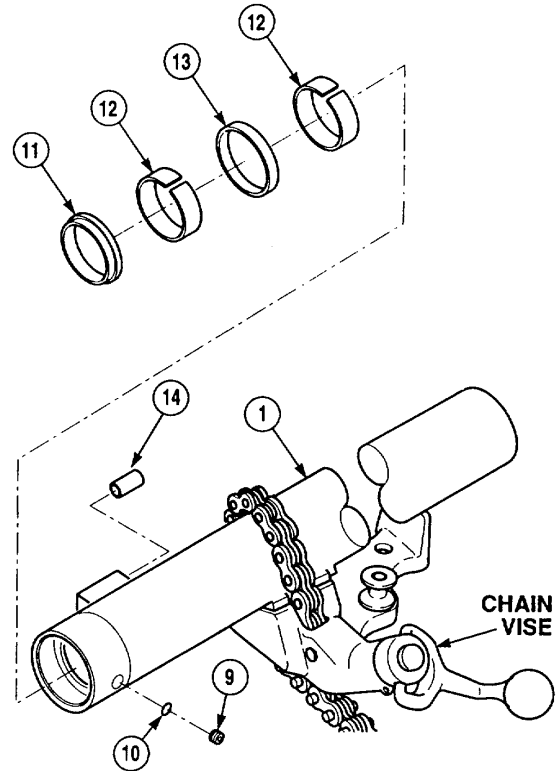
- (4) Inspect rod for scratches or pitting. Remove minor scratches and pitting by using stone and lubrication oil.
- (5) Inspect component threads for burrs and stripped threads. Replace or repair as necessary.

c. Assembly.

NOTE

Coat all internal parts with hydraulic oil before assembly.

- (1) Position mast primary cylinder (1) in chain vise.
- (2) Install flow cartridge (14) in cylinder (1).
- (3) Install seal (13), two wear rings (12), and wiper (11) in cylinder (1).
- (4) Install seal (10) and button screw (9) in cylinder (1).



15-7. MAST PRIMARY CYLINDER REPAIR (CONT).

- (5) Remove cylinder (1) from chain vise, rotate 180 degrees, and position cylinder in chain vise.

CAUTION

Keep piston straight and concentric in cylinder. Do not allow piston to become wedged in cylinder or damage to cylinder or piston may occur.

- (6) Install wear ring (8) on piston (5).
 (7) Install piston (5) in cylinder (1).
 (8) Install preformed packing (7) on base (3).
 (9) Install backup ring (6) on base (3).
 (10) Install two screws (2) in base (3).
 (11) Position base (3) in cylinder (1) with hole in base visible in slot of cylinder.

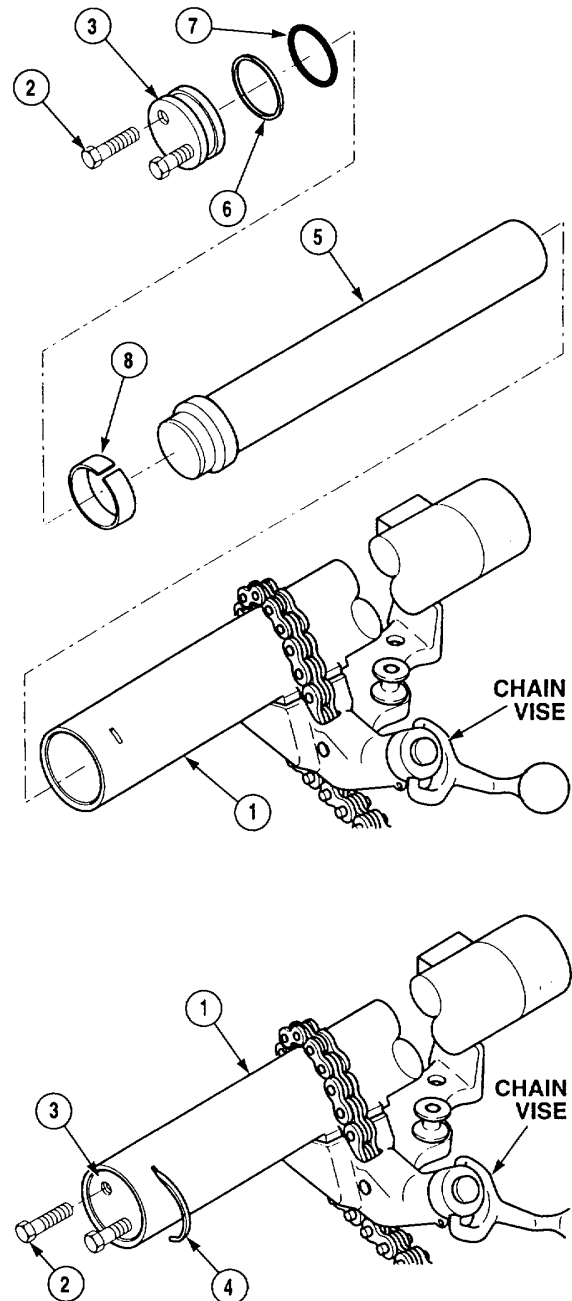
WARNING

Use extreme care when removing or installing lock wire. Lock wire is under tension and can act as a projectile when released suddenly. Ensure proper eye protection is worn to prevent injury to personnel.

- (12) Install lock wire (4) in hole of base (3) rotating base until lock wire locks into groove of base.
 (13) Remove two screws (2) from base (3).
 (14) Remove mast primary cylinder (1) from chain vise.

NOTE**Follow-on Maintenance:**

- **Install mast primary cylinder (Para 13-2).**



END OF TASK

15-8. MAST SECONDARY CYLINDER REPAIR.

This task covers:

- a. Disassembly b. Cleaning/Inspection c. Assembly

INITIAL SETUP*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix E)
Vise, Pipe, Chain (Item 5, Appendix E)
Pan, Drain (Item 11, Appendix E)

Equipment Condition

Mast secondary cylinder removed
(Para 13-2)

Materials/Parts

Oil, Hydraulic (Item 15, Appendix B)
Solvent, Dry-cleaning (Item 20, Appendix B)
Ring, Wear
Ring, Wear (2)
Kit, Seal

a. Disassembly.**NOTE**

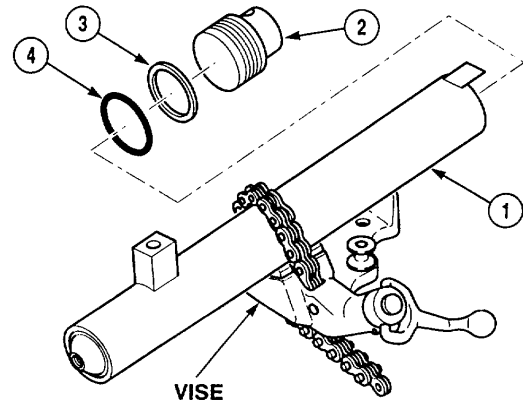
There are two mast secondary cylinders. Both are repaired the same way.

- (1) Position mast secondary cylinder (1) in chain vise.

CAUTION

Do not allow threaded or machined surfaces to come in contact with other metal surfaces. Clearances between cylinder components is very small, any minor damage done during disassembly could require component replacement or make assembly difficult.

- (2) Position drain pan under mast secondary cylinder (1).
(3) Remove base (2) from cylinder (1).
(4) Remove backup ring (3) and preformed packing (4) from base (2). Discard backup ring and preformed packing.

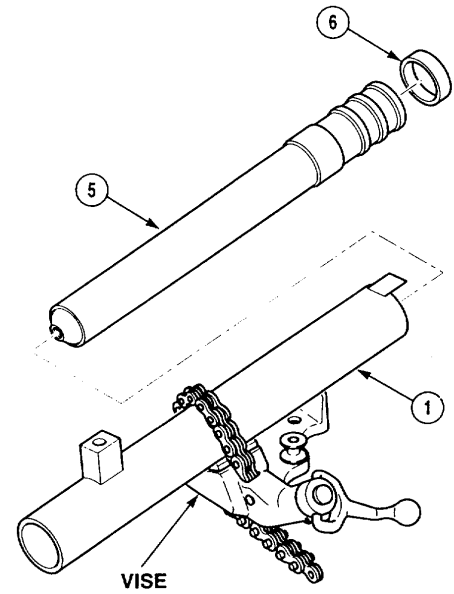


15-8. MAST SECONDARY CYLINDER REPAIR (CONT).

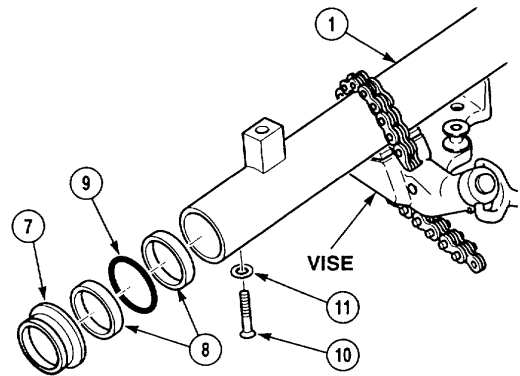
CAUTION

Keep rod straight and concentric in cylinder. Do not allow rod to become wedged in cylinder or damage to cylinder or rod may occur.

- (5) Remove rod (5) from cylinder (1).
- (6) Remove wear ring (6) from rod (5). Discard wear ring.



- (7) Remove wiper (7) from cylinder (1). Discard wiper.
- (8) Remove two wear rings (8) and seal (9) from cylinder (1). Discard wear rings and seal.
- (9) Remove screw (10) and seal (11) from cylinder (1). Discard seal.
- (10) Remove cylinder (1) from chain vise.



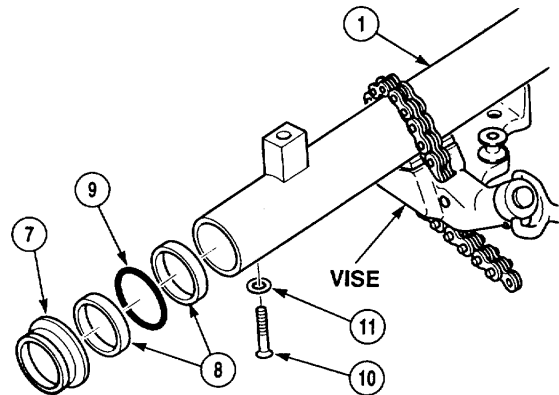
b. Cleaning/Inspection.**WARNING**

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**
 - **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**
- (1) Clean all components and flush cylinder barrel using dry-cleaning solvent only. Do not use cleaning cloth as any foreign material would contaminate hydraulic system.
 - (2) Inspect barrel bore for any scratches or corrosion. Replace barrel if rusted. Replace barrel and piston if either component is scratched.
 - (3) Inspect rod for bending. Replace if necessary.
 - (4) Inspect rod for scratches or pitting. Remove minor scratches and pitting by using stone and lubrication oil.
 - (5) Inspect component threads for burrs and stripped threads. Replace or repair as necessary.

c. Assembly.**NOTE**

Coat all internal parts with hydraulic oil before assembly.

- (1) Position mast secondary cylinder (1) in chain vise.
- (2) Install seal (9) and two wear rings (8) in cylinder (1).
- (3) Install wiper (7) in cylinder (1).
- (4) Install seal (11) and screw (10) in cylinder (1).



15-8. MAST SECONDARY CYLINDER REPAIR (CONT).

- (5) Install wear ring (6) on rod (5).

CAUTION

Keep rod straight and concentric in cylinder. Do not allow rod to become wedged in cylinder or damage to cylinder or rod may occur.

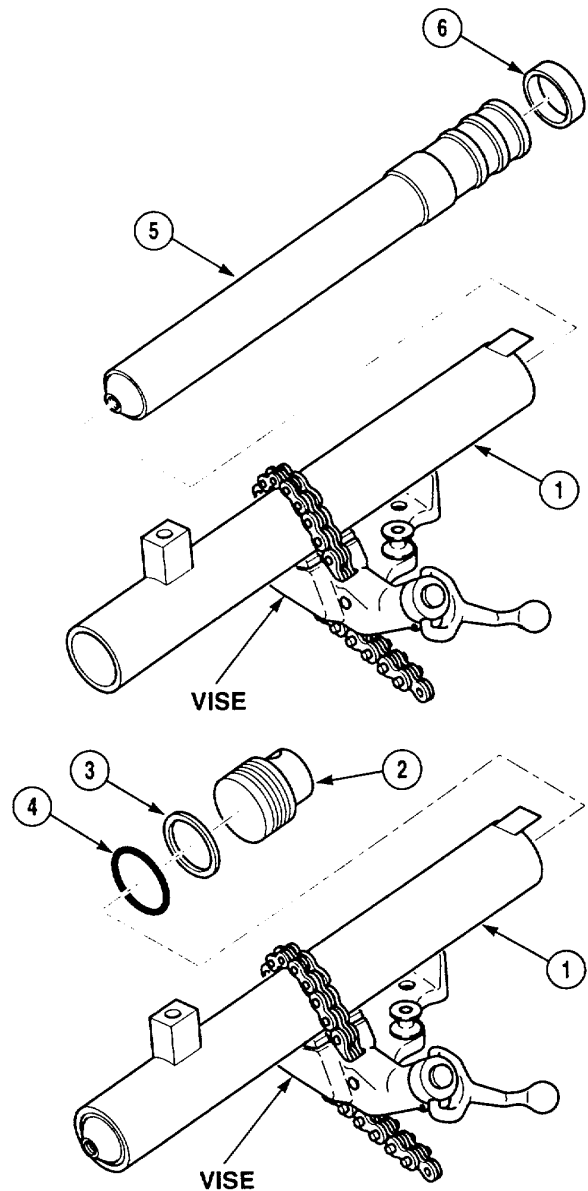
- (6) Install rod (5) in cylinder (1).

- (7) Install preformed packing (3) and backup ring (4) on base (2).
 (8) Install base (2) in cylinder (1).
 (9) Remove mast secondary cylinder (1) from chain vise.

NOTE

Follow-on Maintenance:

- Install mast secondary cylinder (Para 13-2).



END OF TASK

15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR.

This task covers:

- | | | |
|----------------|------------------------|-----------------|
| a. Removal | c. Cleaning/Inspection | e. Installation |
| b. Disassembly | d. Reassembly | |

INITIAL SETUP*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix E)
Lifting Chain, (Item 5, Appendix E)
Jack Kit, Hydraulic 20 Ton
(Item 5, Appendix E)
Jack, Hydraulic 50 Ton (Item 5, Appendix E)
Wrench Set, Socket 3/4 "dr"
(Item 5, Appendix E)
Torque Wrench 0-600 lb ft
(Item 5, Appendix E)
Portable Grinder/Sander
(Item 5, Appendix E)
Lubricant Packer Bearing
(Item 5, Appendix E)
Arc Welding Machine (Item 6, Appendix E)
Spanner Wrench (Item 19, Appendix E)
Lifting Device, Minimum Capacity 4,000 lbs
(1814 kg)

Materials/Parts

Nut (2) (Item 37, Appendix B)
Gasket (2)

Personal Required

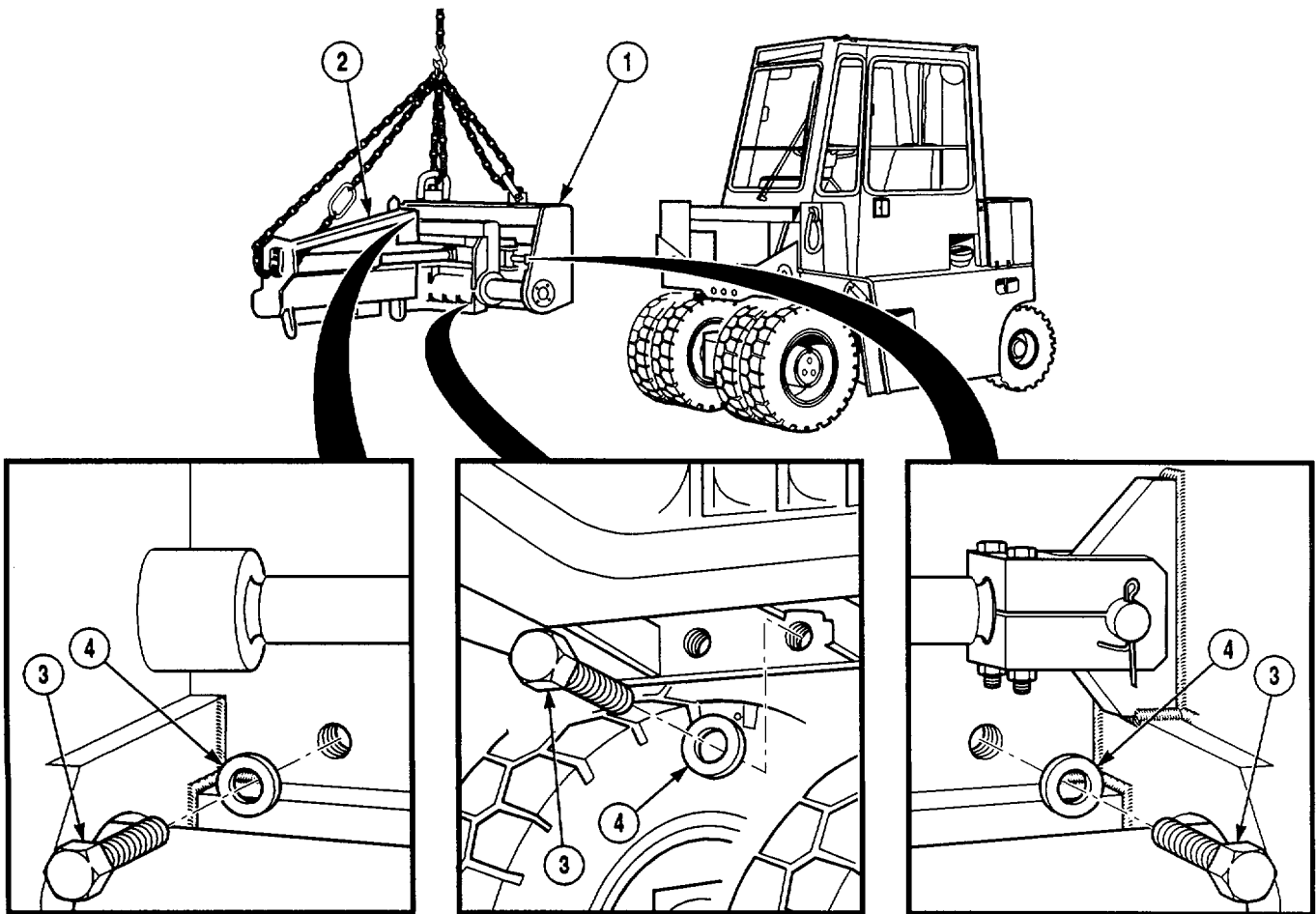
Two

Equipment Condition

Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Shift assembly centered on vehicle
(TM 10-3930-669-10)
Side shift rod scraper removed
(TM 10-3930-669-20)
Batteries disconnected (TM 10-3930-669-20)
Pivot cylinder removed (TM 10-3930-669-20)
Mast removed (Para 13-2)

15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR (CONT).**a. Removal.**

- (1) Install two lifting eyes on side shift housing (1).
- (2) Position blocking in pivot and shift assembly (2).
- (3) Attach suitable three-point sling to pivot and shift assembly (2) and side shift housing (1).

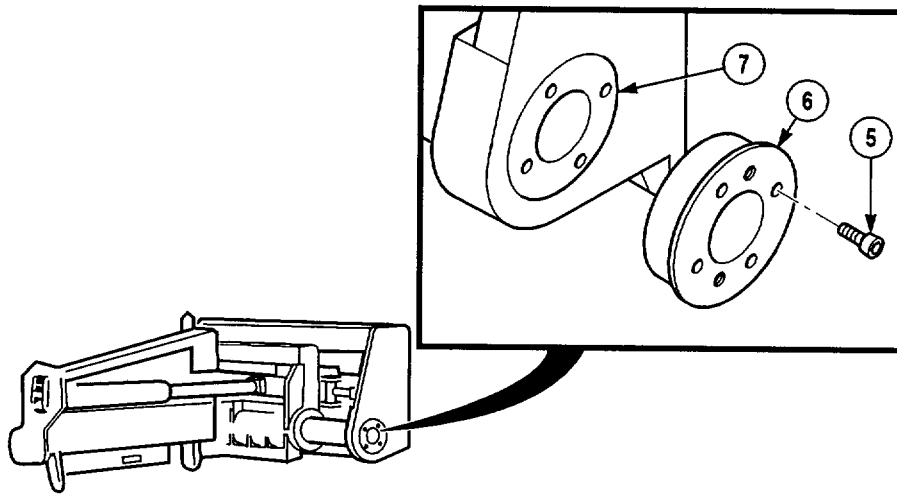
**WARNING**

Pivot and shift assembly weighs 1870 lbs (848 kg). Attach lifting device prior to removal to prevent possible injury to personnel.

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (4) Remove four screws (3) and washers (4) from side shift housing (1).
- (5) Using suitable lifting device, remove side shift housing (1) and pivot and shift assembly (2) and position on flat surface.

b. Disassembly.



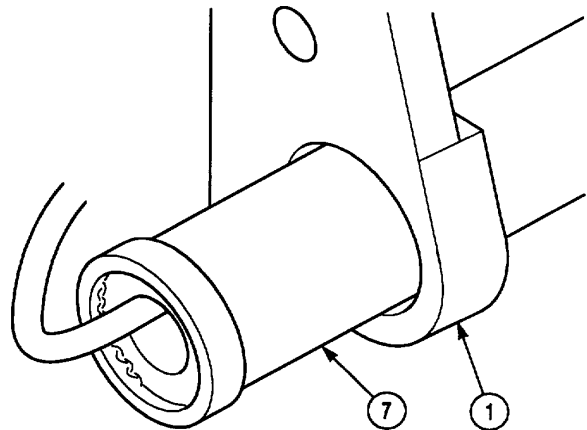
NOTE

The side shift shaft will need to be pulled out two inches in order to be removed from the end cap.

- (1) Remove four screws (5) from plate (6) and shaft (7).

WARNING

- Side shift shaft weighs 295 lbs (134 kg). Attach lifting device prior to removal to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.



- (2) Using a lifting device and suitable press, drive shaft (7) to right side of side shift housing.

15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR (CONT).**WARNING**

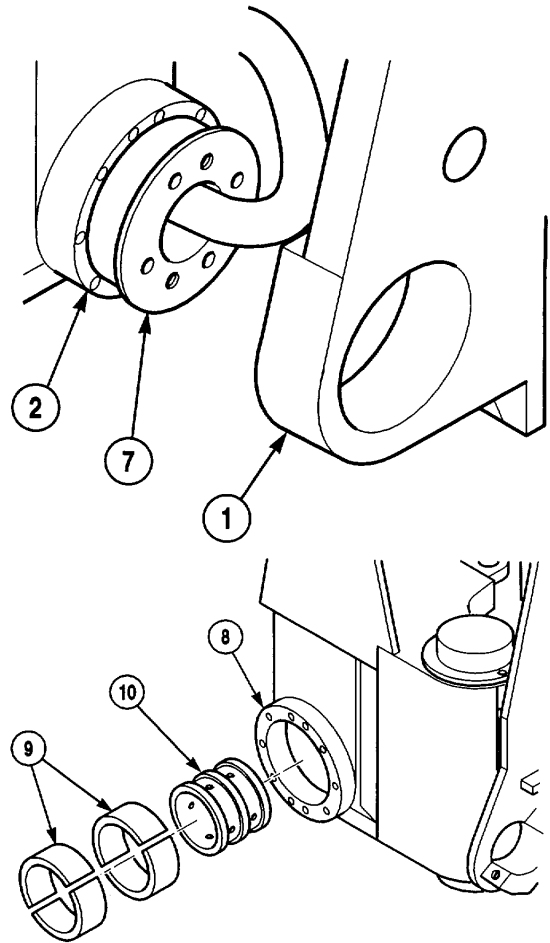
- Side shift shaft weighs 295 lbs (134 kg). Attach lifting device prior to removal to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (3) Using a suitable lifting device, remove shaft (7) from pivot and shift assembly (2) and side shift housing (1).

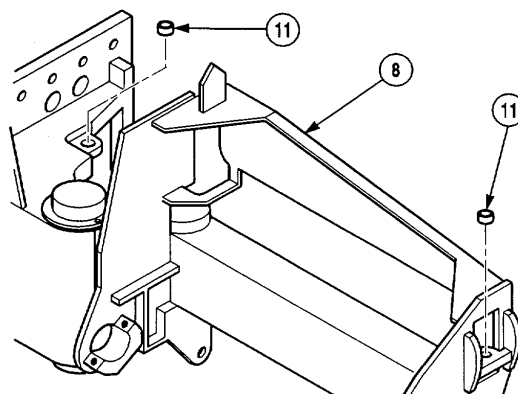
WARNING

- Pivot arm assembly weighs 875 lbs (397 kg). Attach lifting device prior to removal to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (4) Position pivot assembly (8) on flat surface.
- (5) Using bearing tool, remove four bearing halves (9) and spacer (10) from pivot assembly (8).
- (6) Repeat Step (5) to remove four bearing halves (9) from opposite end of pivot assembly (8).



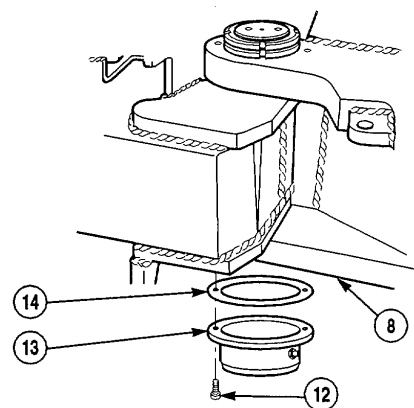
- (7) Remove two radial bushings (11) from pivot assembly (8).



NOTE

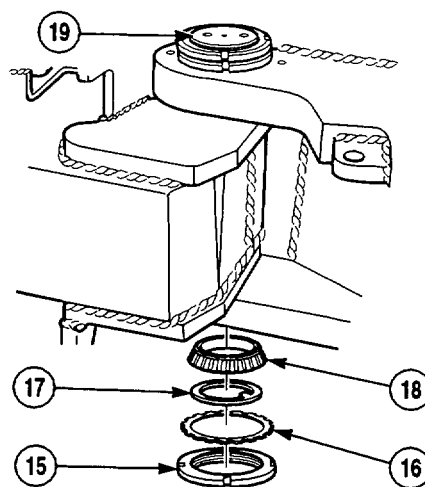
One side shown but both bearing caps removed the same way.

- (8) Remove four screws (12), bearing cap (13), and preformed packing (14) from pivot assembly (8). Discard preformed packing.

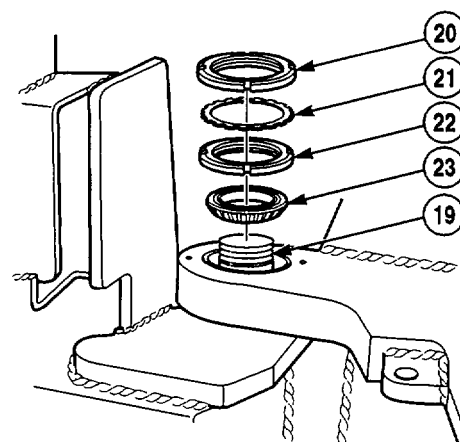


15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR (CONT).

- (9) Remove nut (15), lock ring (16), ring (17), and bearing (18) from pivot pin (19).



- (10) Remove nut (20), lock ring (21), nut (22), and bearing (23) from pivot pin (19).

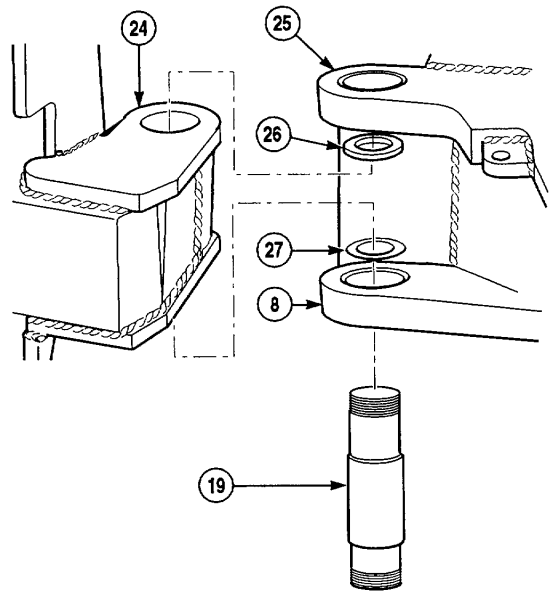


WARNING

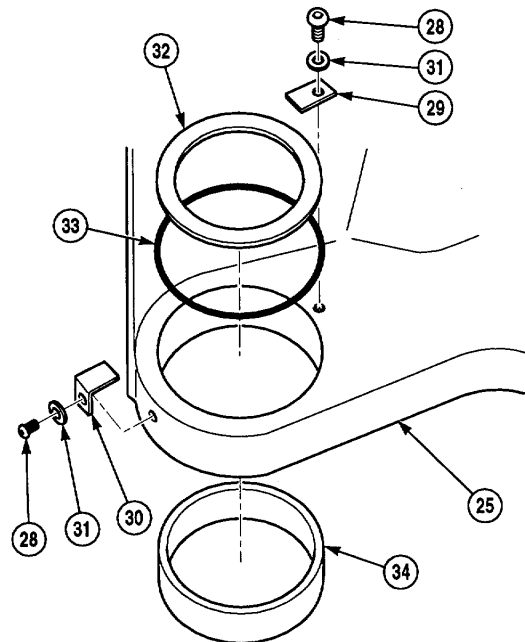
- **Pivot arm weighs 335 lbs (152 kg). Attach lifting device prior to removal to prevent possible injury to personnel.**
- **All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.**

NOTE

Pivot pin can only be removed from the bottom.



- (11) Remove pivot pin (19) from pivot assembly (8) and pivot arm (24).
- (12) Remove pivot arm (24) from side shift assembly (25).
- (13) Remove spacer (26) and preformed packing (27) from side shift assembly (25).
- (14) Remove two screws (28), clips (29 and 30), washers (31), seal (32), and preformed packing (33) from side shift assembly (25).
- (15) Remove two bearing races (34) from side shift assembly (25).



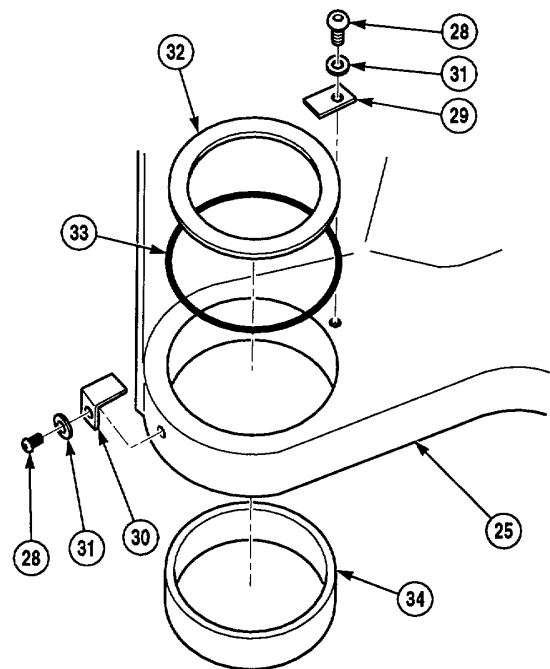
15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR (CONT).**c. Cleaning/Inspection.****WARNING**

- Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

- (1) Clean all components and flush cylinder barrel using dry-cleaning solvent only. Do not use cleaning cloth as any foreign material would contaminate hydraulic system.
- (2) Inspect barrel bore for any scratches or corrosion. Replace barrel if rusted. Replace barrel and piston if either component is scratched.
- (3) Inspect rod for bending. Replace if necessary.
- (4) Inspect rod for scratches or pitting. Remove minor scratches and pitting by using stone and lubrication oil.
- (5) Inspect component threads for burrs and stripped threads. Replace or repair as necessary.

d. Assembly.

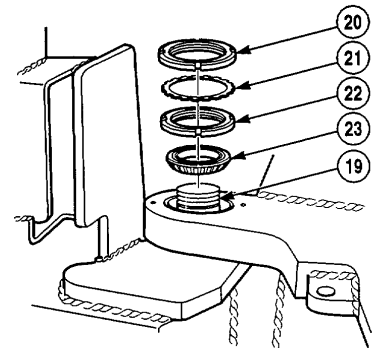
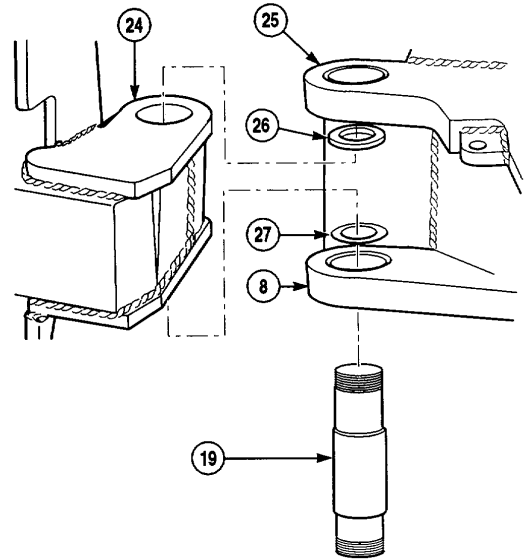
- (1) Install two bearing races (34) in shift assembly (25).
- (2) Position preformed packing (33) and seal (32) into side shift housing (1).
- (3) Install two clips (29 and 30) on side shift assembly (25) with two washers (31) and screws (28). Tighten screw to 10 lb-ft (13.56 N.m)



WARNING

- **Pivot arm weighs 335 lbs (152 kg). Attach lifting device prior to removal to prevent possible injury to personnel.**
- **All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.**

- (4) Position spacer (26) and spacer (27) in side shift assembly (25).
- (5) Using suitable lifting device position pivot arm (24) in side shift assembly (25).
- (6) Position pivot pin (19) in pivot assembly (8) and pivot arm (24) from the bottom.
- (7) Position bearing (23), nut (22), lock ring (21), and nut (20) on pivot pin (19). Do not tighten.
- (8) Using spanner wrench, tighten top nut (20) to 260 lb-ft (352.51 N.m).
- (9) Using spanner wrench, tighten bottom nut (22) to 540 lb-ft (732.14 N.m).



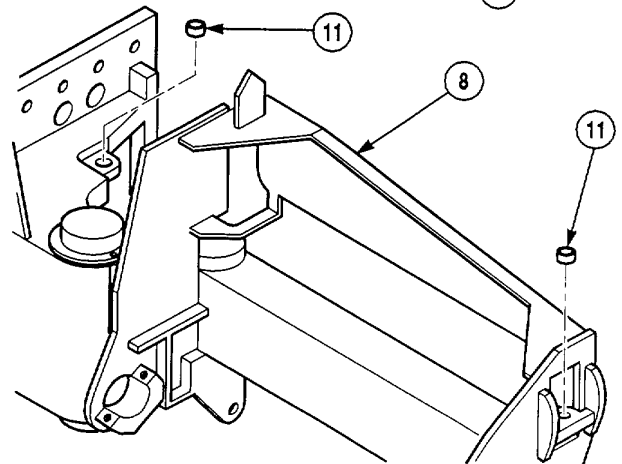
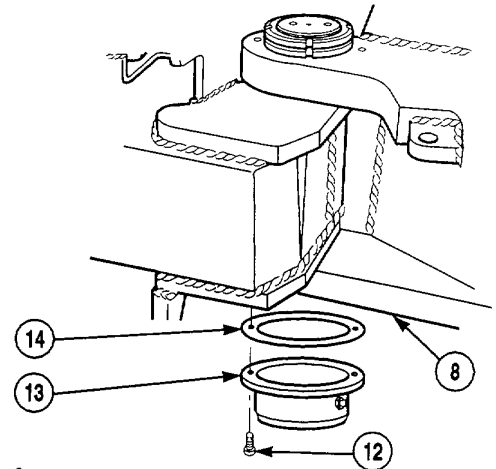
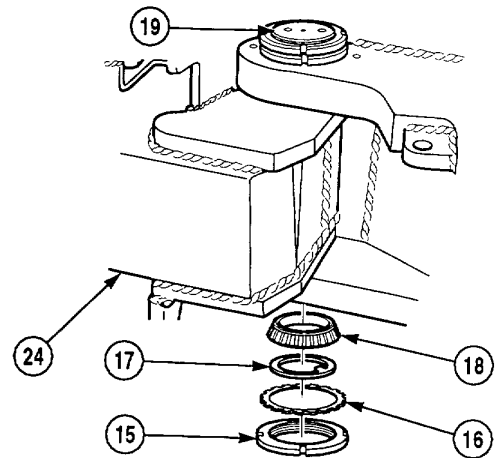
15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR (CONT).

- (10) Check pivot arm (24) for freedom of movement.
- (11) Install bearing (18), ring (17), and lock ring (16) on pivot pin (19) with nut (15). Tighten nut to 20 lb-ft (27.12 N•m).

NOTE

One side shown but both bearing caps installed the same way.

- (12) Install preformed packing (14) and bearing cap (13) on pivot assembly (8) with four screws (12).
- (13) Install two radial bushings (11) in pivot assembly (8).



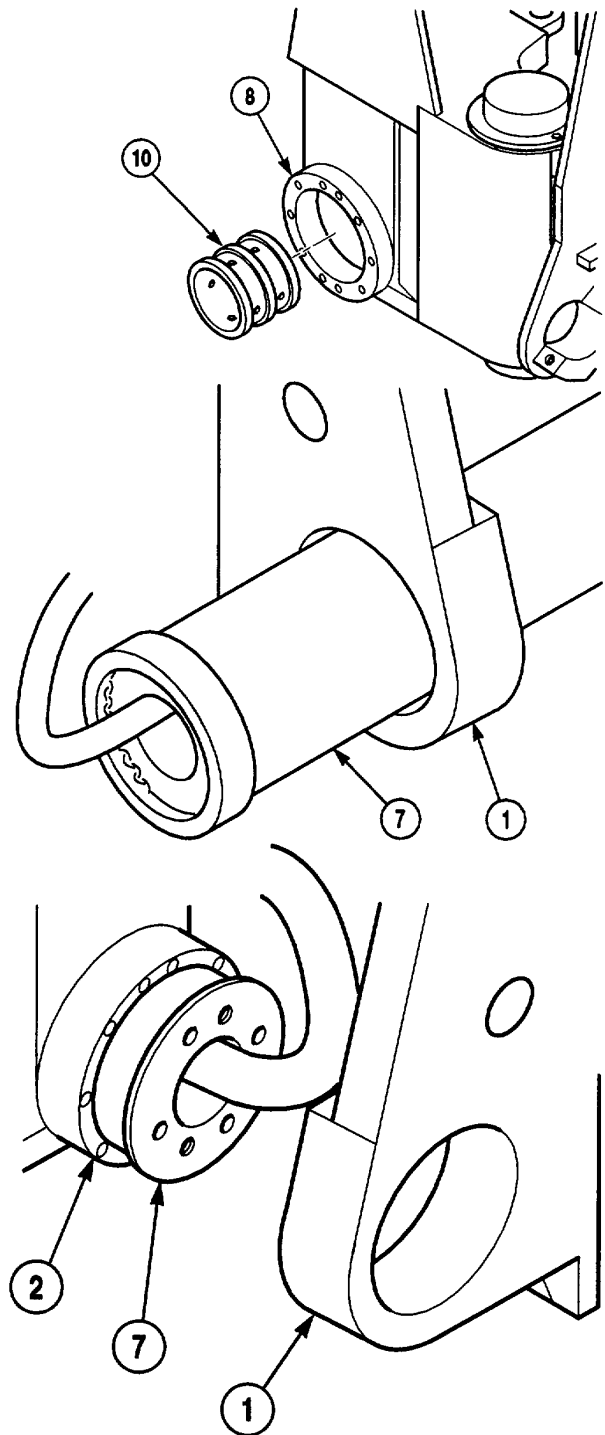
- (14) Apply lithium grease to inside of pivot assembly (8) and position spacer (10) into left side of pivot assembly.

WARNING

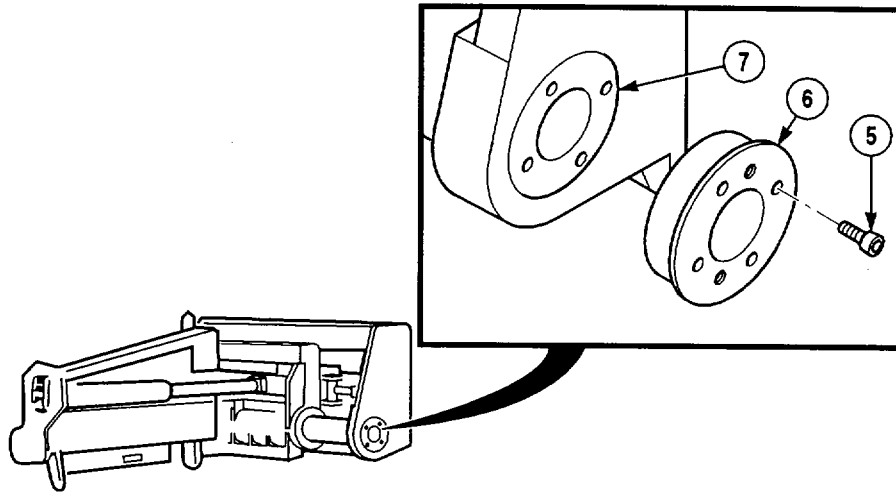
- Side shift shaft weighs 295 lbs (134 kg) Attach lifting device prior to removal to prevent possible injury to personnel.

- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (15) Using a lifting device and a suitable press, position shaft (7) in side shift housing (1).
- (16) Using a suitable lifting device, install shaft (7) on pivot and shift assembly (2) and side shift housing (1).



15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR (CONT).



(17) Using 30 ton ram, press side shift shaft (7) main end cap (6) and bearing cap (5) into side shift housing (1).

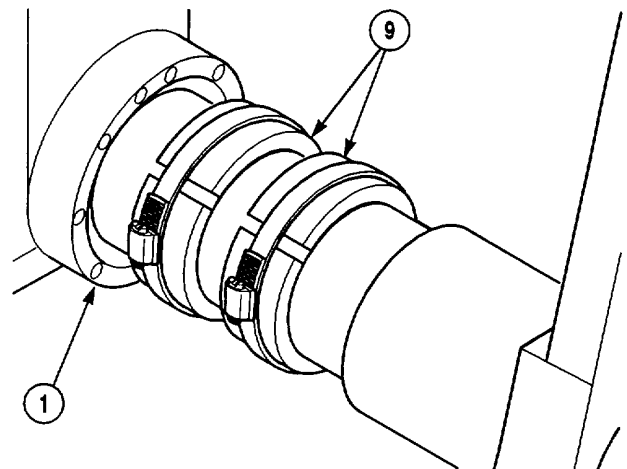
(18) Install main end cap (6) on shaft (7) with four screws (8). Tighten screws to 105 lb-ft (142.36 N.m).

NOTE

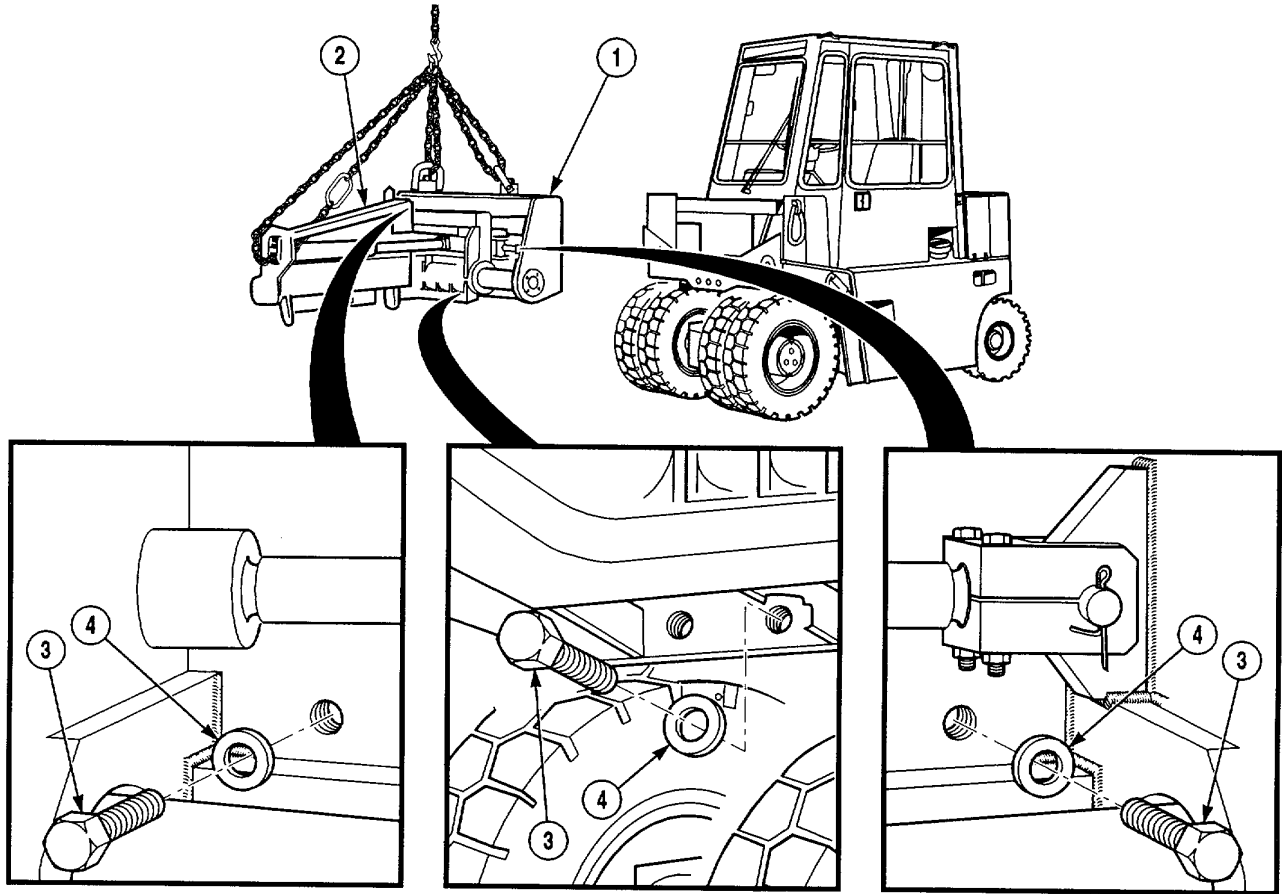
- Left side bearing halves shown but both sides installed the same way.

- Using 50 ton jack, slide the pivot and shift assembly over the bearing halves.

(19) Using bearing tool and four clamps, install eight bearing halves (9) into side shift housing (1).



e. Installation.



WARNING

- Pivot and shift assembly weighs 1870 lbs (848 kg). Attach lifting device prior to installation to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (1) Using suitable lifting device, position pivot and shift assembly (2) approximately 12 inches (305 mm) from side shift housing (1).
- (2) Install shift cylinder/umbilical hoses (TM 10-3930-669-20).

NOTE

- Make sure pivot and shift assembly is positioned securely in weldments on bulkhead.
 - Pivot and shift assembly may need to be moved to install bottom screws.
- (3) Install pivot and shift assembly (2) on side shift housing (1) with four washers (4) and screws (3).

15-9. PIVOT AND SHIFT ASSEMBLY REPLACEMENT/REPAIR (CONT).

NOTE

Follow-on Maintenance:

- **Install mast (Para 13-2).**
- **Install pivot cylinder (TM 10-3930-669-20).**
- **Install side shift rod scraper (TM 10-3930-669-20).**
- **Lube pivot and side shift Assembly (LO 10 3930-669-12).**
- **Connect batteries (TM 10-3930-669-20).**
- **Remove wheel chocks (TM 10-3930-669-20).**

END OF TASK

15-10. HYDRAULIC RESERVOIR REPLACEMENT.

This task covers:

- a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix E)
Wrench, Torque (0 to 175 lb-ft [0-237 N-m])
(Item 5, Appendix E)
Wrench, Torque (0-60 N.m)
(Item 12, Appendix E)

Materials/Parts

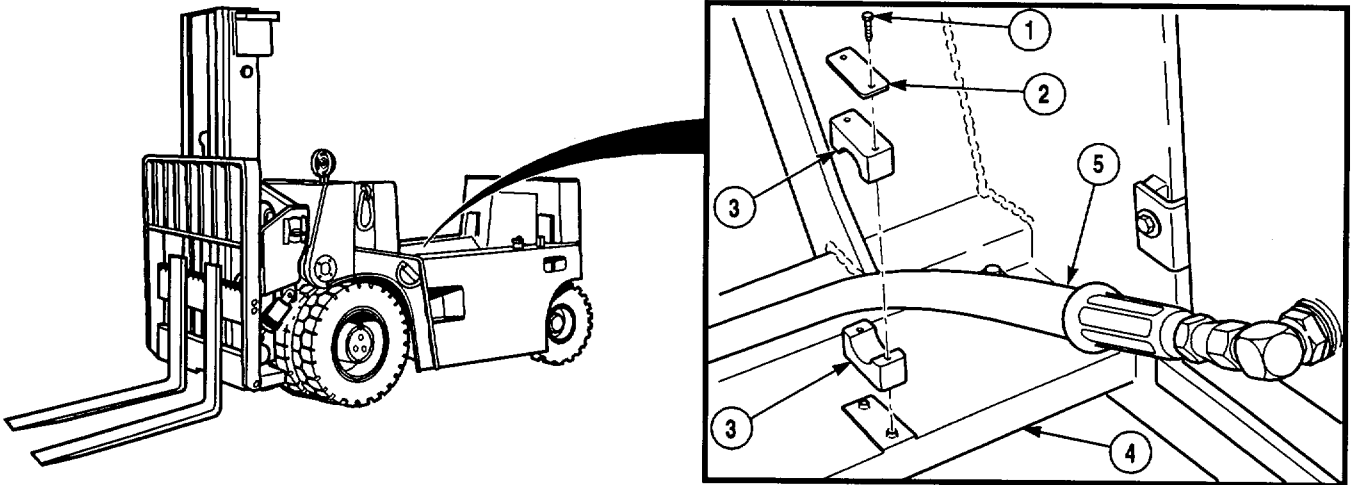
Cap and Plug Set (Item 5, Appendix B)
Rags, Wiping (Item 19, Appendix E)
Solvent, Dry-cleaning (Item 20, Appendix E)
Tags, Identification (Item 21, Appendix E)
Packing, Preformed (3)

Personnel Required

Two

Equipment Condition

Wheels chocked (TM 10-3930-669-10)
Hydraulic reservoir drained
(TM 10-3930-669-10)
Remove shunt (TM 10-3930-669-20)
Engine/transmission assembly removed
(Para 3-3)

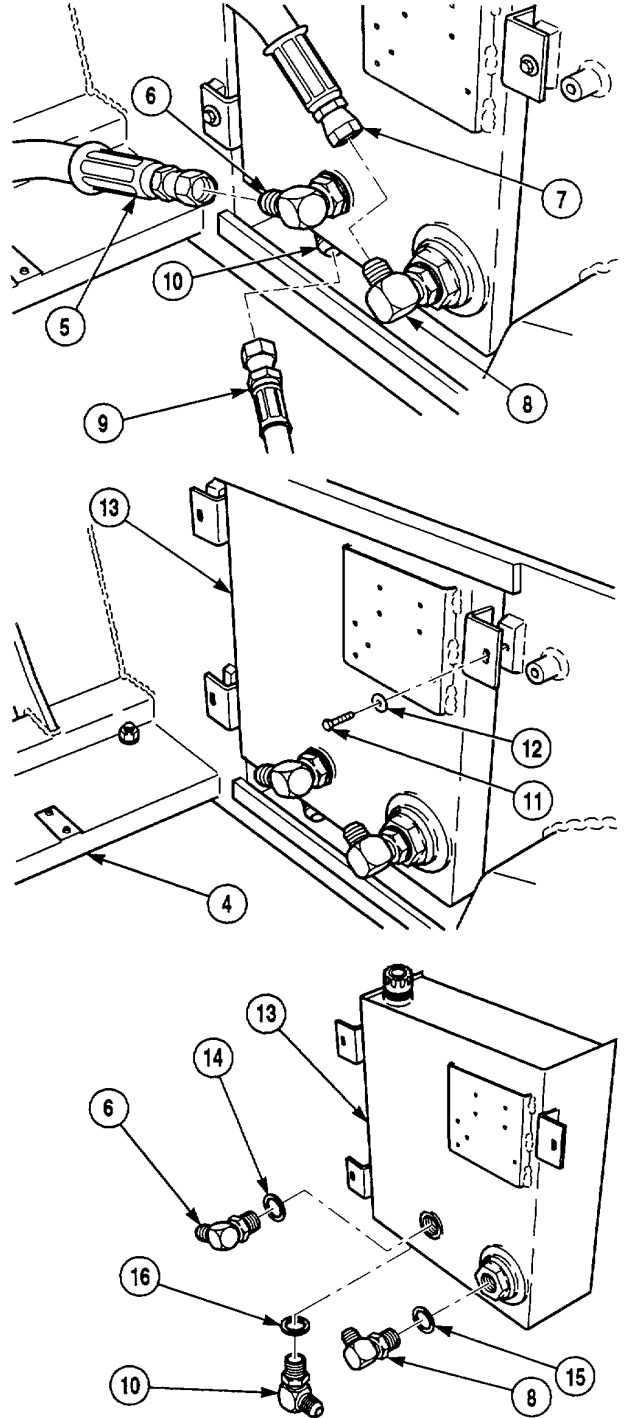
a. Removal.**NOTE**

- Tag and mark all lines, hoses, and fittings prior to removal.
- Cap and plug all lines, hoses, and fittings when disconnected.

(1) Remove two screws (1), cover plate (2), and clamp (3) from frame (4) and hose (5).

15-10. HYDRAULIC RESERVOIR REPLACEMENT (CONT).

- (2) Disconnect hose (5) from elbow (6).
- (3) Disconnect hose (7) from elbow (8).
- (4) Disconnect hose (9) from elbow (10).
- (5) Remove three screws (11) and washers (12) from hydraulic reservoir (13).
- (6) With aid of assistant, remove hydraulic reservoir (13) from frame (4).
- (7) Remove elbow (6) and preformed packing (14) from hydraulic reservoir (13). Discard preformed packing.
- (9) Remove elbow (8) and preformed packing (15) from hydraulic reservoir (13). Discard preformed packing.
- (10) Remove elbow (10) and preformed packing (16) from hydraulic reservoir (13). Discard preformed packing.



b. Cleaning/Inspection.**WARNING**

• Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

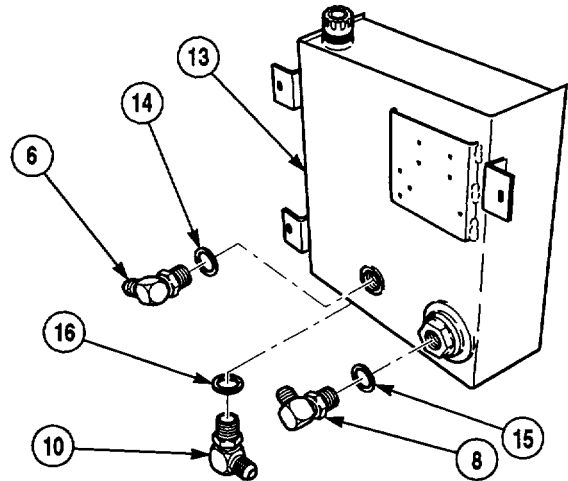
• If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

- (1) Clean all metal parts with dry-cleaning solvent and wipe dry with wiping rag.
- (2) Flush reservoir with dry-cleaning solvent and allow to air dry.
- (3) Inspect all parts for breaks, cracks, burrs, and sharp edges. Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripped threads, and cuts. Replace all damaged parts.

C Installation.**NOTE**

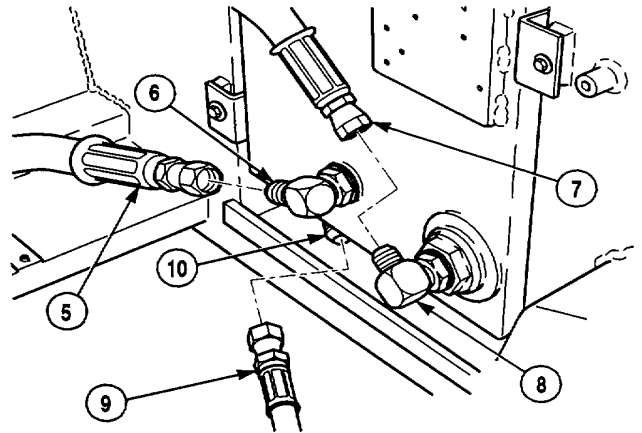
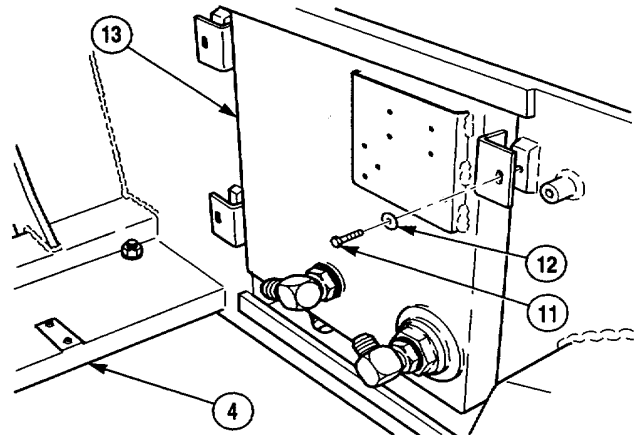
Coat preformed packings with hydraulic fluid prior to installation.

- (1) Install preformed packing (16) and elbow (10) in hydraulic reservoir (13).
- (2) Install preformed packing (15) and elbow (8) in hydraulic reservoir (13).
- (3) Install preformed packing (14) and elbow (6) in hydraulic reservoir (13).



15-10. HYDRAULIC RESERVOIR REPLACEMENT (CONT).

- (4) With aid of assistant, position hydraulic reservoir (13) in frame (4).
- (5) Install hydraulic reservoir (13) in frame (4) with three washers (12) and screws (11).
- (6) Connect hose (9) on elbow (10).
- (7) Connect hose (7) on elbow (8).
- (8) Connect hose (5) on elbow (6).

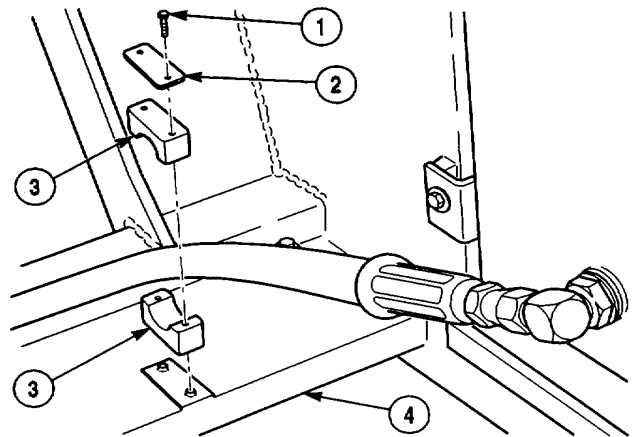


- (9) Install clamp (3) on frame (4) and hose (5) with cover plate (2) and two screws (1).

NOTE

Follow-on Maintenance:

- Install engine/transmission assembly (Para 3-3).
- Install shunt (TM 10-3930-669-20).
- Fill hydraulic reservoir (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR.

This task covers:

- | | | |
|----------------|------------------------|-----------------|
| a. Removal | c. Cleaning/Inspection | e. Installation |
| b. Disassembly | d. Assembly | |

INITIAL SETUP*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix E)
Sander, Disk, Electrical
(Item 5, Appendix E)
Jack, Kit, Hydraulic, 20 Ton Cap
(Item 5, Appendix E)
Wrench, Set, Combination
(Item 5, Appendix E)
Wrench, Set, Socket 1 in dr.
(Item 5, Appendix E)
Jack Kit, 30 Ton
(Item 17, Appendix E)
Bearing Installer
(Item 18, Appendix E)
Wrench, Spanner (Item 19, Appendix E)
Lifting Device, Minimum Capacity 4,000 lbs
(1814 kg)

Material/Parts

Nut, Hex (2)

Personnel Required

Two

Equipment Condition

Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels choked (TM 10-3930-669-10)
Mast assembly side shifted and
pivoted 90 deg. (TM 10-3930-669-10)

15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR (CONT).

a. Removal.

NOTE

Tag and mark all lines, hoses, and fittings prior to removal.

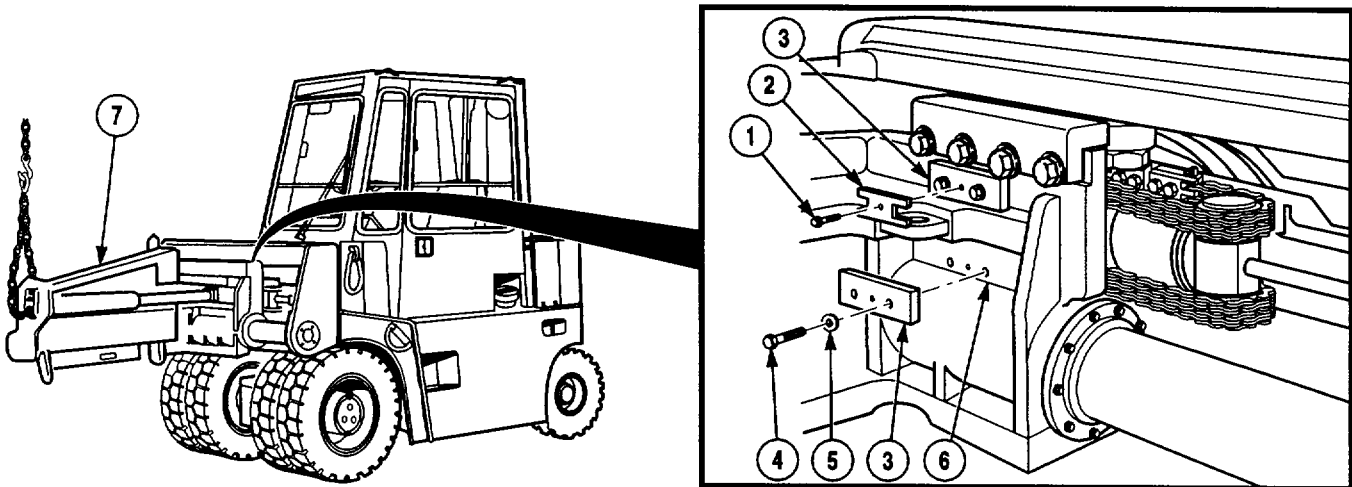
- (1) Remove screw (1) and locking plate (2) from plate assembly (3)

WARNING

- Pivot and shift assembly weighs 1870 lbs (848 kg). Attach lifting device prior to installation to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (2) Remove two screws (4), washers (5) and plate assembly (3) from support (6).

- (3) Attach suitable lifting device to support side shift assembly (7).

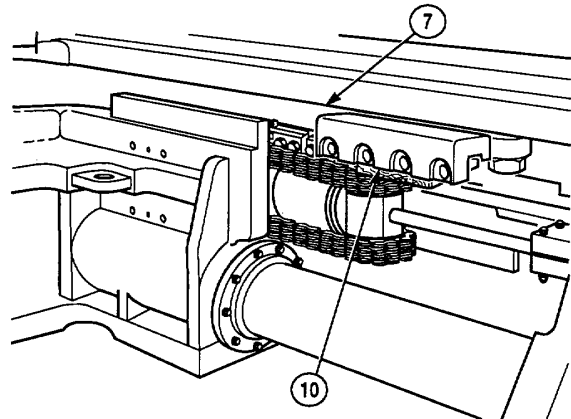
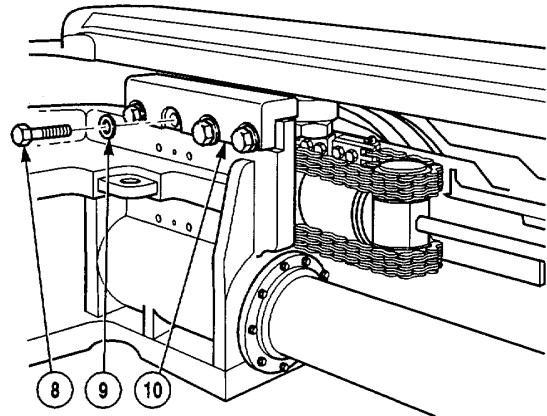


WARNING

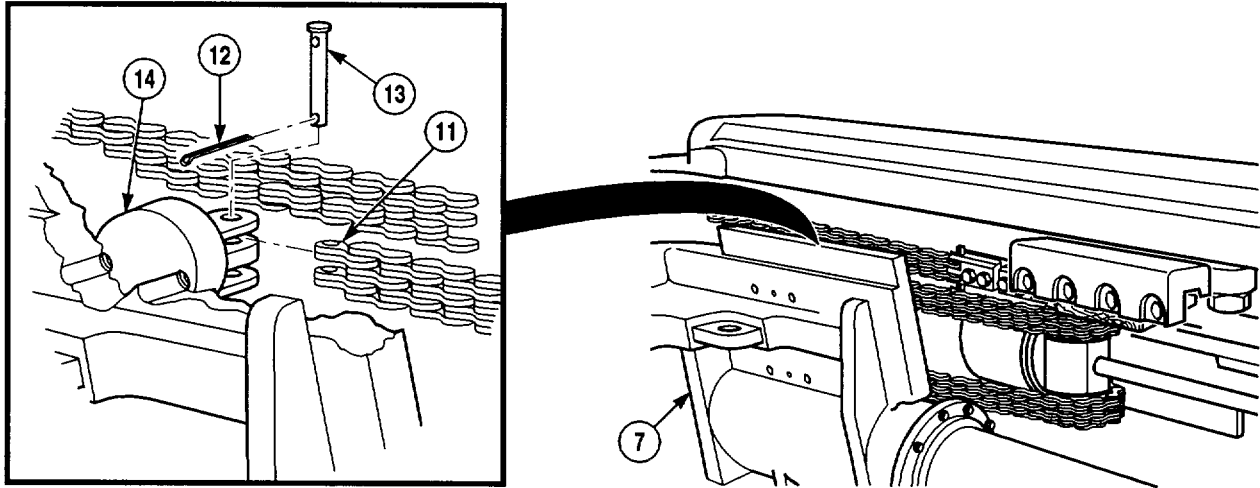
- Side shift assembly weighs 105 lbs (47.63 kg). Attach lifting device prior to installation to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

(4) Remove four screws (8), and washers (9) from support bearing assembly (10).

(5) Position and block support bearing assembly (10) to far right of side shift assembly (7).



15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR (CONT).

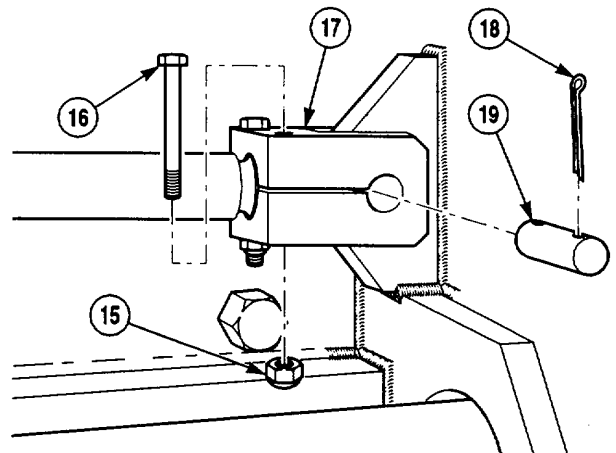


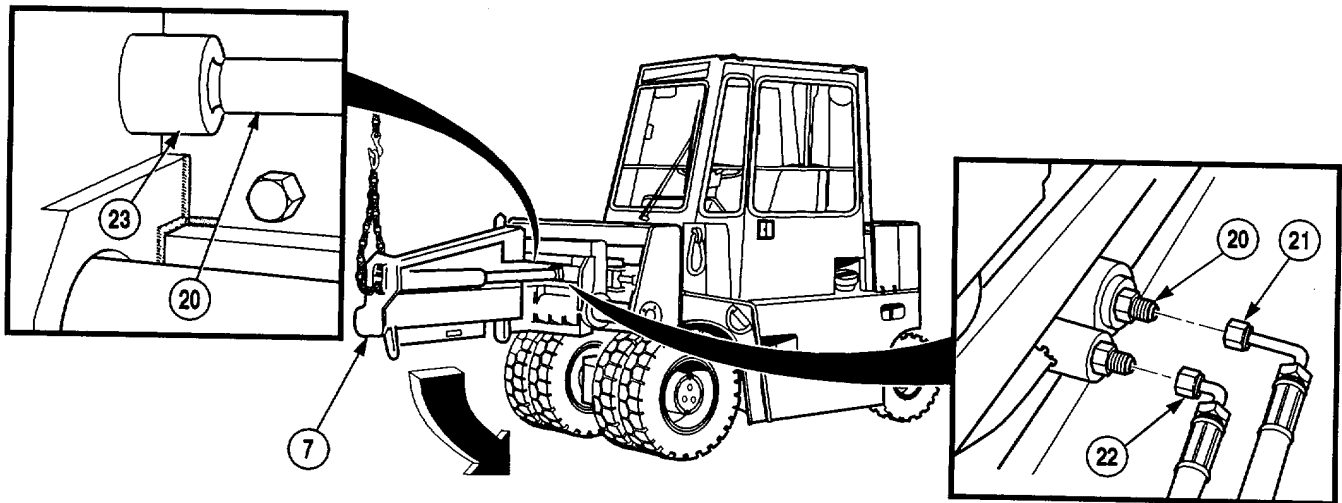
- (6) Lower side shift assembly (7) until access to side shift chains (11) can be achieved.

NOTE

One clevis shown, all chains removed the same way.

- (7) Remove four cotter pins (12), pins (13), and side lift chains (11) from clevis (14).
- (8) Remove two lock nuts (15) and screws (16) from side shift yoke (17).
- (9) Remove two cotter pins (18) and pin (19) from side shift yoke (17).

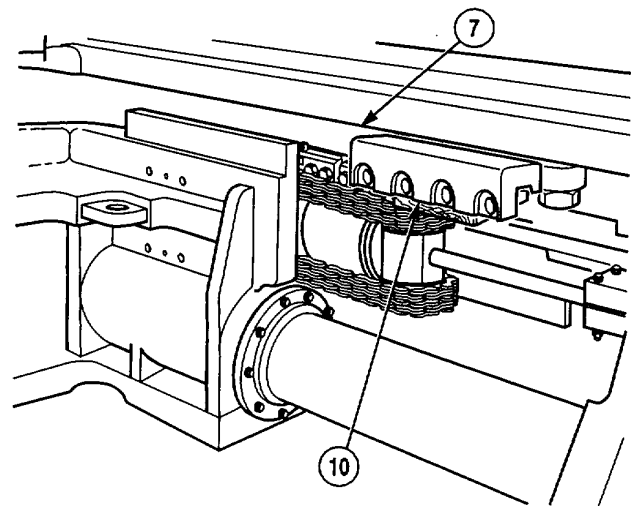




WARNING

- Side shift cylinder weighs 105 lbs (47.63 kg). Attach lifting device prior to installation to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (10) Lower side shift assembly (7) completely down.
- (11) Position side shift cylinder (20) to gain access to hydraulic hoses (21 and 22).
- (12) Remove two hoses (21 and 22) from side shift cylinder (20).
- (13) With the aid of an assistant, remove side shift cylinder (20) from cone roller bearing (23) and side shift assembly (7).
- (14) With the aid of an assistant, remove support bearing assembly (10) and blocking from side shift assembly (7).



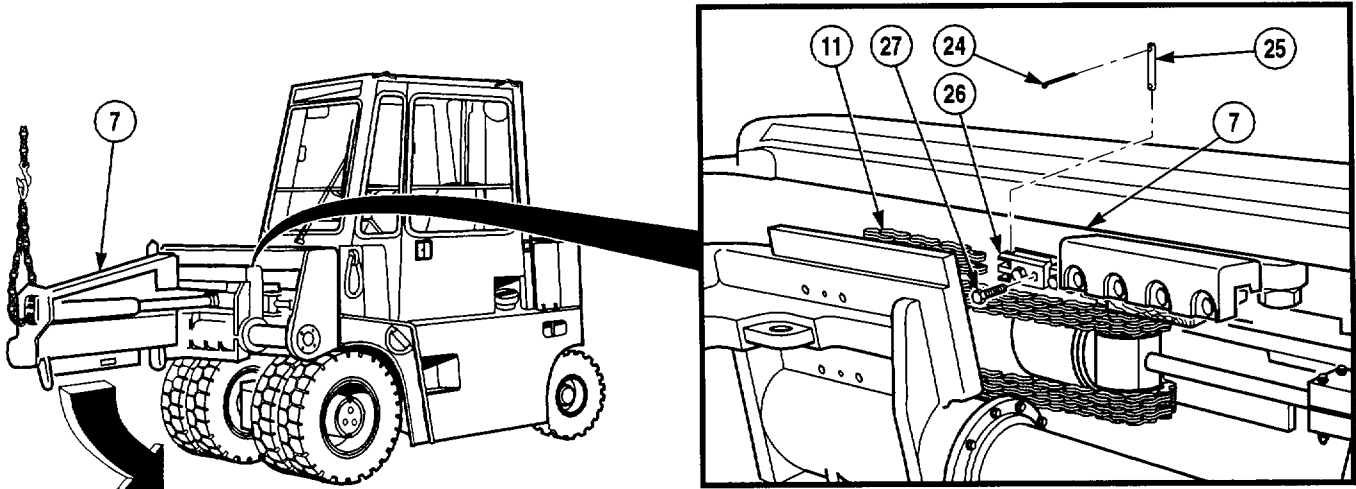
15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR (CONT).

NOTE

One anchor shown, all removed the same way.

(15) Remove cotter pin (24), pin (25), and side shift chains (11) from anchors (26).

(16) Remove two screws (27) and anchor (26) from side shift assembly (7).



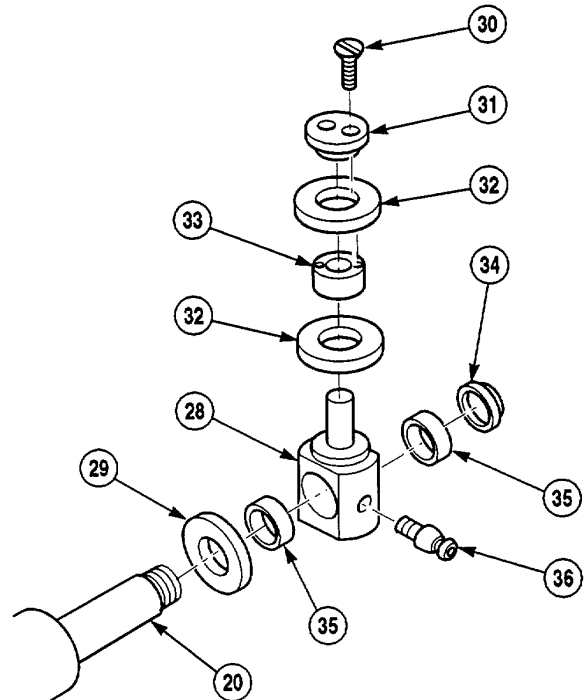
b. Disassembly.

(1) Remove yoke sheave (28) and spacer (29) from side shift cylinder (20).

(2) Remove four screws (30), two bearing covers (31), chain guides (32), bearings (33), and chain guides (32) from yoke sheave (28).

(3) Remove rod wiper (34) and two bearings (35) from yoke sheave (28).

(4) Remove fitting (36) from yoke sheave (28).



CAUTION

Transfer tube is mounted along axis of cylinder. Use blocks to protect transfer tube when clamping cylinder in a chain vise or damage to equipment may result.

- (5) Position side shift cylinder (20) in chain vise using rubber stripping to protect cylinder surface. Use wooden block to protect transfer tube.

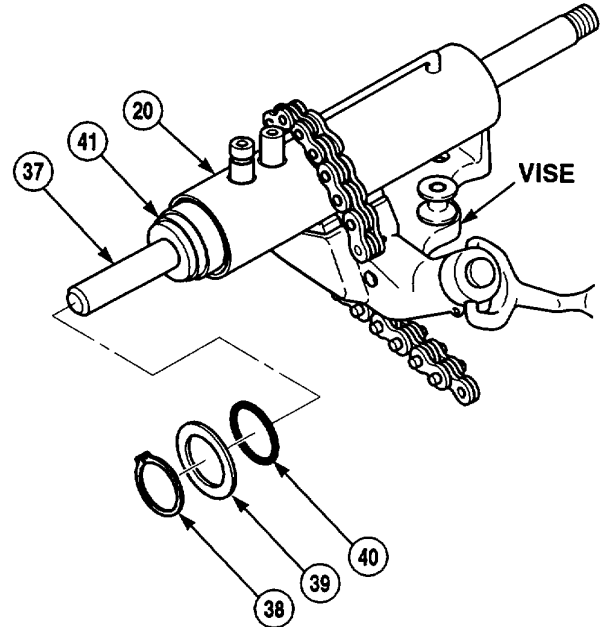
CAUTION

Do not allow threaded or machined surfaces to come in contact with other metal surfaces. Clearances between cylinder components are very small, any minor damage done during disassembly could require component replacement or make assembly difficult.

NOTE

The left head of the side shift cylinder and right head of the side shift cylinder are removed the same way. Right side is shown.

- (6) Position drain pan under side shift cylinder (20).
(7) Position piston rod (37) out of side shift cylinder (20) 4 in. (10.16 cm).

**WARNING**

Use extreme care when removing or installing spring retaining rings. Spring retaining rings are under tension and can act as projectiles when released suddenly. Ensure proper eye protection is worn to prevent injury to personnel.

- (8) Remove retaining ring (38), spacer (39), and preformed packing (40) from side shift cylinder (20) and head (41).

15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR (CONT).

NOTE

Backup seals may come off during the step.

- (9) Push head (41) into the side shift cylinder (20) until shear ring (42) is exposed.
- (10) Remove shear ring (42) from inside of side shift cylinder (20). Discard shear ring.

CAUTION '

Keep piston rod straight and concentric in cylinder. Do not allow piston rod to become wedged in cylinder or damage to cylinder or piston rod may occur.

- (11) Remove shear ring (43) backup seal (44), preformed packing (45), head (41), and piston rod (37) from side shift cylinder (20). Discard preformed packing and backup seal.

NOTE

If the left head of the shift cylinder is to be removed repeat Steps (1 through 7), if not go on to step (8).

- (12) Remove side shift cylinder (20) from chain vise.

CAUTION

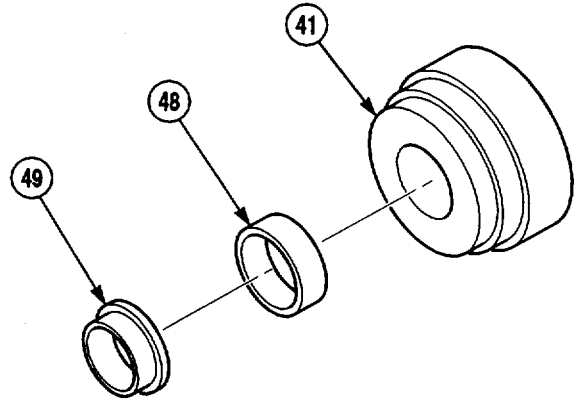
Do not damage piston rod surface. Cylinder will leak if piston rod surface is damaged.

NOTE

Note location and position of preformed packing, gasket, backup seal, and wiper rod prior to removal.

- (13) Remove gasket (46), preformed packing (47) from piston rod (37). Discard gasket and preformed packing.

- (14) Remove rod packing (48), wiper rod (49), from head (41). Discard rod packing and wiper rod.



c. Cleaning/Inspection.

WARNING

- Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flame flash point for type I dry-cleaning solvent is 100F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

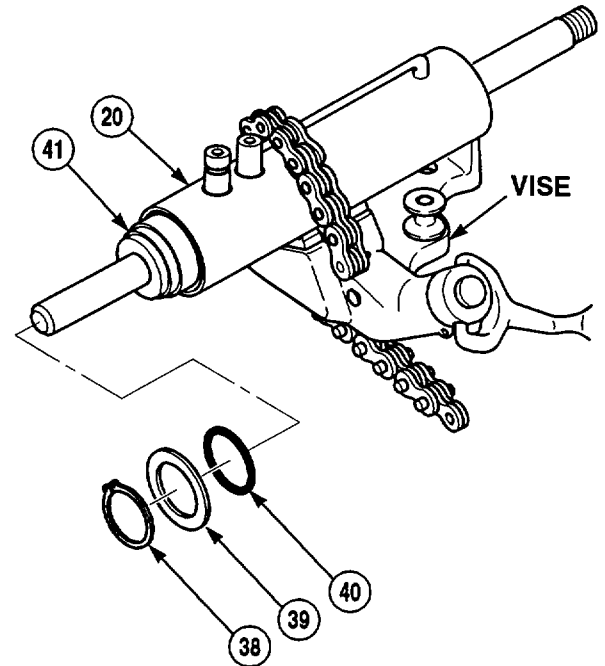
- (1) Clean all components and flush cylinder barrel using dry-cleaning solvent only. Do not use cleaning cloth as any foreign material would contaminate hydraulic system.
- (2) Inspect barrel bore for any scratches or corrosion. Replace barrel if rusted. Replace barrel and piston if either component is scratched.
- (3) Inspect rod for bending. Replace if necessary.
- (4) Inspect rod for scratches or pitting. Remove minor scratches and pitting by using stone and lubrication oil.
- (5) Inspect component threads for burrs and stripped threads. Replace or repair as necessary.

15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR (CONT).

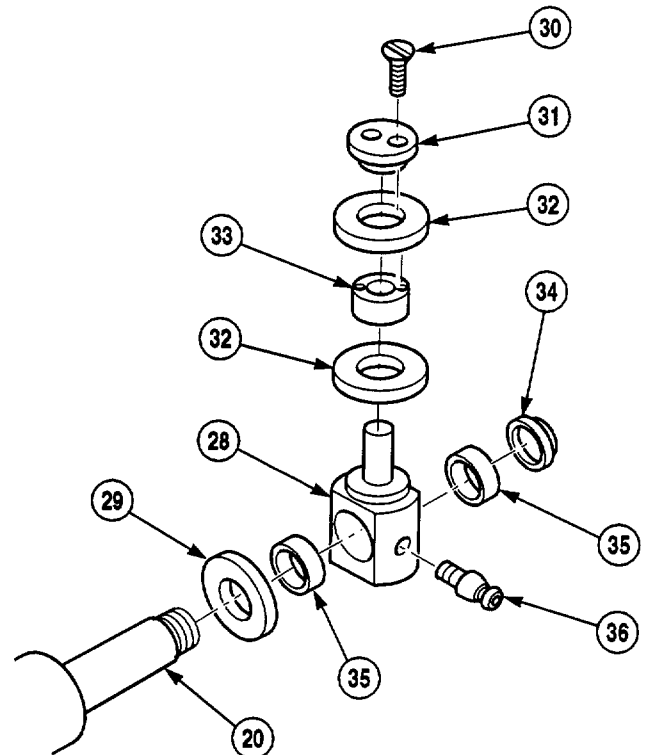
d. Assembly.

- (1) Coat wiper rod (49), rod packing (48) and head (41) with lubricating oil.
- (2) Install wiper rod (49) and rod packing (48) in head (41).

- (3) Coat preformed packing (47), gasket (46), with lubricating oil.
- (4) Install preformed packing (47) and gasket (46) on piston rod (37).



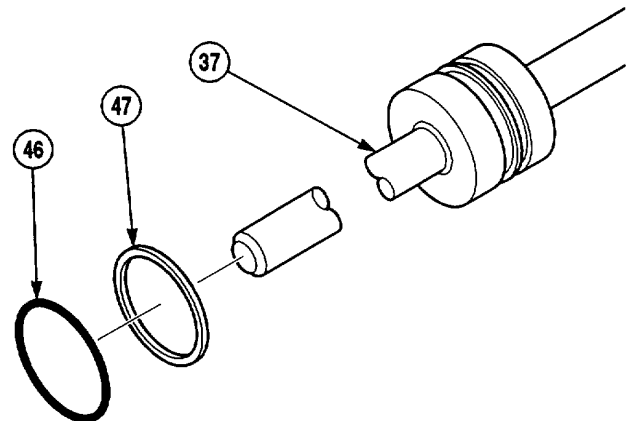
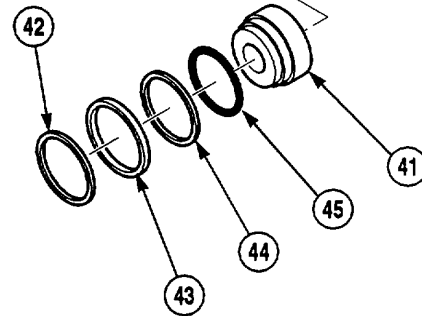
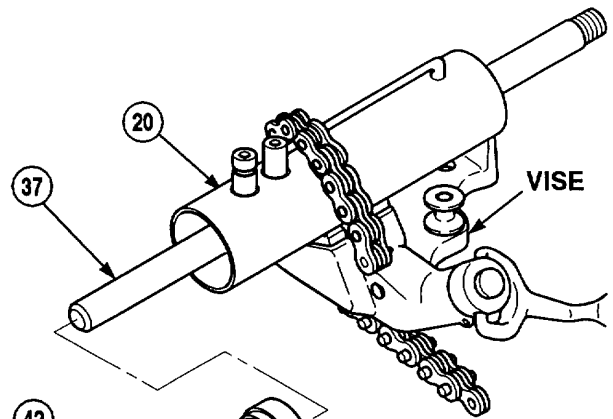
- (5) Coat preformed packing (45), backup seal (44), and head (41) with lubricating oil.
- (6) Install piston rod (37), head (41), preformed packing (45), backup seal (44) and shear rings (43 and 42) in side shift cylinder (20).



WARNING

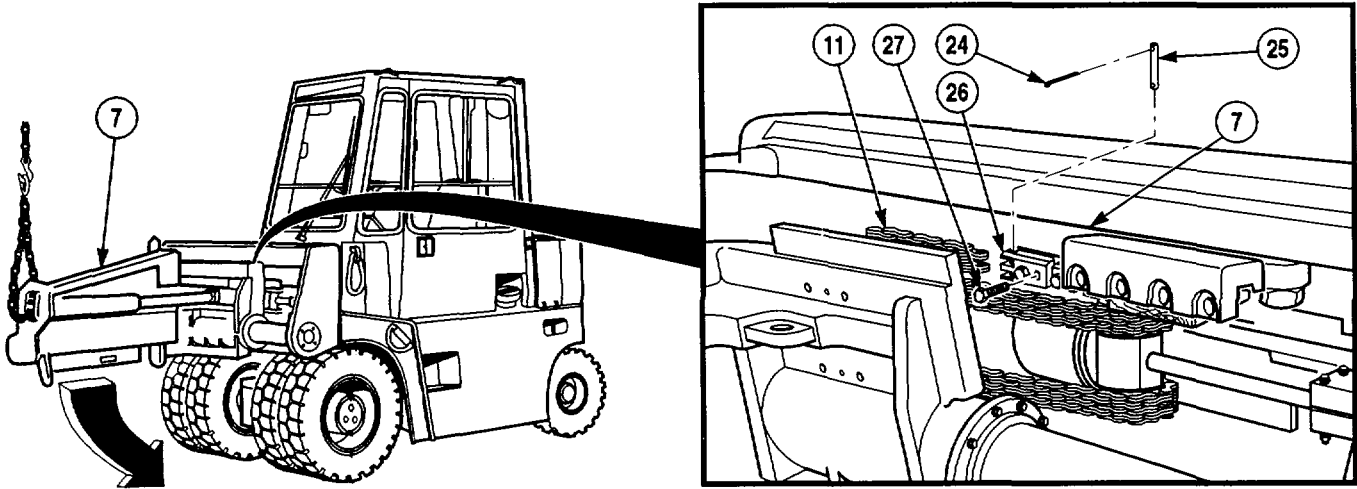
Use extreme care when removing or installing spring retaining rings. Spring retaining rings are under tension and can act as projectiles when released suddenly. Ensure proper eye protection is worn to prevent injury to personnel.

- (7) Install preformed packing (40), spacer (39), and retaining ring (38) in side shift cylinder (20) and head (41).
- (8) Install fitting (36) on yoke sheave (28).
- (9) Install two bearings (35) and rod wiper (34) on yoke sheave (28).
- (10) Install chain guides (32), bearings (33), chain guides (32), and two bearings (31) on yoke sheave (28) with four screws (30).
- (11) Install spacer (29) and yoke sheave (28) on side shift cylinder (20).



15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR (CONT).

e. Installation.



- (1) Install anchor (26) on side shift assembly (7) with two screws (27).

NOTE

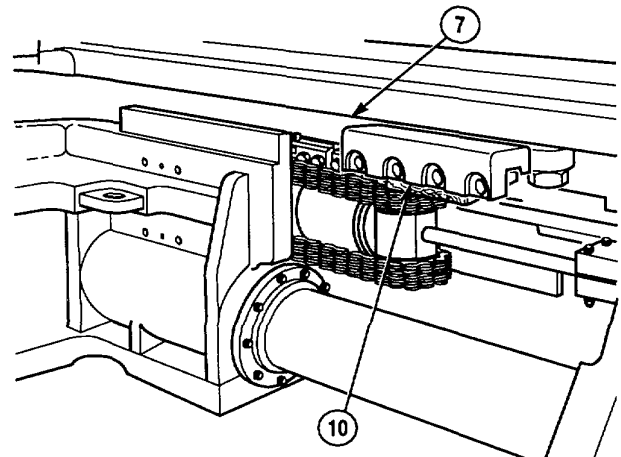
One anchor shown, all installed the same way.

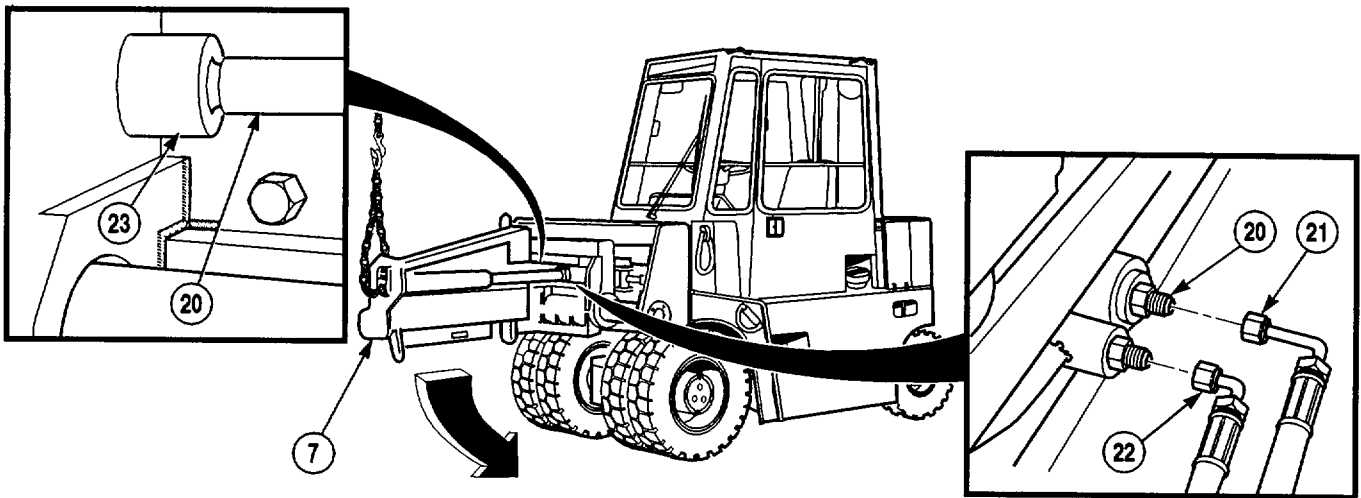
- (2) Install four side shift chains (11) on anchors (26) with four pins (25) and cotter pins (24).

WARNING

- Side shift assembly weighs 105 lbs (47.63 kg). Attach lifting device prior to installation to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (3) With the aid of an assistant, install support bearing assembly (10) on side shift assembly (7).

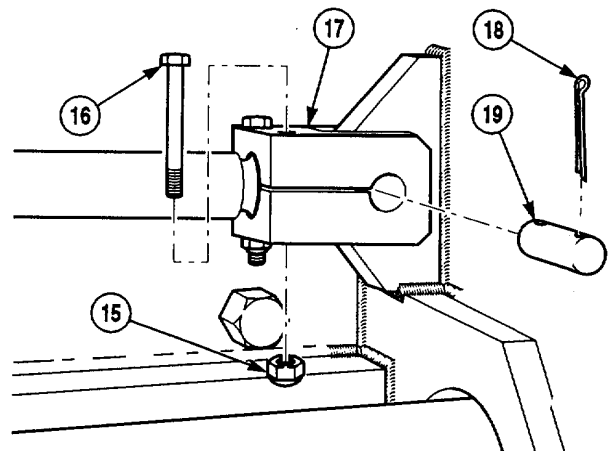




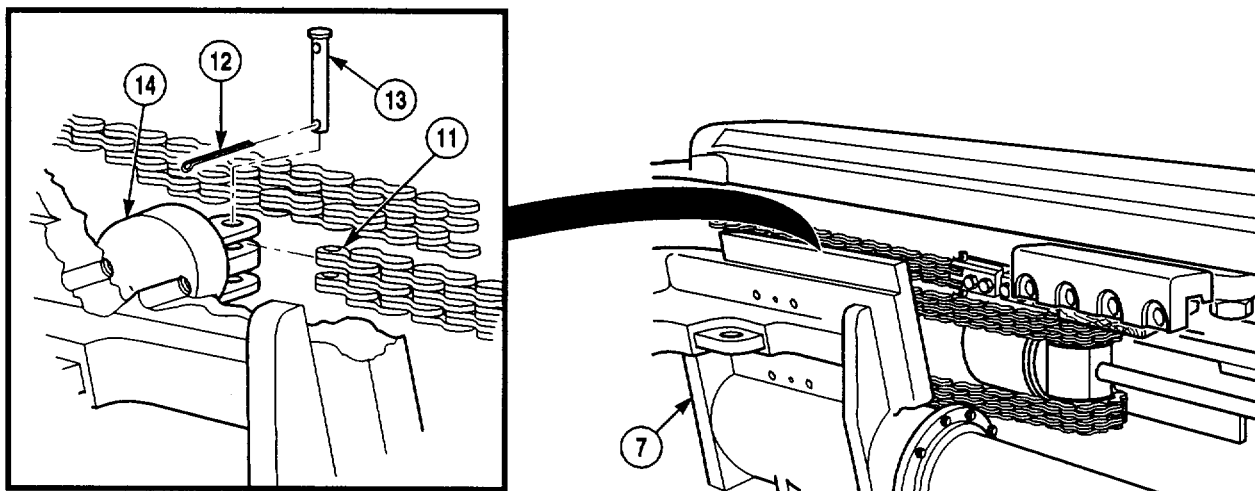
WARNING

- Side shift assembly weighs 105 lbs (47.63 kg). Attach lifting device prior to installation to prevent possible injury to personnel.
- All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

- (4) With the aid of an assistant, install side shift cylinder (20) on cone roller bearing (23) and side shift assembly (7).
- (5) Install two hoses (22 and 21) on side shift cylinder (20).
- (6) Install pin (19) on side shift yoke (17) with two cotter pins (18).
- (7) Install two screws (16) on side shift yoke (17) with two lock nuts (15).



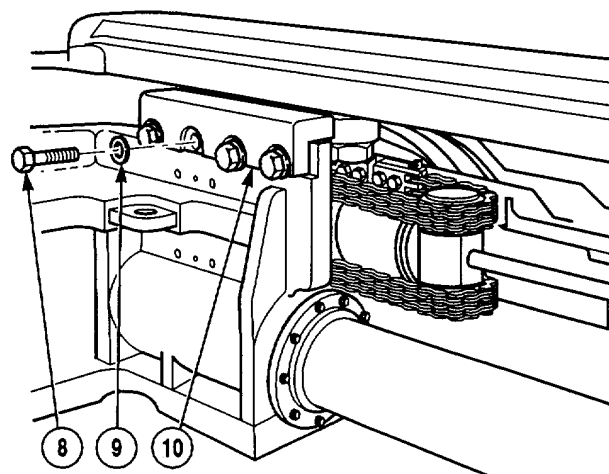
15-11. SIDE SHIFT CYLINDER REPLACEMENT/REPAIR (CONT).

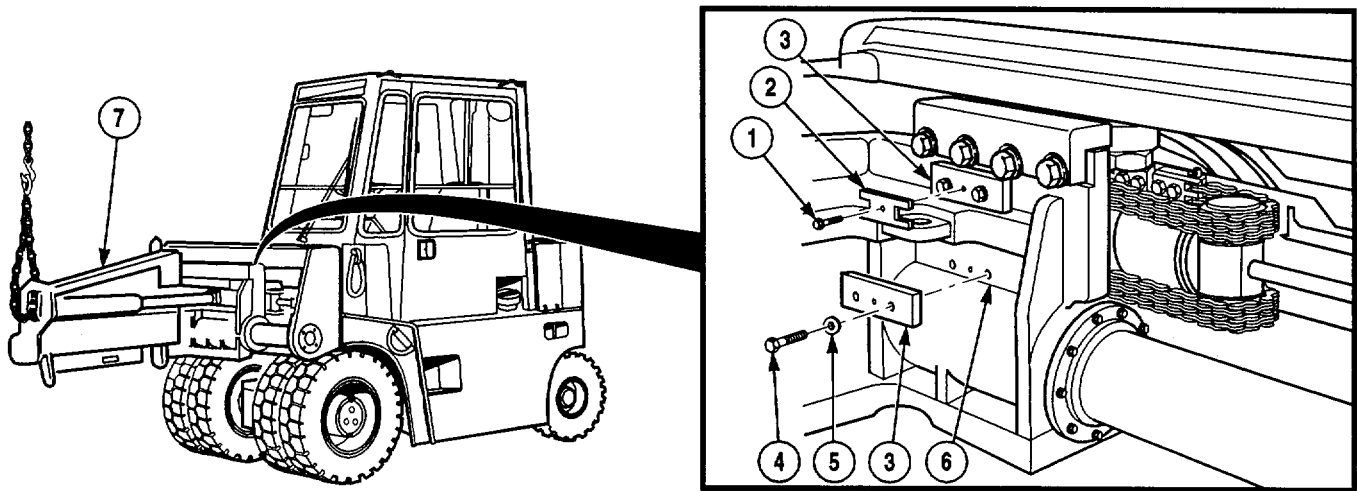


NOTE

One clevis shown, all installed the same way.

- (8) Install clevis (14) on side lift chains (11) with four pins (13) and cotter pins (12).
- (9) Install four washers (9) and screws (8) on support bearing assembly (10).





- (10) Install plate assembly (3) on support (6) with two washers (5) and screws (4).
- (11) Install locking plate (2) on plate assembly (3) with screw (1).
- (12) Remove lifting device from side shift assembly (7).

NOTE

Follow-on Maintenance:

- Close mast assembly (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

APPENDIX A**REFERENCES****A-1. SCOPE.**

Indexes should be consulted frequently for latest changes or revisions given in this appendix and for new publications relating to material covered in this publication.

Military Publication Indexes.

Consolidated of Army Publications and Forms DA PAM 310-1

A-2. FORMS.

Refer to DA PAM 738-750, of the Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to the forklift.

A-3. FIELD MANUALS.

The following publications contain information pertinent to the forklift material.

Camouflage FM 5-20

Basic Cold Weather Manual FM 31-70

Manual for Wheel Vehicle Driver FM 21-305

Army Motor Transport Units and Operations FM 55-30

Northern Operations FM 31-71

Operation and Maintenance of Ordnance Material in Cold Weather 0°F to -65°F , ... FM 9-207

Nuclear, Biological, and Chemical Defense FM 21-40

Nuclear, Biological, and Chemical (NBC) Reconnaissance and Decontamination
Operations (How to Fight) FM 3-87 (HTF)

A-4. TECHNICAL MANUALS.

Administrative Storage of Equipment TM 740-90-1

Chemical, Biological, and Radiological (CBR) Decontamination TM 3-220

Inspection, Care, and Maintenance of Anti-friction Bearings TM 9-214

A-4. TECHNICAL MANUALS (CONT).

Painting Instructions	TM 43-0139
Materials Used for Cleaning, Preserving, Abrading, and Cementing	
Ordnance Material and Related Materials Including Chemicals	TM 9-247
Operator's Manual for Welding Theory and Application	TM 9-237
Procedures for Destruction of Tank Automotive to Prevent	
Enemy Use (U.S. Army Tank-Automotive Command)	TM 750-244-6
Maintenance and Repair for Lead-Acid Storage Batteries	TM 9-6140-200-14
General Shop Practice Requirements for Repair, Maintenance, and	
Test of Electronic Equipment	TM 43-0158

A-5. MISCELLANEOUS PUBLICATIONS.

Description, Use, Bonding, and Properties of Adhesives	TB ORD1032
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**APPENDIX B
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS**

Section I. INTRODUCTION

B-1. SCOPE.

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the Pumping Assembly. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

B-2. EXPLANATION OF COLUMNS.

a. Column (1) -- Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Compound, Sealing, Pipe Thread(item 9, Appendix E)").

b. Column (2) -- Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the part number followed by Commercial And Government Entity (CAGE) Code in parentheses.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by two-character alphabetical abbreviations (e.g., ea., in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UNIT OF MEAS.
1	O,F,H	8040-00-843-0802	Adhesive, Sealant, Silicone, RTV, General Purpose	OZ
2	O,F,H	8030-00-009-5023	Sealant, Teflon Thread	RO
3	O	8950-01-144-4822	Baking Soda	BX
4	O,F,H	5975-01-273-8133	Cable Ties 12 inches long, 100 per package	
5	O,F,H	5340-00-450-5718	Cap and Plug Set ST	
6	O,F,H	5330-01-083-0081	Cloth, Lint -Free	
7	O	8030-00-062-6950	Compound, Corrosion Preventive	
8	O,F,H	9150-01-102-9455	Fluid, Brake, (BFS) Silicone	GL
9	O,F,H	9410-00-286-5294	Fuel, Oil, Diesel, Bulk	GL
10	O,F,H	7930-00-177-5217	Detergent, General Purpose	
11	C,O	9150-01-035-5390 9150-01-035-5391	Gear Oil, Lubricating, GO 75 (MIL-L-2105) 1-qt can 5-gal can	QT GL
12	C,O	9150-01-035-5392 9150-01-035-5393 9150-01-035-5394	Gear Oil, Lubricating, GO 80/90 (MIL-L-2105) 1-qt can 5-gal can 55-gal drum	QT GL GL
13	C,H	9150-00-190-0904 9150-00-190-0905 9150-00-190-0907	Grease, Automotive and Artillery, MIL-L-10924 1 lb can 5 lb can 35 lb can	LB LB LB
14	C	9150-00-754-2595	Grease, Ball and Roller Bearing, MIL-G-18709	LB
15	C	9150-00-189-6727	Lubricating Oil, Internal Combustion Engine, Tactical Service, MIL-L-2104C (OE/HDO 10)	GL
16	C	9150-00-186-6681	Lubricating Oil, Internal Combustion Engine, Tactical Service, MIL-L-2104C (OE/HDO 30)	GL

SECTION II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) UNIT OF MEAS.
17	O,F,H	9150-00-402-4478 9150-00-402-2372 9150-00-491-7197	Oil, Lubricating, OEA, MIL-L-46167 (81349)	1 QT 5 GL 55 GL
18	O	9150-00-153-0207	Oil, Preservation, Grade 30, Type II, MIL-L-21260	QT
19	O,F,H	7920-00-306-1711	Rags, Wiping (58536) A-A-531 50 Pound Bale	LB
20	O,F,H	6850-00-274-5241	Solvent, Drycleaning, P-D-680, Type II	GL
21	O,F,H	8135-00-178-9200	Tags, Identification (MIL-S-2910) 1,000 count	CT
22	F,H	8030-01-104-5392 8030-01-025-1692	Loctite #242 (80244) MIL-S-461463A Type 2 Grade N 10 milliliter bottle 250 milliliter bottle	BT BT
23	F,H	8030-01-158-6070	Loctite #271 (80244) MIL-S-461463 Type I Grade L	BT
24	F	8040-01-010-8753	Compound, Sealing RTV-732 Clear (77247)	TU
25	O,F	9150-01-177-3988	Oil, Transmission (MIL-2104)	QT
26	O,F	7519-00-663-3732	Tape, Packaging, Waterproof	RL
27	O,F,H	9505-00-293-4208	Wire, Safety	LB
28	H	8010-00-652-3626	Magnaflux, Penetrate	OZ

Section III. REMARKS

REFERENCE CODE	REMARKS
A	In the "O" category repair is limited to splicing of wires, taping of the harness or wires, and the replacement of wire ends.
B	At the "F" level the entire wire harness is replaced.
C	High pressure hoses are non-repairable.
D	Repair of the M-13 decontamination unit is covered in TM 3-4230-214-12&P.
E	Ensure pivot arm is blocked in outward position.

APPENDIX C

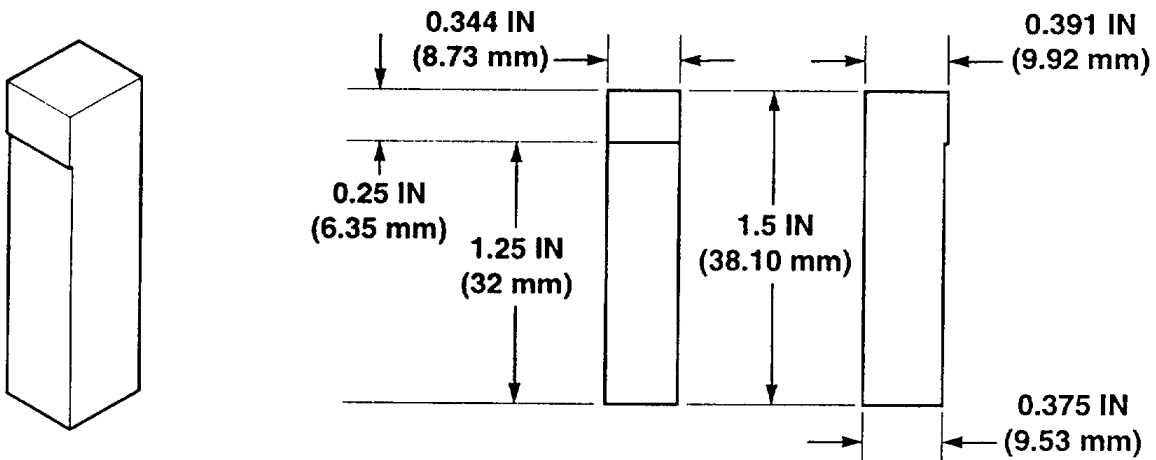
ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

C-1. INTRODUCTION.

This appendix includes complete instructions for manufacturing or fabricating items for Direct Support Maintenance.

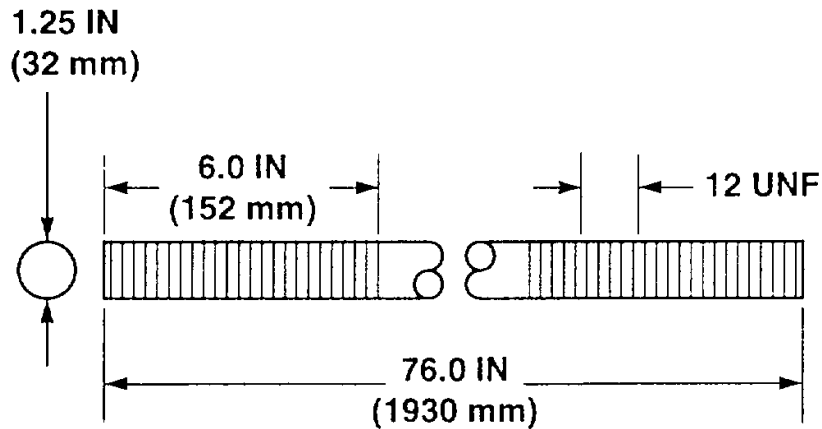
C-2. SPANNER WRENCH POST FABRICATION.



NOTES:

1. Make 4 each from stock steel.
2. Cut to dimensions as shown above.
3. To be used with Spanner Wrench PN 12268039, NSN 5120-01-095-7451.

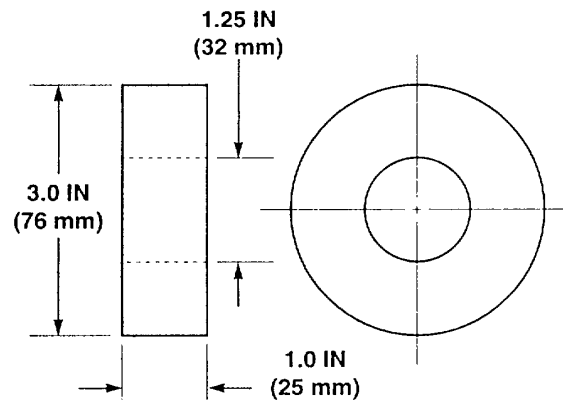
C-3. SIDE SHIFT BAR FABRICATION.



NOTES:

1. Make from stock steel.
2. Cut to dimensions as shown above.
3. Use two 12 universal fine (UNF) nuts with this bar, refer to (Item 37, Appendix E).
4. To be used with Jack, Hydraulic, 30 Ton, NSN 5120-00-188-1790.

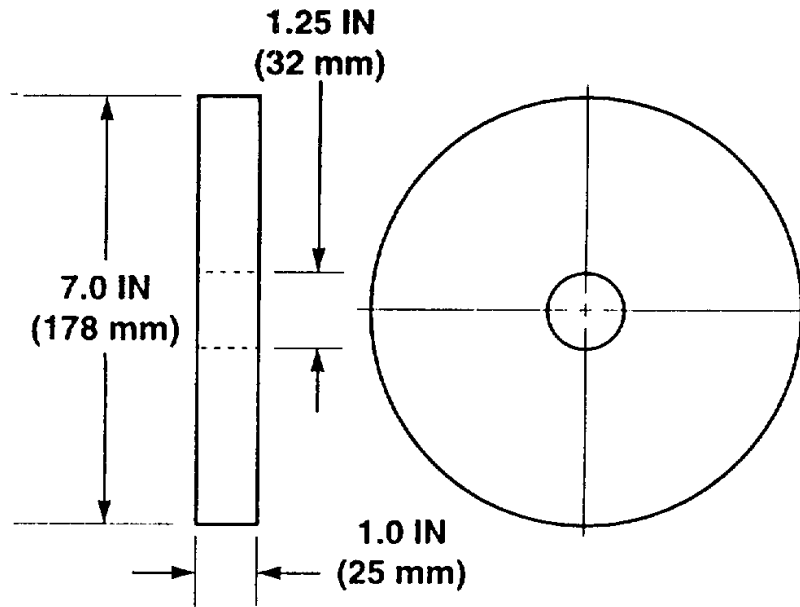
C-4. INSTALLER DISK FABRICATION.



NOTES:

1. Make 2 each from stock steel.
2. Cut to dimensions as shown above.
3. To be used with Jack, Hydraulic, 30 Ton, NSN 5120-00-188-1790.

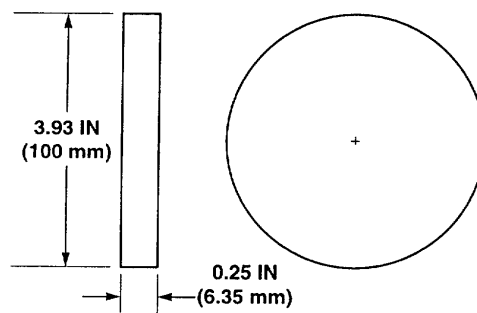
C-5. WASHER, FLAT FABRICATION.



NOTES:

1. Make 2 each from stock steel.
2. Cut to dimensions as shown above.
3. To be used with Jack, Hydraulic, 30 Ton, NSN 5120-00-188-1790.

C-6. BASE PLATE FABRICATION.



NOTES:

1. Make from stock steel.
2. Cut to dimensions as shown above.
3. Using center punch, mark center of base plate.

APPENDIX D

TORQUE LIMITS

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists torque specifications and torquing instructions for specific engine nuts and screws.

D-2. GENERAL.

Preloading and angle torques are applied.

Section II. TORQUE SPECIFICATIONS

D-3. TORQUE SPECIFICATIONS.

The application, preloading, and torque angles in degrees are listed in Table D-1.

D-4. TORQUE INSTRUCTIONS.

Preloading is applied with a torque wrench that is calibrated in foot pounds (lb-ft) or newton meters (N•m). Preloading is applied before angle torques. All angle torques listed in Table D-1 are accomplished by turning the screw/nut a specific number of degrees from a zero reference point as shown. The tightening angle is obtained by turning the handle of the wrench being used to the desired angle selected from a clock face you mentally superimpose over the screw head. Torquing of two or more screws securing one assembly should be accomplished in an alternating fashion to ensure assembly seating and equal load distribution. For example, if angle torque specified is 30° initial then 30° final, proceed as follows:

- Coat screw and surface under screw head with engine oil, MIL-L-2104.
- Set screws squarely to ensure assembly seating.
- Apply specified preload with torque wrench.
- Using angle torque meter and socket wrench, apply 30° initial torque to screw 1.
- Apply 30° initial torque to screw 2.
- Apply 30° final torque to screw 1.
- Apply 30° final torque to screw 2.

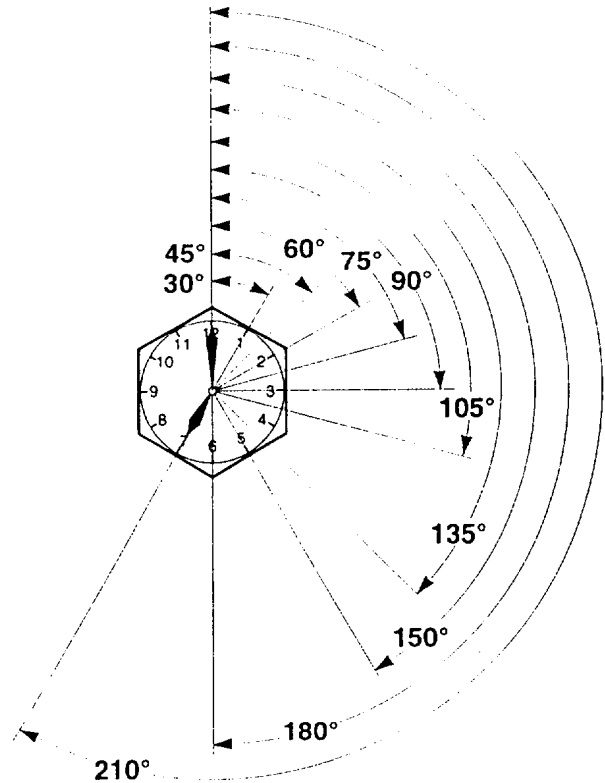


Table D-1. Torque Specifications

Application	Preloading		Angle in Degrees or Torque Values				Total		
	lb-ft	N•m	Stage 1	Stage 2	Stage 3	Stage 4	Degree	lb-ft	N•m
Cylinder head	29.5	40	45°	45°	45°	30	165°	-	-
Cylinder head screw plug	-	-	-	-	-	-	-	59-66	80-90
Rocker arm bracket nut	-	-	-	-	-	-	-	21	28
Rocker chamber cover screw	-	-	-	-	-	-	-	7 (+4; 2)	10 (+5;3)

Table D-1. Torque Specifications - CONT.

Application	Preloading		Angle in Degrees or Torque Values				Total		
	lb-ft	N•m	Stage 1	Stage 2	Stage 3	Stage 4	Degree	lb-ft	N•m
Connecting rod	22	30	60°	30°	-	-	90°	-	-
Bearing cap	22	30	60°	45°	-	-	105°	-	-
Idler gear	22	30	60°	-	-	-	60°	-	-
Flywheel screws	22	30	30°	30°	-	-	60°	-	-
Balance weight	22	30	30°	30°	-	-	60°	-	-
Flywheel nuts	37	50	90°	90°	-	-	180°	-	-
Injection nozzle	-	-	-	-	-	-	-	18.5-22	25-30
Fuel injection pump drive nut	-	-	-	-	-	-	-	44-52	60-70
Fuel injector cap nut	-	-	-	-	-	-	-	44-59	60-80
V-belt pulley	37	50	210°	-	-	-	210°	-	-
Cooling blower	22	30	90°	-	-	-	90°	-	-
Filter carrier	18.5	25	30°	60°	60°	-	150°	-	-
Oil pump retaining screw	-	-	-	-	-	-	-	26	35
Oil connecting pipe) (+20) union screw	80	-	-	-	-	-	-	59 (+15)	80
Alternator	22	30	180°	-	-	-	180°	-	-
Idler pulley	22	30	45°	-	-	-	45°	-	-
Engine suspension	22	30	45°	60°	-	-	105°	-	-
Pump stud nuts 3/8-16	-	-	-	-	-	-	-	17-19	23-26
Pump stud nuts 1/2-13	-	-	-	-	-	-	-	40-42	54-57
Discharge and suction valve fasteners	-	-	-	-	-	-	-	44-48	60-65
Impeller bearing cap screws	-	-	-	-	-	-	-	21	28
Impeller shaft bushing set screw	-	-	-	-	-	-	-	12	16
Intermediate bracket seal plate nuts	-	-	-	-	-	-	-	21	28
Exhaust pipe locking nuts	15	20	26 lb-ft (35 N•m)	37 lb-ft (50 N•m)	-	-	-	37	50

D-5. U.S. STANDARD TORQUE VALUES.

Table D-2. U.S. Standard Torque Values

	Minimum Breakaway		Minimum Breakaway		Minimum Breakaway	
	Torque Value		Torque Value		Torque Value	
	S.A.E. Grade 2		S.A.E. Grade 5		S.A.E. Grade 8	
Thread Size	U.S.	Metric	U.S.	Metric	U.S.	Metric
1/4-20	5 lb-ft	7 N•m	8 lb-ft	11 N•m	12 lb-ft	16 N•m
1/4-28	6 lb-ft	8 N•m	10 lb-ft	14 N•m	14 lb-ft	19 N•m
5/16-18	11 lb-ft	15 N•m	17 lb-ft	23 N•m	24 lb-ft	33 N•m
5/16-24	13 lb-ft	18 N•m	19 lb-ft	26 N•m	27 lb-ft	37 N•m
3/8-16	20 lb-ft	27 N•m	30 lb-ft	41 N•m	45 lb-ft	61 N•m
3/8-24	22 lb-ft	30 N•m	35 lb-ft	47 N•m	50 lb-ft	68 N•m
7/16-14	30 lb-ft	41 N•m	50 lb-ft	68 N•m	70 lb-ft	95 N•m
7/16-20	35 lb-ft	47 N•m	55 lb-ft	75 N•m	80 lb-ft	108 N•m
1/2-13	50 lb-ft	68 N•m	75 lb-ft	102 N•m	105 lb-ft	142 N•m
1/2-20	55 lb-ft	75 N•m	85 lb-ft	115 N•m	120 lb-ft	163 N•m
9/16-12	70 lb-ft	95 N•m	110 lb-ft	149 N•m	155 lb-ft	210 N•m
9/16-18	80 lb-ft	108 N•m	120 lb-ft	163 N•m	170 lb-ft	230 N•m
5/8-11	100 lb-ft	136 N•m	150 lb-ft	203 N•m	210 lb-ft	285 N•m
5/8-17	110 lb-ft	149 N•m	170 lb-ft	230 N•m	240 lb-ft	325 N•m
3/4-10	170 lb-ft	230 N•m	270 lb-ft	366 N•m	375 lb-ft	508 N•m
3/4-16	190 lb-ft	258 N•m	300 lb-ft	407 N•m	420 lb-ft	569 N•m
7/8-9	165 lb-ft	224 N•m	430 lb-ft	583 N•m	610 lb-ft	827 N•m
7/8-14	180 lb-ft	244 N•m	475 lb-ft	644 N•m	670 lb-ft	908 N•m
1-8	250 lb-ft	339 N•m	645 lb-ft	875 N•m	910 lb-ft	1,234 N•m
1-12	270 lb-ft	366 N•m	705 lb-ft	956 N•m	1,000 lb-ft	1,356 N•m
1-14	280 lb-ft	380 N•m	720 lb-ft	976 N•m	1,015 lb-ft	1,376 N•m

D-6. METRIC TORQUE VALUES. ½**Table D-3. Metric Torque Values**

	Minimum Breakaway Torque Value Grade 8.8		Minimum Breakaway Torque Value Grade R10		Minimum Breakaway Torque Value Grade 12	
	U.S.	Metric	U.S.	Metric	U.S.	Metric
Thread Size						
4 mm	3 lb-ft	4 N•m	4 lb-ft	5 N•m	5 lb-ft	7 N•m
5 mm	5 lb-ft	7 N•m	7 lb-ft	9 N•m	9 lb-ft	12 N•m
6 mm	9 lb-ft	12 N•m	13 lb-ft	18 N•m	15 lb-ft	20 N•m
7 mm	15 lb-ft	20 N•m	21 lb-ft	28 N•m	25 lb-ft	34 N•m
8 mm	22 lb-ft	30 N•m	31 lb-ft	42 N•m	37 lb-ft	50 N•m
9 mm	28 lb-ft	38 N•m	40 lb-ft	54 N•m	47 lb-ft	64 N•m
10 mm	39 lb-ft	53 N•m	55 lb-ft	75 N•m	66 lb-ft	89 N•m
12 mm	66 lb-ft	89 N•m	93 lb-ft	126 N•m	111 lb-ft	150 N•m
14 mm	100 lb-ft	136 N•m	140 lb-ft	190 N•m	169 lb-ft	229 N•m
16 mm	152 lb-ft	206 N•m	214 lb-ft	290 N•m	256 lb-ft	347 N•m
18 mm	190 lb-ft	258 N•m	28 lb-ft	363 N•m	321 lb-ft	435 N•m
20 mm	265 lb-ft	359 N•m	372 lb-ft	504 N•m	447 lb-ft	606 N•m
22 mm	321 lb-ft	435 N•m	45 1 lb-ft	611 N•m	542 lb-ft	735 N•m
24 mm	412 lb-ft	559 N•m	578 lb-ft	784 N•m	695 lb-ft	942 N•m

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APPENDIX E

TOOL IDENTIFICATION LIST

Section I. INTRODUCTION

E-1. SCOPE.

This appendix identifies all the tools and special tools you will need to operate and maintain the Fork Lift.

E-2. EXPLANATION OF COLUMNS.

Maintenance functions will be limited to and defined as follows:

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Tool Kit, General Mechanics: Automotive (Item x, Appendix E)").

b. Column (2) - Nomenclature. Indicates the item name, if required, a description to identify the item.

c. Column (3) - National/NATO Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4) - Tool Number. Identifies the part number of the item.

Section II. TOOLS AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
1	O,F,H	TOOL KIT, General Mechanic's: Automotive	5180-00-177-7033	SC5180-90-CL-N26
2	O,F,H	SHOP EQUIPMENT, Automotive Maint and Repair: Common No. 1	4910-00-754-0654	SC4910-95-CL-A74
3	O,F,H	SHOP EQUIPMENT, Automotive Maintenance and Repair: Supp. 1	4910-00-754-0653	SC4910-95-CL-A73
4	F,H	SHOP EQUIPMENT, Automotive Maintenance and Repair: Supp. 1	4910-00-754-0706	SC4910-95-A62
5	F	SHOP EQUIPMENT, Automotive Maintenance and Repair: Field Maintenance, Basic	4910-00-754-0705	SC4910-95-CL-A31
6	F,H	SHOP EQUIPMENT, Fuel and Electrical System, Engine: Field Maintenance, Basic	4910-00-754-7791	SC4910-95-CL-A66
7	F	SHOP EQUIPMENT, Fuel and Electrical System, Engine: Field Maintenance, Basic	4910-00-754-0714	SC4910-95-CL-A01
8	F,H	SHOP EQUIPMENT, Machine Shop CL-A02	3470-00-754-0708	SC3470-95-
9	F	Tool Kit, Glass Cutting: Vehicle	4940-00-357-7737	SC 4910-95 CL-18
10	O,F,H	Shop Welding Set	3433-00-357-6311	SC3433-90-CL-N01
11	O,F,H	Pan, drain, 12 qt.	4910-00-287-2944	
12	O,F,H	Wrench, Torque, 0-60 N(m	5120-01-112-9531	
13	O,F,H	Retainer, Crankshaft Pulley		030 1107
14	O,F,H	System Test Equipment Internal Combustion Engine-Reprogrammable (STE/ICE-R)	4910-01-222-6589	12259266
15	O	Square, Combination	5210-00-078-8949	

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
16	F,H	Lifting Eye		27-0935
17	F,H	Jack, Kit 30 Ton	5120-00-188-1790	
18	F,H	Bearing, Installer		1400154
19	F,H	Wrench, Spanner	5120-01-095-7451	12268039
20	H	Compressor, Piston Ring	5120-01-247-6128	003-0430
21	H	Spring, Compressor		125300
22	O,F,H	Gage, Tightening	5120-10-212-9224	0031102
23	F,H	Compressor, Valve Spring	5120-01-208-7036	J-33345
24	F,H	Mandrel, Exhaust	3460-01-203-7946	003-0441
25	F,H	Mandrel, Intake	3460-01-203-7947	003-0620
26	H	Cutter, Valve Seat		003-0784
27	H	Reamer, Hand	5110-01-203-7945	003-0452
28	H	Reamer, Hand	5110-01-204-5070	003-0652
29	H	Punch, Valve Guide	5120-01-202-5073	003-0453
30	F,H	Hand Pump, High Pressure		003-0714
31	F,H	Puller, Gear		003-0762
32	H	Insertor and Remover	5120-01-280-0077	003-0433
33	H	Installing Tool	5120-01-189-5221	003-0789
34	H	Spanner, Wrench		003-1078
35	H	Wrench, Pinion		1401499
36	H	Wrench, Socket	5120-01-248-1797	003-1043
37	H	Nut	5310-00-761-6869	

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	In the "O" category repair is limited to splicing of wires, taping of the harness or wires, and the replacement of wire ends.
B	At the "F" level the entire wire harness is replaced.
C	High pressure hoses are non-repairable.
D	Repair of the M-13 decontamination unit is covered in TM 3-4230-214-12&P.
E	Ensure pivot arm is blocked in outward position.
F	Refer to Appendix C for fabricated items.
G	End cap on side shift rod must be welded by certified welder.
H	Check for serviceability.
I	Limited welding.
J	Function performed by Specialized Repair Activity (SRA).
K	Repair by piece parts only.

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DENNIS J. REIMER
General, United States Army
Chief of Staff

Official: 
JOEL B. HUDSON
Administrative Assistant to the
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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 Lb
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
 1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
 1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

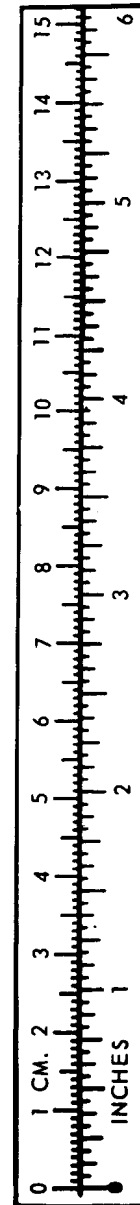
TEMPERATURE

$5.9^{\circ}\text{F} - 32 = ^{\circ}\text{C}$
 $212^{\circ}\text{ Fahrenheit is equivalent to } 100^{\circ}\text{ Celsius}$
 $90^{\circ}\text{ Fahrenheit is equivalent to } 32.2^{\circ}\text{ Celsius}$
 $32^{\circ}\text{ Fahrenheit is equivalent to } 0^{\circ}\text{ Celsius}$
 $9 \text{ } ^{\circ}\text{C} + 32 = \text{ } ^{\circ}\text{F}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



TA089991

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



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DOPE ABOUT IT ON THIS
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• ARE OBSOLETE.

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