

# **S**ERVICE MANUAL

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## ***D-Series***

### ***Single-Double Pallet Handler***

***Manual Number 206531***

**cascade<sup>®</sup>**  
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# **C**ONTENTS

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	Page
<b>INTRODUCTION, Section 1</b>	i
Special Definitions	1
<b>INSTALLATION, Section 2</b>	2
Truck Requirements	2
Recommended Hydraulic Supply	2
Installation	3
<b>PERIODIC MAINTENANCE, Section 3</b>	5
<b>TROUBLESHOOTING, Section 4</b>	7
General Procedures	7
Plumbing	8
Hosing Diagram	8
Circuit Schematic	8
Fork Position Circuit	9
Sideshift Circuit	10
<b>SERVICE, Section 5</b>	11
Attachment Removal	11
Forks, Arm Bars and Latches	12
Outer Fork Assembly Removal	12
Outer Fork Removal	12
Inner Fork Removal and Bearing Service	13
Arm Bar (Latch Operating) Service	13
Latch Service	14
Sideshift Cylinder	14
Cylinder Removal	14
Cylinder Disassembly	15
Cylinder Inspection	15
Cylinder Reassembly	16
Fork Position Cylinders	17
Cylinder Removal	17
Cylinder Disassembly	18
Cylinder Inspection	18
Cylinder Reassembly	19
Valve	20
Valve Removal	20
Valve Service	20
Frame	21
Frame Bearing Service	21
Anchor Bracket and Mounting Plate	
Bearing Service	21
Frame and Mounting Plate Disassembly	22
<b>SPECIFICATIONS, Section 6</b>	23
Hydraulics	23
Auxiliary Valve Functions	23
Truck Carriage	24
Torque Values	24

This manual provides the installation instructions, periodic maintenance requirements, troubleshooting procedures and service guides for D-Series Single-Double Pallet Handlers. Note that all specifications are shown in US and (Metric) units.

**IMPORTANT:** All hoses, tubes and fittings on D-Series attachments are JIC.

## 1.1 Special Definitions

### **WARNING**

A statement preceded by  **WARNING** is information that should be acted upon to prevent **bodily injury**. A **WARNING** is always inside a ruled box.

### **CAUTION**

A statement preceded by **CAUTION** is information that should be acted upon to prevent machine damage.

### **IMPORTANT**

A statement preceded by **IMPORTANT** is information that possesses special significance.

### **NOTE**

A statement preceded by **NOTE** is information that is handy to know and may make your job easier.

## 2.1

# Truck Requirements

### Truck Relief Setting

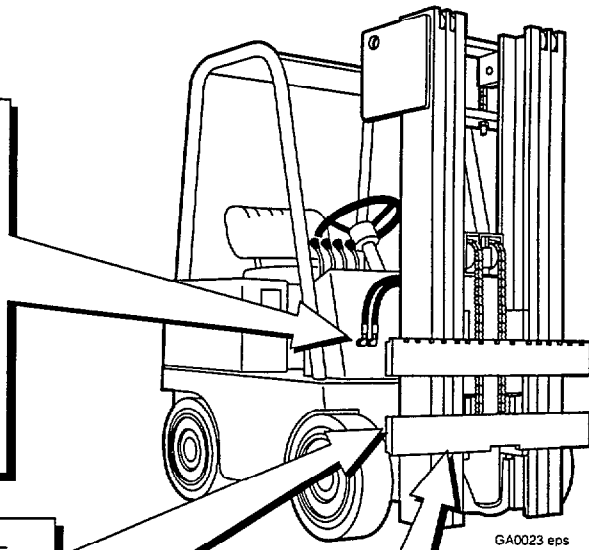
2000 psi (140) bar – Minimum  
2300 psi (159) bar – Maximum

### Truck Flow Volume

6 GPM (23 L/min.) – Minimum  
7 GPM (26 L/min.) – Recommended  
10 GPM (38 L/min.) – Maximum



Mounting	Dimension A-ITA (ISO)	
	Minimum	Maximum
Class II	14.96 in. (380.0mm)	15.00 in. (381.0mm)
Class III	18.68 in. (474.5mm)	18.74 in. (476.0mm)



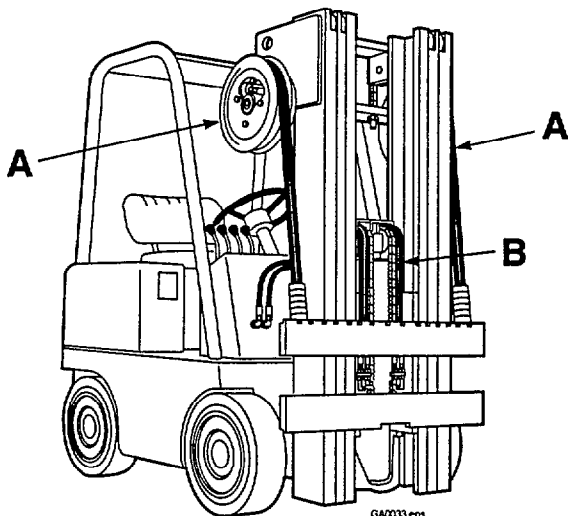
Clean carriage bars and inspect for damaged notches.

## 2.2

# Recommended Hydraulic Supply

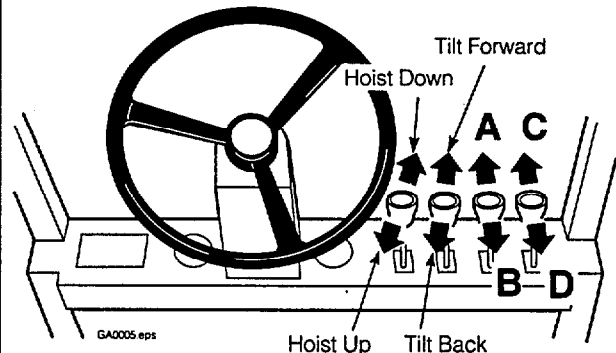
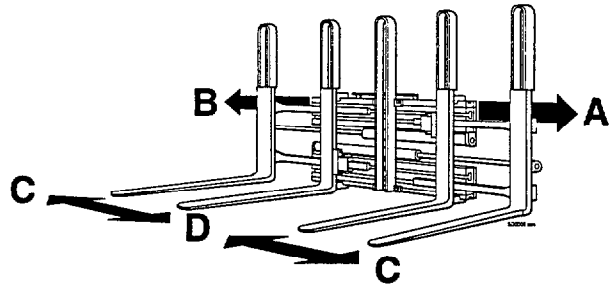
The attachment will require one of the hydraulic supply arrangements shown below. All hoses and fittings should be at least No. 6 with 9/32 in. (7 mm) minimum I.D. Refer to Hose and Cable Reel Selection Guide Form 4099 to select the correct hose reel for the mast and truck.

- A** RH and LH THINLINE™ 2-Port Hose Reel Supply Groups
- OR
- B** Mast Double Internal Hose Reaving Groups



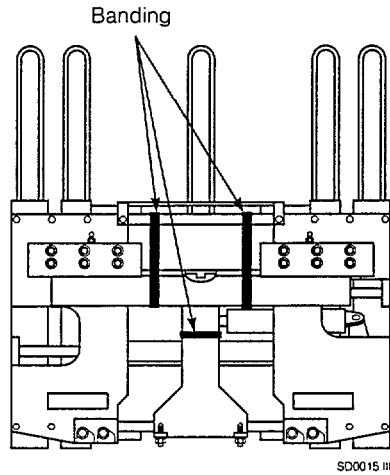
### Auxiliary Valve Functions

- A** Sideshift Left
- B** Sideshift Right
- C** Spread Forks
- D** Retract Forks

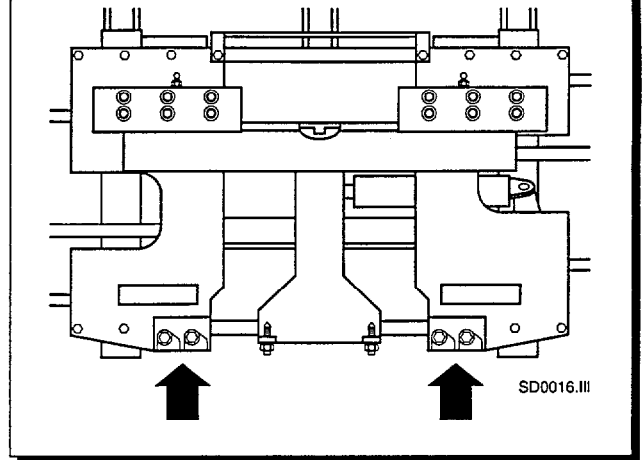


## 2.3 Installation

### 1 Remove banding and stand attachment upright

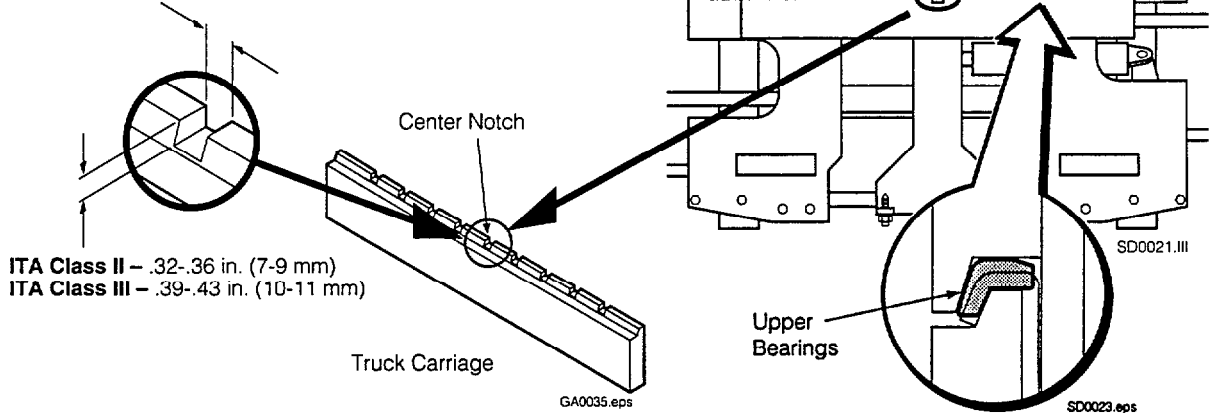


### 2 Remove lower hooks

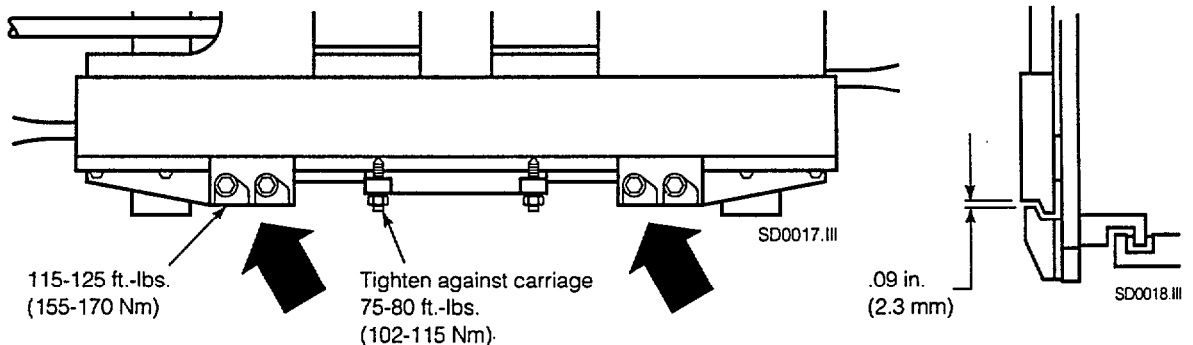


### 3 Mount on truck carriage

ITA Class II – .60-.66 in. (15-17 mm)  
ITA Class III – .72-.78 in. (18-20 mm)

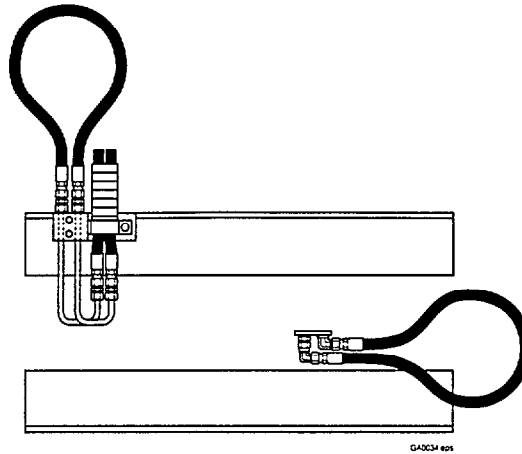


### 4 Install lower hooks and anchor plate setscrews

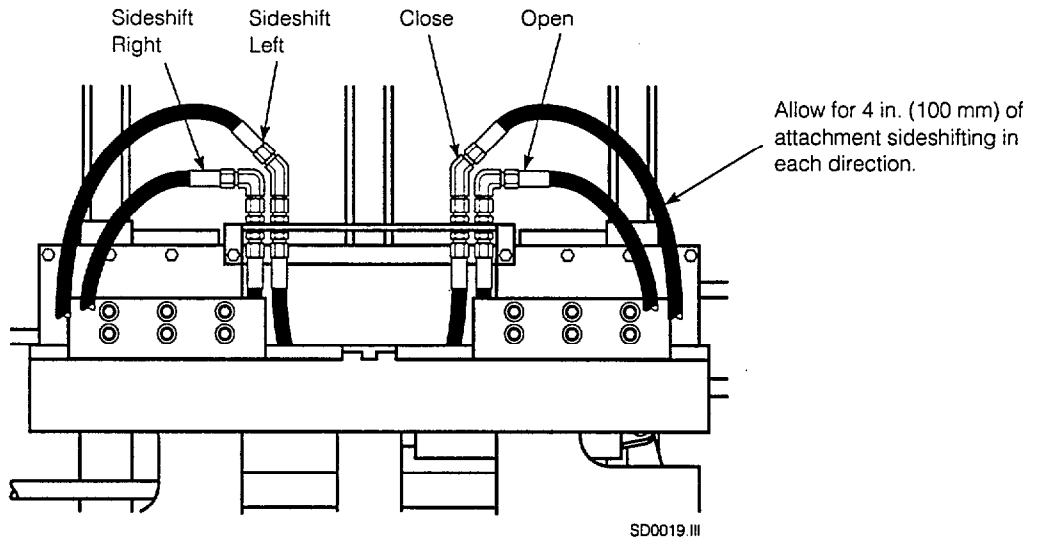


## 5 Flush hoses

Flush truck supply hoses to remove air and debris.



## 6 Install hoses

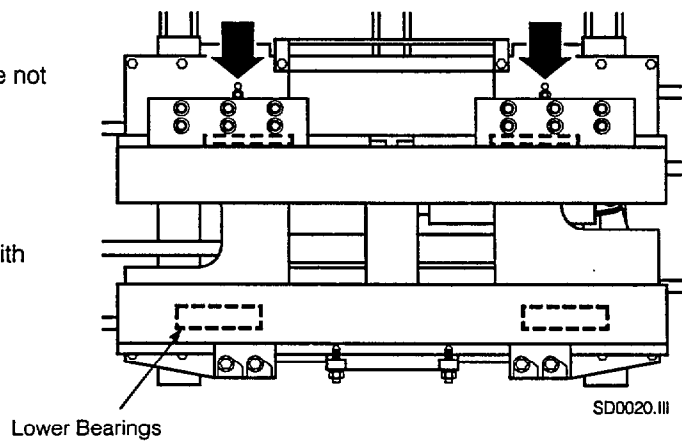


## 7 Lubrication Points

**IMPORTANT:** Prelubed at factory. Lube not necessary for installation.

Lubricate every 500 hours with chassis grease.

**OPTIONAL:** Lubricate lower bearings with chassis grease.



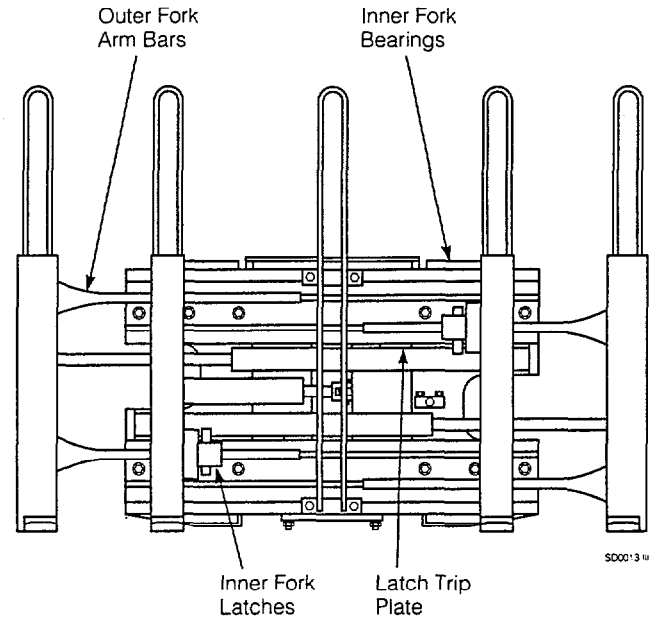
Lower Bearings

**IMPORTANT:** After completing any service procedure, always test the attachment through 5 complete cycles. First test the attachment empty, then test with a load to make sure the attachment operates correctly before returning it to the job.

## 3.1 100 Hour Maintenance

Every time the lift truck is serviced or every 100 hours of truck operation, whichever comes first, complete the following maintenance procedures.

- Check for loose or missing bolts, worn or damaged hoses and hydraulic leaks.
- Check the inner fork latches for broken springs, worn latch plates and proper operation. When the cylinders are fully retracted, the latch plates can be manually disengaged from the arm bar to allow manual inner fork movement.
- Inspect the cylinder anchor nuts. Apply wheel bearing grease to the spherical portion of the anchor nuts.
- Tighten the arm bar capscrews to a torque of 280-320 ft.-lbs. (380-434 Nm) using Cascade hex extension tool 667699.



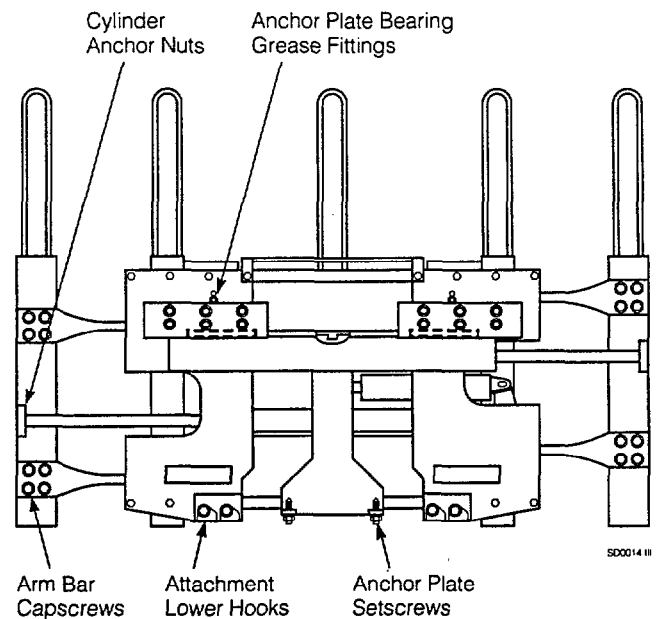
## 3.2 500 Hour Maintenance

After each 500 hours of truck operation, in addition to the 100 hour maintenance, perform the following procedures.

- Apply chassis grease to the anchor plate bearing grease fittings.
- Apply chassis grease to the outer fork arm bar bearing surfaces.
- Apply chassis grease to the inner fork bearing surfaces.

**IMPORTANT:** Do not apply grease to the arm bars in the areas where the latch plates operate. Grease will make the latch plates loose grip on the arm bars and not allow the inner forks to operate correctly.

- Inspect the clearance between the truck lower carriage bar and the attachment lower hooks. The clearance between the carriage bar and lower hooks should be 3/32 in. (2.3 mm). Tighten the lower hook capscrews to 105-115 ft.-lbs. (142-155 Nm).
- Adjust the anchor plate setscrews to fully engage the truck lower carriage bar, then tighten the nuts.
- Tighten the inner fork latch capscrews to a torque of 55-60 ft.-lbs. (75-81 Nm).
- Tighten the latch trip plate capscrews to a torque of 25-30 ft.-lbs. (34-40 Nm).
- Inspect the latch plates and arm bars for wear. If the latches or arm bars are worn to where they do not operate, they should be inspected and serviced as described in Sections 5.2-4 and 5.2-5.



## 4.1 General Procedures



**WARNING:** Before servicing any hydraulic component, relieve pressure in the system. Turn the truck off, then actuate the truck auxiliary control valve(s) several times in both directions.

After completing any service procedure, always test the function through several cycles. First test the attachment empty to bleed air trapped in the system to the truck tank. Then test the attachment with a load to be sure it operates correctly before returning to the job.

Stay clear of the load while testing. Do not raise the load more than 3 in. (75 cm) off the floor while testing.

### 4.1-1 Truck System Requirements

- The lift truck must supply sufficient hydraulic pressure to handle the heaviest load, **PRESSURE MUST NOT EXCEED 2300 psi (159 bar)**.
- Hydraulic flow should be within volume range shown.
- The truck hydraulic system must supply hydraulic oil to the attachment that meets the specifications shown.

#### Truck Relief Setting

2000 psi (138) bar – Minimum  
2300 psi (159) bar – Maximum

#### Truck Flow Volume

6 GPM (23 L/min.) – Minimum  
7 GPM (26 L/min.) – Recommended  
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#### Hydraulic Oil

Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. MIL-O-5606 or MIL-O-2104B.

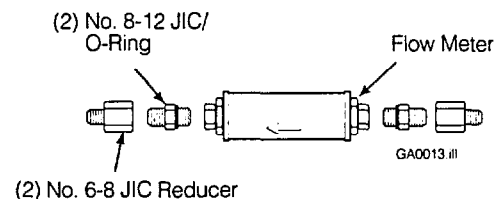
Use of synthetic or aqueous base hydraulic oil is not recommended. Contact Cascade if fire resistant hydraulic oil must be used.

### 4.1-2 Tools Required (Metric)

In addition to a normal selection of hand tools you will need:

- An inline flow meter capable of measuring hydraulic flow to 20 GPM (80 L/min), Cascade part no. 671477.
- A pressure gauge capable of measuring pressure to 3500 psi (240 bar), Cascade part no. 671212.

#### Flow Meter Kit 671477



### 4.1-3 Get All The Facts

It is important that you gather all the facts regarding the problem before you begin service procedures. The best way is to talk to the operator. Ask for a complete description of the malfunction. The following guidelines will help you decide where to begin your troubleshooting procedures.

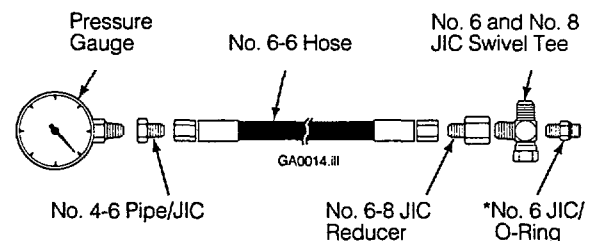
- Forks spread and close unevenly.
- Forks will not spread or close.

For help with one of these problems, see Section 4.3.

- Attachment will not sideshift.
- Attachment sideshifts slowly.

For help with one of these problems, see Section 4.4.

#### Pressure Gauge Kit 671212



\* Not included in Pressure Gauge Kit part no. 671212.

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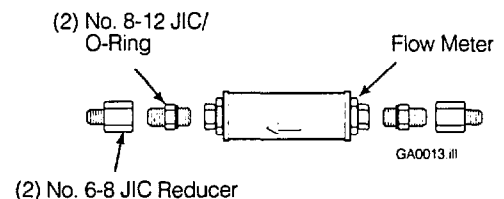
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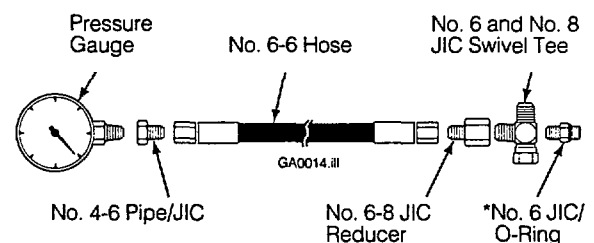
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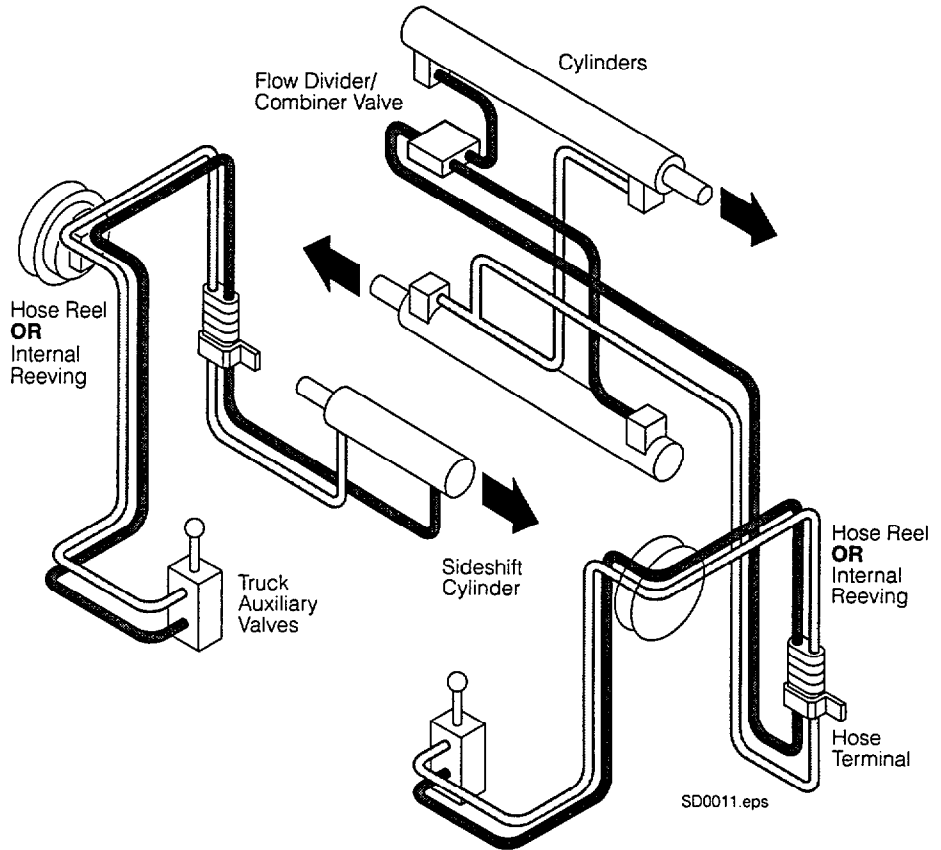
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## 4.2 Plumbing

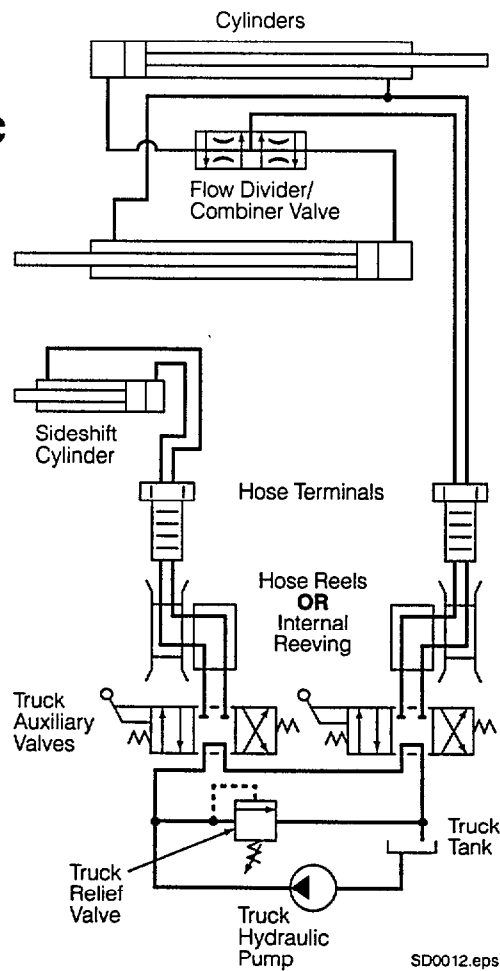
### 4.2-1 Hosing Diagram

(Forks Spreading and Sideshifting Right Shown)

**PRESSURE**   
**RETURN** 



### 4.2-2 Circuit Schematic



## 4.3

# Fork Position Circuit

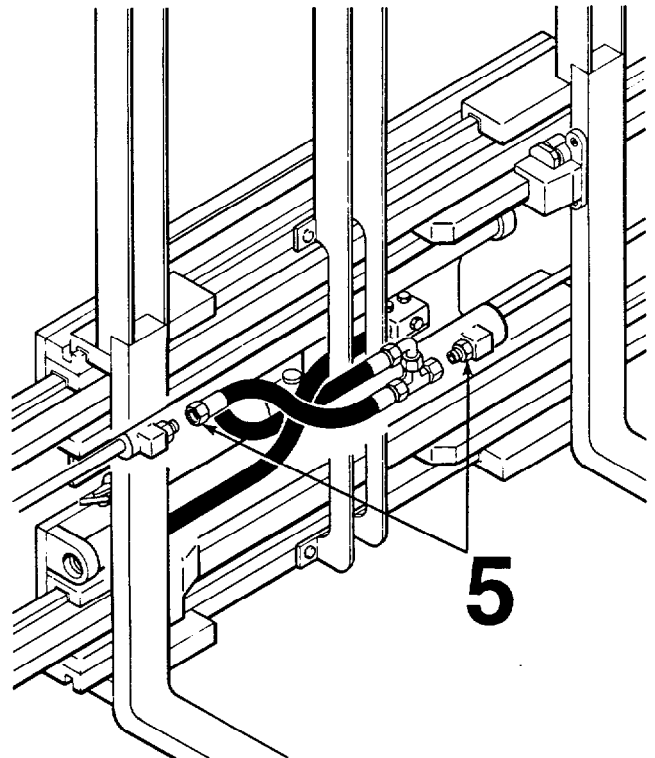
There are seven potential problems that could affect fork positioning operation:

- Kinked supply hoses.
- External leaks.
- Incorrect hydraulic pressure/volume from the truck.
- Worn or defective cylinder seals.
- Defective flow divider/combiner valve cartridge.
- Inadequate bearing lubrication or worn bearings.
- Bent arm bars.

- 1** Check the pressure delivered by the truck. Refer to the truck service manual. The minimum recommended truck pressure is 2000 psi (138 bar). **TRUCK PRESSURE MUST NOT EXCEED 2300 PSI (159 BAR)**, measured at the carriage hose terminal or internal reeving terminals.
- 2** Check the flow volume at the carriage hose terminals or internal reeving terminals. The recommended flow volume is 7 GPM (26 L/min).
- 3** Check for external leaks. Spread the forks fully. Hold the control handle in the spread forks position for a few seconds.
- 4** Return the handle to neutral. Inspect all fittings, hoses and the cylinders for leaks. If there are no leaks, proceed with the pressure test.
- 5** Turn off the truck. Disconnect the supply hose tee fitting from the lower fork position cylinder's rod end port. Disconnect the supply hose from the upper fork position cylinder's rod end port. Plug the tee fitting and hose end.
- 6** Start the truck. Spread the forks fully. Hold the control handle in the spread position for a few seconds.
  - If there is oil flow out of one or both of the cylinder ports, the cylinder leaking needs repair. Refer to Section 5.4 for cylinder service.
  - If there is no oil flow from the cylinder ports, the valve flow divider cartridge needs repair. Refer to Section 5.5 for valve service.



**WARNING:** Before removing any hoses or fittings, relieve pressure in the hydraulic system. With the truck off, open the truck auxiliary control valve(s) several times in both directions.



## 4.4

# Sideshift Circuit

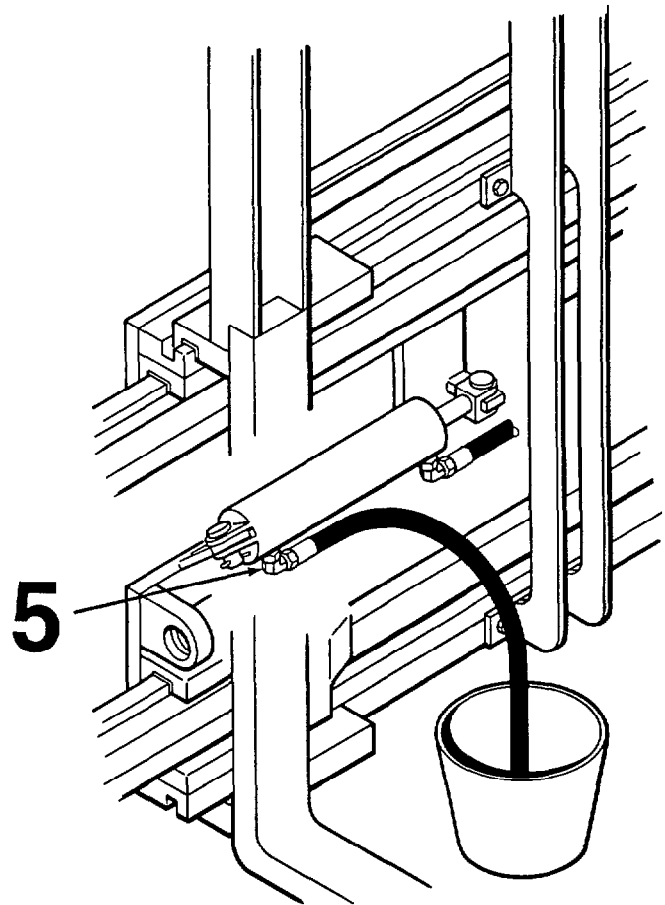
There are six potential problems that could affect sideshifting operation.

- Inadequate upper bearing lubrication or worn bearings. See sections 5.2-1 and 5.2-2.
- Kinked supply hoses.
- External leaks.
- Incorrect hydraulic pressure/volume from the truck.
- Lower mounting hooks installed incorrectly. See section 5.1 step 6.
- Worn or defective cylinder seals.

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- 2** Check the flow volume at the carriage hose terminal or internal reeving terminals. The recommended flow volume is 7 GPM (26 L/min).
- 3** Check for external leaks. Sideshift completely to the right and left and hold the control handle in each position for a few seconds.
- 4** Return the handle to neutral. Inspect all fittings, hoses and the cylinder for leaks. If there are no leaks, proceed with the pressure test.
- 5** Disconnect the sideshift cylinder base end hose. Plug the supply hose end. Install a short hose to the cylinder base end fitting and place the other hose end in a bucket. Start the truck. Actuate the sideshift left control handle for 5 seconds.
  - If there is oil flow out of the hose, the cylinder seals are defective and require service. Refer to Section 5.3.
  - If there is no oil flow out of the hose, the problem is not hydraulic.



**WARNING:** Before removing any hoses or fittings, relieve pressure in the hydraulic system. With the truck off, open the truck auxiliary control valve(s) several times in both directions.



## 5.1

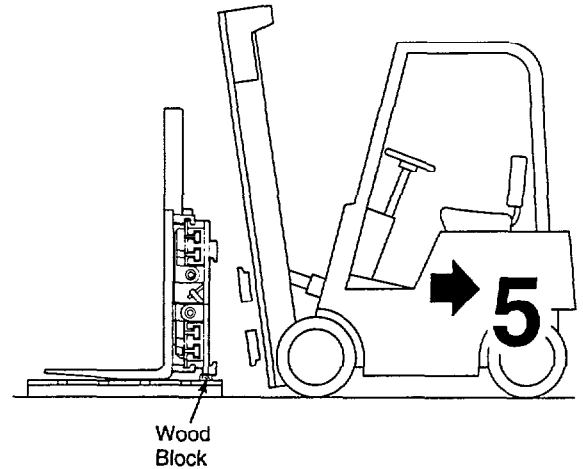
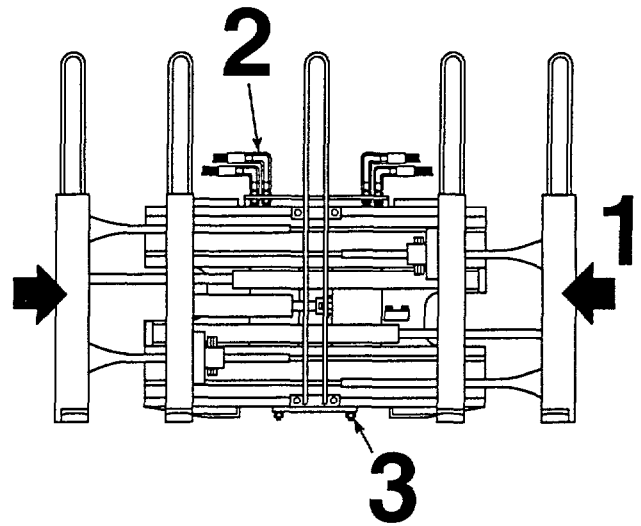
# Attachment Removal

- 1 Position the outer forks approximately at the width of the frame.

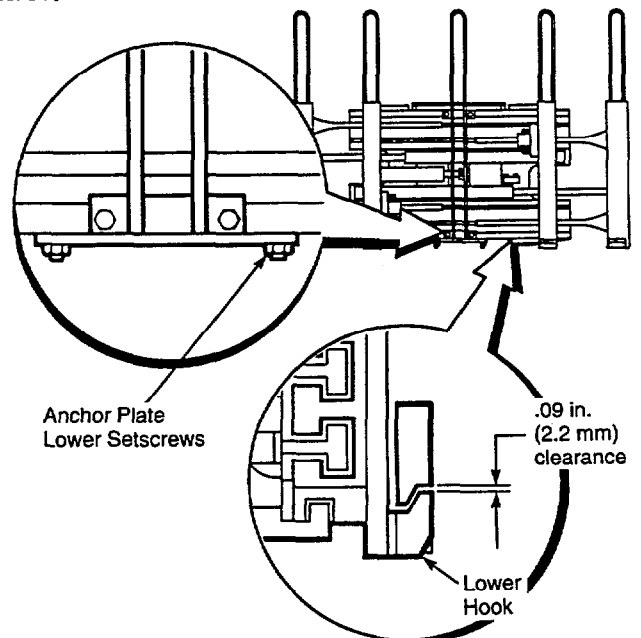
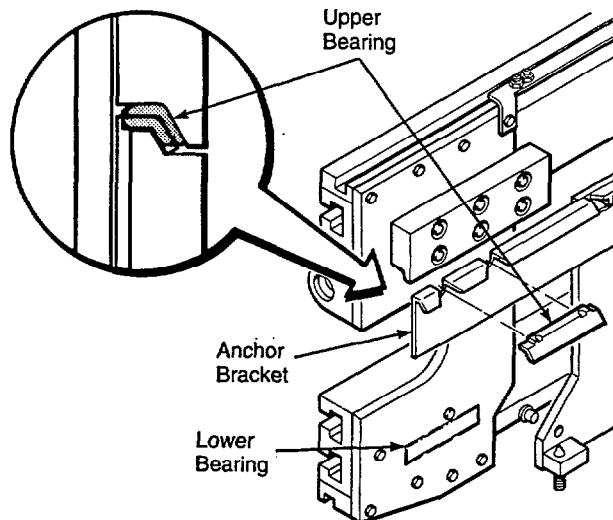


**WARNING:** Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then actuate the truck control valve several times in both directions.

- 2 Disconnect the supply hoses at the top of the frame. Tag the hoses for reassembly.
- 3 Loosen the anchor bracket setscrews to disengage them from the truck lower carriage bar.
- 4 Remove the lower mounting hooks.
- 5 Position the fork positioner over a pallet and place a 2x4 in. (50x100 mm) wood block under the frame. Lower the attachment onto the pallet and wood block. Tilt the truck carriage forward and back away.
- 6 For installation, reverse the above procedures except for the following special instructions:
  - Clean the upper and lower bearings and bearing areas.
  - Locate the upper bearings in the anchor bracket cutouts. Be careful not to install the bearings backwards.
  - Tighten the anchor plate lower setscrews against the lower carriage bar. Tighten the setscrew nuts to a torque of 75-85 ft.-lbs. (102-115 Nm).
  - Install lower hooks with the truck lower carriage bar to leave .09 in. (2.5 mm) clearance for sideshifting. Tighten the hook capscrews to a torque of 105-115 ft.-lbs. (142-155 Nm).



## 6 Installation



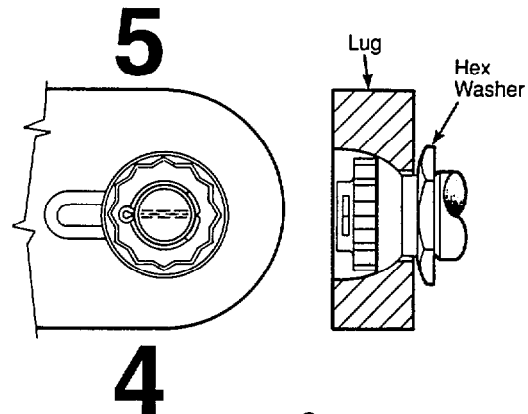
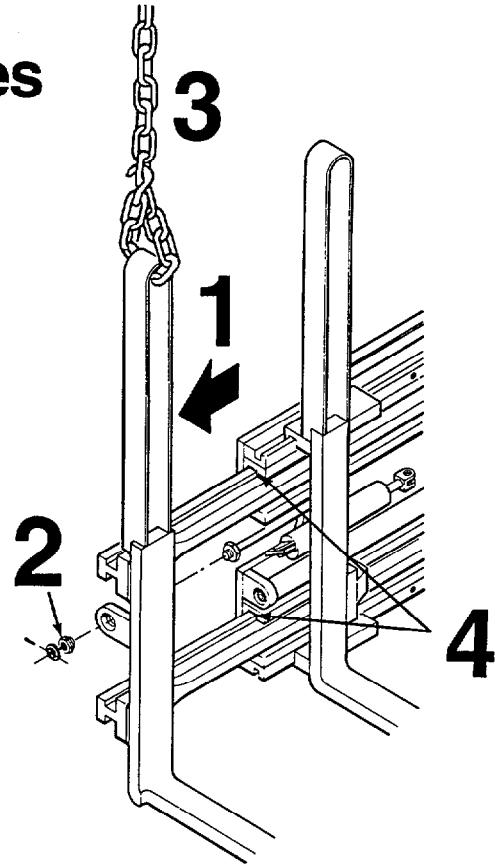
## 5.2 Forks, Arm Bars and Latches

### 5.2-1 Outer Fork Assembly Removal

- 1 Extend the outer forks outside the width of the frame. Position the forks .5 in. (12 mm) above the floor.
- 2 Remove the cotter pin, locking cap and nut retaining the cylinder rod to the fork lug.
- 3 Attach a suitable overhead hoist to the fork backrest. Pull the fork assembly out of the frame.
- 4 Inspect the arm bearings for wear. If the bearing are worn in any area to less than .06 in. (1.5 mm), they should be replaced.
- 5 For reassembly, reverse the above procedures except for the following special instructions:
  - Lubricate the cylinder rod threads, nut threads and spherical portion of the nut with chassis grease.
  - Install the hex washer on the rod end with the beveled side facing the lug. Engage the rod end into the lug.
  - Tighten the rod end nut to 150-175 ft.-lbs. (200-235 Nm). Prevent the rod turning by using a wrench on the hex washer.

**NOTE:** The rod end nut is being tightened against the hex washer. The nut will not be tight against the arm lug. This looseness allows for cylinder alignment during clamping.

  - Install the locking cap and cotter pin.
  - Lubricate the bearing portion of the arm bars with a thin film of chassis grease.

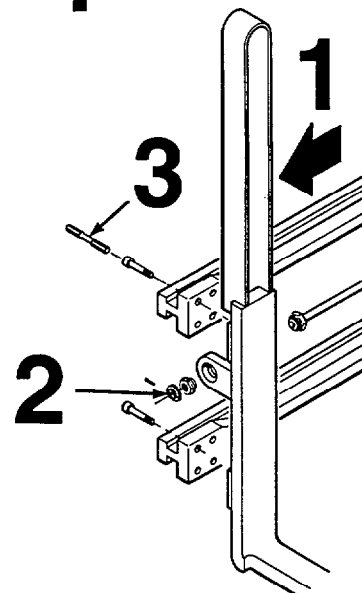


### 5.2-2 Outer Fork Removal

- 1 Extend the outer forks outside the width of the frame. Position the outer forks just touching the floor. Attach a suitable overhead hoist to the fork backrest for stability.
- 2 Remove the cotter pin, locking cap and nut retaining the cylinder rod to the fork lug.
- 3 Remove the capscrews fastening the fork to the arm bar using drive extension tool 667699. For reassembly, tighten the capscrews (lubed) to a torque of 280-320 ft.-lbs. (380-434 Nm) using the drive extension tool.
- 4 For reassembly, reverse the above procedures except for the following special instructions:
  - Lubricate the cylinder rod threads, nut threads and spherical portion of the nut with chassis grease.
  - Install the hex washer on the rod end with the beveled side facing the lug. Engage the rod end into the lug.
  - Tighten the rod end nut to 150-175 ft.-lbs. (200-235 Nm). Prevent the rod turning by using a wrench on the hex washer.

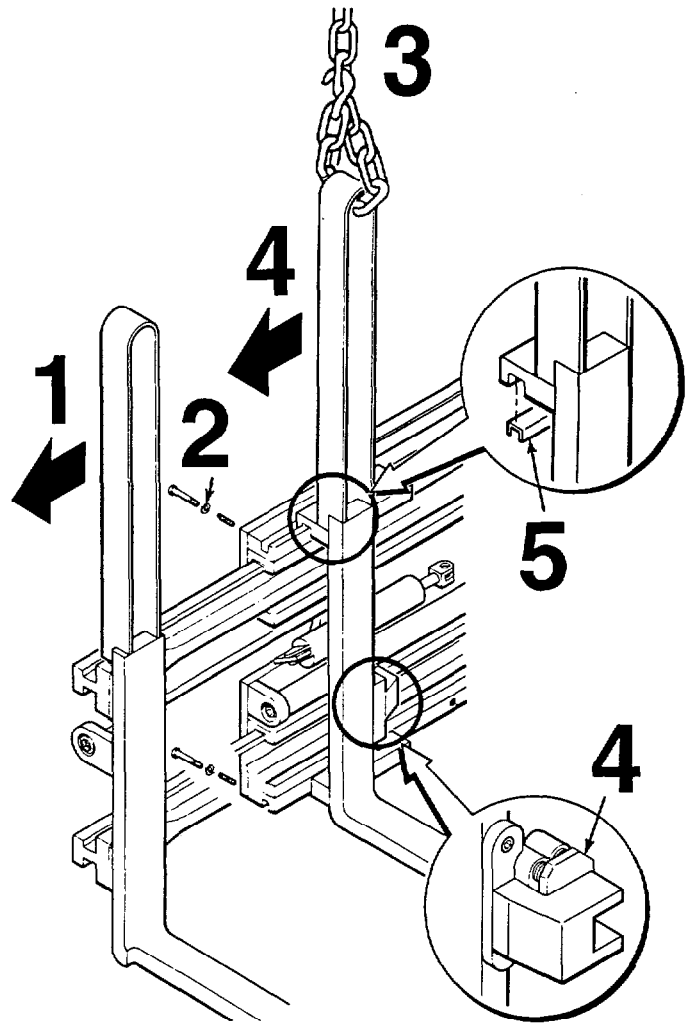
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  - Install the locking cap and cotter pin.



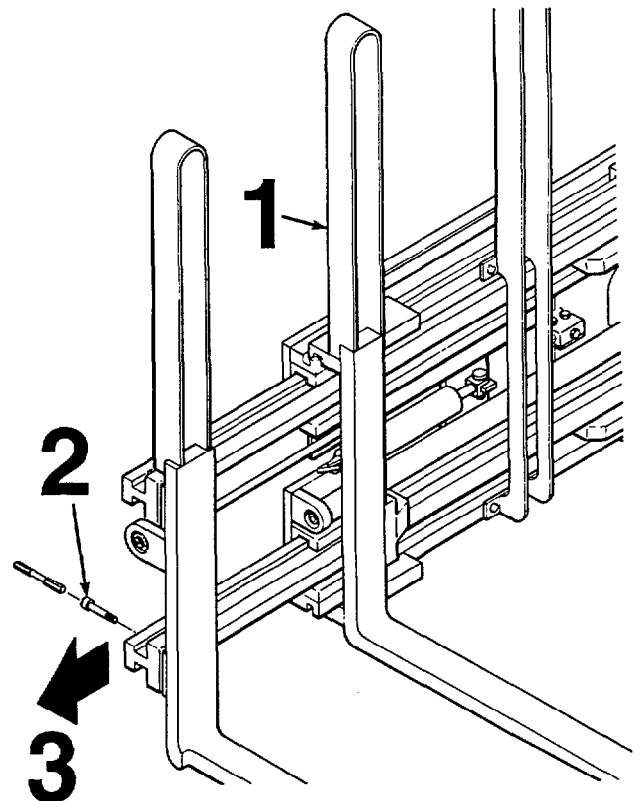
## 5.2-3 Inner Fork Removal and Bearing Service

- 1 Position the outer forks 1 ft. (30 cm) outside the width of the frame. Position the inner forks just touching the ground.
- 2 Remove the capscrews and spiral pin behind it (4 places) at the end of the top and bottom frame guides. For reassembly, tighten the capscrew to a torque of 70-75 ft.-lbs.
- 3 Attach a suitable overhead hoist to the fork backrest.
- 4 Press the fork latch plate to release it from the arm bar and slide the inner fork off of the frame.
- 5 Inspect the fork bearings for wear. If the bearings are worn in any area to less than .06 in. (1.5 mm), they should be replaced.
- 6 For reassembly, reverse the above procedures.



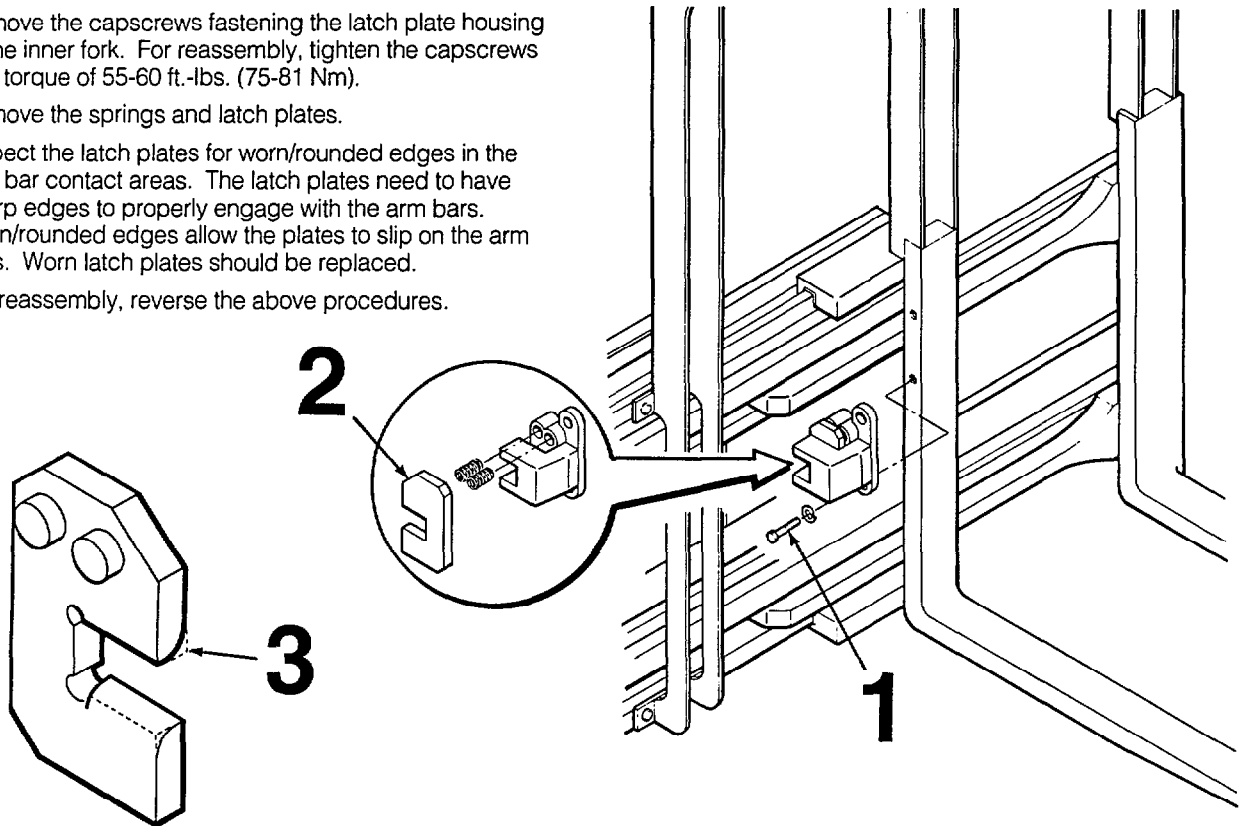
## 5.2-4 Arm Bar (Latch Operating) Service

- 1 Remove the inner fork as described in section 5.2-3.
- 2 Remove the capscrews fastening the fork to the arm bar using drive extension tool 667699. For reassembly, tighten the capscrews (lubed) to a torque of 280-320 ft.-lbs. (380-434 Nm) using the drive extension tool.
- 3 Pull the arm bar out of the frame.
- 4 For reassembly, reverse the above procedures except for the following special instructions:
  - Inspect the arm bar bearings for wear. If the bearings are worn in any area to less than .06 in. (1.5mm), they should be replaced.
  - Lubricate the bearing portion of the arm bars with a thin film of chassis grease.



## 5.2-5 Latch Inspection and Service

- 1 Remove the capscrews fastening the latch plate housing to the inner fork. For reassembly, tighten the capscrews to a torque of 55-60 ft.-lbs. (75-81 Nm).
- 2 Remove the springs and latch plates.
- 3 Inspect the latch plates for worn/rounded edges in the arm bar contact areas. The latch plates need to have sharp edges to properly engage with the arm bars. Worn/rounded edges allow the plates to slip on the arm bars. Worn latch plates should be replaced.
- 4 For reassembly, reverse the above procedures.



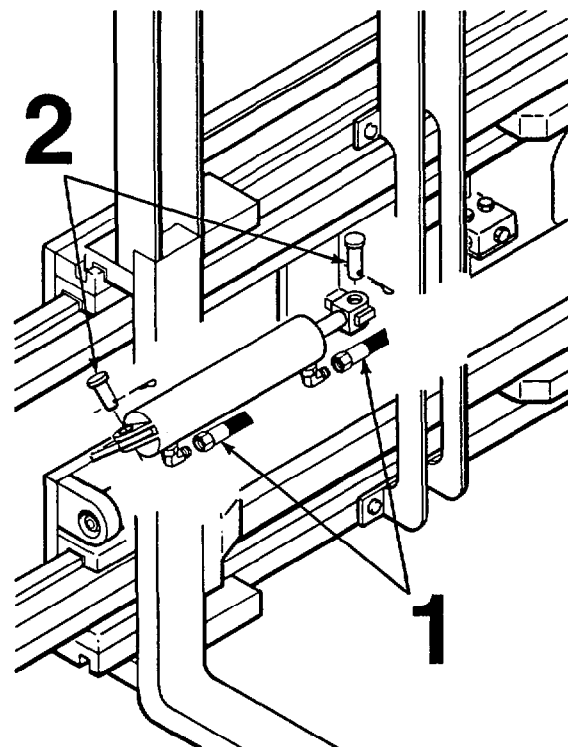
## 5.3 Sideshift Cylinder

### 5.3-1 Cylinder Removal



**WARNING:** Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then actuate the truck control valve several times in both directions.

- 1 Disconnect the hoses from the cylinder ports. Tag the hoses for reassembly.
- 2 Remove the clevis pins from the cylinder ends.
- 3 For reassembly, reverse the above procedures except for the following special instructions:
  - Operate the sideshifter through several full cycles to force air in the system to the truck hydraulic tank. Check for leaks at all fittings.



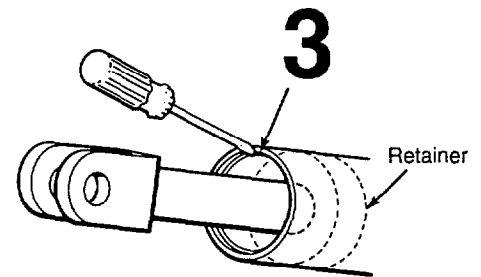
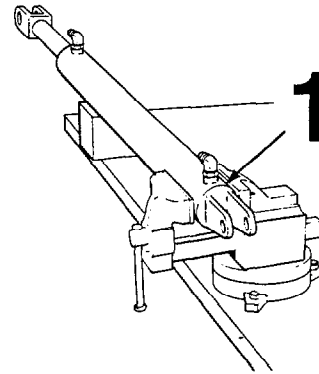
## 5.3-2 Cylinder Disassembly

- 1 Clamp the cylinder in a soft-jawed vise. Clamp lightly at the extreme base end only.
- 2 Position the cylinder rod in the fully extended position. Remove the spiral snap ring from the retainer. See the illustration below.
- 3 Tap the retainer into the shell approximately 2 in. (50 mm). Remove the retaining ring by placing a screwdriver on one side of the ring near the split and tapping with a hammer. The retaining ring will compress and turn sideways for removal. Remove the retainer.

**CAUTION:** Do not scratch the cylinder bore.

- 4 Remove the rod assembly from the cylinder. See the illustration below.
- 5 Clamp the rod assembly in a soft-jawed vise to remove the seals. Never clamp directly on the rod sealing surface. Remove the nut fastening the piston to the rod. Pry the seals up with a blunt screwdriver. Cut the seals to remove.

**CAUTION:** Do not scratch the seal grooves.

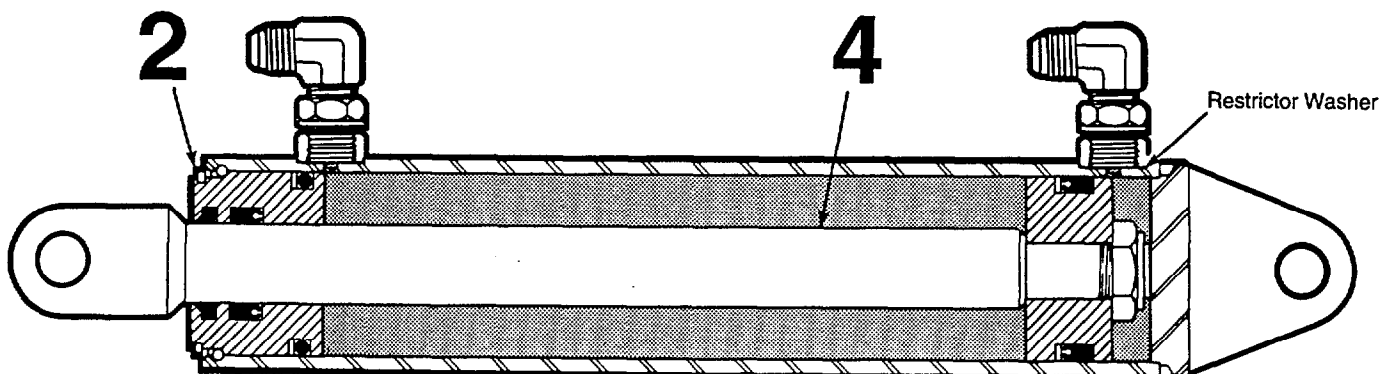
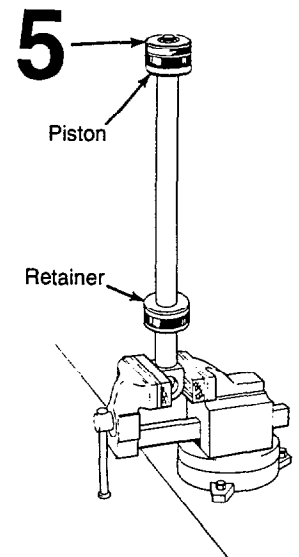


## 5.3-3 Cylinder Inspection

- Inspect all components for nicks or burrs. Minor nicks or burrs can be removed with 400 grit emery cloth.

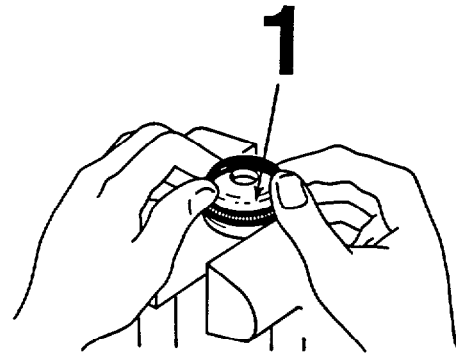
**NOTE:** Minor nicks are those that will not bypass oil under pressure. If nicks cannot be removed with emery cloth, replace the part.

- Inspect the outside of the shell for deformities that could weaken the shell's performance when under pressure. Replace if necessary.

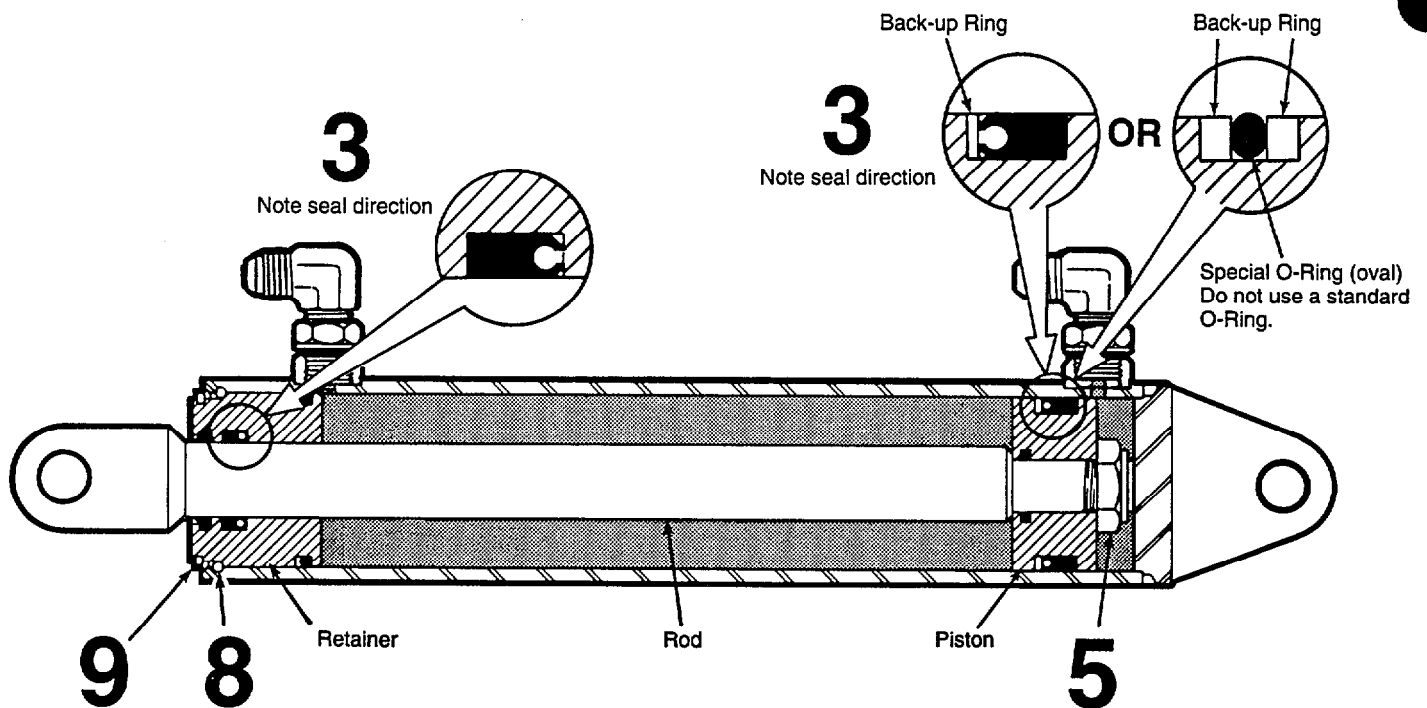


## 5.3-4 Cylinder Reassembly

- 1 Polish the piston and retainer chamfer angle with emery cloth. This allows the seals to slide over the chamfer easier.
- 2 Wash all components with cleaning solvent. Lubricate all new seals and rings with petroleum jelly.
- 3 Note the direction of the U-cup seals. If the seals are installed backward they will not work properly. For proper seal placement see the illustration below.
- 4 Install the new seals on the piston and retainer. Hook one side of the seal in the groove and push it over the piston or retainer.
- 5 Install the retainer and piston on the rod and tighten the piston retaining nut to 70-75 ft.-lbs. (95-102 Nm).
- 6 Apply a thick film of petroleum jelly to the inside of the cylinder shell, piston seals and retainer.
- 7 Insert the rod assembly into the cylinder shell. If resistance is encountered, tap the rod end with a rubber mallet.
- 8 Tap the retainer into the shell far enough to install the retaining ring in the groove.
- 9 Pull the rod out to the fully extended position. This will position the retainer so the spiral snap ring can be installed.



**4** Install new seals.



## 5.4 Fork Position Cylinders

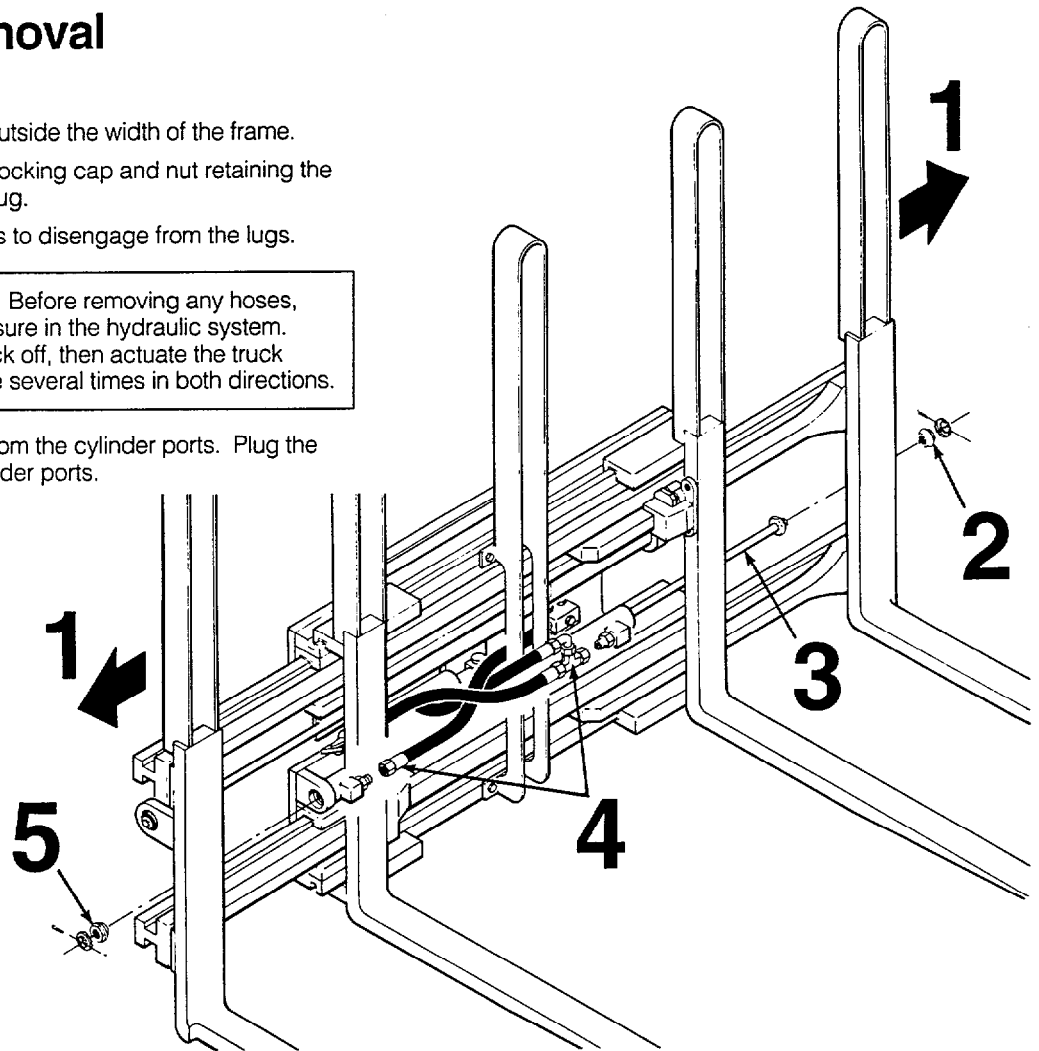
### 5.4-1 Cylinder Removal

- 1 Extend the outer forks outside the width of the frame.
- 2 Remove the cotter pin, locking cap and nut retaining the cylinder rod to the fork lug.
- 3 Retract the cylinder rods to disengage from the lugs.



**WARNING:** Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then actuate the truck control valve several times in both directions.

- 4 Disconnect the hoses from the cylinder ports. Plug the hoses and cap the cylinder ports.

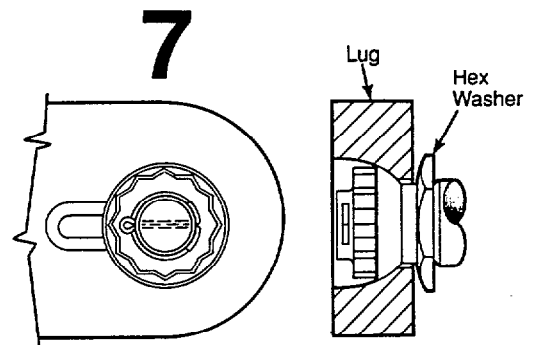


- 5 Remove the cotter pin, locking cap and nut retaining the cylinder base end to the frame lug.
- 6 Lift the cylinder away from the frame.
- 7 For reassembly, reverse the above procedures except for the following special instructions:

- Lubricate the cylinder rod threads, nut threads and spherical portion of the nut with chassis grease.
- Install the hex washer on the rod end with the beveled side facing the lug.
- Tighten the rod end nut to 150-175 ft.-lbs. (200-235 Nm). Prevent the rod turning by using a wrench on the hex washer.

**NOTE:** The rod end nut is being tightened against the hex washer. The nut will not be tight against the arm lug. This looseness allows for cylinder alignment during clamping.

- Install the locking cap and cotter pin.
- Operate the forks through several full cycles to force air in the system to the truck hydraulic tank. Check for leaks at all fittings.

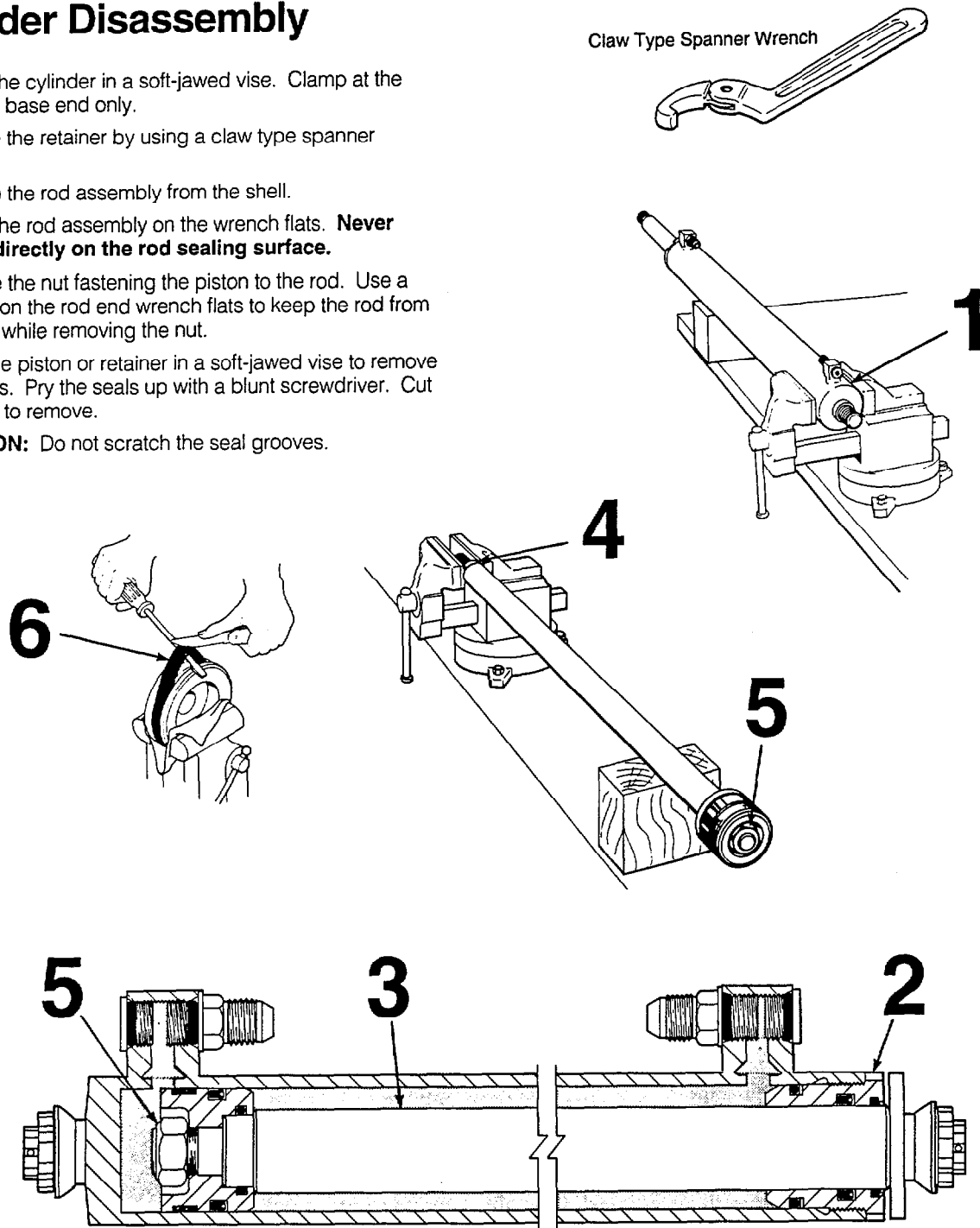


## 5.4-2 Cylinder Disassembly

- 1 Clamp the cylinder in a soft-jawed vise. Clamp at the extreme base end only.
- 2 Remove the retainer by using a claw type spanner wrench.
- 3 Remove the rod assembly from the shell.
- 4 Clamp the rod assembly on the wrench flats. **Never clamp directly on the rod sealing surface.**
- 5 Remove the nut fastening the piston to the rod. Use a wrench on the rod end wrench flats to keep the rod from rotating while removing the nut.
- 6 Place the piston or retainer in a soft-jawed vise to remove the seals. Pry the seals up with a blunt screwdriver. Cut the seal to remove.

**CAUTION:** Do not scratch the seal grooves.

Claw Type Spanner Wrench

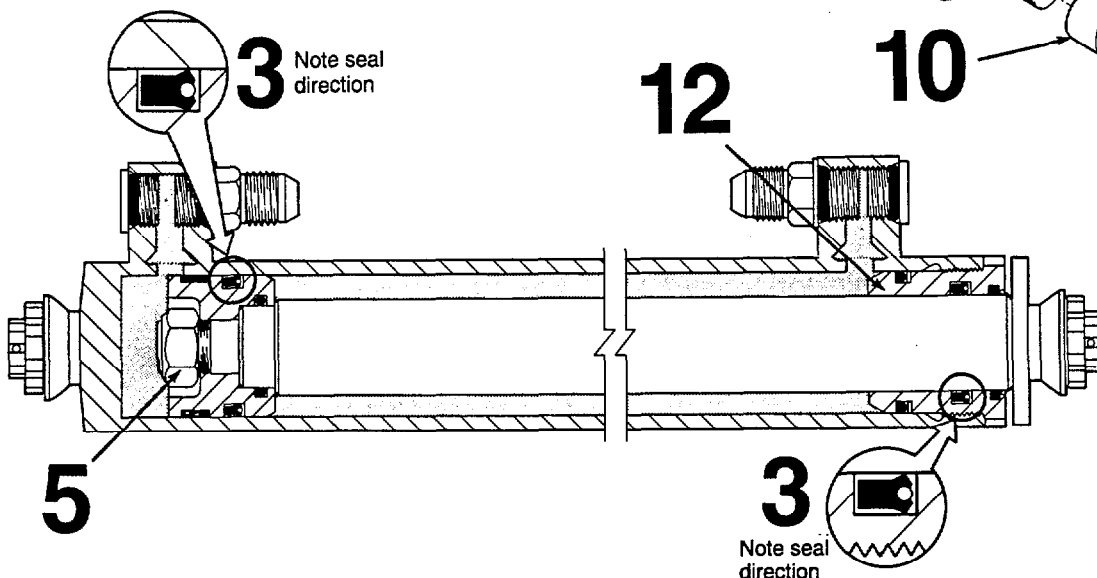
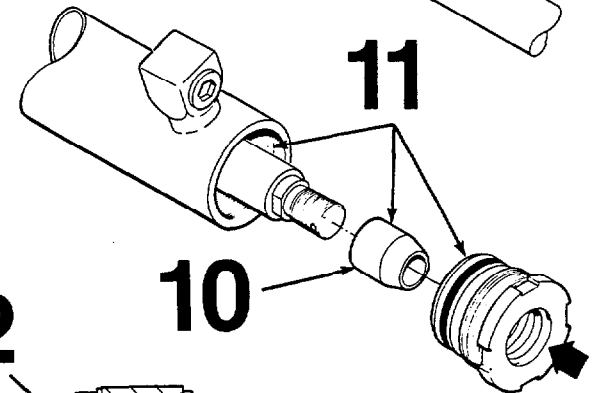
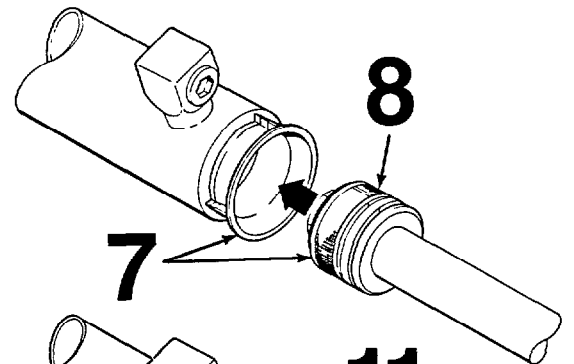
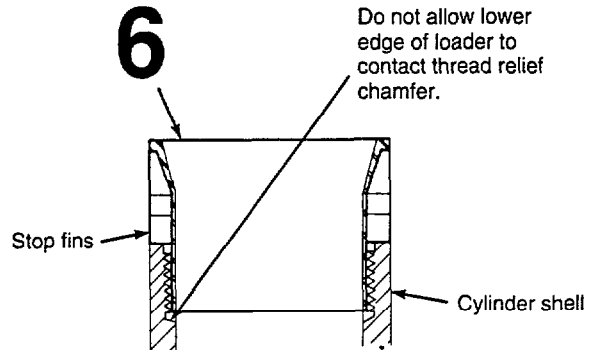
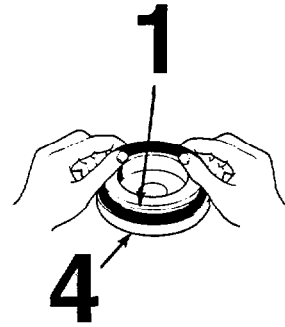


## 5.4-3 Cylinder Inspection

- Inspect all components for nicks or burrs. Minor nicks or burrs can be removed with 400 grit emery cloth.  
**NOTE:** Minor nicks are those that will not bypass oil under pressure. If nicks cannot be removed with emery cloth, replace the part.
- Inspect the outside of the shell for deformities that could weaken the shell's performance when under pressure. Replace if necessary.

## 5.4-4 Cylinder Reassembly

- 1 Polish the piston and retainer chamfer angle with emery cloth. This allows the seals to slide over the chamfer easier.
- 2 Wash all components with cleaning solvent. Lubricate all new seals and rings with petroleum jelly.
- 3 Note the direction of the U-cup seals. If the seals are installed backward they will not work properly. For proper seal placement see the illustration below.
- 4 Install the new seals on the piston and retainer. Hook one side of the seal in the groove and push it over the piston or retainer.
- 5 Install the piston on the rod. Tighten the piston retaining nut to a torque of 36-44 ft.-lbs. (48-60 Nm).
- 6 Place the piston loader in the cylinder shell. The loader must cover all of the threads but not contact the thread relief chamfer. The length of the stop fins can be trimmed with a sharp knife if more engagement is needed. The piston will not enter the shell if the loader contacts the thread relief chamfer.
- 7 Apply a thick film of petroleum jelly to the inside of the cylinder shell, loader and piston seals.
- 8 Insert the rod assembly into the cylinder shell. If resistance is encountered, tap the rod end with a rubber mallet.
- 9 Remove the loader from the shell.
- CAUTION:** Do not scratch the cylinder bore.
- 10 Place the retainer loader over the rod end.
- 11 Apply a thick film of petroleum jelly to the inside of the cylinder shell, retainer loader and retainer seals.
- 12 Slide the retainer over the retainer loader and screw it into the shell. Remove the retainer loader. Tighten the retainer to a torque of 60-70 ft.-lbs. (81-95 Nm).



5.5

## Valve

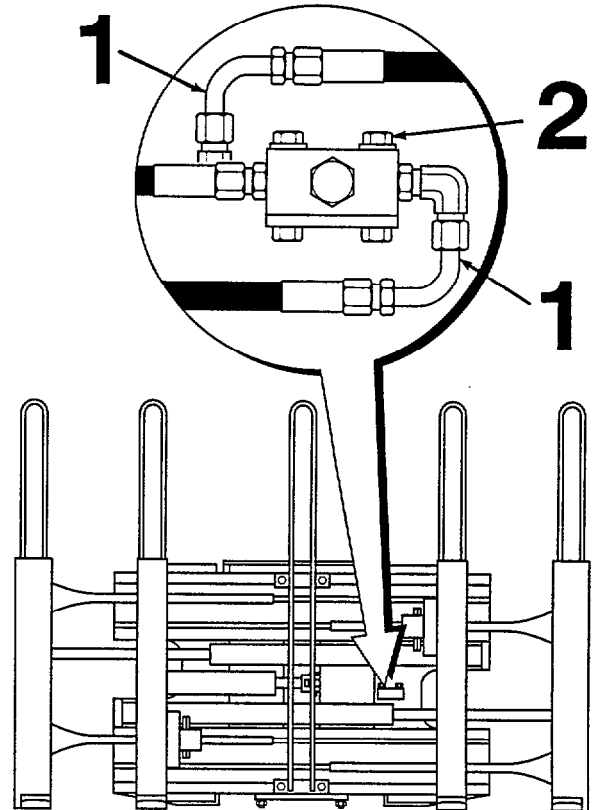
5.5-1

### Valve Removal



**WARNING:** Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then actuate the truck control valve several times in both directions.

- 1 Disconnect the hoses from the valve ports. Plug the hoses and tag them for reassembly.
- 2 Remove the capscrews fastening the valve to the bracket. For reassembly, tighten the capscrews to a torque of 7-12 ft.-lbs. (10-16 Nm).
- 3 For reassembly, reverse the above procedures.

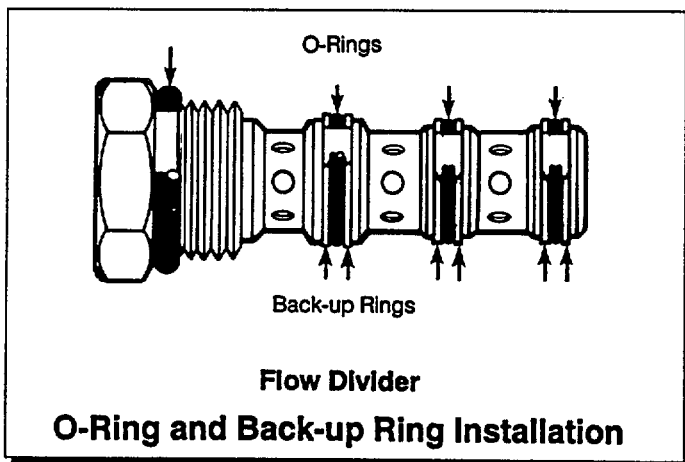
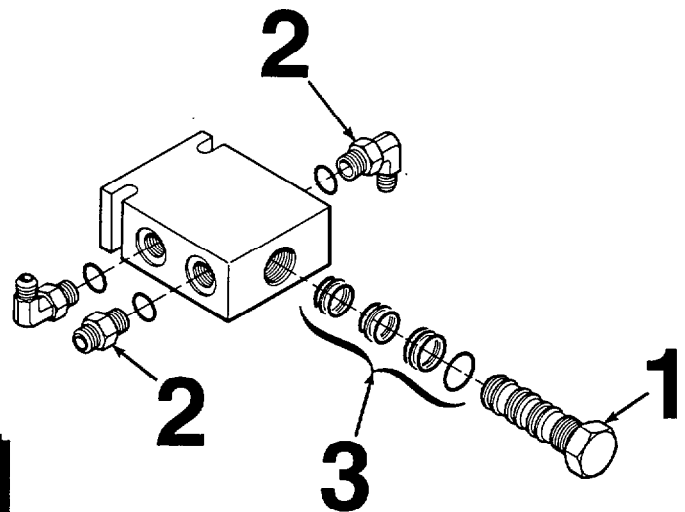


SD0022.II

5.5-2

### Valve Service

- 1 Remove the cartridge from the valve.
- 2 Remove the remaining fittings.
- 3 Remove the O-rings and back-up rings from the cartridge.
- 4 Clean all parts with kerosene or cleaning solvent.
- 5 For reassembly, reverse the above procedures except for the following special instructions:
  - The cartridge O-rings and back-up rings must be installed as shown to avoid seal damage during reassembly.
  - Lubricate the cartridge and seals with petroleum jelly prior to reassembly.



## 5.6 Frame

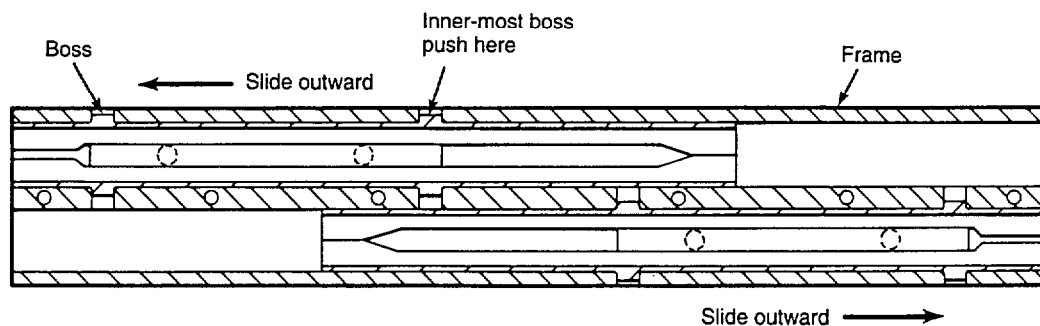
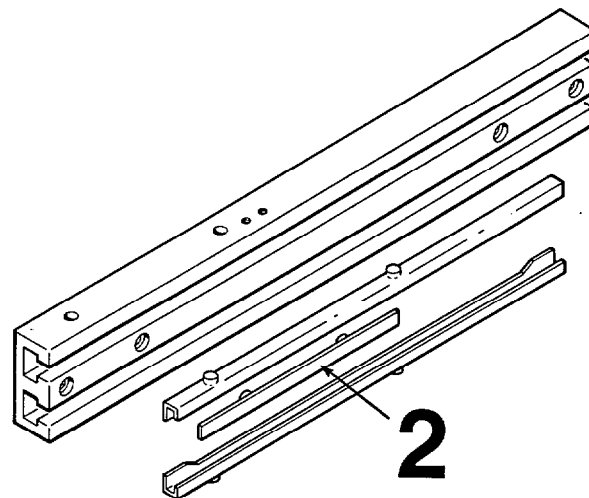
### 5.6-1 Frame Bearing Service

- 1 Remove the outer fork assembly as described in section 5.2-1.
- 2 Remove the bearing spacers located between the upper and lower bearings in each frame arm bar slot.
- 3 Pry the bearing strips out of the frame with a screwdriver and slide outward.

**CAUTION:** Do not gouge the aluminum frame surfaces.

**NOTE:** To ease removal of the first bearing strip from the frame, push the innermost boss out of its hole.

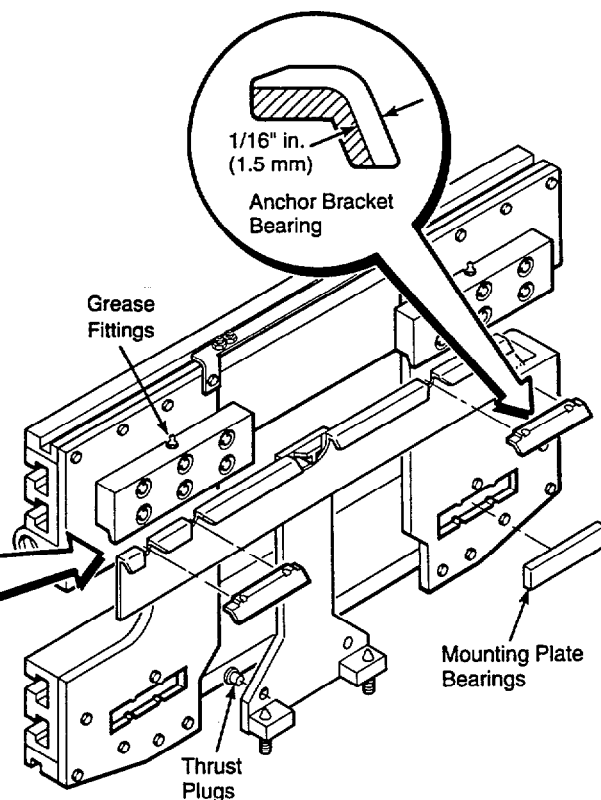
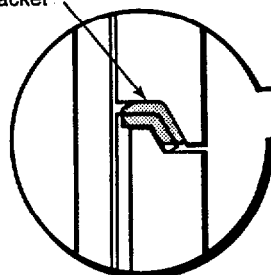
- 4 For reassembly, reverse the above procedures.



### 5.6-2 Anchor Bracket and Mounting Plate Bearing Service

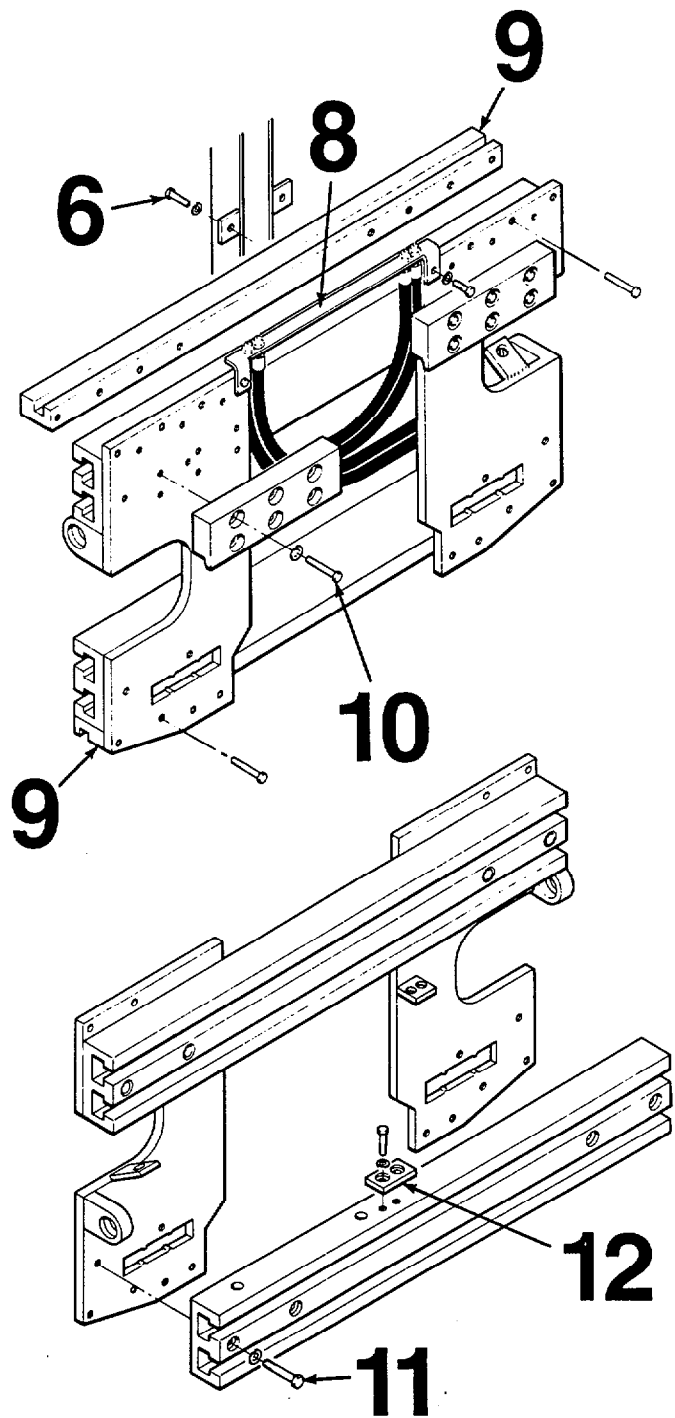
- 1 Remove the attachment from the truck as described in section 5.1.
- 2 Remove the anchor bracket upper bearings. Replace both bearings if either one is worn to less than 1/16 in. (1.5 mm) thick on the back side.
- 3 Measure the exposed thickness of the anchor bracket lower thrust plugs. If the wear surface is worn to less than 1/16 in. (1.5 mm), they should be replaced.
- 4 Measure the exposed thickness of the mounting plate bearings. Replace both bearing segments if either one is worn to less than 1/16 in. (1.5 mm).
- 5 For reassembly, reverse the above procedures except for the following special instructions:
  - Clean the upper hook bearing surfaces of any built-up grease.
  - After mounting the attachment on the truck, apply chassis grease to the upper hook grease fittings.

Anchor Bracket Bearing



## 5.6-3 Frame and Mounting Plate Disassembly

- 1 Remove the attachment from the truck as described in section 5.1.
- 2 Remove the fork position cylinders as described in section 5.4-1, steps 3 through 7.
- 3 Remove the sideshift cylinder as described in section 5.3-1.
- 4 Remove the outer fork assemblies as described in section 5.2-1, steps 3 through 5.
- 5 Remove the inner forks as described in section 5.2-3, steps 2 through 6.
- 6 Remove the center backrest from the frames. For reassembly, tighten the capscrews to a torque of 75-85 ft.-lbs. (102-115 Nm).
- 7 Remove the valve from the mounting plate as described in section 5.5-1.
- 8 Remove the hose bracket and hoses from the mounting plates. For reassembly, tighten the capscrews to a torque of 75-85 ft.-lbs. (102-115 Nm).
- 9 Remove the upper and lower frame channels. For reassembly, tighten the capscrews to a torque of 75-85 ft.-lbs. (102-115 Nm).
- 10 Remove the upper hooks from the mounting plates. For reassembly, tighten the capscrews to a torque of 75-85 ft.-lbs. (102-115 Nm).
- 11 Remove the frames from the mounting plates. For reassembly, tighten the capscrews to a torque of 75-85 ft.-lbs. (102-115 Nm).
- 12 Remove the latch plates from the frames. For reassembly, tighten the capscrews to a torque of 20-25 ft.-lbs. (27-34 Nm).
- 13 For reassembly, reverse the above procedures.

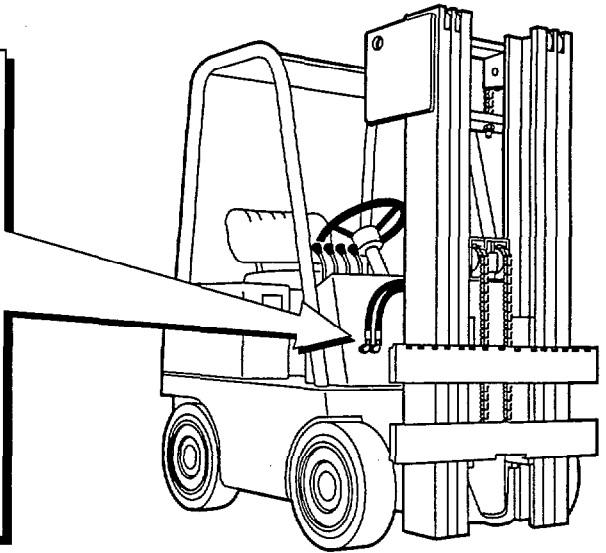


## 6.1-1 Hydraulics

**Truck Relief Setting**  
 2000 psi (138) bar – Minimum  
 2300 psi (159) bar – Maximum

**Truck Flow Volume**  
 6 GPM (23 L/min.) – Minimum  
 7 GPM (26 L/min.) – Recommended  
 10 GPM (38 L/min.) – Maximum

**Hydraulic Oil**  
 Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. MIL-O-5606 or MIL-O-2104B.  
 Use of synthetic or aqueous base hydraulic oil is not recommended. Contact Cascade if fire resistant hydraulic oil must be used.



GA0025 eps

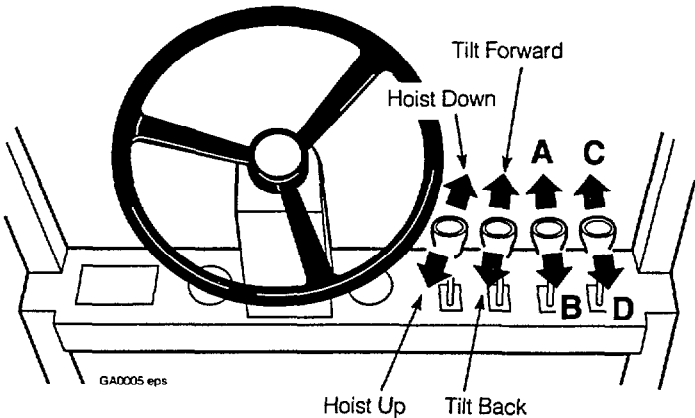
## 6.1-2 Auxiliary Valve Functions

**Single-Double Operation**

- A** Sideshift Left
- B** Sideshift Right
- C** Spread Forks
- D** Retract Forks

A line drawing of the mast and forks of a forklift. Four thick black arrows point to specific locations on the mast: 'A' points to the left side, 'B' to the right side, 'C' to the front of the forks, and 'D' to the rear of the forks.

SC0008 eps



GA0005 eps

## 6.1-3 Truck Carriage

The truck carriage must conform to ISO dimensional standard 2328, equivalent to Industrial Truck Association (ITA) dimensions shown.

Make sure the truck carriage is clean and the notches are undamaged.

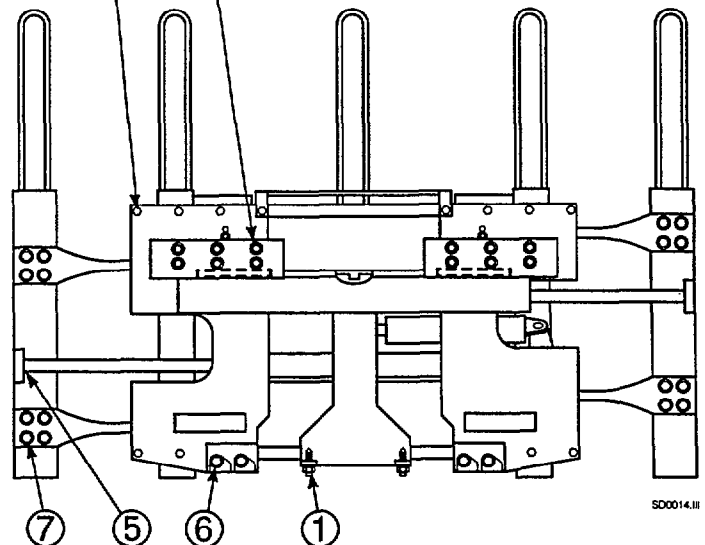
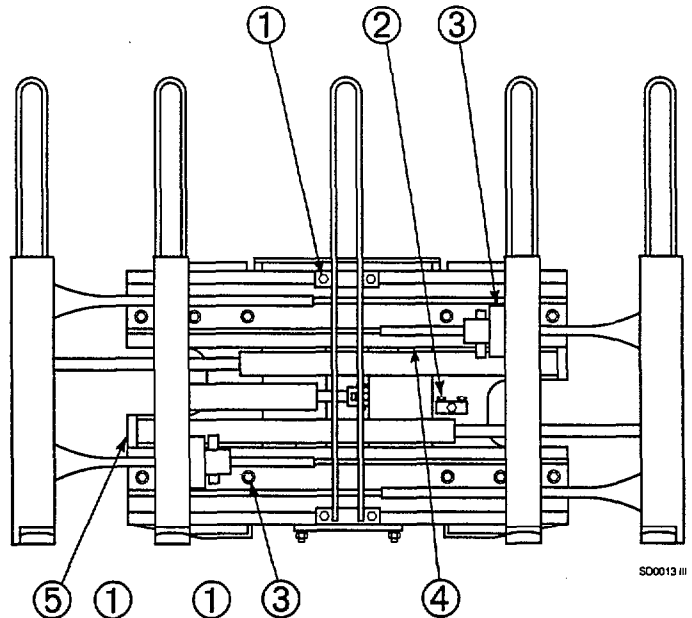


GA0028 eps

Mounting	Dimension A-ITA (ISO)	
	Minimum	Maximum
Class II	14.96 in. (380.0 mm)	15.00 in. (381.0 mm)
Class III	18.68 in. (474.5mm)	18.74 in. (476.0mm)

## 6.1-4 Torque Values

Ref. No.	Torque Values	
	Ft.-lbs.	(Nm)
1	75-85	101-115
2	7-12	9-16
3	55-60	75-81
4	20-25	27-34
5	150-175	203-237
6	105-115	142-156
7	280-320	380-434



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