

SERVICE MANUAL

E & F-Series

Single-Double Pallet Handler

Manual Number 215793-R2

**cascade[®]
corporation**

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1.1 Introduction

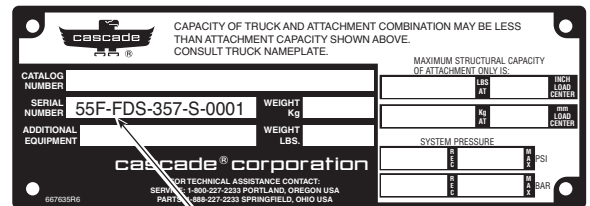
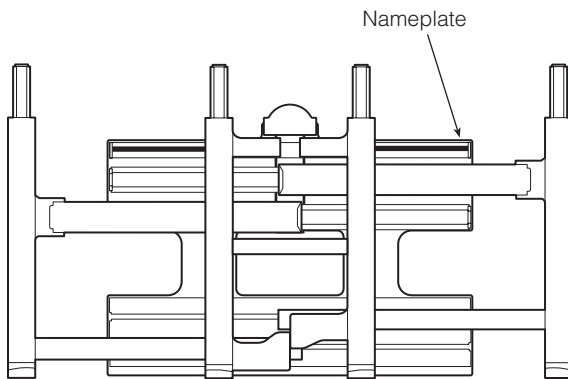
This Manual provides the Installation, Periodic Maintenance, Troubleshooting, Service and Specifications for Cascade E and F Series Single-Double Pallet Handlers.

These attachments are designed for three-shift-a-day continuous-duty operations with minimal maintenance. They offer exceptional visibility for the lift truck driver and provide optimized load handling.

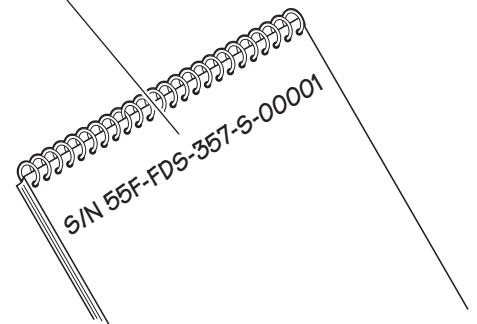
In any communication about the attachment, refer to the product I.D. number stamped on the nameplate as shown. If the nameplate is missing, the numbers can be found stamped on the right front web of the baseplate.

IMPORTANT: All hoses, tubes and fittings on these attachments are JIC.

NOTE: Specifications are shown in both inch and (Metric) units.




SD0634.eps



1.2 Special Definitions

The statements shown appear throughout this Manual where special emphasis is required. Read all **WARNINGS** and **CAUTIONS** before proceeding with any work. Statements labeled **IMPORTANT** and **NOTE** are provided as additional information of special significance or to make your job easier.



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 System Requirements

The Single-Double Pallet Handler will provide maximum operating efficiency and capability when the following requirements are met.

WARNING: Rated capacity of the truck/attachment combination is a responsibility of the original truck manufacturer and may be less than that shown on the attachment nameplate. Consult the truck nameplate.

Truck Relief Setting
 2300 psi (160 bar) Recommended
 2600 psi (180 bar) Maximum

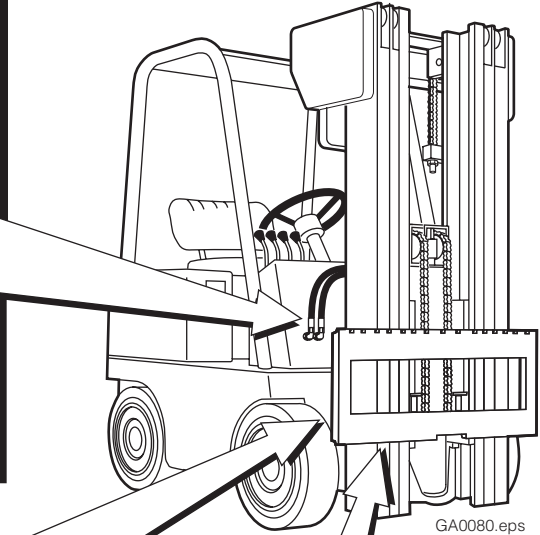
Truck Flow Volume ^①

	Min. ^②	Recommended	Max. ^③
E-Series,	4 GPM	7 GPM	7 GPM
F-Series	(15 L/min.)	(26 L/min.)	(26 L/min.)

① Cascade E-Series Single-Double Pallet Handlers are compatible with SAE 10W petroleum base hydraulic fluid meeting Mil. Spec. MIL-0-5606 or MIL-0-2104B. Use of synthetic or aqueous base hydraulic fluid is not recommended. If fire resistant hydraulic fluid is required, special seals must be used. Contact Cascade.

② Flow less than recommended will result in reduced or unequal arm speed.

③ Flow greater than maximum can result in excessive heating, reduced system performance and reduced hydraulic system life.



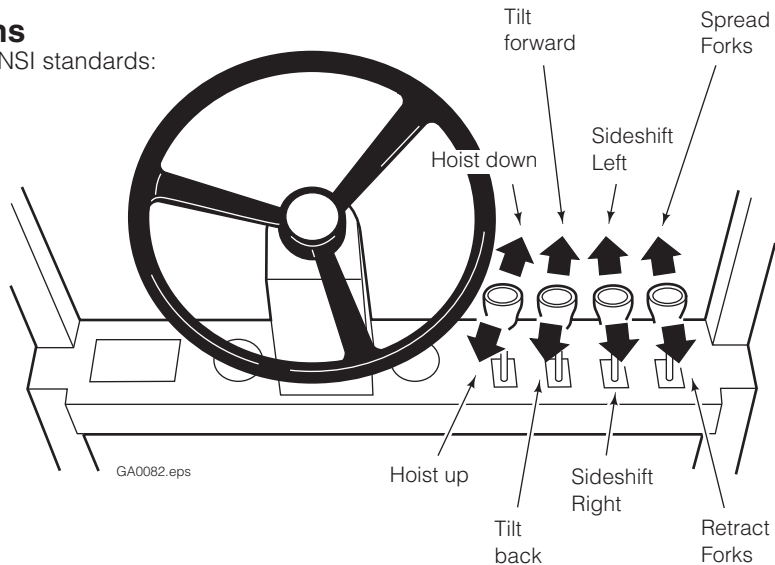
Carriage Mount Dimension (A) ITA (ISO)

	Minimum	Maximum
Class II	14.96 in. (380.0 mm)	15.00 in. (381.0 mm)
Class III	18.68 in. (474.5 mm)	18.74 in. (476.0 mm)
Class IV	23.44 in. (595.5 mm)	23.50 in. (597.0 mm)

Carriage
 Clean carriage bars and inspect for damaged notches.

Auxiliary Valve Functions

Check for compliance with ANSI standards:

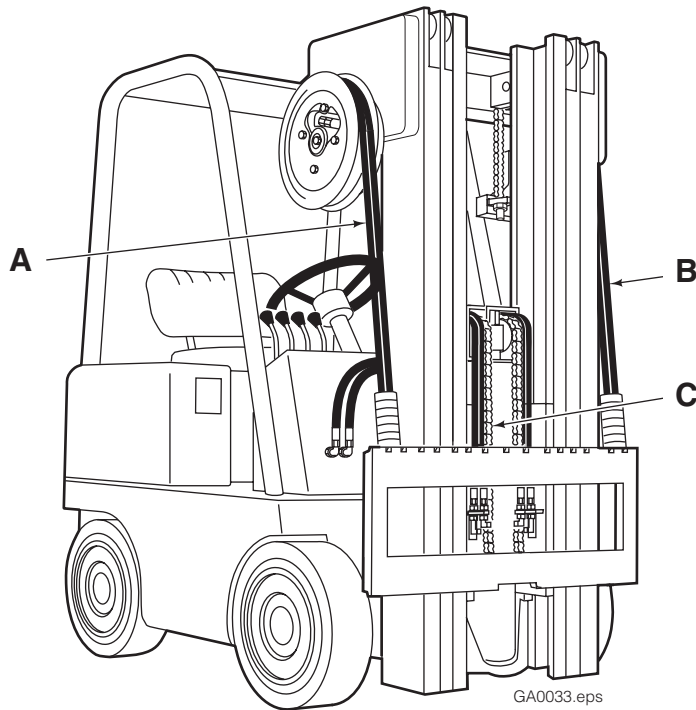


2.2 Recommended Hydraulic Supply Options

The E and F Series Single-Double Pallet Handler will operate with any of the hydraulic supply arrangements listed below.

- All hoses and fittings for FORK POSITION and SIDESHIFT functions should be at least No. 6 with a minimum internal diameter of 9/32 in. (7 mm).

Refer to *Cascade Hose & Cable Reel Selection Guide*, Part No. 212199, to select the correct hose reel for the mast and truck.



Sideshifting

A and B

RH and LH THINLINE™ 2-port hose reel groups.

OR

C Mast double internal hose reeving group.

Solenoid Adaption

A 6-N-1 cable/hose reel group.

OR

A and C

Cable reel and single internal hose reeving group.

2.3 Installation Procedures

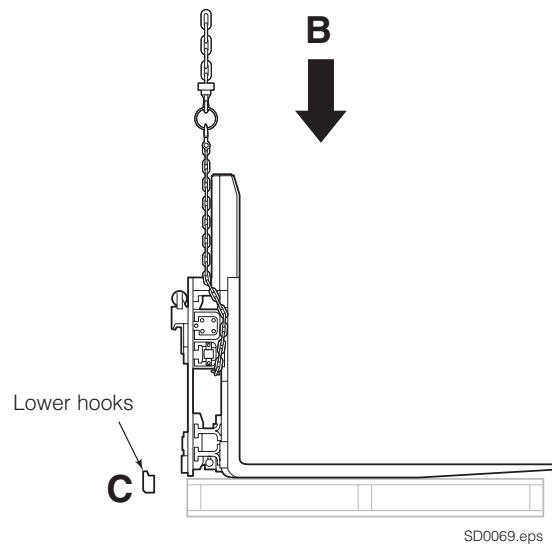
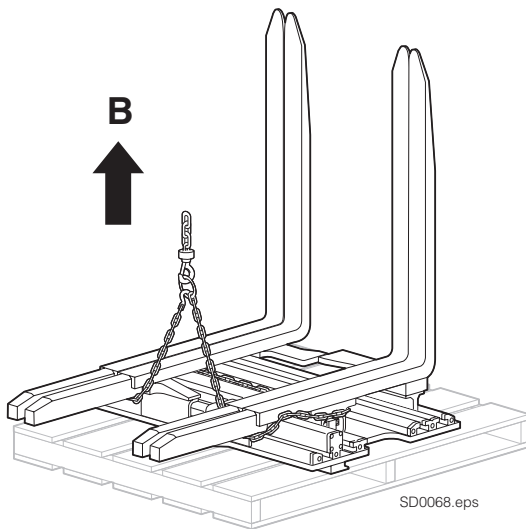
Follow the steps shown to install the Single-Double Pallet Handler on the truck. Read all **WARNINGS** and **CAUTIONS** carefully. If you don't understand a procedure, ask your supervisor, or call the nearest Cascade Service Department for assistance.

1 Attach overhead hoist

- A** Remove banding.
- B** Set Attachment upright on pallet.
- C** Remove bolt-on lower hooks (if equipped).

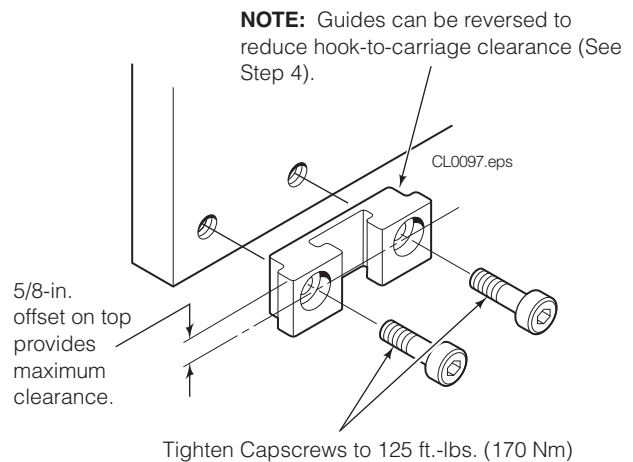
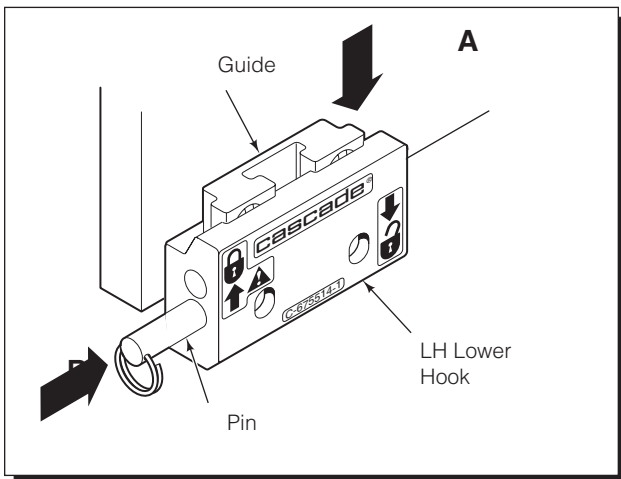


WARNING: Make sure overhead hoist has rated capacity of at least 2000 lbs. (900 kg).



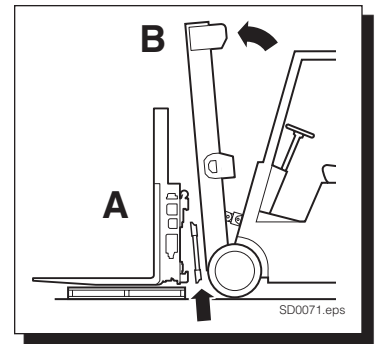
2 Unlock Quick-Change lower mounting hooks

- A** Remove pin and drop hooks into unlocked position.
- B** Re-install pin in lower hole.

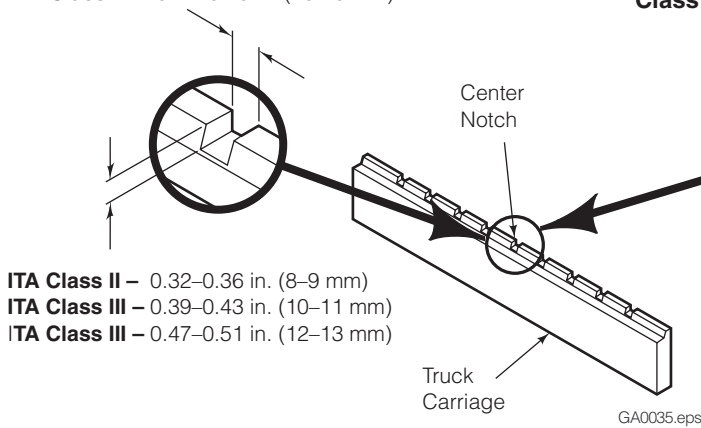


3 Mount Attachment on truck carriage

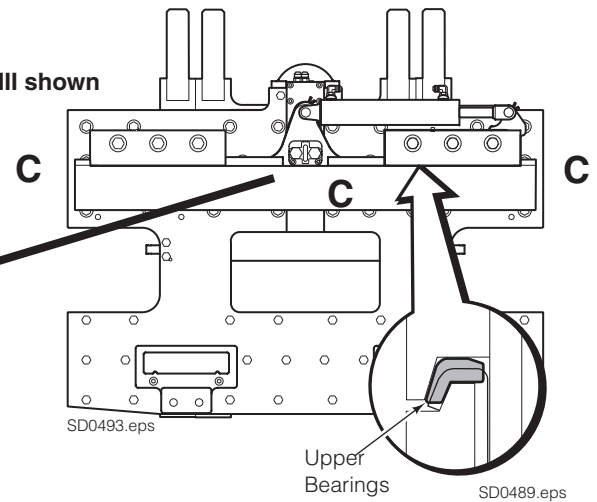
- A** Center truck behind attachment.
- B** Tilt forward and raise carriage into position.
- C** Engage top mounting hooks with carriage. Make sure center locator tab engages center notch on top carriage bar.
- D** Lift Attachment 2 in. (5 cm) off pallet.



ITA Class II – 0.60–0.66 in. (15–17 mm)
 ITA Class III – 0.72–0.78 in. (18–20 mm)
 ITA Class IV – 0.72–0.78 in. (18–20 mm)

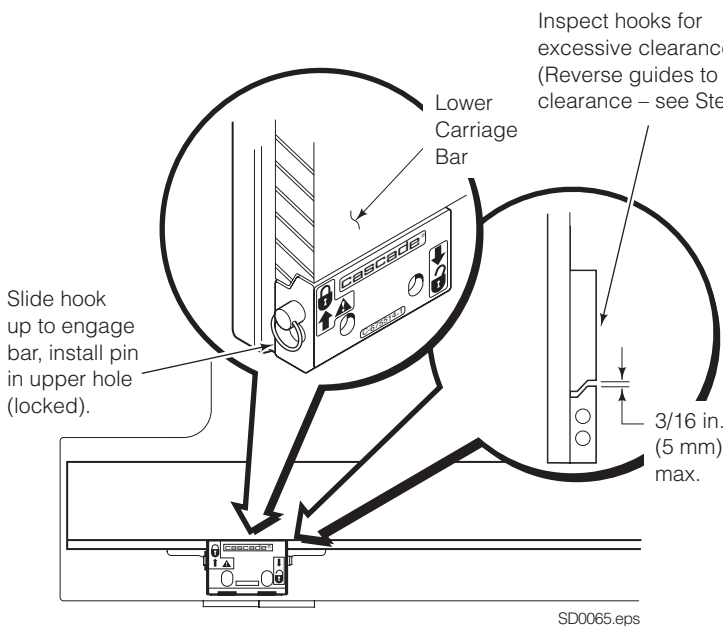


Class III shown

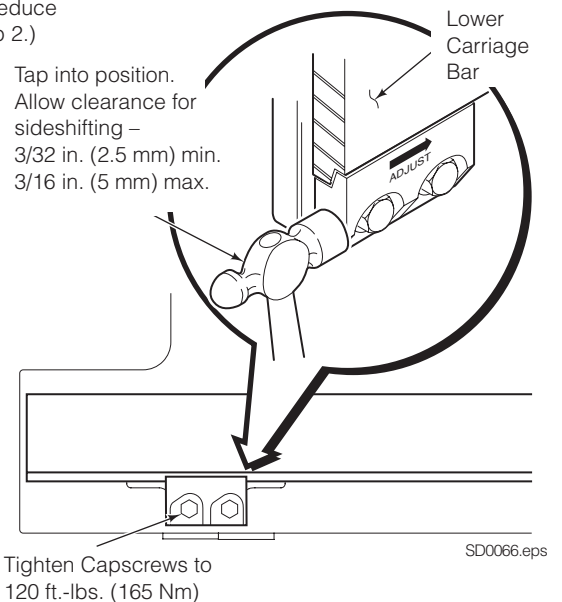


4 Install and engage lower hooks

QUICK-CHANGE TYPE



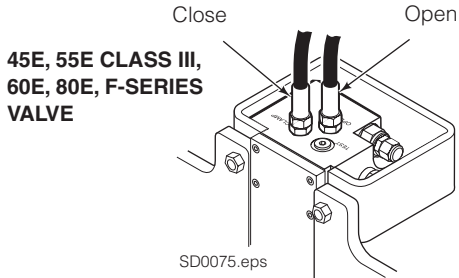
BOLT-ON TYPE (if fitted)



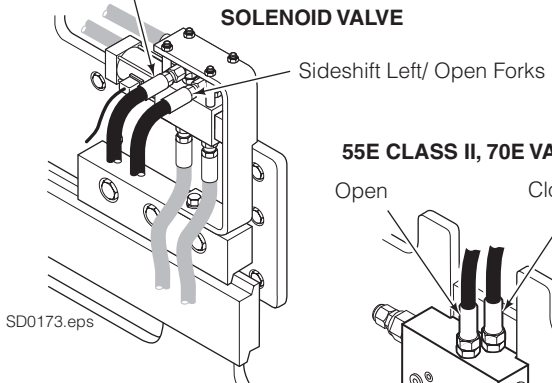
5 Prepare hoses

- A** Determine hose lengths required for hydraulic supply configuration of truck.
- B** Cut hoses to length, install end fittings or quick-disconnect kits.

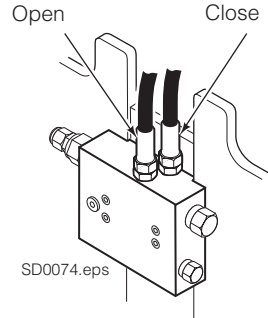
CAUTION: Allow 4 in. (10 cm) extra hose length in each direction for sideshifting movement between Attachment valve and truck carriage.



Sideshift Right/ Close Forks



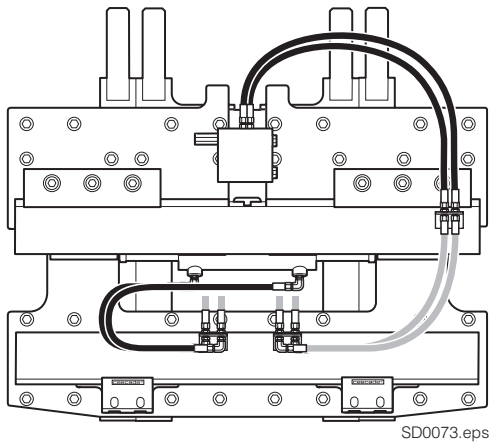
55E CLASS II, 70E VALVE



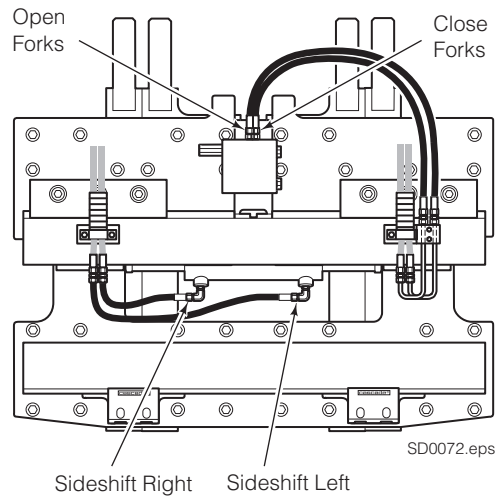
NOTE: Attachment serial numbers less than 55E-FD-500 use both types of valves.

MAST DOUBLE INTERNAL REEVING

55E - CLASS II

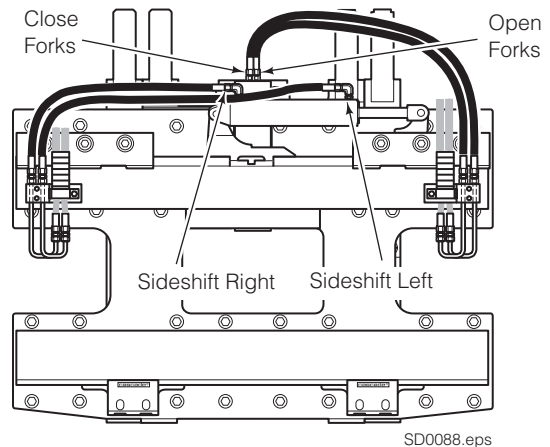
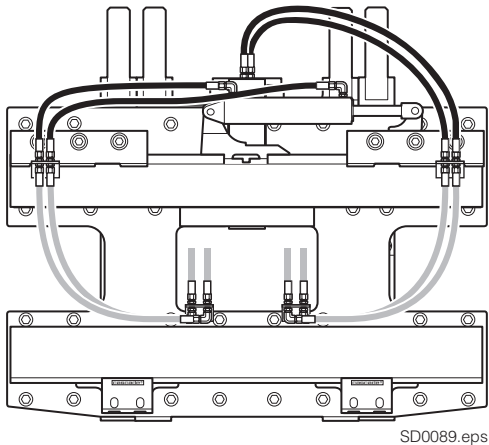


RH & LH 2-PORT THINLINE™ HOSE REELS



Class II Back

55E - CLASS III 48F/55F/65F

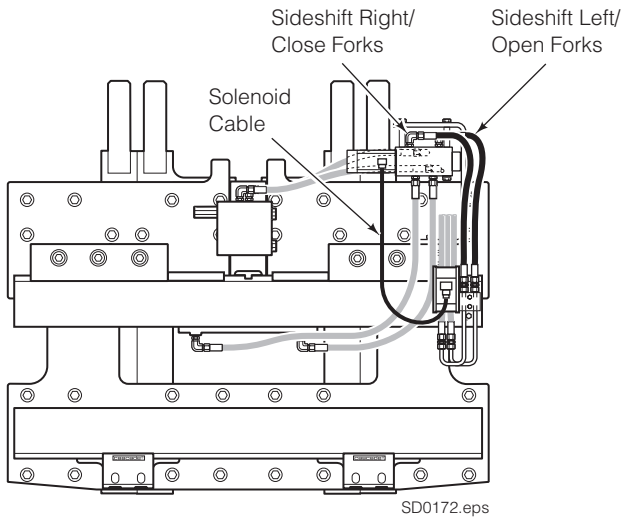


Class III Back

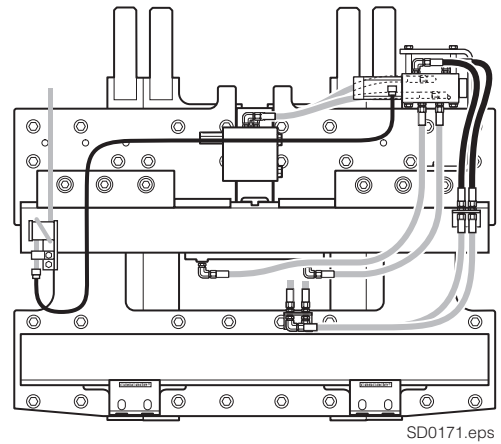
CAUTION: Allow 4 in. (10 cm) extra hose length in each direction for sideshifting movement between solenoid valve and truck carriage.

6-N-1 CABLE / HOSE REEL

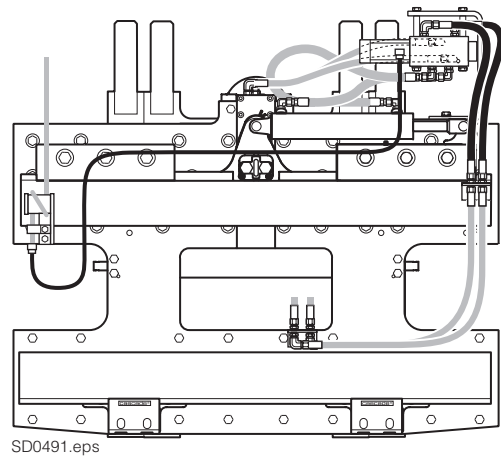
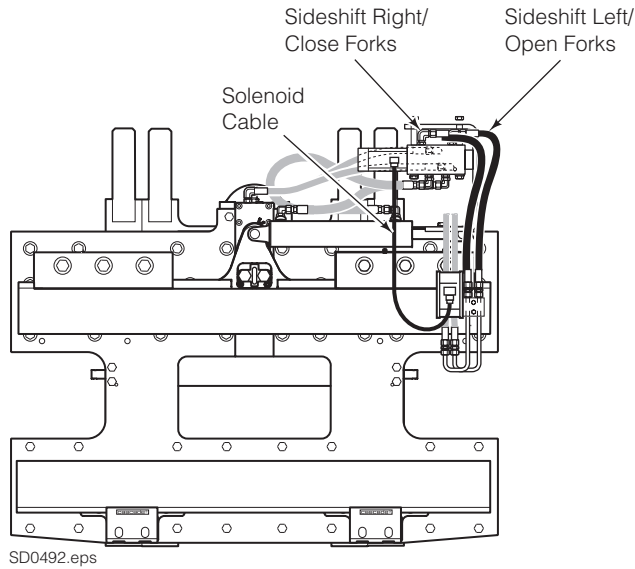
E-SERIES



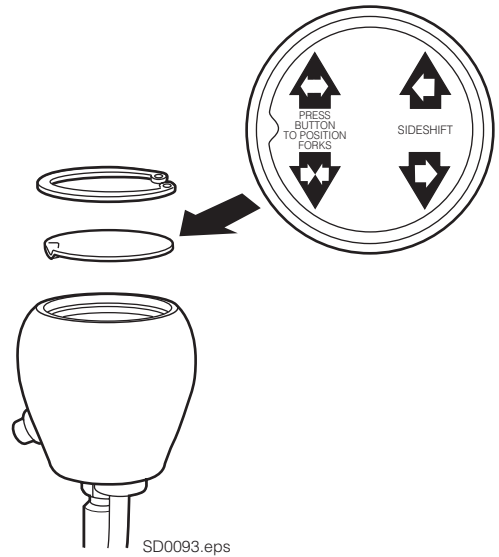
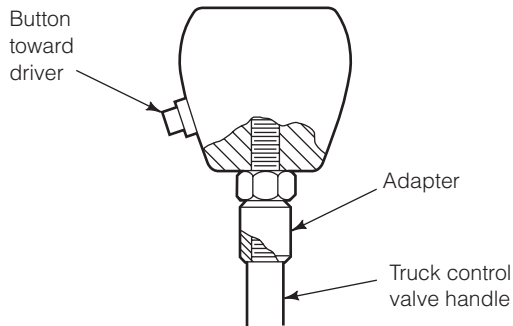
SINGLE INTERNAL HOSE REEVING with CABLE REEL



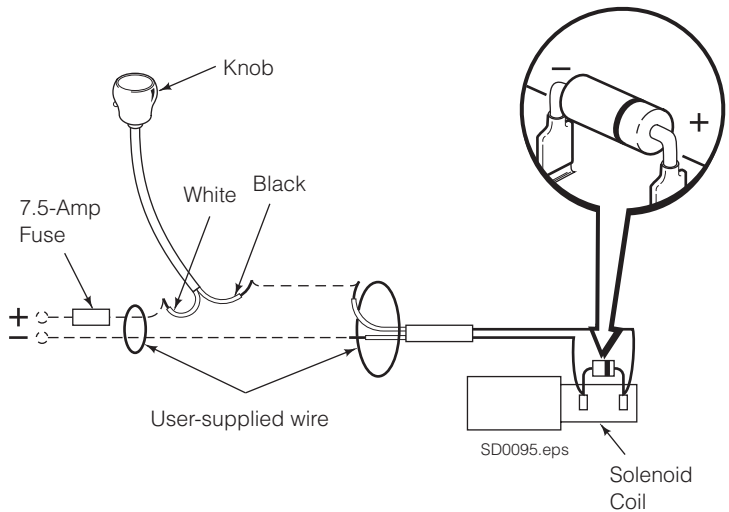
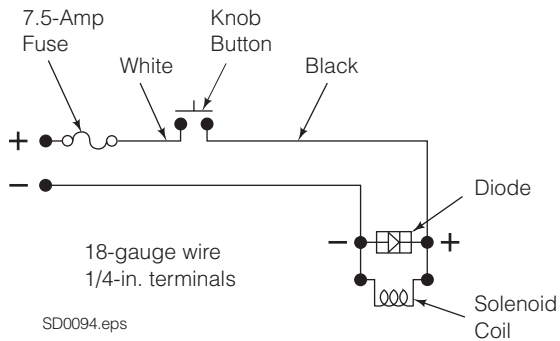
F-SERIES



6 Install solenoid control knob – (Solenoid equipped units)

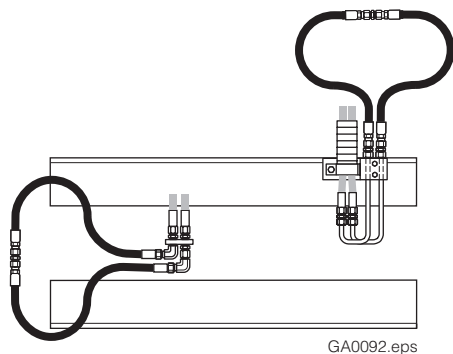


7 Install wiring – (Solenoid equipped units)

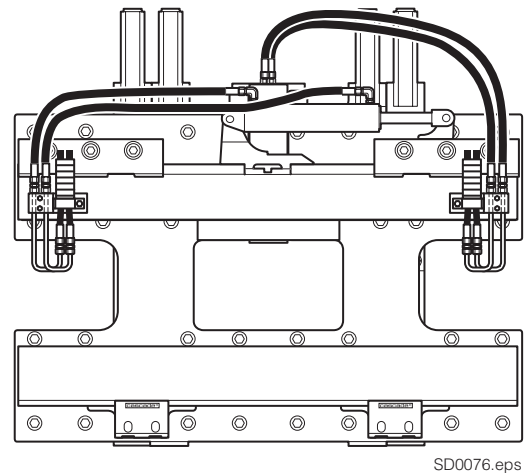


8 Flush hydraulic supply hoses

- A** Install hoses as shown.
- B** Operate auxiliary valves for 30 sec.
- C** Remove hoses.



9 Connect hoses as shown in Step 5 to attachment fittings



10 Check Attachment functions

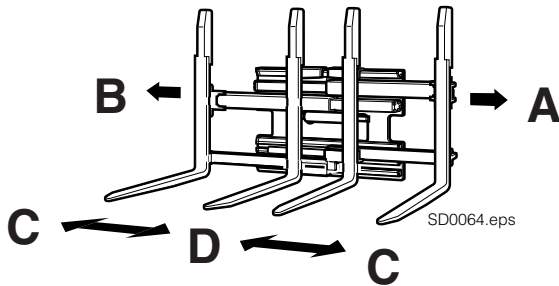
- With no load, cycle all Attachment functions several times.
- Check for operation in accordance with ITA (ISO) standards.
- Lift maximum load and sideshift left and right. Check for smoothness and adequate speed.
- Check for leaks at fittings, valve, manifold and cylinders.



WARNING: Make sure all personnel are clear of the attachment during testing.

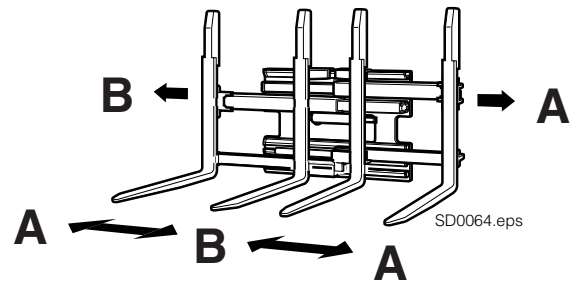
SIDESHIFTING

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

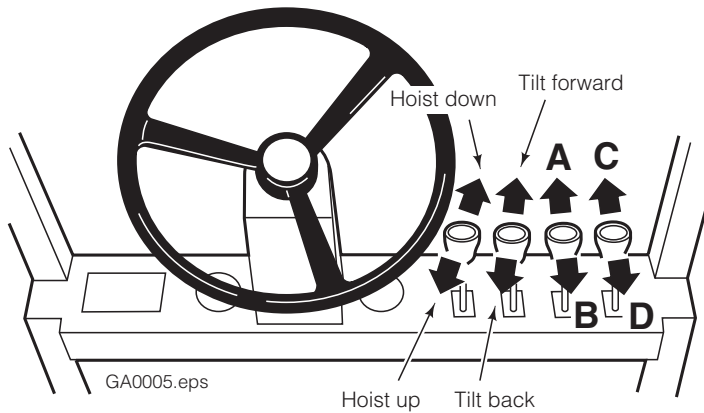


SIDESHIFTING WITH SOLENOID VALVE

- A** Sideshift Left
- A** Spread Forks (press knob button)
- B** Sideshift Right
- B** Retract Forks (press knob button)



Auxiliary Valve Functions



11 Adjust Relief Cartridge

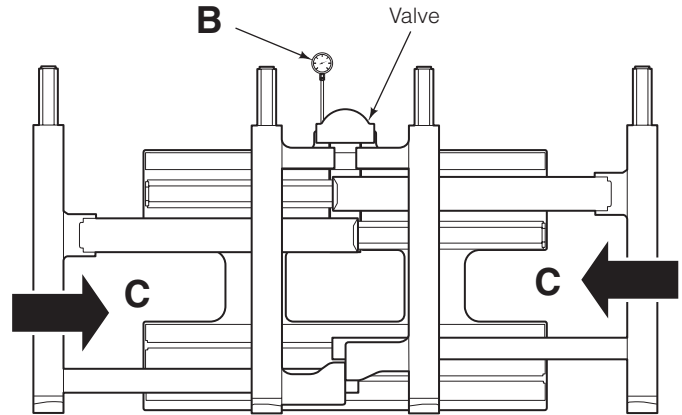
For over-pressure protection, the relief valve cartridge for the FORK POSITION function should be adjusted to match the truck hydraulic flow rate. **MAXIMUM RELIEF VALVE SETTING = 2600 psi (180 bar).**

Fork positioning relief adjustment:

- A** Confirm that the truck pressure is between 2300–2600 psi (160–180 bar).
- B** Install a 3000-psi (200 bar) pressure gauge on the TEST port of the main hydraulic valve (No. 4 O-ring fitting required).
- C** Cycle forks to full open, then slowly close forks fully. Hold lever in the CLOSE position and accelerate engine to develop full system pressure.
- D** Adjust the relief cartridge for an indicated 2300 psi (160 bar). Turn clockwise (CW) to increase pressure, counterclockwise (CCW) to decrease pressure. Tighten jam nut and replace cap.



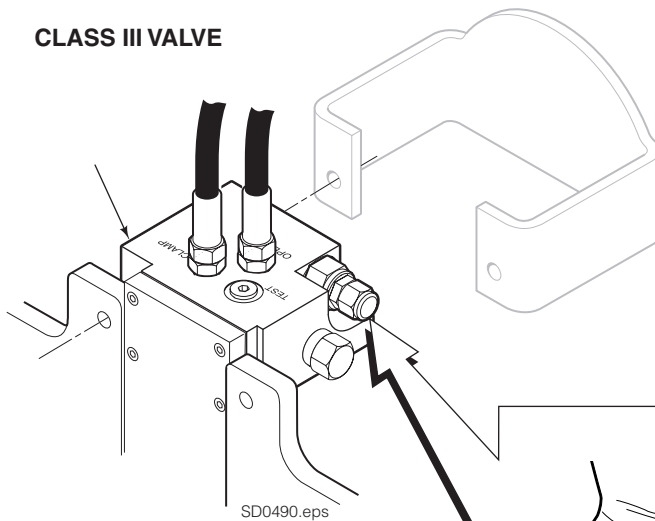
WARNING: Before removing hydraulic lines or components, relieve pressure in the hydraulic system. Turn the truck off and open the truck auxiliary control valves several times in both directions.



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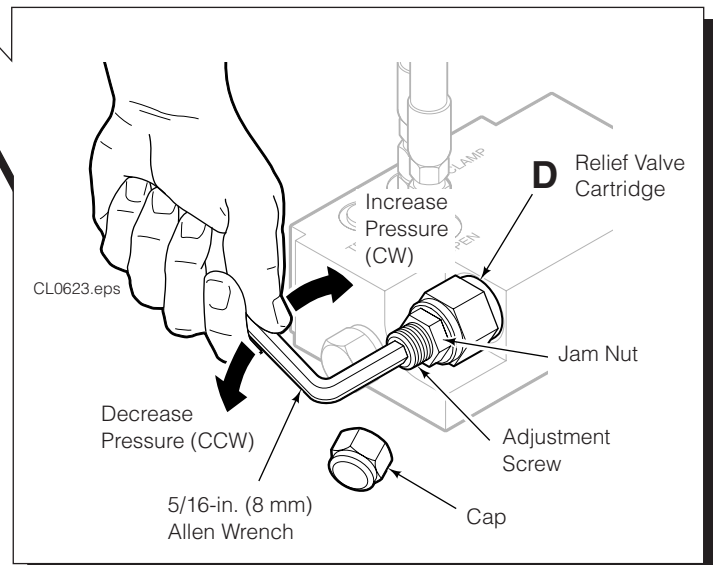
Front View

CLASS III VALVE



SD0490.eps

Back (Driver's) View



CL0623.eps

IMPORTANT: Attachment is prelubed at the factory. Lubrication is not required for installation. If required, silicone spray or light grease is recommended.

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 on the attachment:

- Check for loose or missing bolts, worn or damaged supply hoses and hydraulic leaks.
- Inspect the cylinder rod ends and anchor bars for damage. Anchors operate with a loose clearance and require no lubrication.
- Check for equal movement of the inner and outer forks.

3.2 500-Hour Maintenance

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

- Inspect the inner and outer fork bearing surfaces for wear or damage. Lubricate with silicone spray or light grease as required.
- Rock the inner forks to check for looseness. Install shims as required. See Section 5.2-8.
- Apply chassis grease to the upper bearing grease fittings and lower bearings.
- Check the clearance between the lower mounting hooks and the truck carriage bar:

Quick-Change Hooks – 3/16 in. (4.8 mm) max.

Bolt-on Hooks – 3/32 in. (2.4 mm) min. and 3/16 in. (4.8 mm) max. for sideshifting.

If adjustment is necessary, refer to Installation Step 4. Tighten the lower hook capscrews to 125 ft.-lbs. (170 Nm).

- Inspect the gas springs and inner fork springs for damage or loose fasteners. Replace or tighten fasteners as necessary.

3.3 1000-Hour Maintenance

After each 1000 hours of truck operation, in addition to the 100 and 500-hour maintenance, perform the following procedures:

- Tighten the inner and outer fork capscrews to 225 ft.-lbs. (300 Nm).
- Tighten the frame capscrews to the following torque:

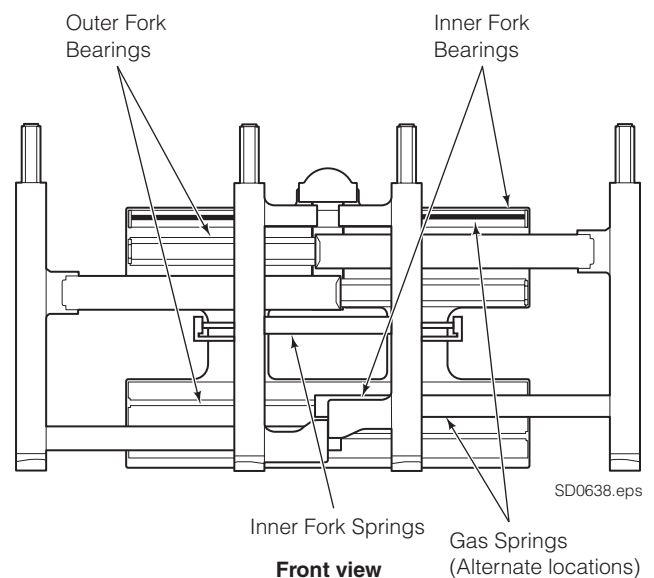
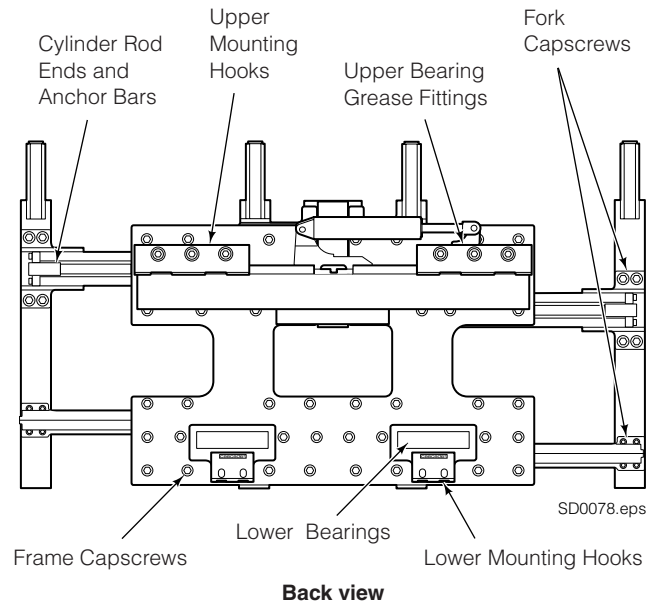
48, 55, 65 (E & F) – 75 ft.-lbs. (100 Nm)

70E, 80E Class III – 130 ft.-lbs. (175 Nm)

80E Class IV – 195 ft.-lbs. (265 Nm)



WARNING: After completing maintenance procedures, always test the Attachment through five 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.



4.1 General Procedures

4.1-1 Truck System Requirements

- Truck hydraulic pressure should be within the pressure range as shown in Section 6.1. **PRESSURE MUST NOT EXCEED 2600 psi (180 bar).**
- Truck hydraulic flow should be within the volume range as shown in Section 6.1-1.
- Truck hydraulic fluid supplied to the Attachment must meet the specifications as shown in Section 6.1-1.

4.1-2 Tools Required (Metric)

In addition to a normal selection of hand tools, the following are required:

- 20 GPM (80 L/min) inline flow meter. (Cascade Flow Meter Kit, part no. 671477).
- 3500 psi (240 bar) pressure gauge. (Cascade Pressure Gauge Kit, part no. 671212).
- Assorted fittings, lines, drain hoses and quick-couplers as required.

4.1-3 Troubleshooting Chart

Determine All The Facts – It is important to gather all the facts about the problem before beginning any service procedures. The first step is to talk to the equipment operator. Ask for a complete description of the malfunction. Guidelines below can then be used as a starting point to begin troubleshooting.

- Forks spread and close unevenly.
 - Forks will not spread or close.
- To correct these problems, see Section 4.3.
- Attachment will not sideshift.
 - Attachment sideshifts slowly.
- To correct these problems, see Section 4.4.

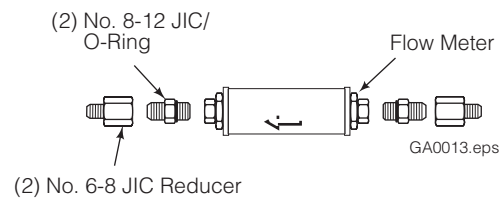


WARNING: Before servicing any hydraulic component, relieve pressure in the system. Turn the truck off and move the truck auxiliary control valves several times in both directions.

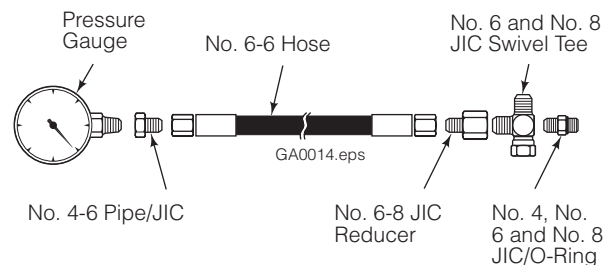
After completing any service procedure, always test the Attachment through several cycles. First test the Attachment empty to bleed any air trapped in the system to the truck tank. Then test the Attachment with a load to be sure it operates correctly before returning to the job.

Stay clear of the load while testing. Do not raise the load more than 4 in. (10 cm) off the floor while testing.

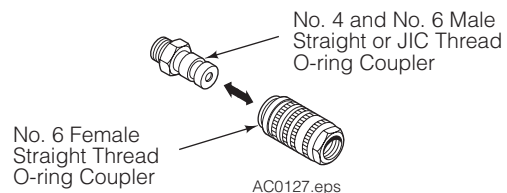
Flow Meter Kit 671477



Pressure Gauge Kit 671212

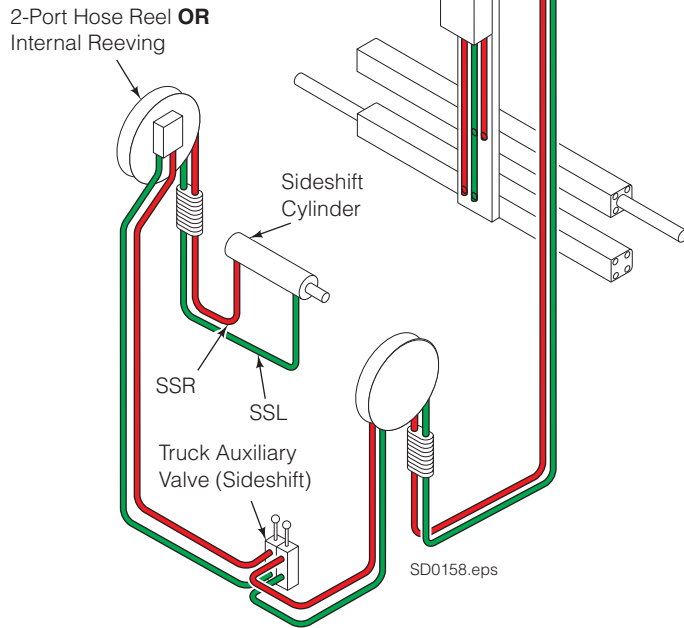


Quick-Coupler



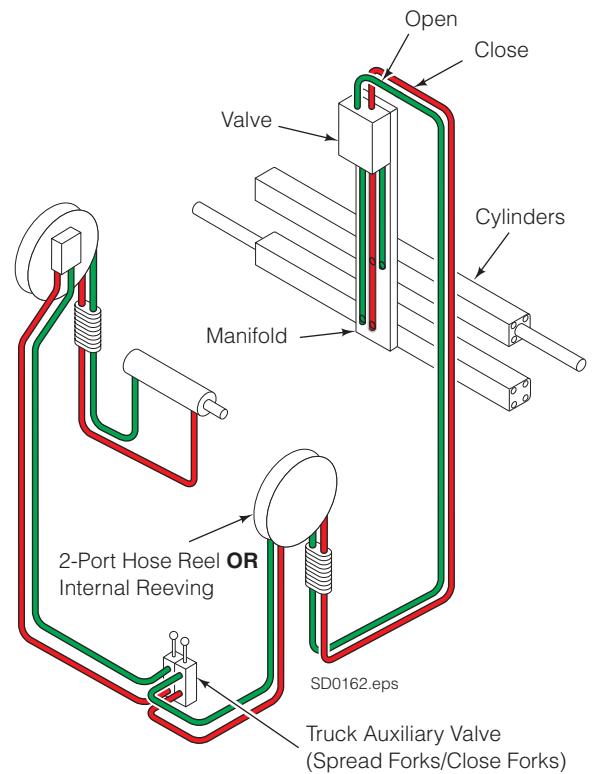
4.2 Plumbing

4.2-1 Hosing Diagram



**SIDESHIFT RIGHT,
CLOSE FORKS**

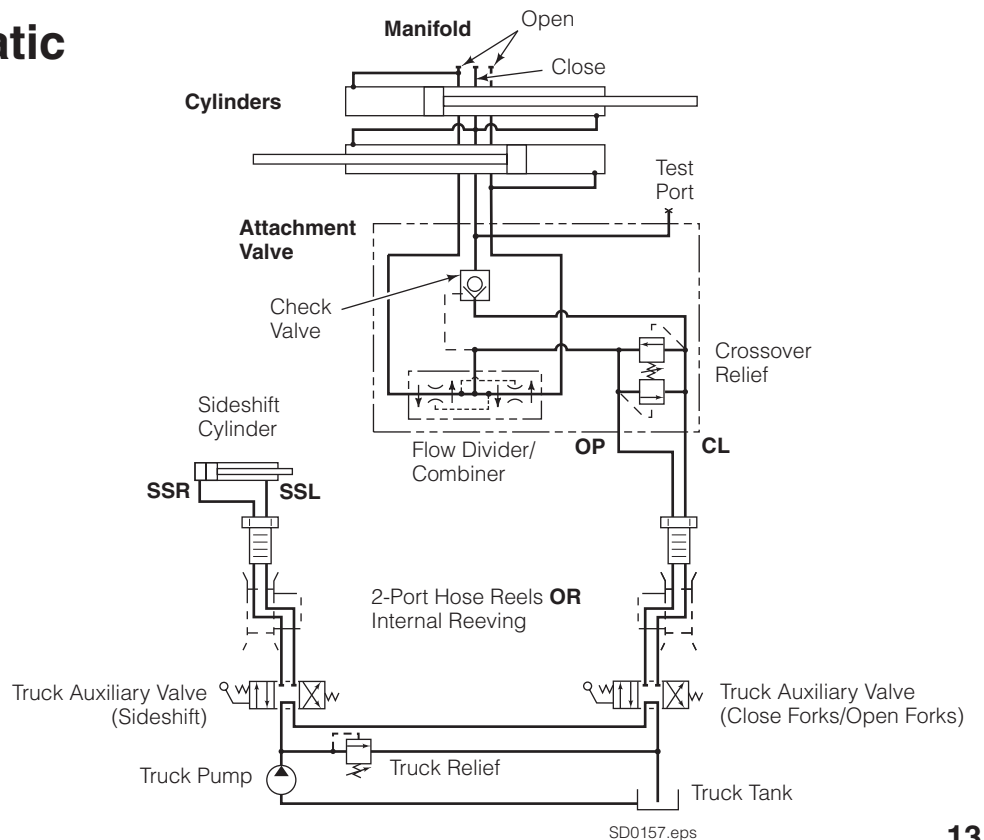
Pressure: █
Return: █



**SIDESHIFT LEFT,
OPEN FORKS**

Pressure: █
Return: █

4.2-2 Circuit Schematic



4.3 Fork Position Function

There are six potential problems that could affect the fork positioning function:

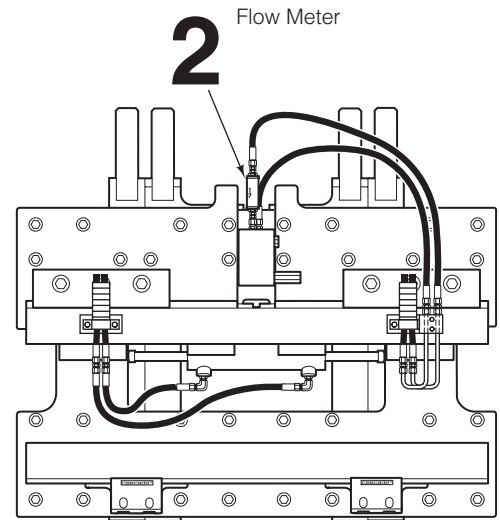
- Bent arm bars.
- Incorrect hydraulic pressure or flow from lift truck.
- Defective gas cylinders.
- External leaks.
- Defective solenoid coil or valve (if equipped).
- Worn/defective cartridge valves or cylinder seals.



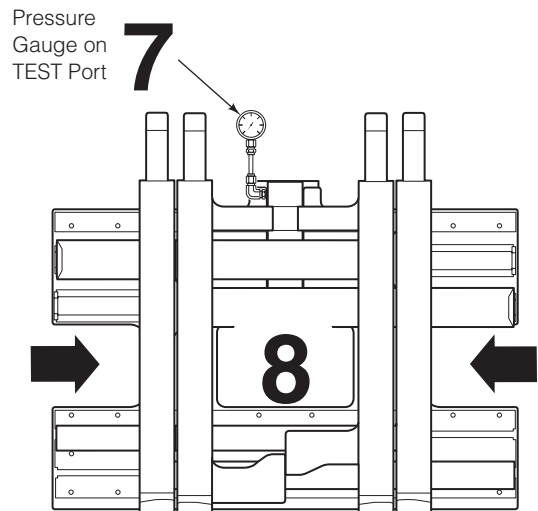
WARNING: Before removing hydraulic lines or components, relieve pressure in the hydraulic system. With the truck off, open the truck auxiliary control valves several times in both directions.

4.3-1 Fork Position Circuit Test

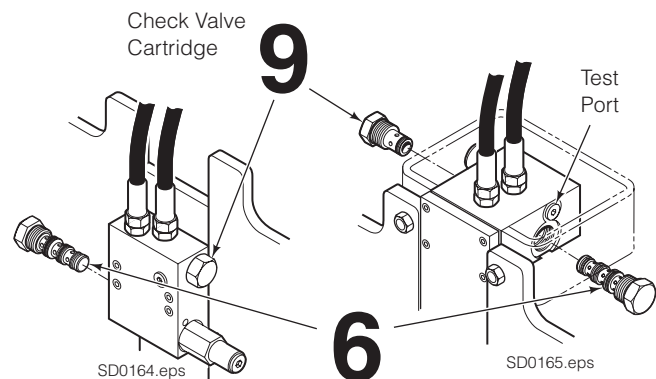
- 1 Check the truck pressure at the carriage hose terminal. Pressure must be within 100 psi (7 bar) of the specifications in the truck service manual. **TRUCK PRESSURE MUST NOT EXCEED 2600 psi (180 bar).** See Section 6.1 for recommended operating pressure.
- 2 Check the flow volume at the carriage hose terminal. See Section 6.1 for recommended flow volume.
- 3 Spread the forks and check that the inner forks remain in contact with the outer forks until reaching their stops. If they do not, the gas cylinders or spring cylinders are faulty. Replace the gas cylinders (see Section 5.7-2 or 3) or spring cylinders (see Section 5.7-5).
- 4 Spread the forks fully and hold the lever in the OPEN position for 2 seconds. Release the lever and check for external leaks at fittings, hoses, valve and manifold.
- 5 Press the solenoid button (if equipped) and listen for a 'click' at the solenoid valve. If no sound is heard, check the fuse, wiring and coil (see Section 4.5).
IMPORTANT: Solenoid-operated valves must be plumbed so that the solenoid is energized during the fork positioning function.
- 6 Open and close the forks fully. If the arms move at different speeds, the flow divider/combiner cartridge may be faulty. Replace the cartridge.
- 7 Turn the truck off and connect a 3500 psi (240 bar) pressure gauge to the TEST port on the main valve.
- 8 Start the truck and close the forks fully. Hold the lever in the CLOSE position for a few seconds.
- 9 Release the lever and watch the pressure gauge:
 - If the pressure drop **is less** than 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, the problem is not hydraulic (see Section 4.1-3).
 - If the pressure drop **is more** than above, the check valve cartridge may be faulty. Replace the cartridge.
- 10 Close the forks fully and hold the lever in the CLOSE position for a few seconds. If the pressure still drops as before, the cylinders are at fault and must be serviced



SD0150.eps



SD0149.eps



SD0164.eps

SD0165.eps

55E CLASS II, 70E VALVE

Flow Divider
Cartridge

45E, 55E CLASS III,
60E, 80E, F-SERIES
VALVE

4.4 Sideshift Function

There are five potential problems that could affect the sideshifting function:

- Inadequate sideshifter upper bearing lubrication or worn bearings (see Section 5.7-1).
- Incorrect hydraulic pressure or flow from lift truck.
- External leaks.
- Lower mounting hooks installed incorrectly (see Section 5.1 Step 6).
- Worn or defective cylinder seals.

4.4-1 Sideshift Circuit Test

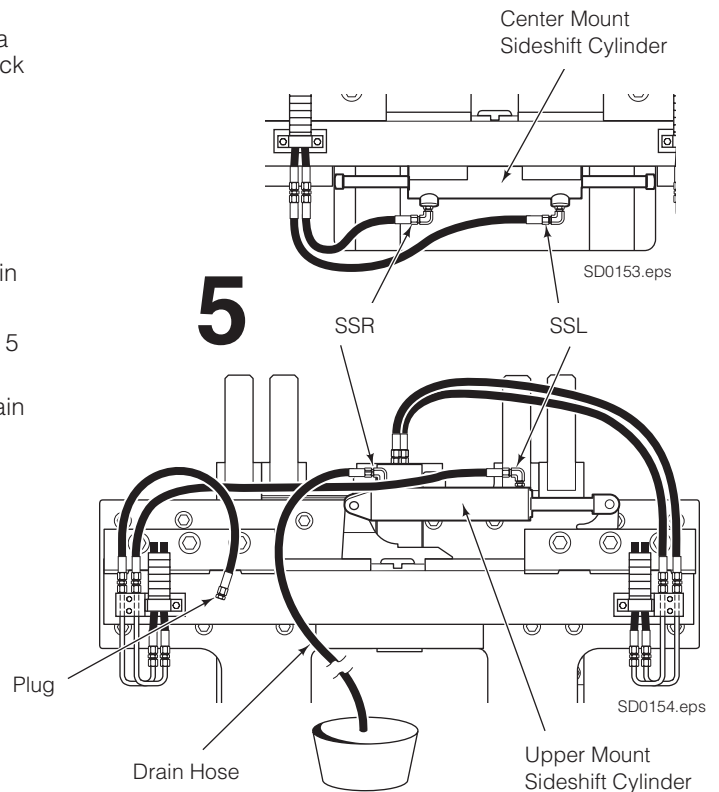
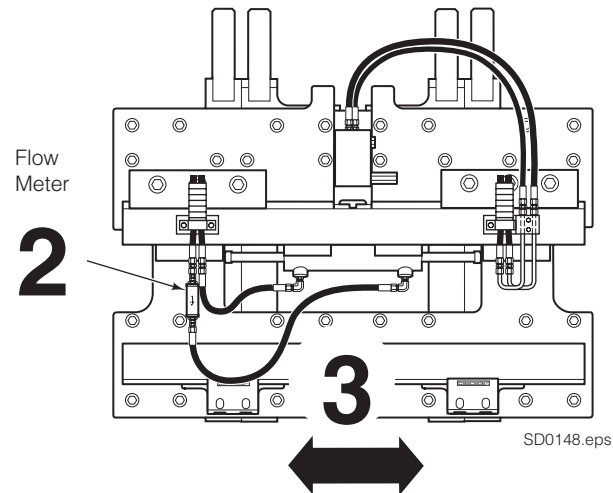
- 1 Check the truck pressure at the carriage hose terminal. Pressure must be within 100 psi (7 bar) of that specified in the truck service manual. **TRUCK PRESSURE MUST NOT EXCEED 2600 psi (180 bar)**. See Section 6.1 for recommended operating pressure.
- 2 Check the flow volume at the carriage hose terminal. See Section 6.1 for recommended flow volume.
- 3 Sideshift left or right fully, holding the lever in the SIDESHIFT position for a few seconds. Release the lever and check for external leaks at fittings, hoses, valve and manifold.
- 4 Press the solenoid button (if equipped) and listen for a 'click' at the solenoid valve. If no sound is heard, check the fuse, wiring and coil (see Section 4.5).

IMPORTANT: Solenoid-operated valves must be plumbed so that the solenoid is energized during the fork positioning (not sideshifting) function.

- 5 Turn the truck off and relieve system pressure. Disconnect the SIDESHIFT RIGHT supply hose from the sideshift cylinder. Plug the hose end. Install a drain hose from the cylinder fitting to a catch bucket.
- 6 Start the truck. Actuate the SIDESHIFT LEFT lever for 5 seconds.
 - If there is **substantial hydraulic flow** out of the drain hose, the sideshift cylinder is faulty and requires service (see Section 5.3).
 - If there is **no hydraulic flow** out of the hose, the problem is not hydraulic (see Section 4.1-3).



WARNING: Before removing hydraulic lines or components, relieve pressure in the hydraulic system. Turn the truck off and open the truck auxiliary control valves several times in both directions.



Back (Driver's) View

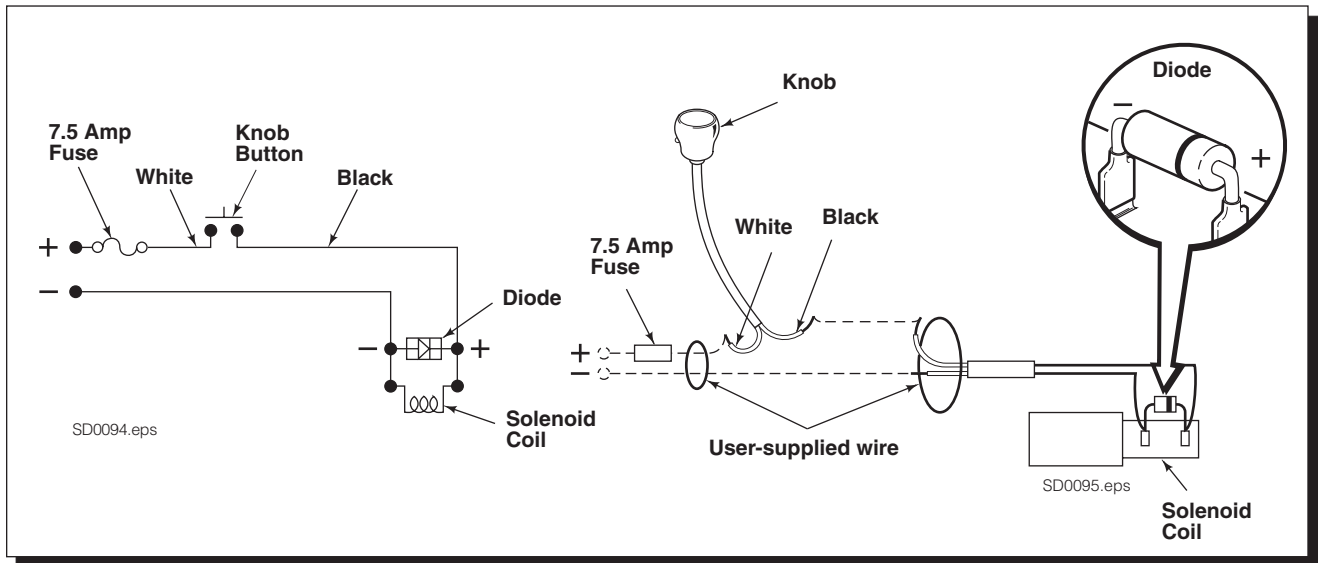
4.5 Electrical Circuit (Solenoid-equipped attachments)

Use the schematic shown and follow the steps below.

- 1 Check the control knob circuit fuse. Replace if necessary.
- 2 Check for loose electrical connections at the truck ignition switch, control knob button, solenoid coil terminals and diode.
- 3 Remove the diode from the solenoid coil terminal. Test with an ohmmeter for high resistance in one direction and no resistance in the other direction. If there is no resistance in both directions, replace the diode.

NOTE: When replacing the diode, the banded end must be connected to the coil and wiring as shown.

- 4 Disconnect the electrical leads from the solenoid coil terminals. Use a voltmeter to take a current reading at the electrical lead terminals when the button is depressed.
 - If there is **no current** to the solenoid, troubleshoot the electrical circuit for shorts.
 - If there is **current** to the solenoid, test for coil continuity.
- 5 Test for coil continuity by placing an ohmmeter test lead on each solenoid coil terminal (ohmmeter on Rx1 scale).
 - If there is an ohmmeter reading, the coil is good.
 - If the coil is good, but the solenoid does not 'click' when the control button is depressed, the solenoid cartridge may be jammed.
 - If there is no ohmmeter reading, the coil is defective and should be replaced.



5.1 Attachment Removal

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



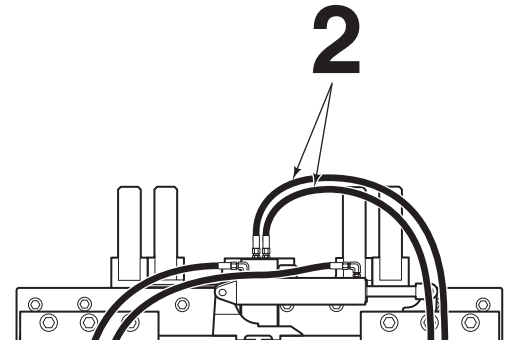
WARNING: Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then actuate the truck control valve several times in both directions.

- 2 Disconnect the supply hoses from the valve and sideshift cylinder fittings. Tag hoses for reassembly.
- 3 Remove the lower mounting hooks.

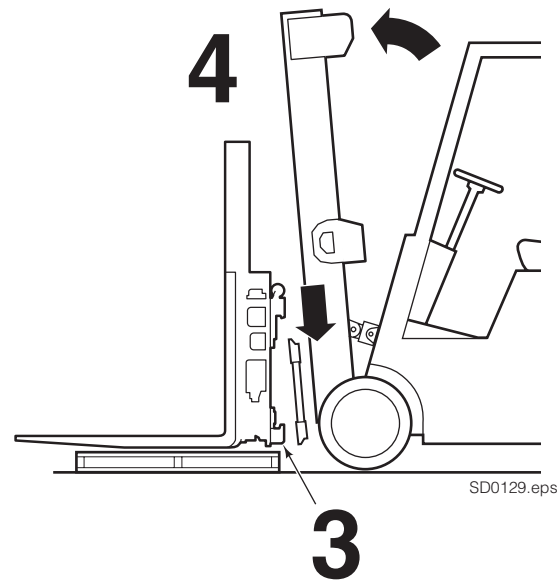
Quick Disconnect Hooks - Remove the pins to lower the hooks.

Bolt-On Hooks - Remove the capscrews fastening the hooks to the baseplate. For reassembly, install the lower hooks to the truck lower carriage bar leaving .09 in. (2.5 mm) clearance for sideshifting. Tighten the hook capscrews to a torque of 125 ft.-lbs. (170 Nm).

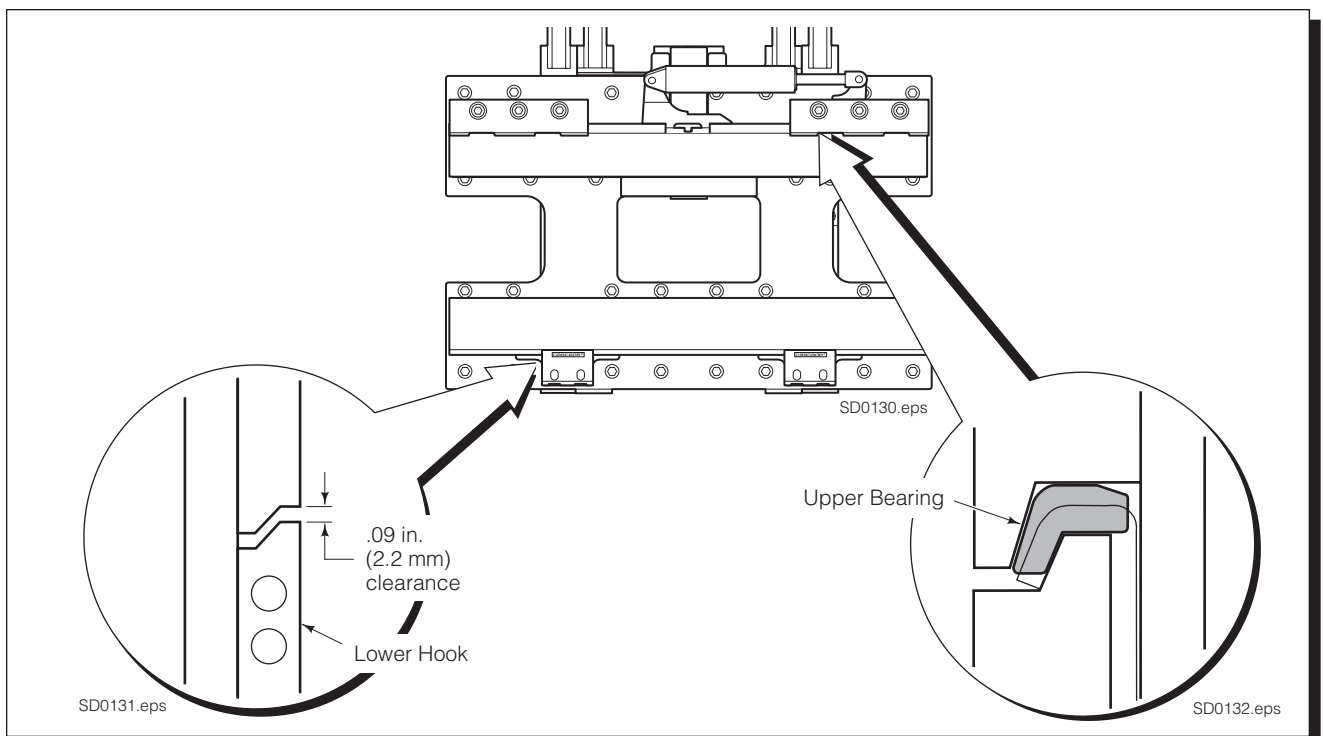
- 4 Position the attachment over a pallet. Lower the attachment onto the pallet. Tilt the truck carriage forward and back away.
- 5 For installation, reverse the above procedures except for the following special instructions:
 - Clean the upper and lower bearings and bearing contact surfaces.
 - Locate the upper bearings in the anchor bracket cutouts. Be careful not to install the bearings backwards.



SD0128.eps



SD0129.eps



SD0130.eps


SD0131.eps

SD0132.eps

5.2 Forks

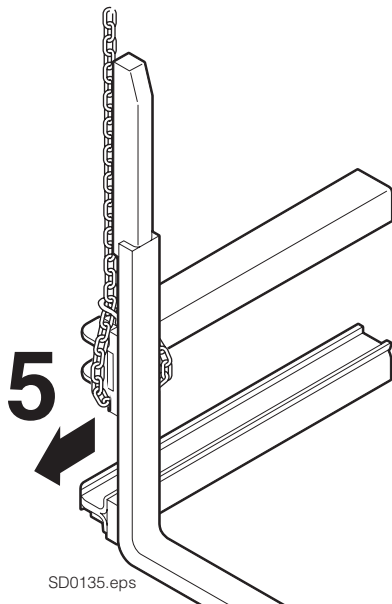
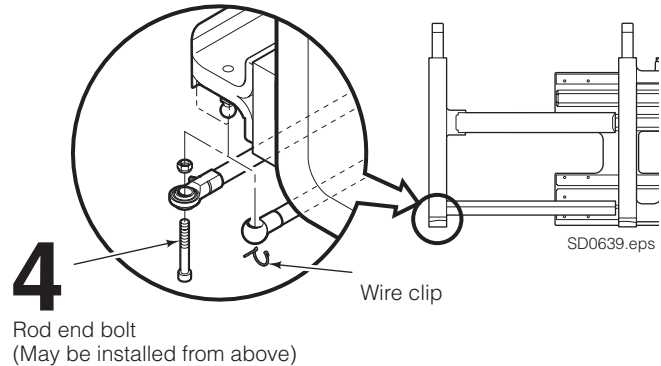
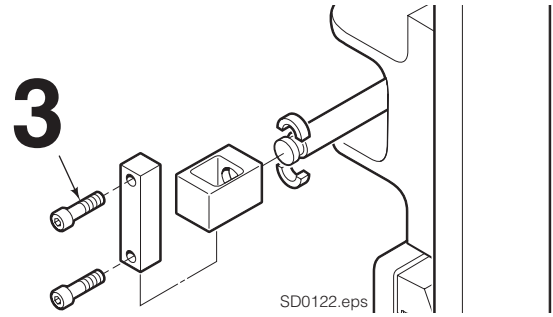
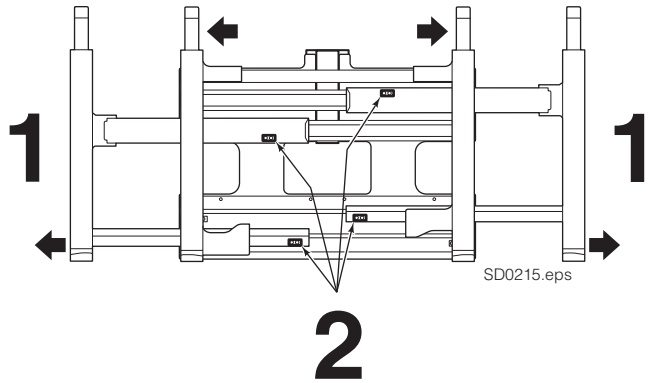
5.2-1 Outer Fork Removal

- 1 Extend the outer forks outside the width of the frame. Position the forks .5 in. (12 mm) above the floor.
- 2 Remove the bolt-on stops from the outer fork arms. For reassembly, clean and dry capscrews and threaded holes. Apply Loctite 242 (blue) to the capscrew threads and tighten to a torque of:
 - 48E/55E/60E/80E – 30 ft.-lbs. (40 Nm)
 - 48F/55F/60F/70E – 48 ft.-bs. (65 Nm)
- 3 Open the outer forks to full width. Remove the capscrews fastening the cylinder rod anchor bars to the outer forks. For reassembly, tighten capscrews of:
 - 48/55/60 (E & F) – 30 ft.-lbs. (40 Nm)
 - 70E/80E – 50 ft.-lbs. (70 Nm)



WARNING: The outer forks must be fully extended prior to disconnecting the gas cylinder rod end.


- 4 **Units with Serial No.s less than 55E-FD-500**
Disconnect the gas spring rod end from the anchor by removing the wire clip or rod end bolt.
- 5 Attach a suitable overhead hoist around the fork. Pull the fork assembly out of the frame.
- 6 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.
- 7 For reassembly, reverse the above procedures.



5.2-2 Inner Fork Removal

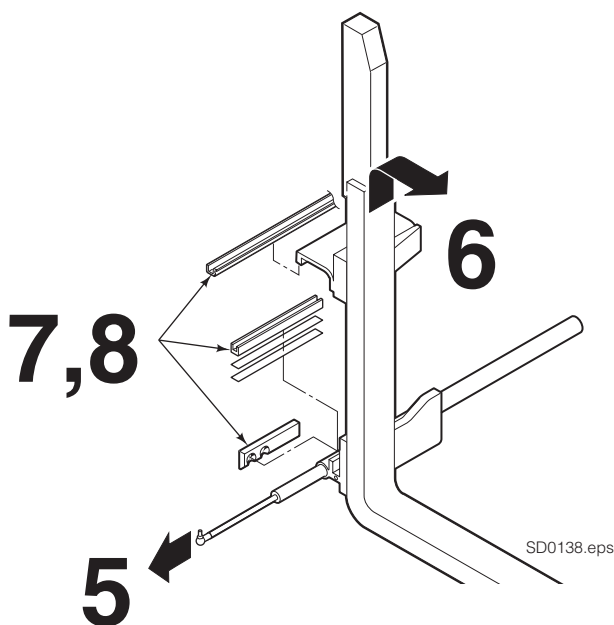
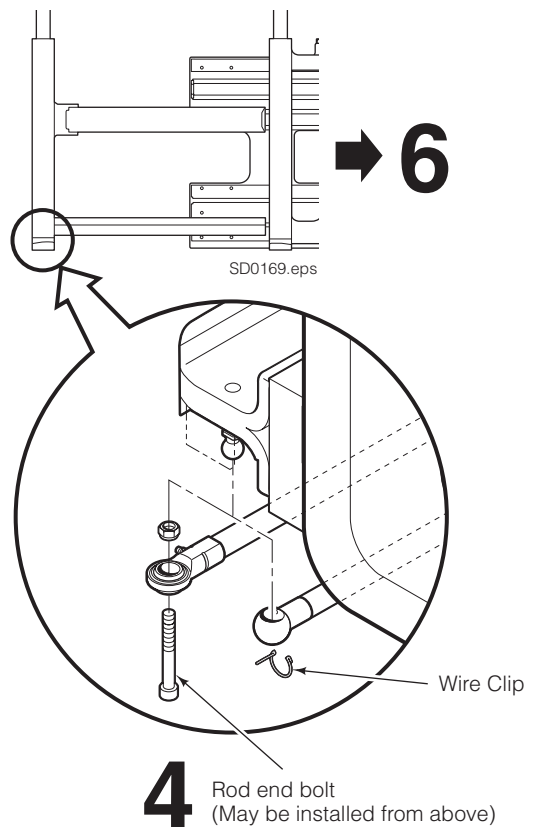
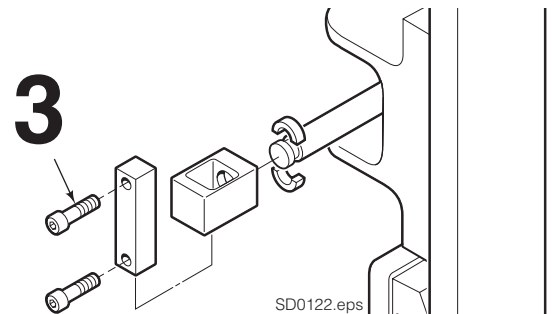
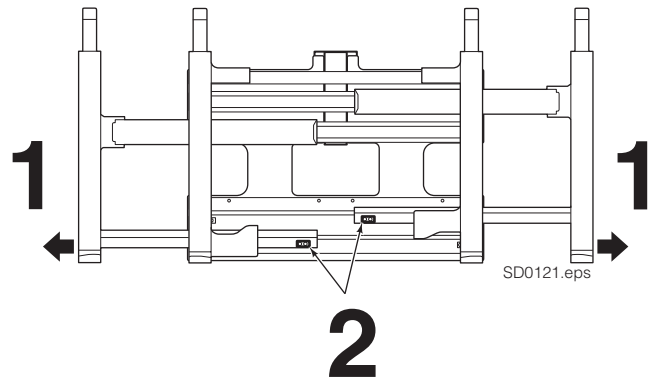
Serial numbers less than 55E-FD-500

- 1 Extend the outer forks outside the width of the frame. Position the forks .5 in. (12 mm) above the floor.
- 2 Remove the bolt-on stops from the outer fork lower arms. For reassembly, tighten the capscrews to a torque of 30-ft.-lbs. (40 Nm).
- 3 Open the outer forks to full width. Remove the capscrews fastening the cylinder rod anchor bars to the outer forks. For reassembly, apply Loctite 242 to the capscrew threads then tighten them to a torque of 30 ft.-lbs. (40 Nm).



WARNING: The outer forks must be fully extended prior to disconnecting the gas cylinder rod end.

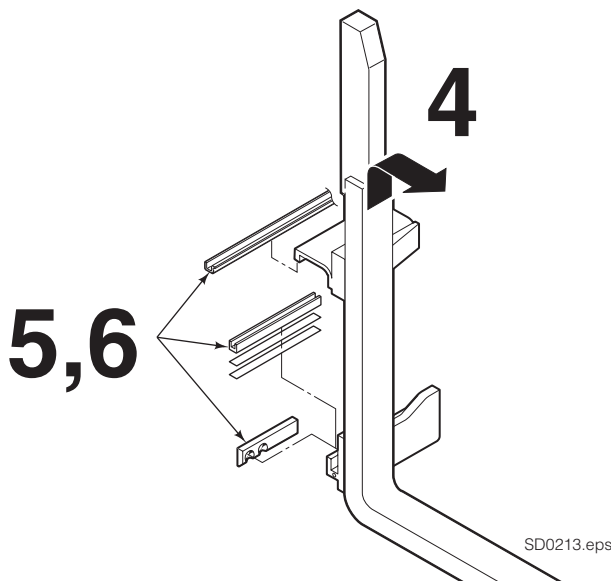
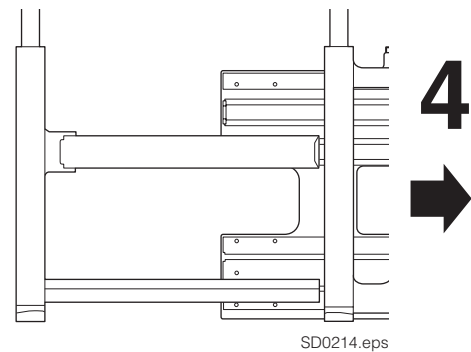
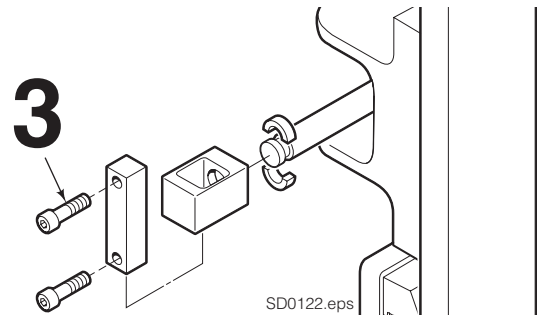
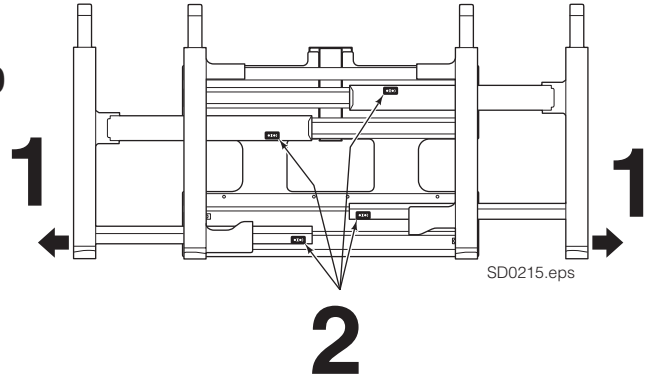
- 4 Disconnect the gas spring rod end from the outer fork anchor by removing the wire clip or rod end bolt.
- 5 Remove the gas spring by pulling with a quick jerk to disengage the base end from the anchor.
- 6 Move the inner fork to center then lift up to remove.
- 7 Inspect the arm bearings for wear. If the bearing are worn in any area to less than .06 in. (1.5 mm), they should be replaced.
- 8 For reassembly, reverse the above procedures except as follows:
 - Refer to Section 5.2-8 for properly shimming inner lower hooks.



5.2-3 Inner Fork Removal

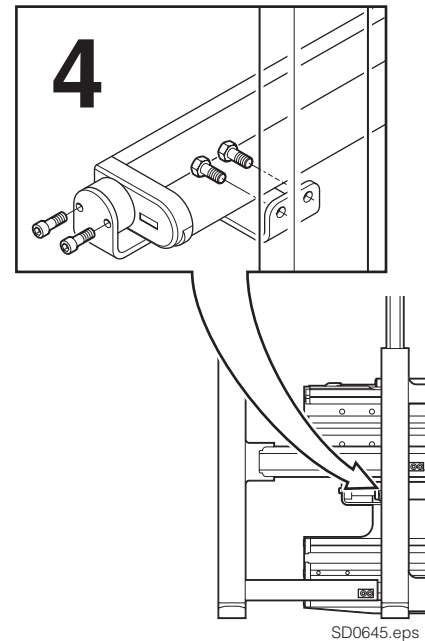
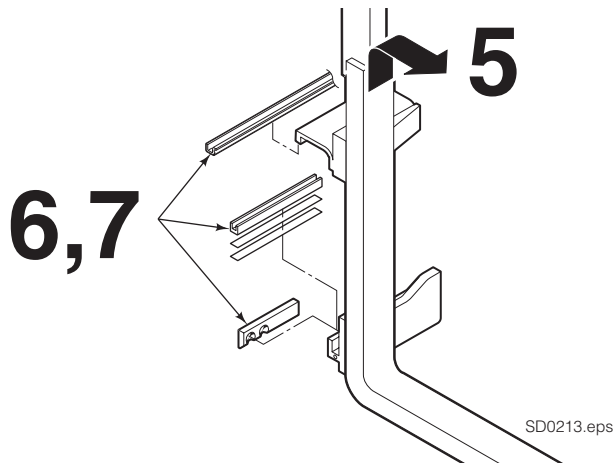
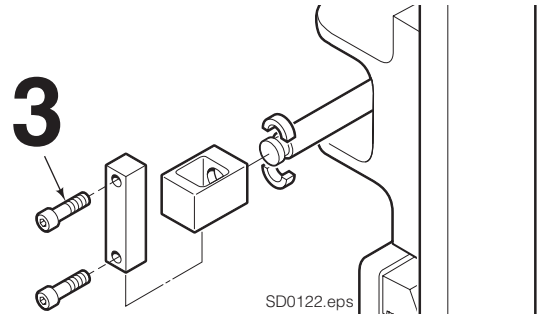
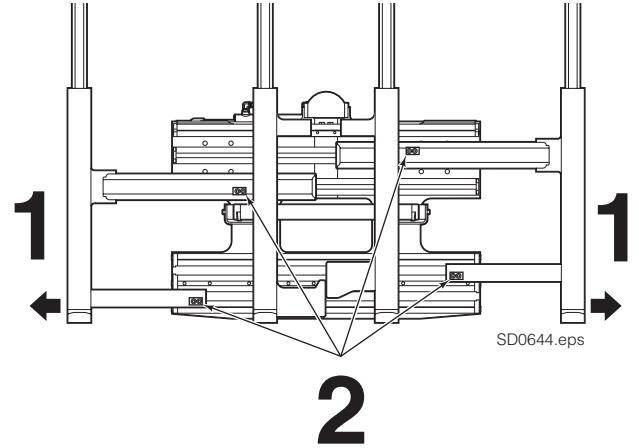
Serial Numbers greater than 55E-FD-499 and 70E/80E

- 1 Extend the outer forks outside the width of the frame. Position the forks .5 in. (12 mm) above the floor.
- 2 Remove the bolt-on stops from the outer fork arms. For reassembly, clean and dry capscrews and threaded holes. Apply Loctite 242 (blue) to the capscrew threads and tighten to a torque of:
 - 55E/80E – 30 ft.-lbs. (40 Nm)
 - 70E – 48 ft.-lbs. (65 Nm)
- 3 Open the outer forks to full width. Remove the capscrews fastening the cylinder rod anchor bars to the outer forks. Tighten capscrews to a torque of:
 - 55E – 30 ft.-lbs. (40 Nm)
 - 70E/80E – 50 ft.-lbs. (70 Nm)
- 4 Move the inner fork to center then lift up to remove. The upper gas cylinders will disengage with inner fork bracket.
- 5 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.
- 6 For reassembly, reverse the above procedures except as follows:
 - Place the rod end of the upper gas cylinders in the pockets of the inner fork brackets.
 - Refer to Section 5.2-8 for properly shimming inner lower hooks.



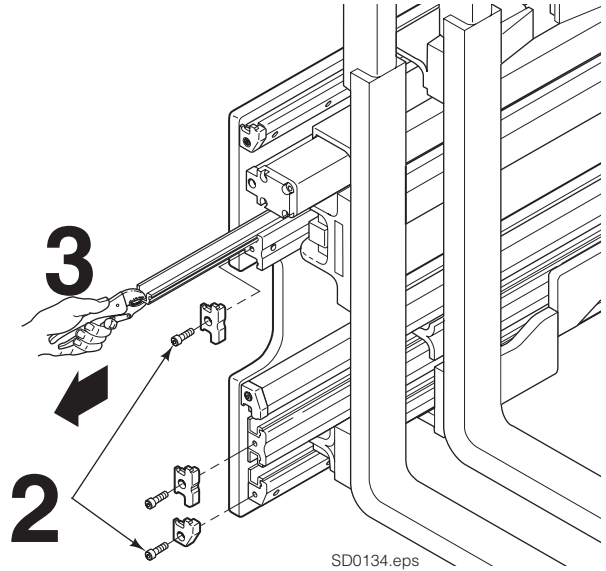
5.2-4 Inner Fork Removal 48E/60E, 55E-FDS, and all F-Series

- 1 Extend the outer forks outside the width of the frame. Position the forks .5 in. (12 mm) above the floor.
- 2 Remove the bolt-on stops from the outer fork arms. For reassembly, clean and dry capscrews and threaded holes. Apply Loctite 242 (blue) to the capscrews threads and tighten to a torque of:
 - 48E/55E/60E – 30 ft.-lbs. (40 Nm)
 - 48F/55F/60F – 48 ft.-bs. (65 Nm)
- 3 Open the outer forks to full width. Remove the capscrews fastening the cylinder rod anchor bars to the outer forks. Tighten capscrews to a torque of 30 ft.-lbs. (40 Nm).
- 4 Remove spring cylinder bracket from inner forks. For reassembly, apply Loctite 242 blue to capscrews and tighten to 30 ft.-lbs (40 Nm).
- 5 Move the inner fork to center then lift up to remove.
- 6 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.
- 7 For reassembly, reverse the above procedures except as follows:
 - Refer to Section 5.2-8 for properly shimming inner lower hooks and setting adjusting screw (if equipped).



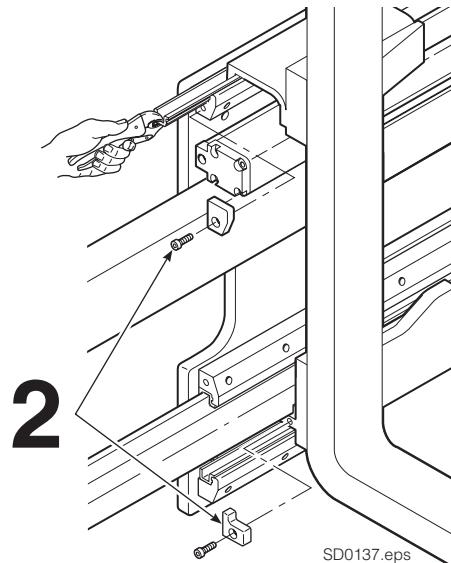
5.2-5 Outer Fork Bearing Service

- 1 Fully close the outer forks.
- 2 Remove the capscrews from the bearing retainers. For reassembly, clean and dry capscrews and threaded holes. Apply Loctite 242 (blue) to capscrews and tighten to a torque of:
48E/55E/60E – 30 ft.-lbs. (40 Nm)
70E/80E/48F/55F/60F – 15 ft.-bs. (20 Nm)
- 3 Remove and replace one bearing at a time. Grab the end of the bearing with vise grips to remove.
- 4 For reassembly, reverse the above procedures.



5.2-6 Inner Fork Bearing Service

- 1 Position outer forks just outside the width of the frame.
- 2 Remove the inner fork bearing retainers. For reassembly, clean and dry capscrews and threaded holes. Apply Loctite 242 (blue) to capscrews and tighten to a torque of:
48E/55E/60E – 30 ft.-lbs. (40 Nm)
70E/80E (Upper Retainers) – 30 ft.-bs. (40 Nm)
70E/80E (Lower Retainers) – 15 ft.-bs. (20 Nm)
48F/55F/60F – 15 ft.-bs. (20 Nm)
- 3 Remove and replace one bearing at a time. Grab the end of the bearing with vise grips to remove.
- 4 For reassembly, reverse the above procedures except as follows:
 - Refer to Section 5.2-8 for properly shimming inner lower hooks.



5.2-7 Fork Tip Alignment

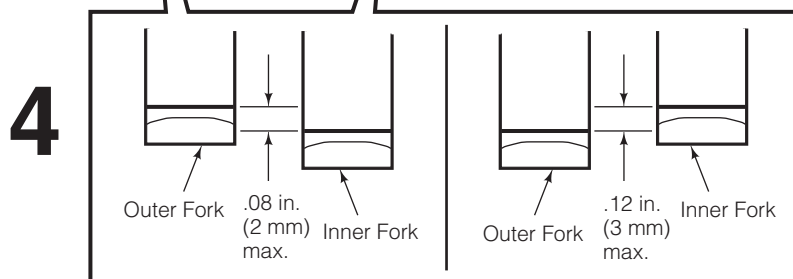
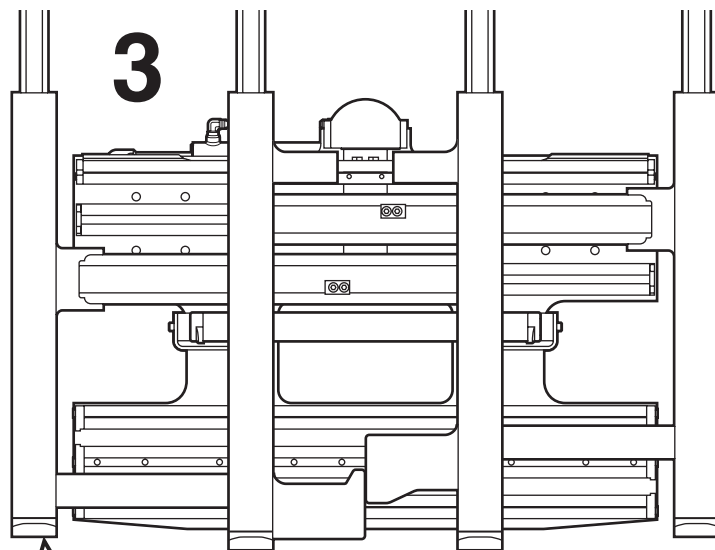
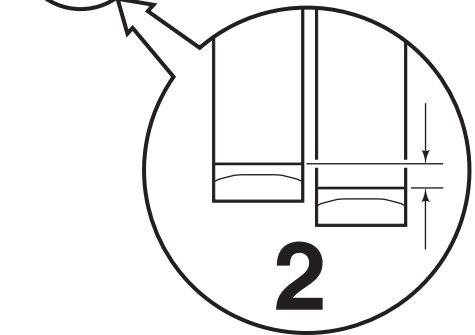
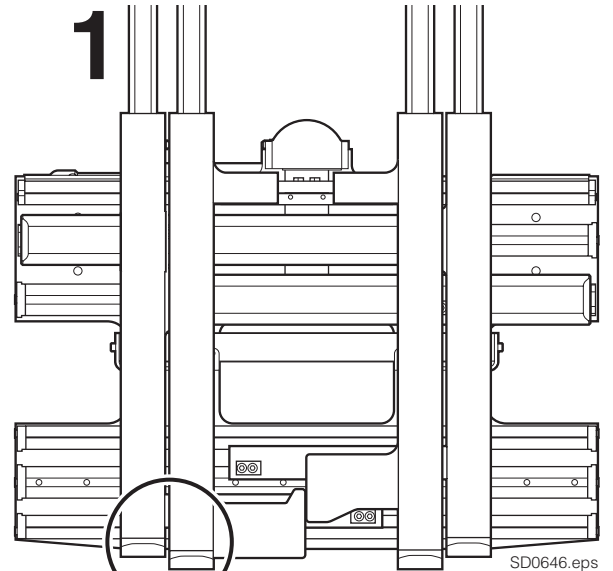
- 1 Fully close forks.
- 2 Measure the vertical offset of the forks 5 in. (125 mm) from the tip of the forks. Outer forks can have a maximum vertical offset of .2 in. (5 mm) from the inner fork. The inner fork must be **lower** than the outer fork.
- 3 Fully open forks.
- 4 Measure the vertical offset of the forks. Outer fork can have a maximum vertical offset of .08 in. (2 mm) **above** or .12 in. (3 mm) **below** the inner fork.
- 5 To align arm bars, remove forks from arm bars. For reassembly, tighten capscrews to 220 ft.-lbs. (300 Nm).

IMPORTANT: For 70E, 80E, and F-Series apply Loctite 242 (blue) to capscrew threads for reassembly.

- 6 Place shims where needed. To lower fork tips, add shim(s) to the upper arm bar. To raise fork tips, add shim (shims) to lower arm bar.

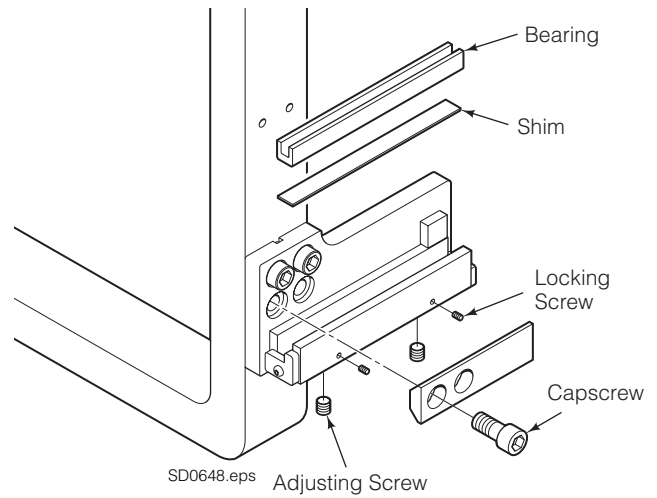
IMPORTANT: Do not exceed 3 mm of shimming.

Series	Shim Part Numbers	
	Upper Arm Bars	Lower Arm Bars
48E/55E/60E	797610	797611
70E/80E	6108554	6108555
48F/55F/60F	797610	797611



5.2-8 Inner Fork Shimming

- 1 Rock the inner forks to check for looseness.
- 2 Install shims as required to remove looseness. Use Shim kit 219316 for E-Series attachments and shim 228395 for F-Series attachments. For E-Series, shim packs should not exceed .25 in (6 mm) of shims.
- 3 Position the arm bars by hand. If the arm bars will not move with minimum force, check the following:
 - Check the adjusting screws (if equipped). If the adjusting screws are loose and the arm bars are tight, the lower hooks may need to be inspected.
 - Check the inner fork timing. If the arm bars move without the forks stops engaged, the bearing may need to be loosened.
 - Arm bars that can not be positioned with minimal force, should be inspected for further interferences.
- 4 If equipped, install locking screws into adjusting screws. Tighten locking screw approximately one-quarter turn after locking screw engages the adjusting screw.



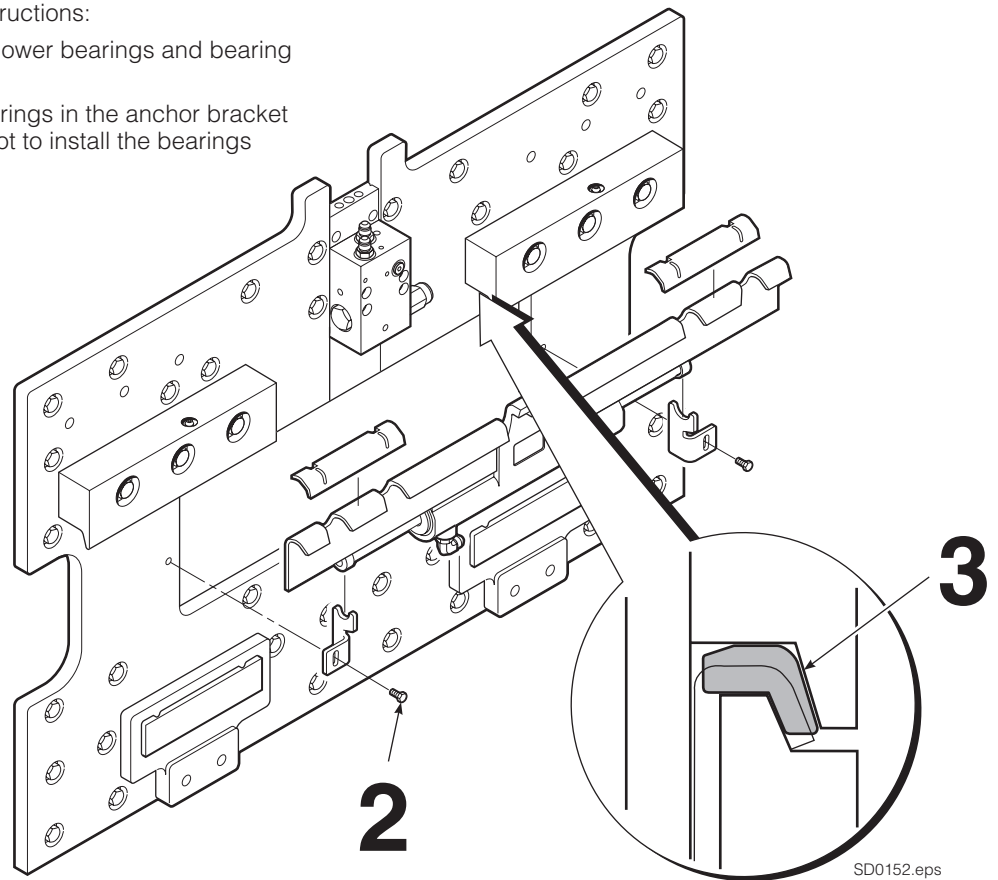
5.3 Sideshift Cylinder-Center Mount

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 Remove the attachment from the truck as described in Section 5.1.
- 2 Loosen the support bracket capscrews. Lift away the cylinder. For reassembly, tighten the capscrews to a torque of:
 - 48E/55E** – 22 ft.-lbs. (30 Nm) ▲
 - 70E/80E** – 15 ft.-lbs. (20 Nm)▲ Apply Loctite 242 (Blue) to threads.
- 3 For reassembly, reverse the above procedures except for the following special instructions:
 - Clean the upper and lower bearings and bearing contact surfaces.
 - Locate the upper bearings in the anchor bracket cutouts. Be careful not to install the bearings backwards.



5.3-2 Cylinder Disassembly

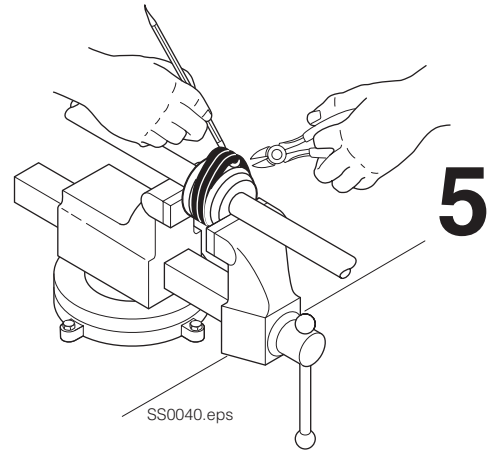
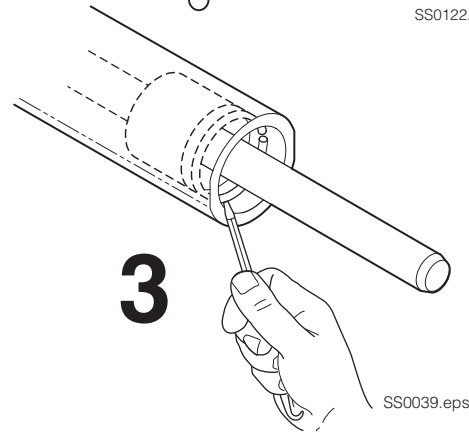
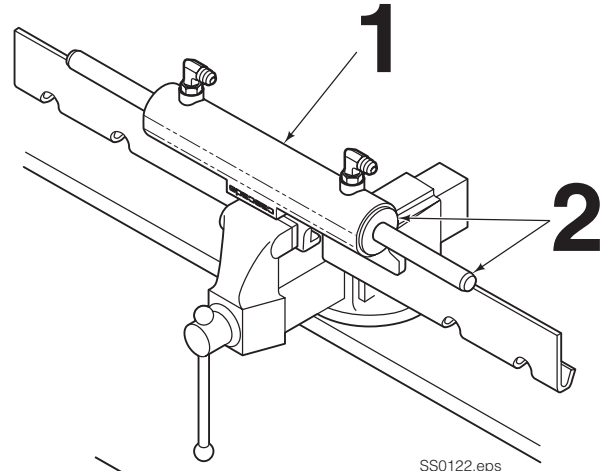
- 1** Clamp the cylinder in a soft-jawed vise. Do not clamp on the cylinder shell.
- 2** Center the cylinder rod in the cylinder. Remove the spiral snap rings from the retainers. See the illustration below.
- 3** Tap the retainers into the shell approximately 2 in. (50 mm). Remove the retaining rings by prying one end up and working the ring out of the groove.

Service Tool Kit 674424 includes two double-ended brass tools that make seal and retaining ring removal easy and won't damage the cylinder components with dents or scratches.

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 or between two blocks of wood to remove the seals. Pry the seals up with a brass tool. Cut the seals to remove.

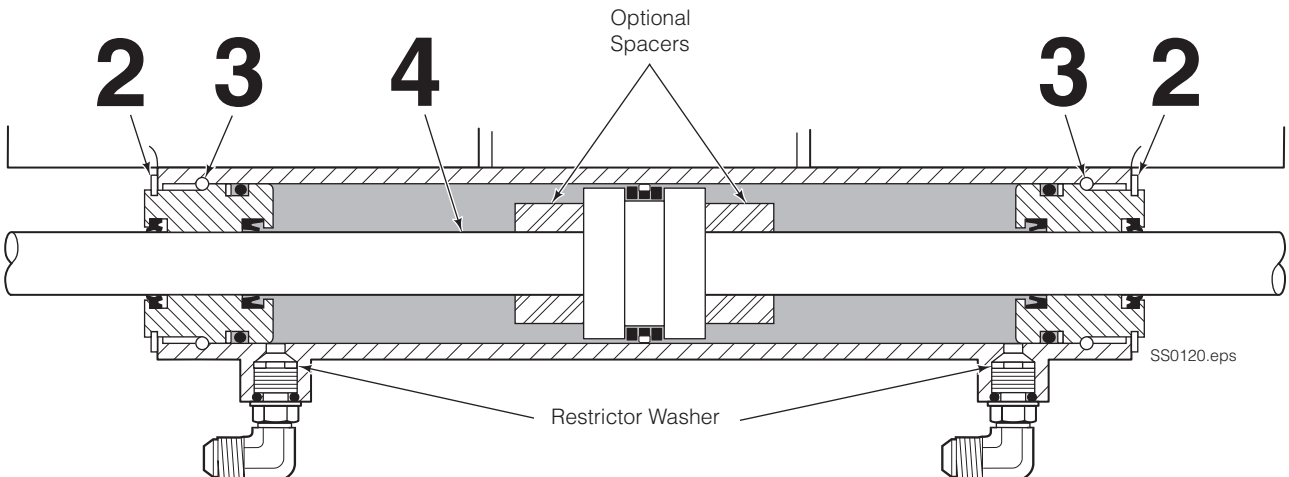
CAUTION: Do not scratch the seal grooves.



5.3-3 Cylinder Inspection

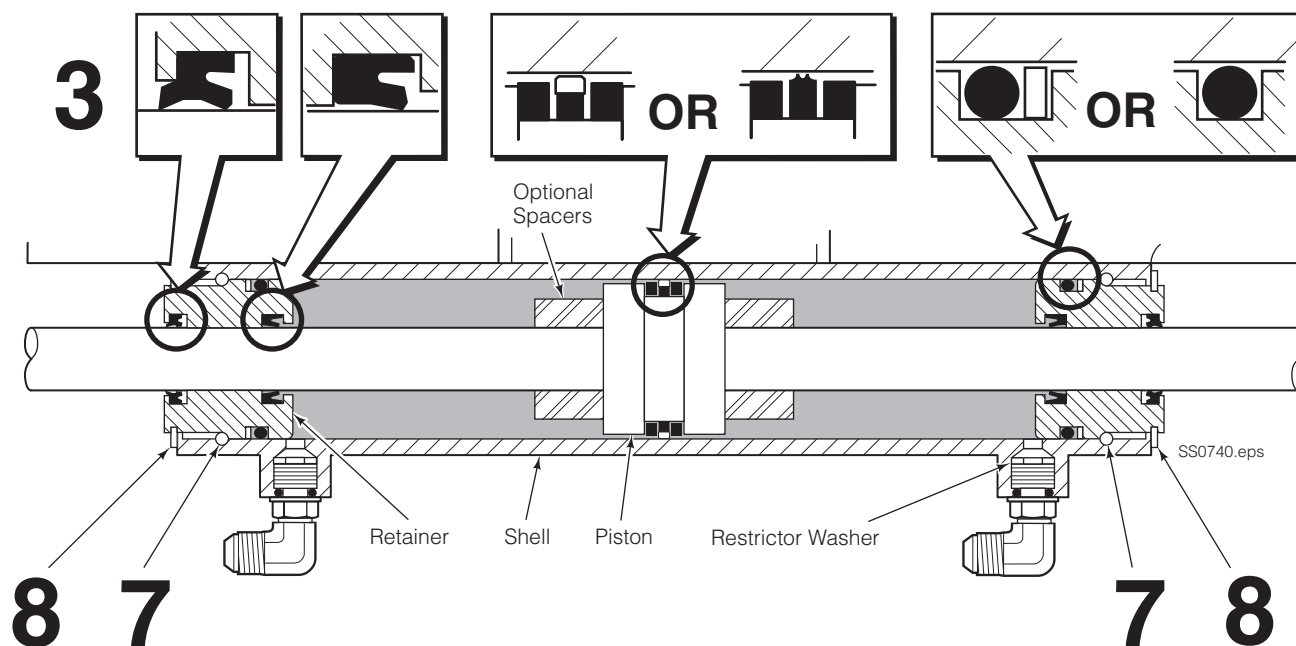
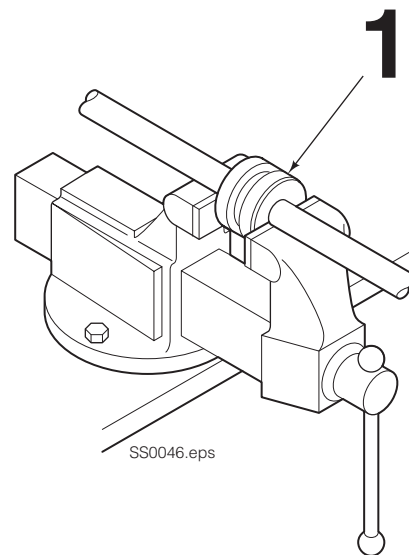
- Inspect all components for nicks or burrs. Minor nicks or burrs can be removed with 400 grit emery cloth.

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.
- Thread the fittings into the cylinder port to maximum depth. This allows the restrictor washer to operate correctly.



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 or STP.
- 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 Apply a thick film of petroleum jelly or STP to the inside of the cylinder shell, piston seals and retainers.
- 6 Insert the rod assembly into the cylinder shell. If resistance is encountered, tap the rod end with a rubber mallet.
- 7 Tap the retainers into the shell far enough to install the retaining rings in their grooves.
- 8 Pull the rod out to one side to the fully extended position. This will position the retainer so the spiral snap ring can be installed. Repeat for the retainer on the other end.



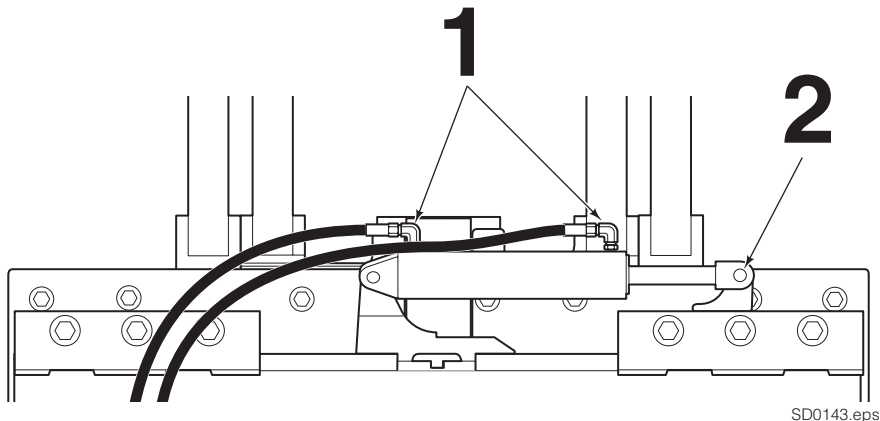
5.4 Sideshift Cylinder - Top Mount

5.4-1 Cylinder Removal



WARNING: Before removing any hoses, relieve pressure in the truck 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. Remove the cylinder.
- 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.



SD0143.eps

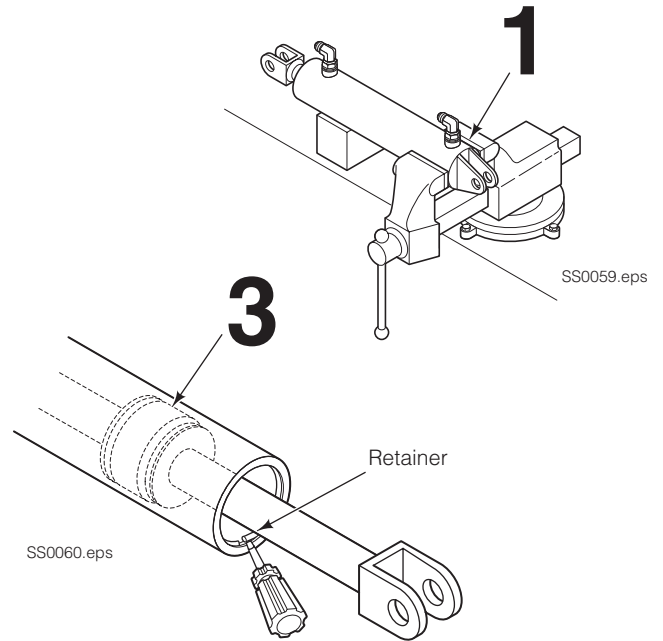
5.4-2 Cylinder Disassembly

- 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 or dental tool. Cut the seals to remove.

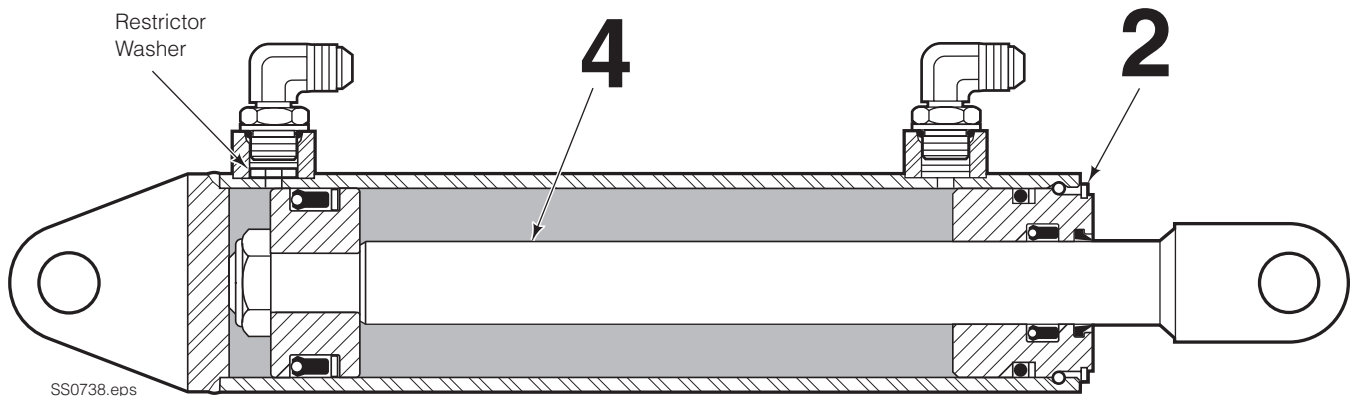
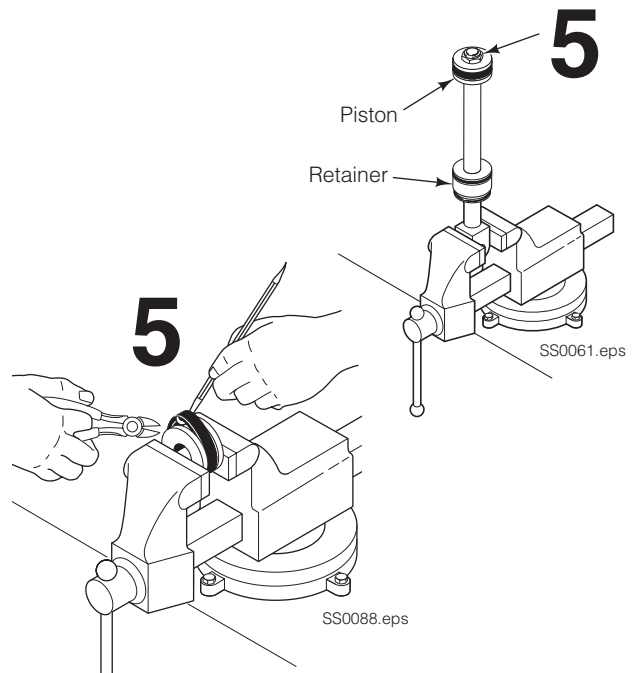
CAUTION: Do not scratch the seal grooves.



5.4-3 Cylinder Inspection

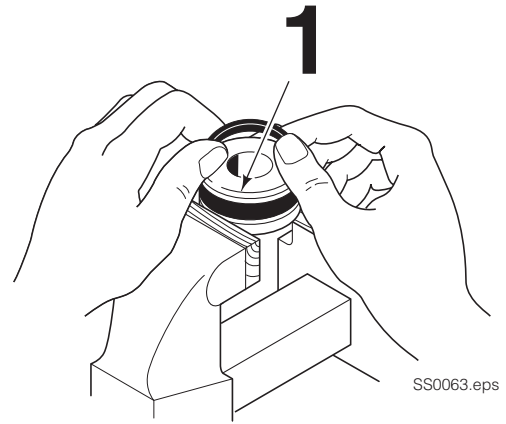
- Inspect all components for nicks or burrs. Minor nicks or burrs can be removed with 400 grit emery cloth.

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.

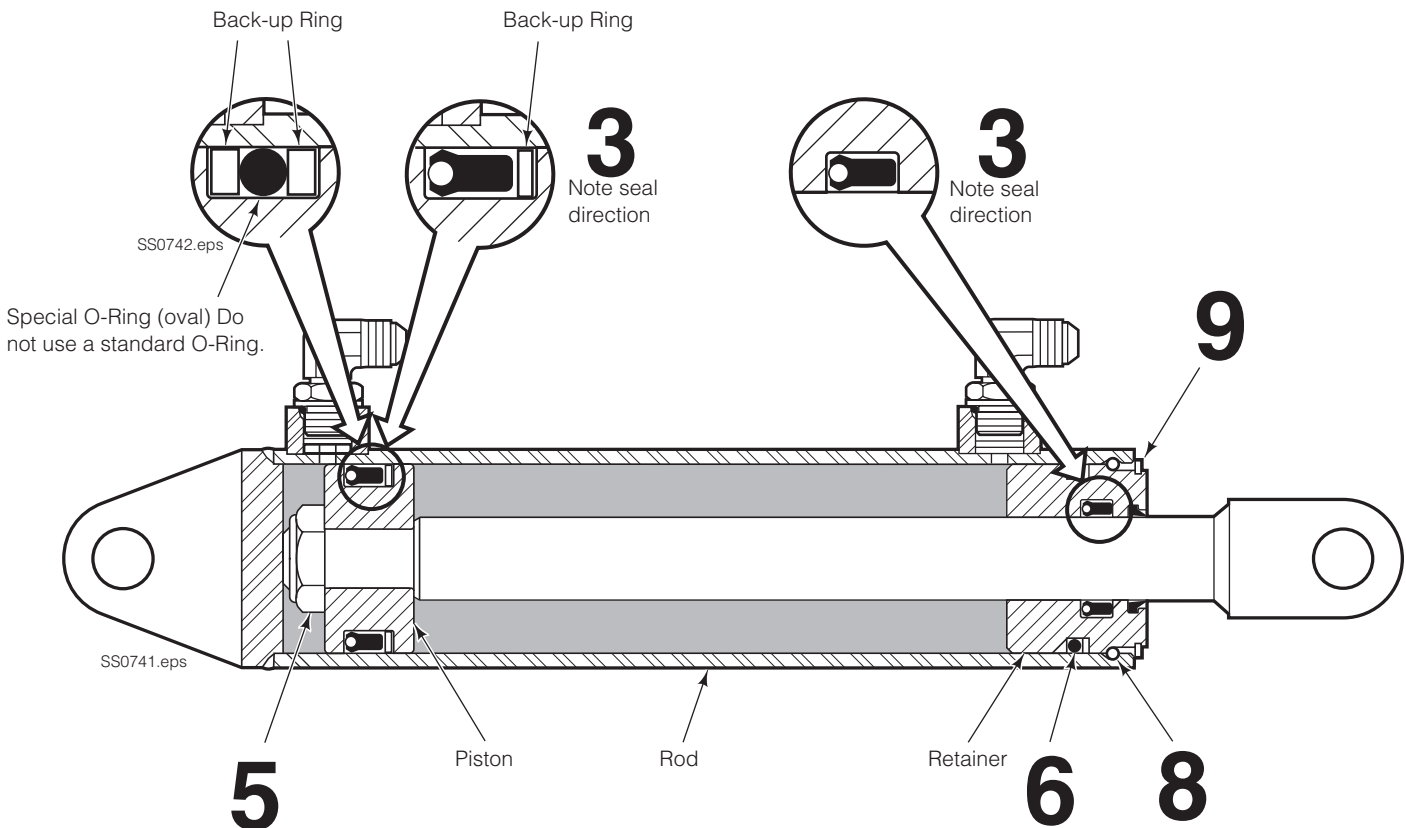


5.4-4 Cylinder Reassembly

- 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 retainer and piston on the rod and tighten the piston retaining nut to 75 ft.-lbs. (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.



5.5 Fork Position Cylinders

5.5-1 Cylinder Removal

The cylinder internal components can be serviced with the cylinder in place on the attachment. The following procedures need to be followed only if the cylinder assembly is being replaced.

- 1 Extend the outer forks outside the width of the frame.
- 2 Remove the outer fork that rides on the cylinder to be removed. Refer to Section 5.2-1.
- 3 Remove the attachment from the truck as described in Section 5.1.
- 4 Remove the sideshifting anchor bracket.

Center Mount – Loosen the support bracket capscrews. For reassembly, tighten the capscrews to a torque of:

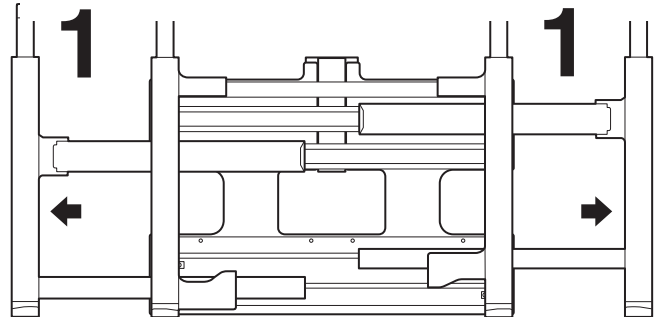
48E/55E – 22 ft.-lbs. (30 Nm) ▲

70E/80E – 15 ft.-lbs. (20 Nm)

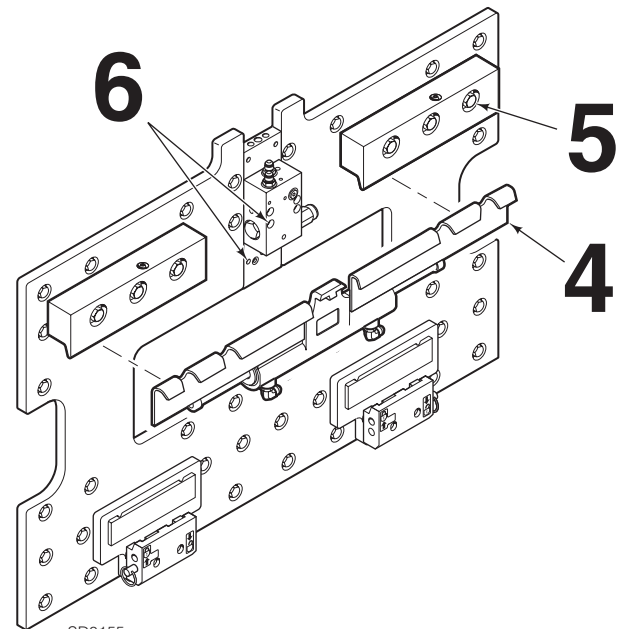
▲ Apply Loctite 242 (Blue) to threads

Top Mount – Remove the sideshift cylinder base end pivot pin from the anchor bracket.

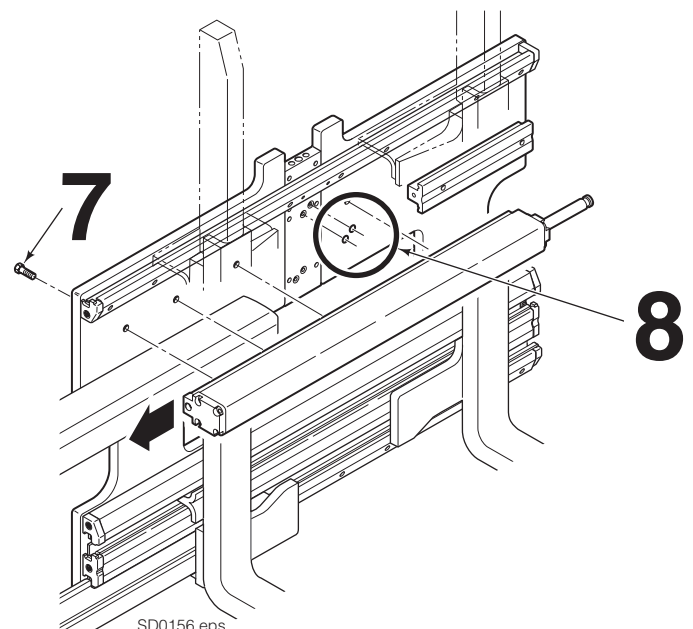
- 5 Remove the upper mounting hooks. For reassembly, tighten the capscrews to a torque of 125 ft.-lbs. (170 Nm).
- 6 Remove the capscrews fastening the valve and manifold to the cylinder being removed. For reassembly, tighten the capscrews to a torque of 15 ft.-lbs. (20 Nm).
- 7 Remove the capscrews fastening the cylinder to the frame. For reassembly, tighten the capscrews to a torque of 75 ft.-lbs. (100 Nm).
- 8 Lift the cylinder away from the frame. Collect the O-rings between the cylinder and manifold.
- 9 For reassembly, reverse the above procedures except for the following special instructions:
 - Apply a small amount of petroleum jelly to hold the O-rings in position while installing the cylinder.
 - Apply an anti-seize compound such as Chesterton 725 Anti-Seize Compound to the cylinder and baseplate mating surfaces.



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5.5-2 Cylinder Disassembly

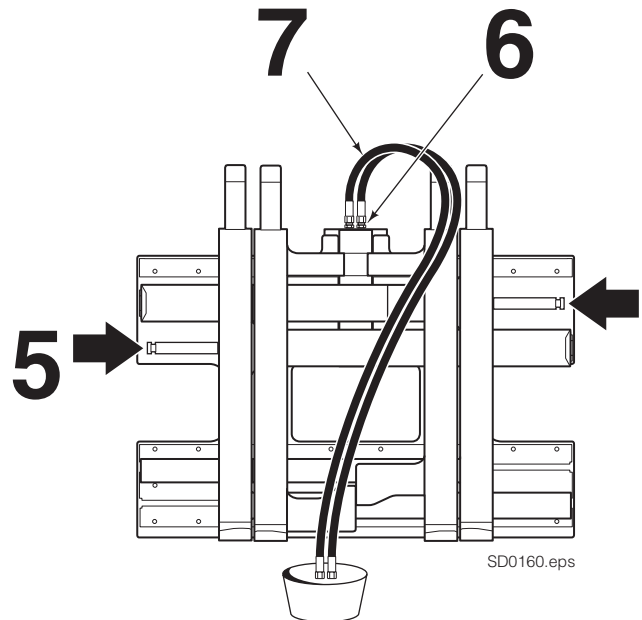
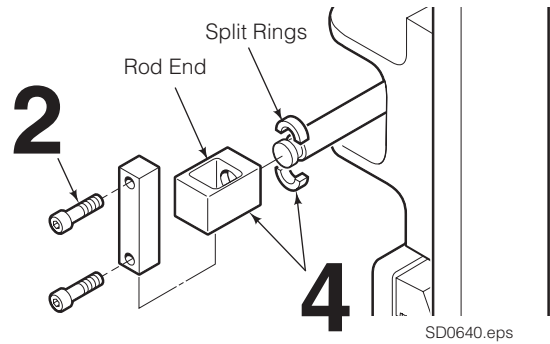
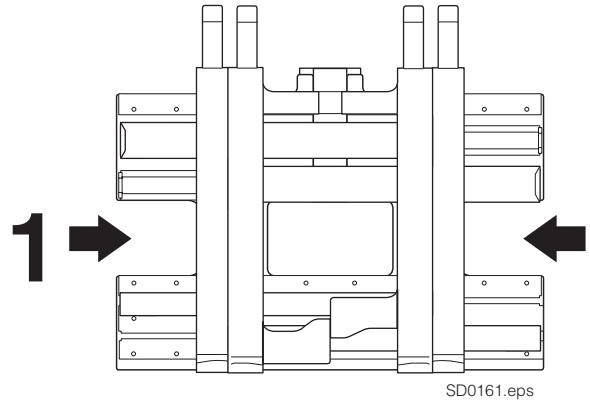
These cylinders can be serviced in place on the attachment. The following procedures can be performed with the forks in place and the attachment mounted on the truck. It is recommended that both cylinders be serviced at the same time.

- 1 Fully close the forks.
- 2 Remove the capscrews fastening the cylinder rod anchor bars to the arm.
- 3 Power the cylinders out 3 in. (75 mm) to expose the cylinder rod end.
- 4 Slide the rod ends inward to to remove the split rings. Remove rod ends from the cylinder rods.
- 5 Completely retract the cylinders.



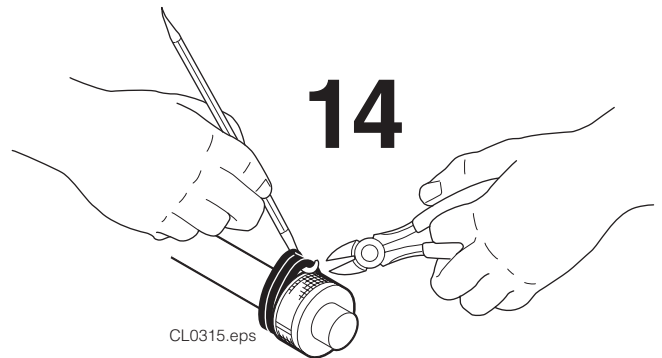
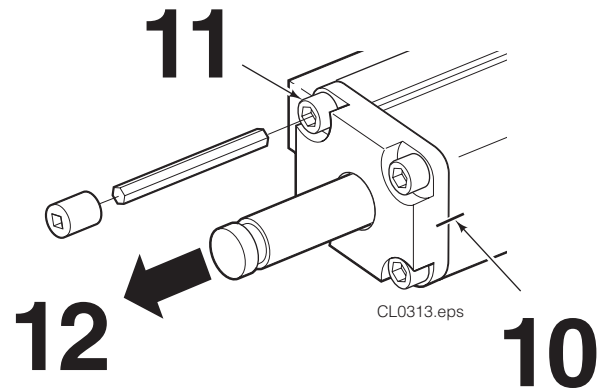
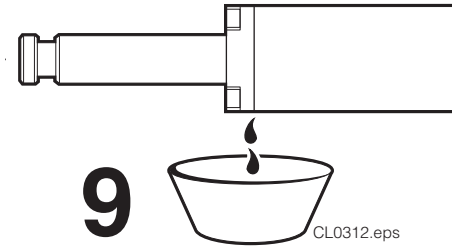
WARNING: Before disconnecting hoses, relieve pressure in the hydraulic system. Turn the truck off and open the truck auxiliary control valves several times in both directions.

- 6 Disconnect the supply hose from the valve OPEN port and plug the hose end. Install a No. 6 drain hose to the fitting and place the hose end in a bucket.
- 7 Install a No. 4 fitting and drain hose to the valve TEST port. Place the hose end in the bucket.
- 8 Starting with the **bottom cylinder** in the retracted position, manually extend the cylinder rod to remove oil from the shell and leave it extended. Repeat the procedure for the top cylinder.



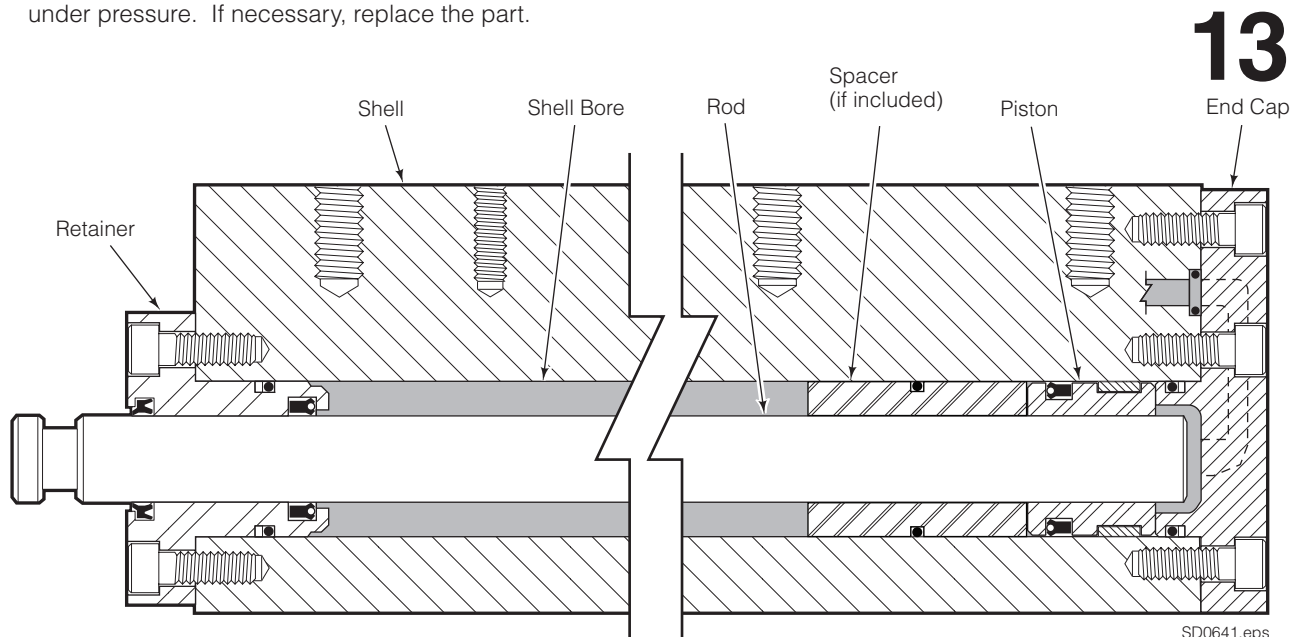
- 9 Place a towel or drip pan under the cylinder retainer.
- 10 Scribe a mark on the cylinder retainer and shell for alignment during reassembly.
- 11 Use a 6 mm hex extension to remove the capscrews fastening the cylinder retainer to the shell. Be prepared to collect a small amount of oil from the cylinder cavity when the retainer is loosened from the shell. Remove the retainer.
- 12 Remove the rod assembly and spacer (if included) from the cylinder. Place a towel in the cylinder bore to absorb oil.
- 13 Remove the end cap.
- 14 Remove all seals from the piston, spacer (if included), retainer and end cap by prying them out with a brass tool and cutting with diagonal cutters.

CAUTION: Do not scratch the seal grooves.



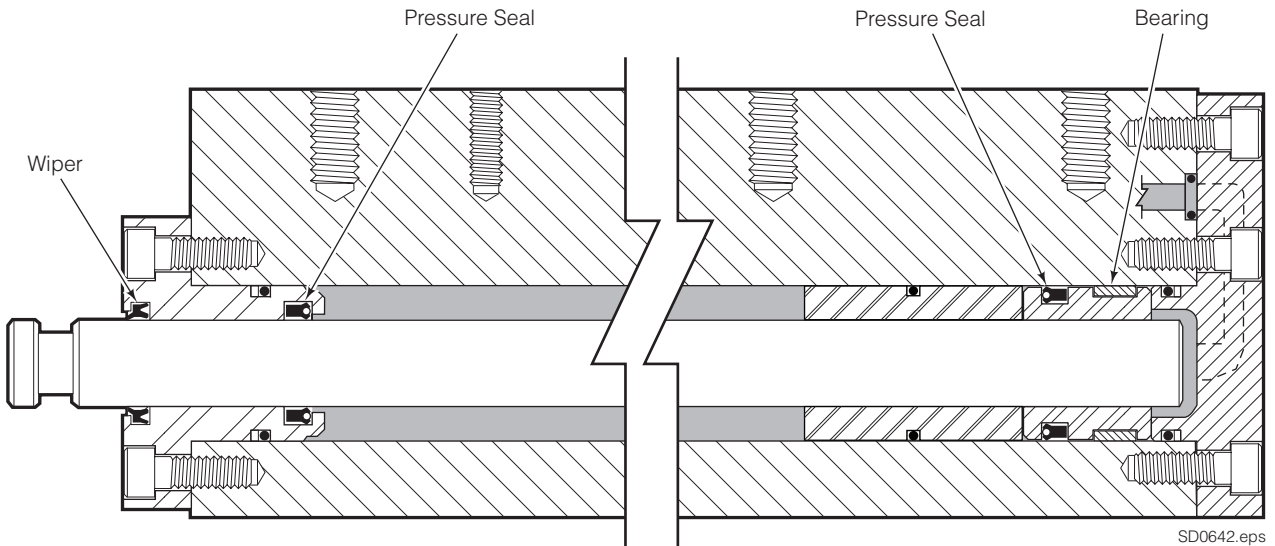
5.5-3 Cylinder Inspection

- Inspect the rod, piston and retainer for nicks or burrs. Minor nicks and burrs may be removed with 320 grit emery cloth. If they cannot be removed, replace the part.
- Inspect the cylinder shell bore and remove any minor nicks or burrs with a butterfly hone. If they cannot be removed, replace the part.
- Inspect the outside of the shell for any deformities or cuts that could impair performance or cause leaks under pressure. If necessary, replace the part.

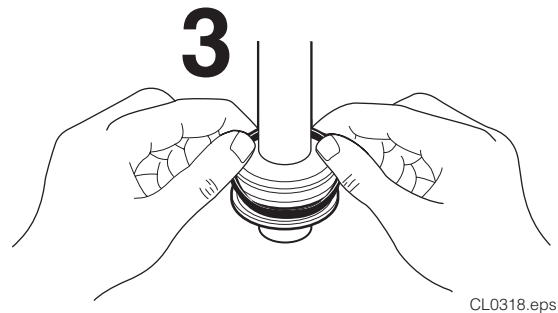


5.5-4 Cylinder Reassembly

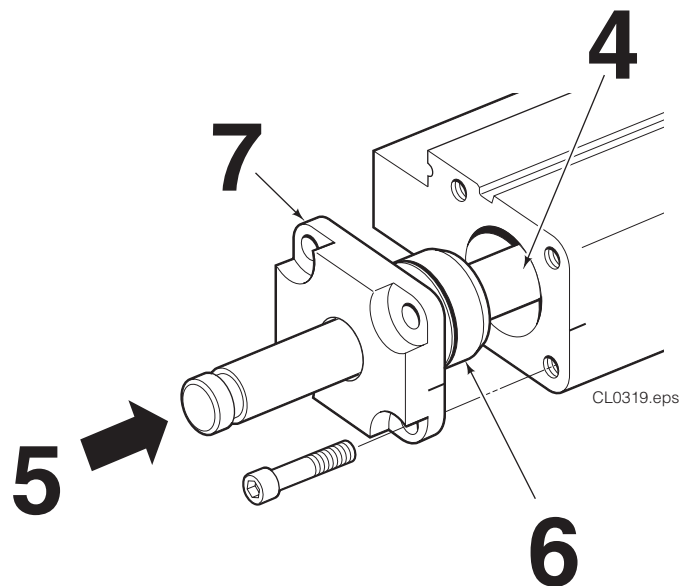
- 1 Lubricate all new seals and O-rings with petroleum jelly.
- 2 Note the direction of the U-cup seals. **Pressure seals must always be installed with the lip toward the high pressure side to the cylinder.**



- 3 Install new seals on the piston, spacer (if included), retainer and end cap. Install the piston seal on the rod side of the piston. Hook one side of the seal in the groove and carefully work it over the piston.



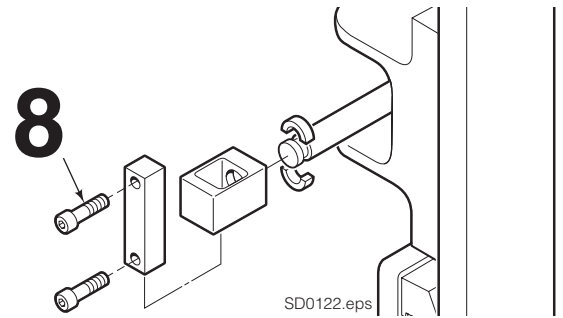
- 4 Apply a thick film of petroleum jelly to the inside of the cylinder shell and piston seals.
- 5 Using a rubber mallet, tap the rod assembly into the cylinder shell.
- 6 Apply a thick film of petroleum jelly to the retainer.
- 7 Slide the retainer onto the rod and align with the scribe mark and shell holes. Install the end cap. Install and tighten the retainer and end cap capscrews to a torque of 18 ft.-lbs. (25 Nm).



- 8** Reassemble the rod end, split rings and anchor bar to the fork. Clean and dry capscrews and threaded holes. Apply Loctite 242 (blue) to the capscrew threads and tighten to a torque of:

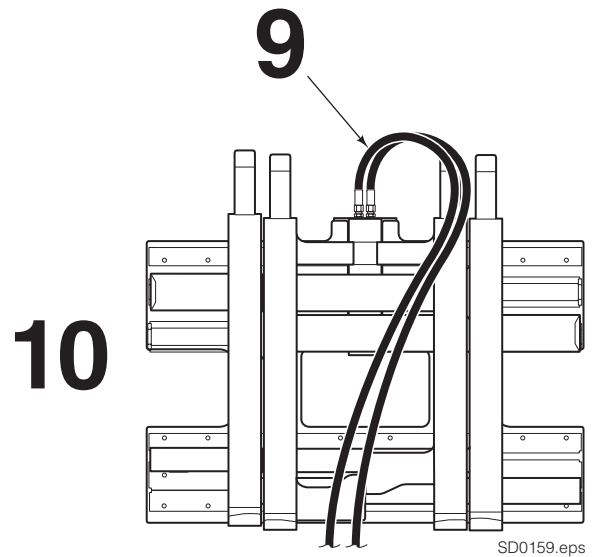
48E/55E/60E/80E – 30 ft.-lbs. (40 Nm)

48F/55F/60F/70E – 48 ft.-bs. (65 Nm)



- 9** Remove the hose from the valve OPEN port fitting. Remove the hose and fitting from the valve TEST port. Install the supply hose and TEST port plug.

- 10** Cycle the attachment through 10 complete cycles to remove air from the hydraulic circuit. Check for leaks and proper operation.



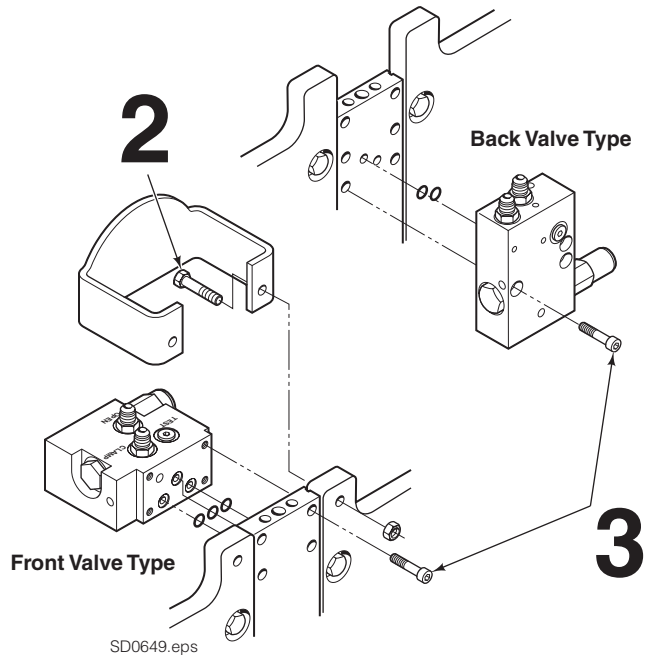
5.6 Valve and Manifold

5.6-1 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 **Attachments with Valve Guard** – Remove the capscrews fastening the valve guard to the frame. For reassembly, tighten the capscrews to a torque of:
 - E-Series** – 30 ft.-lbs. (40 Nm)
 - F-Series** – 40 ft.-lbs. (55 Nm)
- 3 Remove the capscrews fastening the valve to the manifold. For reassembly, tighten the capscrews to a torque of 15 ft.-lbs. (20 Nm).
- 4 For reassembly, reverse the above procedures except for the following special instructions:
 - Apply a small amount of thick grease to hold the O-rings in position while installing the valve.

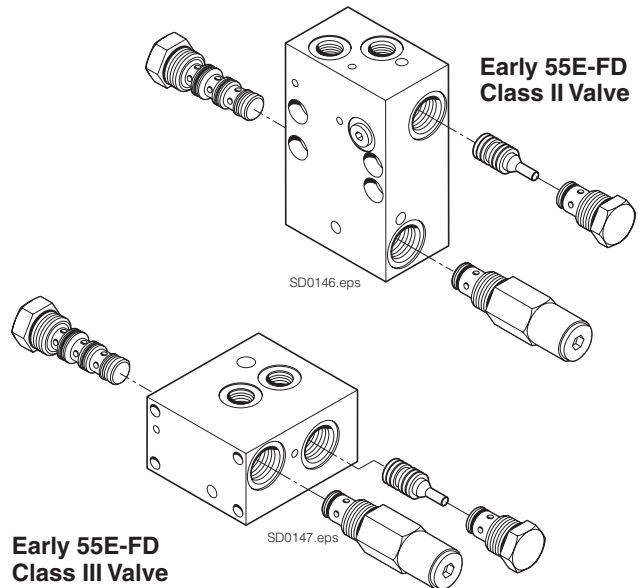


5.6-2 Valve Service

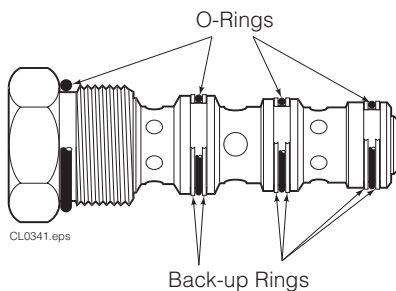
Class II Serial No.s less than 55E-FD-442
Class III Serial No.s less than 55E-FD-018

- 1 Remove the cartridges from the valve.
- 2 Remove the remaining fittings.
- 3 Remove the O-rings and back-up rings from the cartridges.
- 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 for proper hydraulic operation.
 - Lubricate the cartridges and seals with petroleum jelly prior to reassembly.

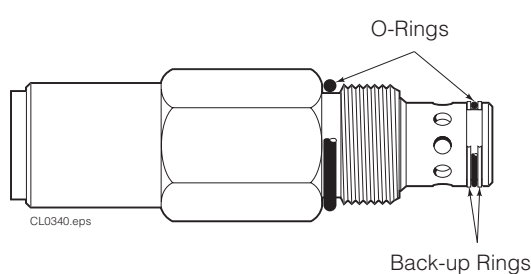
3



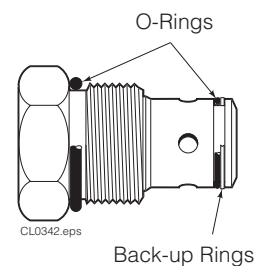
Flow Divider Cartridge



Crossover Relief Cartridge



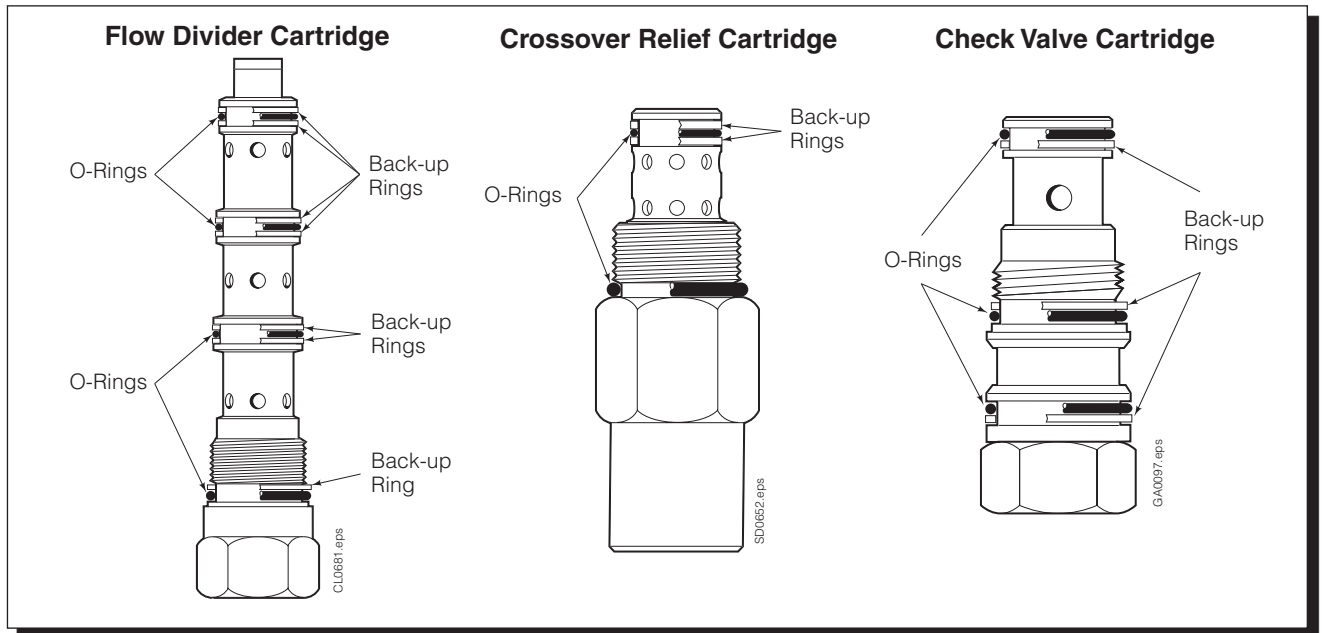
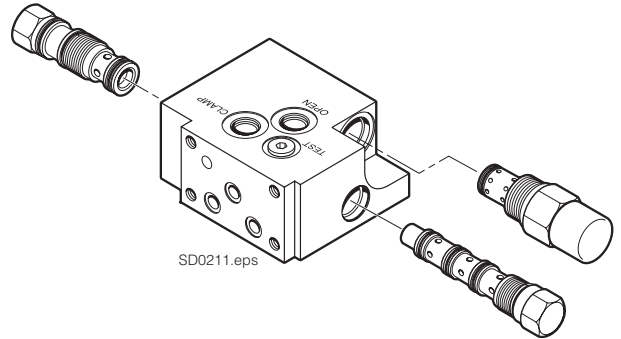
Check Valve Cartridge



5.6-3 Valve Service

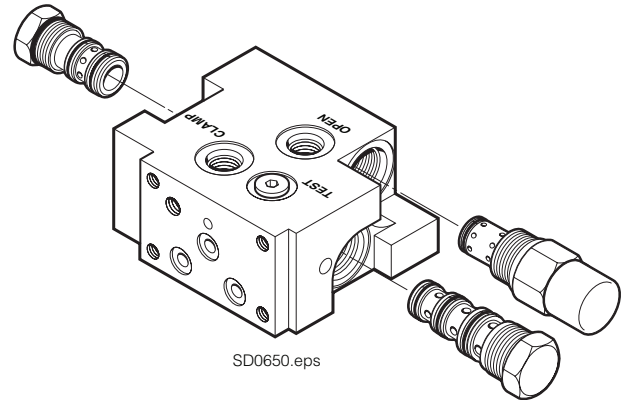
**Class II Serial No.s greater than 55E-FD-509,
Class III Serial No.s greater than 55E-FD-104,
and 70E Models**

- 1 Remove the cartridges from the valve.
- 2 Remove the remaining fittings.
- 3 Remove the O-rings and back-up rings from the cartridges.
- 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 for proper hydraulic operation.
 - Lubricate the cartridges and seals with petroleum jelly prior to reassembly.

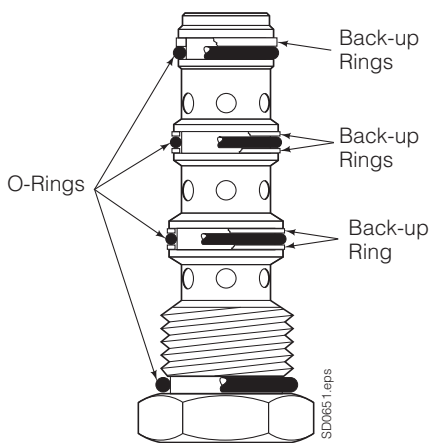


5.6-4 Valve Service 45E/55E/65E-FDS Models, 80E and F-Series Models

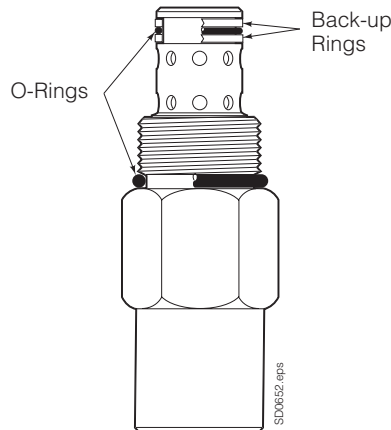
- 1 Remove the cartridges from the valve.
- 2 Remove the remaining fittings.
- 3 Remove the O-rings and back-up rings from the cartridges.
- 4 Clean all parts with kerosene or cleaning solvent.
- 5 For reassembly, reverse the above procedures except for the following special instructions:
 - The cartridge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



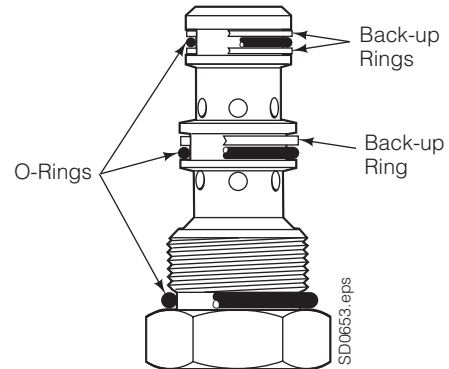
Flow Divider Cartridge



Crossover Relief Cartridge

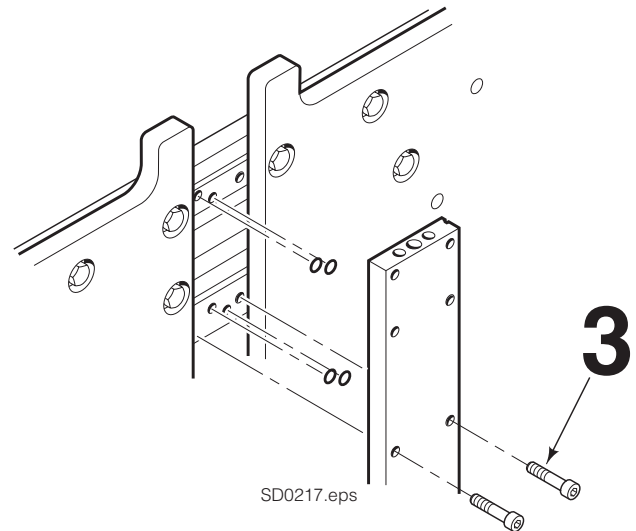


Check Valve Cartridge



5.6-5 Manifold Service

- 1 Remove the attachment from the truck as described in Section 5.1.
- 2 Remove the valve from the manifold as described in Section 5.6-1.
- 3 Remove the capscrews fastening the manifold to the cylinders. Collect the O-rings. For reassembly, tighten the capscrews to a torque of 15 ft.-lbs. (20 Nm).
- 4 Clean all parts with cleaning solvent.
- 5 Check for imperfections and scratches where O-rings sit.
- 6 For reassembly, reverse the above procedures except for the following special instructions:
 - Apply a small amount of petroleum jelly to hold the O-rings in position while installing the manifold.



5.6-6 Valve Relief Adjustment

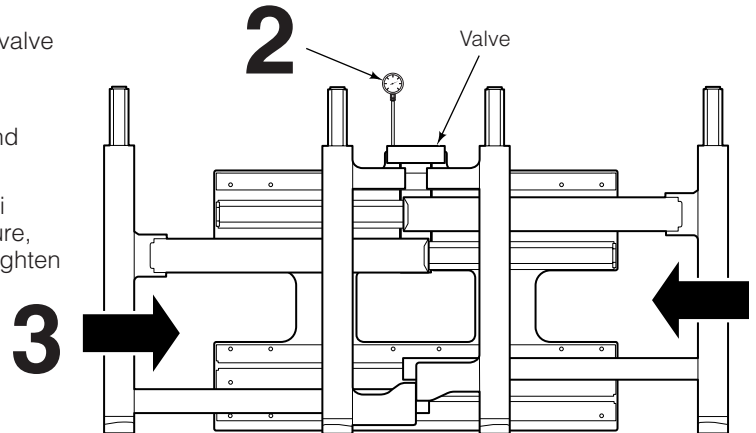
Class II Serial numbers greater than 55E-FD-509
Class III Serial numbers greater than 55E-FD-104
All FDS Models

For over-pressure protection, the relief valve cartridge for the FORK POSITION function should be adjusted to match the truck hydraulic flow rate. **MAXIMUM RELIEF VALVE SETTING = 2600 psi (180 bar).**

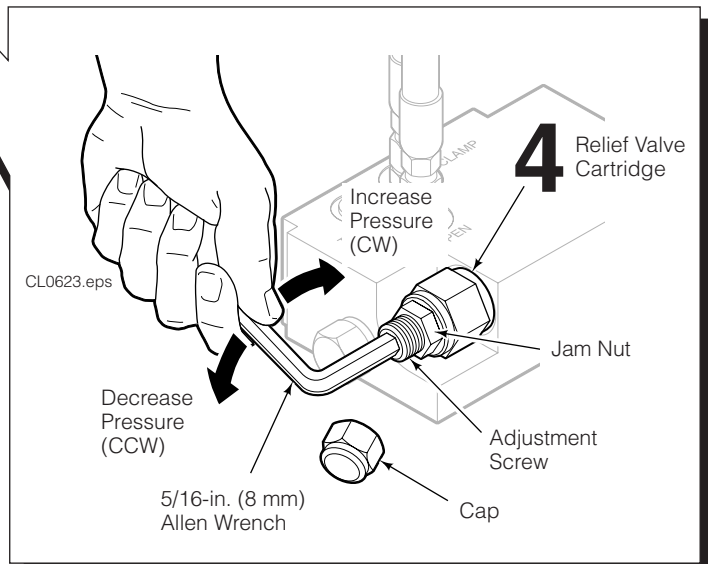
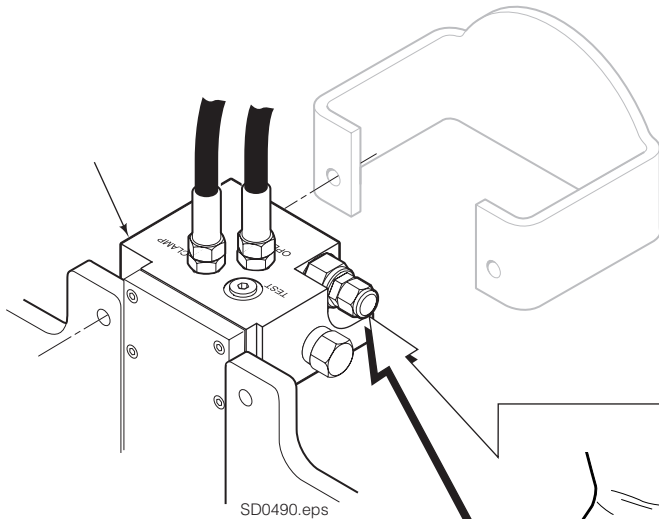
- 1 Confirm that the truck pressure is between 2300–2600 psi (160–180 bar).
- 2 Install a 3000 psi (200 bar) pressure gauge to the valve TEST port (No. 4 O-ring fitting required).
- 3 Cycle the forks to full open, then slowly close the forks fully. Hold the lever in the CLOSE position and accelerate engine to develop full system pressure.
- 4 Adjust the relief cartridge for an indicated 2300 psi (160 bar). Turn clockwise (CW) to increase pressure, counterclockwise (CCW) to decrease pressure. Tighten the jam nut and the replace cap.



WARNING: Before installing or removing hydraulic lines or components, relieve pressure in the hydraulic system. Turn the truck off and open the truck auxiliary control valves several times in both directions.



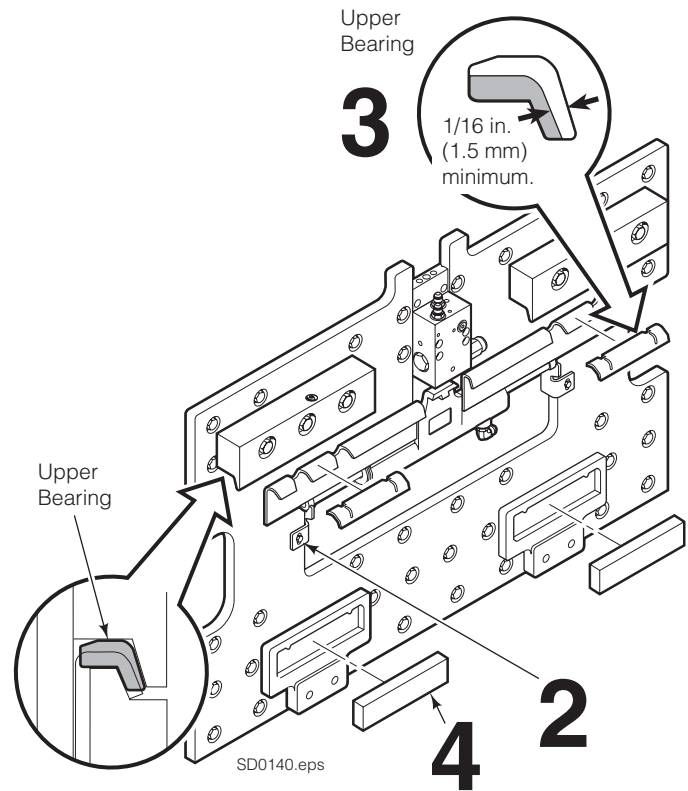
SD0198.eps



5.7 Base Unit

5.7-1 Sideshift Bearing Service

- 1 Remove the attachment from the truck as described in Section 5.1.
- 2 **Center Mount Sideshifters** – Loosen the support bracket capscrews. Lift away the cylinder. For reassembly, tighten the capscrews to a torque of:
 - ▲ **48E/55E** – 22 ft.-lbs. (30 Nm) ▲
 - ▲ **70E/80E** – 15 ft.-lbs. (20 Nm)
 - ▲ Apply Loctite 242 (Blue) to threads
- 3 Inspect the upper bearing thickness. If either bearing is worn to less than 1/16 in. (1.5 mm) thick on the back surface, replace both bearings.
- 4 Inspect the lower bearing exposed thickness. If the thickness is less than 1/16 in. (1.5 mm), replace both bearings.
- 5 For reassembly, reverse the above procedures except for the following special instructions:
 - Clean the upper and lower bearings and bearing contact surfaces.
 - Locate the upper bearings in the anchor bracket cutouts. Be careful not to install the bearings backwards.



5.7-2 Lower Mounted Gas Cylinder Service

1 Remove the bolt on stops from the outer fork lower arms. For reassembly, clean and dry capscrews and threaded holes. Apply Loctite 242 (blue) to the capscrew threads and tighten to a torque of:

48E/55E/60E/80E – 30 ft.-lbs. (40 Nm)

48F/55F/60F/70E – 48 ft.-bs. (65 Nm)

2 Remove the gas spring rod end guard. For reassembly, tighten the capscrews to a torque of 22 ft.-lbs. (30 Nm).



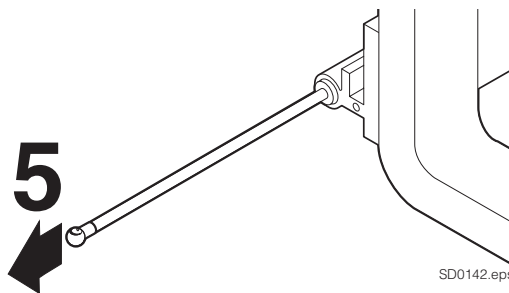
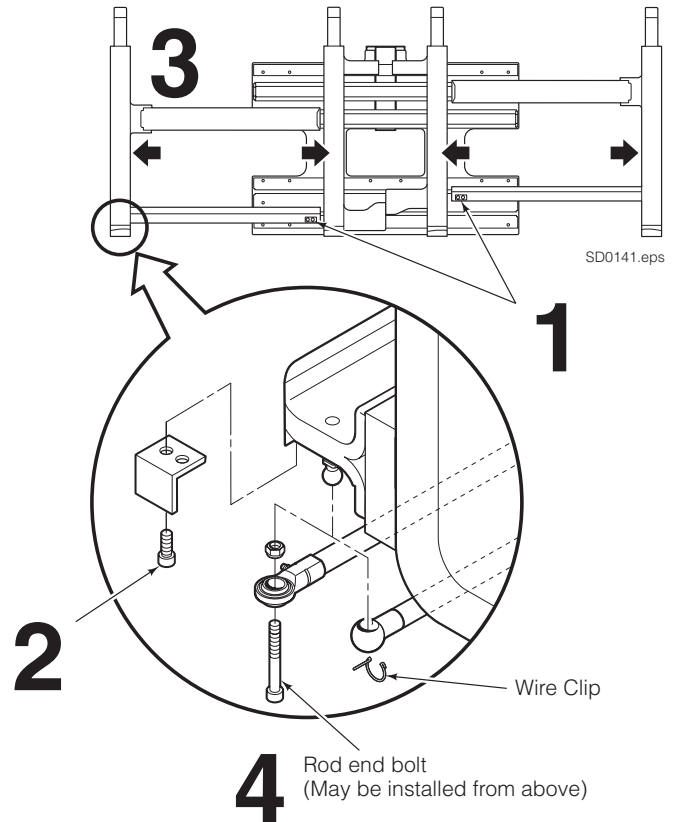
WARNING: The outer forks must be fully extended prior to disconnecting the gas cylinder rod end.

3 Fully extend the outer forks.

4 Disconnect the gas spring rod end from the anchor by removing the wire clip or rod end bolt.


5 Remove the gas spring by pulling with a quick jerk to disengage the base end from the anchor.

6 For reassembly, reverse the above procedures.



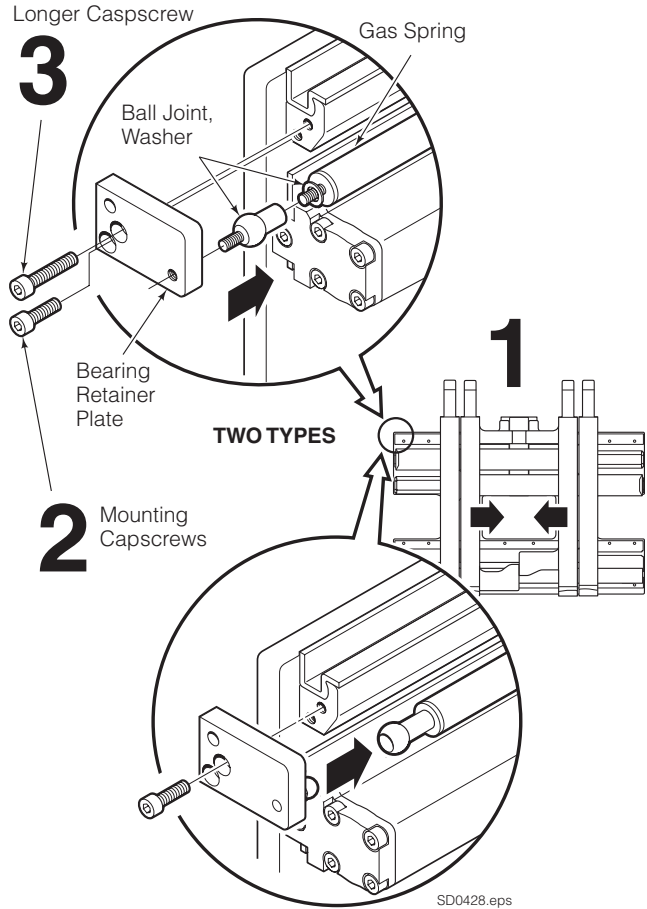
5.7-3 Upper Mounted Gas Cylinder Service

1 Fully close the inner forks.



WARNING: The outer forks must be fully extended prior to disconnecting the gas cylinder rod end.

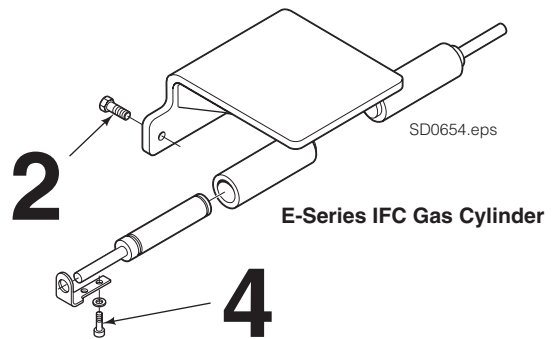
- 2 Remove the capscrew fastening the gas cylinder anchor plate to the frame. For reassembly, tighten the capscrew to a torque of 22 ft.-lbs. (30 Nm).
- 3 Remove the gas spring by pulling with a quick jerk to disengage the base end from the anchor plate, or unscrew the threaded ball joint end.
- 4 For reassembly, reverse the above procedures except as follows:
 - Assure rod end of gas cylinder is secure in pocket of inner fork bracket, or, ball joint is properly connected.
 - A large "C"-Clamp may be helpful to compress the gas cylinder during reassembly.
 - Use of a longer (M8 x 25L) capscrew will aid in pulling the bearing retainer plates flush with the frame during installation.



5.7-4 Inner Fork Control (IFC)

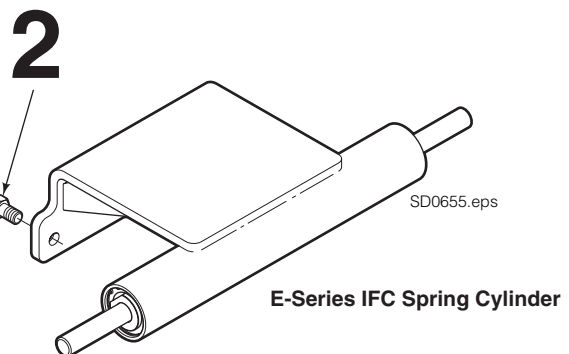
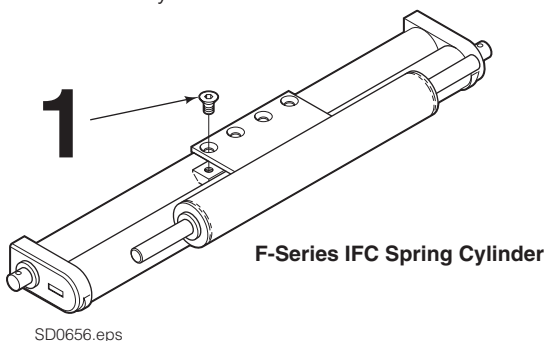
E-Series

- 1 Remove attachment as described in Section 5.1
- 2 Remove capscrews from bracket. For reassembly, tighten capscrews to a torque value of 30 ft.-lbs. (40 Nm).
- 3 **IFC Spring Cylinder arrangement** – Replace the assembly.
- 4 **IFC Gas Cylinder arrangement** – Remove capscrew from gas cylinder retainer. Remove gas cylinder. For reassembly, tighten capscrews to a torque value of 6 ft.-lbs (8 Nm).



F-Series

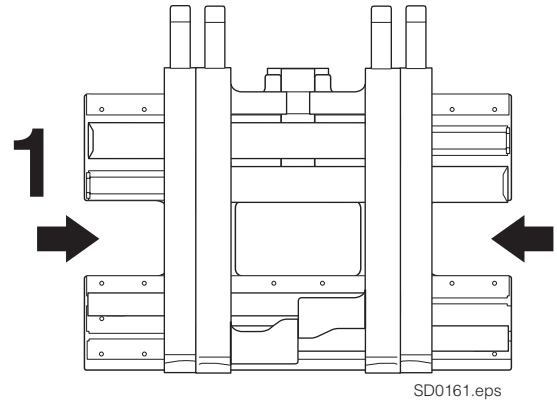
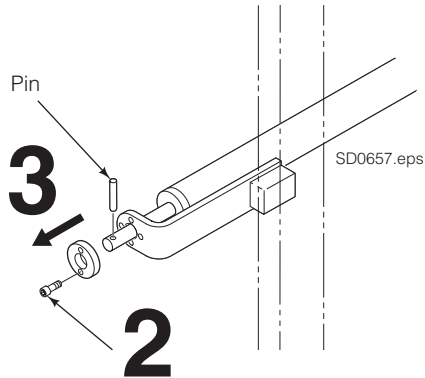
- 1 Remove capscrews from spring can assembly. For reassembly, apply Loctite 242 (blue) to capscrews and tighten to a torque value of 30 ft.-lbs. (40 Nm).
- 2 Replace the assembly.



5.7-5 Spring Cylinder Service

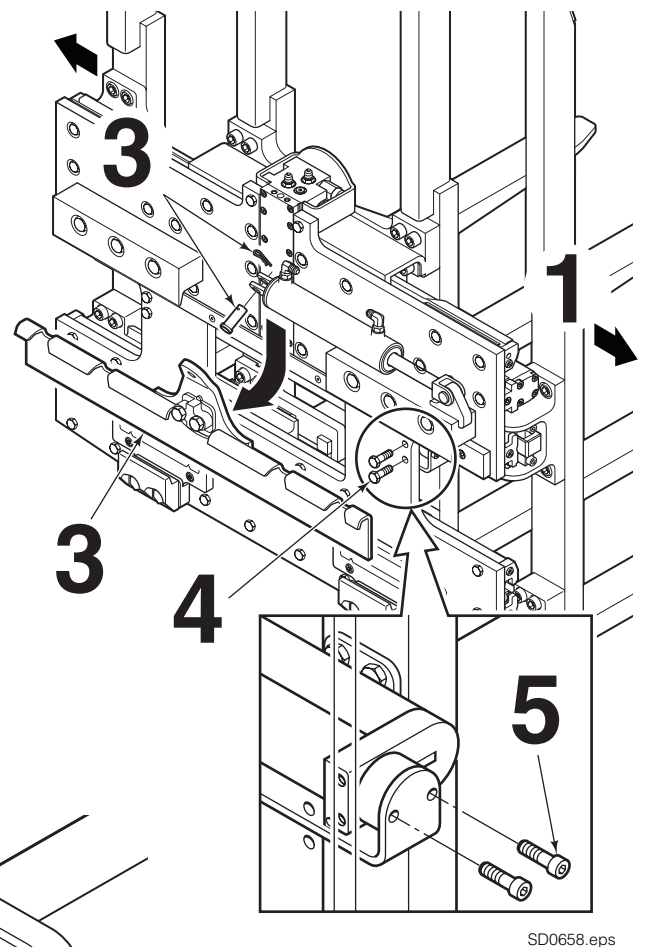
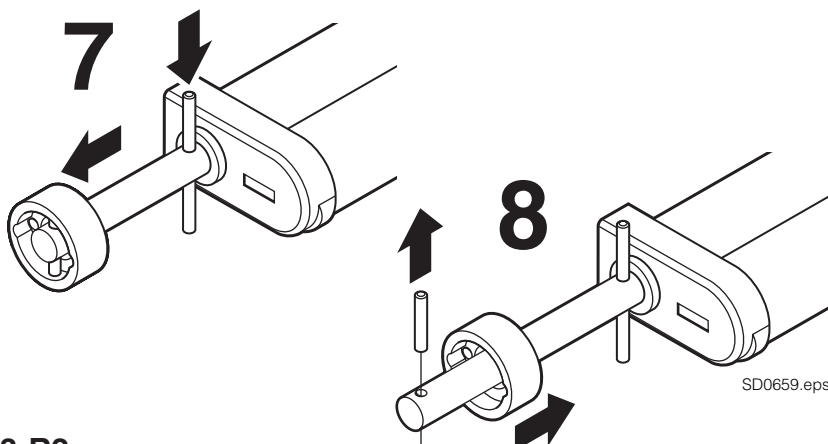
E-Series Spring Cylinder

- 1 Fully close the inner forks.
- 2 Remove capscrews from retainers. For reassembly, tighten capscrews to a torque of 22 ft.-lbs. (30 Nm).
- 3 Remove retainer and pin.
- 4 Remove cylinder from brackets.



F-Series Spring Can Assembly

- 1 Open outer forks enough to not engage fork stops with inner forks.
- 2 Remove attachment as described in Section 5.1
- 3 Remove anchor bracket from attachment by removing the clevis pin and cotter hair pin from the sideshifter.
- 4 Remove spring cylinder capcrews from the back of the attachment. For reassembly, tighten capscrews to a torque of 30 ft.-lbs. (40 Nm).
- 5 Remove capscrews from the spring cylinder retainers. For reassembly, apply Loctite 242 (blue) to capscrews and tighten to a torque of 15 ft.-lbs. (20 Nm).
- 6 Remove spring cylinder assembly from the attachment.
- 7 Pull the rod out from spring cylinder and place a pin and screwdriver into the second hole, as shown.
- 8 Move the retainer towards the spring cylinder assembly and pull the rod pin out from the rod.
- 9 Remove the retainer from the rod.



6.1 Specifications

6.1-1 Hydraulics

Truck Relief Setting

2300 psi (160 bar) Recommended
2600 psi (180 bar) Maximum

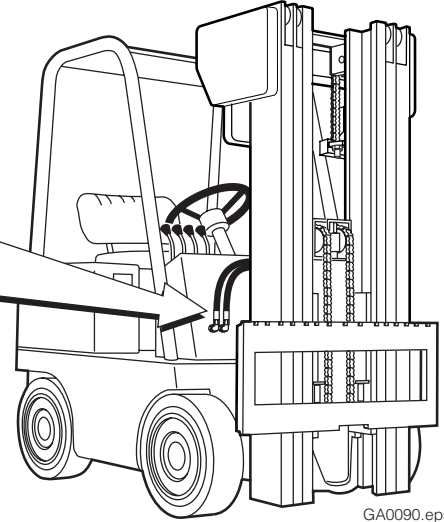
Truck Flow Volume ^①

	Min. ^②	Recommended	Max. ^③
E-Series	4 GPM	7 GPM	7 GPM
F-Series	(15 L/min.)	(26 L/min.)	(26 L/min.)

- ① Single-Double Pallet Handlers are compatible with SAE 10W petroleum base hydraulic fluid meeting Mil. Spec. MIL-0-5606 or MIL-0-2104B. Use of synthetic or aqueous base hydraulic fluid is not recommended. If fire resistant hydraulic fluid is required, special seals must be used. Contact Cascade.
- ② Flow less than recommended will result in reduced or unequal arm speed.
- ③ Flow greater than maximum can result in excessive heating, reduced system performance and reduced hydraulic system life.

Hoses and Fittings

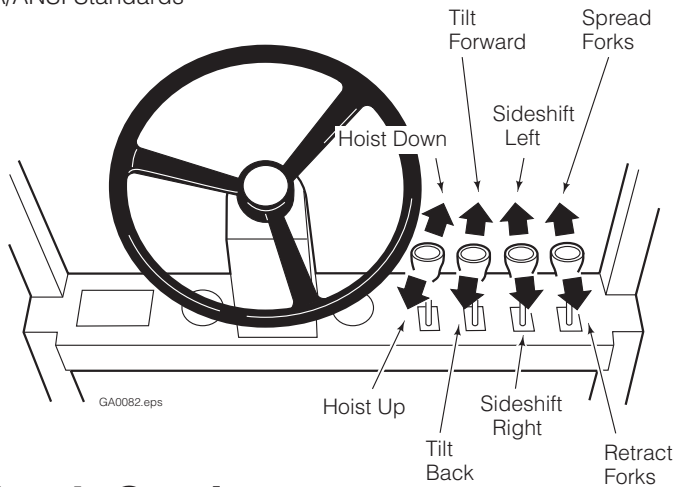
All supply hoses must be at least No. 6 minimum.
All fittings must have an orifice size of 9/32 in. (7 mm) minimum.



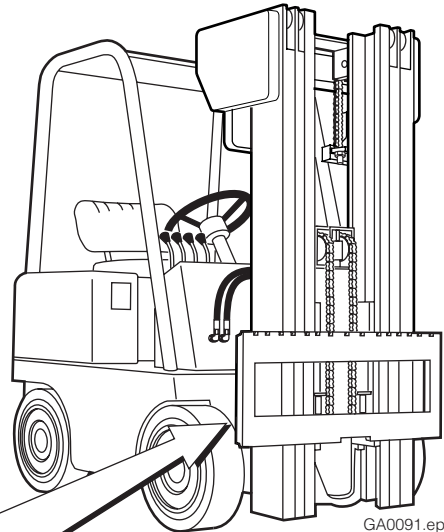
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6.1-2 Auxiliary Valve Functions

ITA/ANSI Standards



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6.1-3 Truck Carriage



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Carriage Mount Dimension (A) ITA (ISO)

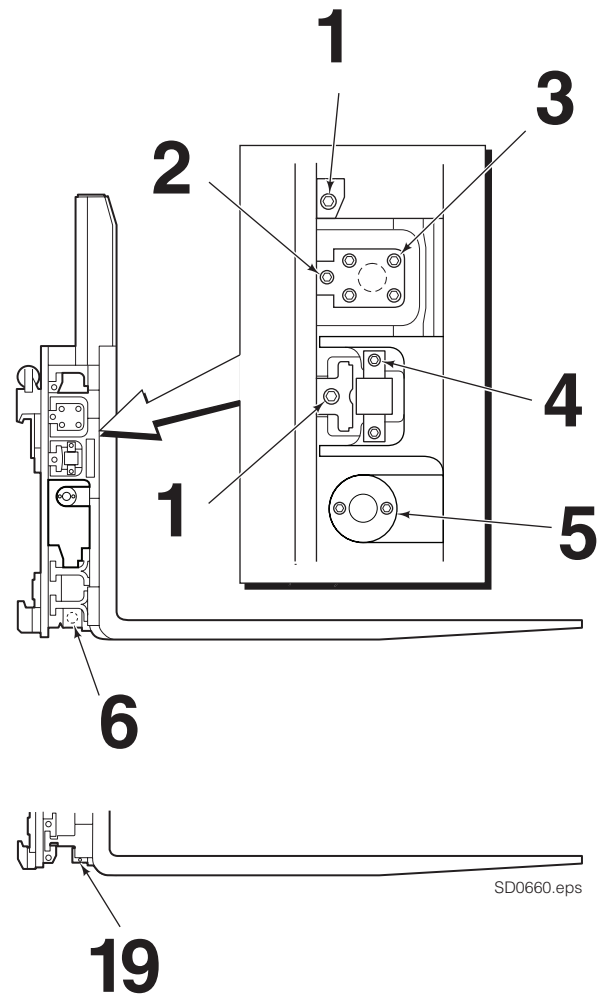
	Minimum	Maximum
Class II	14.96 in. (380.0 mm)	15.00 in. (381.0 mm)
Class III	18.68 in. (474.5 mm)	18.74 in. (476.0 mm)
Class IV	23.44 in. (595.5 mm)	23.50 in. (597.0 mm)

6.1-4 48E/55E/60E Torque Values

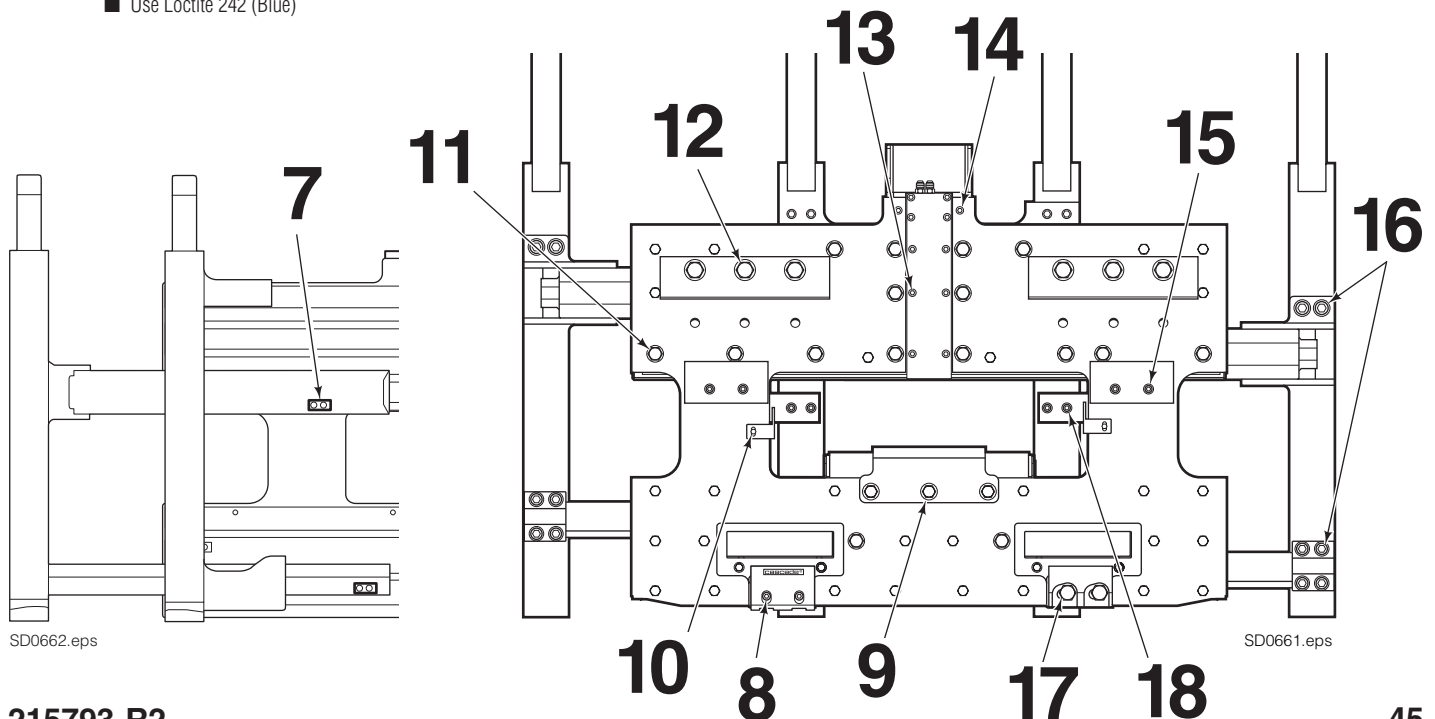
Fastener torque values for the E-Series Multi Load Handler are shown in the table below in both U.S. and Metric units. Torque values are also found in each specific service procedure section throughout the Manual.

Ref.	Fastener Location	Size	N·m	Ft.-lbs.
1	Bearing Retainer Capscrews	M6	20	15 ■
		M8	20	15 ■
2	Cylinder Retainer Capscrew	M8	25	18
3	Cylinder End Cap Capscrews	M8	25	18
4	Anchor Bar Capscrews	M10	20	15
5	Center Spring Retainer Capscrews	M8	20	15
6	Lower Gas Spring Cylinder Capscrews	M10	20	15
7	Fork Stop Capscrews	M10	65	48 ■
8	Quick Disconnect Guide Capscrews	M16	170	125 ■
9	Inner Fork Control Bracket Capscrews	M12	70	50
10	Center Sideshifter Bracket Capscrews	M8	20	15 ■
11	Baseplate Bearing Capscrews	M12	100	74
12	Upper Mounting Hook Capscrews	M16	170	125
13	Manifold Capscrews	M8	20	15
14	Valve Guard Capscrews	M8	30	22
		M10	65	48
15	Block Capscrew	M10	20	15 ■
16	Inner/Outer Fork Capscrews	M16	300	220 ■
17	Lower Hook Capscrews	M16	170	125
18	Center Spring Bracket Capscrews	M10	40	30
19	Inner Lower Bearing Retainer Capscrews	M8	20	15

■ Use Loctite 242 (Blue)



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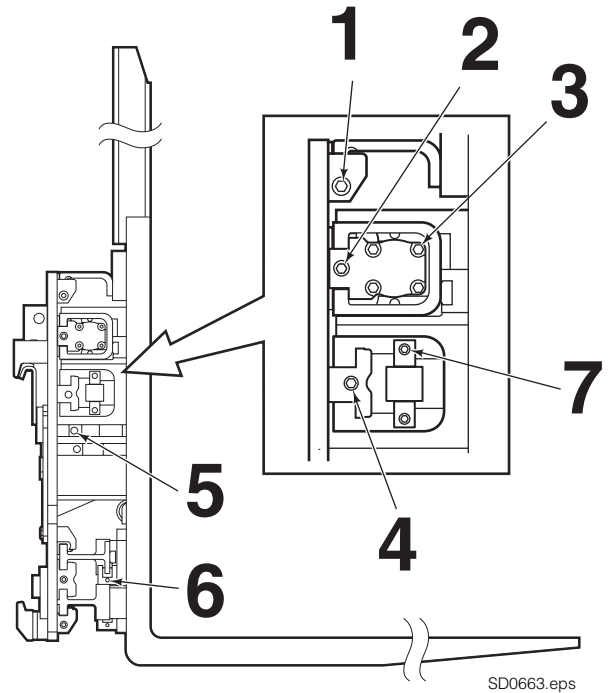
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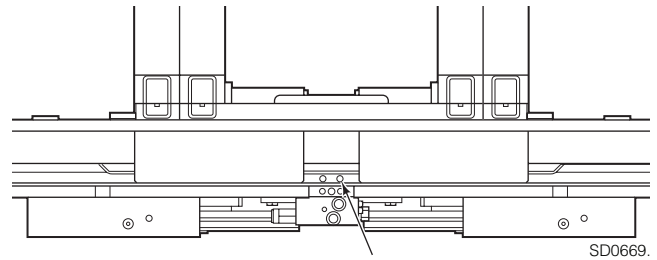
6.1-5 70E/80E Torque Values

Ref.	Fastener Location	Size	N·m	Ft.-lbs.
1	Top Bearing Retainer Capscrews	M10	40	30 ■
2	Cylinder Retainer Capscrews	M8	25	18
3	Cylinder End Cap Capscrews	M8	25	18
4	Bearing Retainer Capscrews	M8	20	15 ■
5	Gas Cylinder Head End Capscrew	M10	40	30
6	Inner Lower Bearing Retainer Capscrew	M8	20	15
7	Anchor Bar Capscrews	M12	70	50
8	Fork Stop Capscrews	M10	65	48 ■
9	Quick Disconnect Guide Capscrews	M16	170	125 ■
10	Center Sideshifter Bracket Capscrews	M8	20	15
11	Baseplate Bearing Capscrews	M16	170	125
12	Upper Mounting Hook Capscrews	M16	170	125
13	Manifold Capscrews	M8	20	15
14	Valve Guard Capscrews	M10	40	30
15	Class III Valve Capscrews	M8	20	15
16	Gas Cylinder Bracket Capscrews	M16	40	30
17	Spacer Block Capscrew	M10	20	15
18	Inner/Outer Fork Capscrews	M16	300	220 ■
19	Lower Hook Capscrews	M16	170	125
20	Inner Fork Control Bracket Capscrews	M12	70	50
21	Upper Fork Stop Capscrews	M10	40	30

■ Use Loctite 242 (Blue)

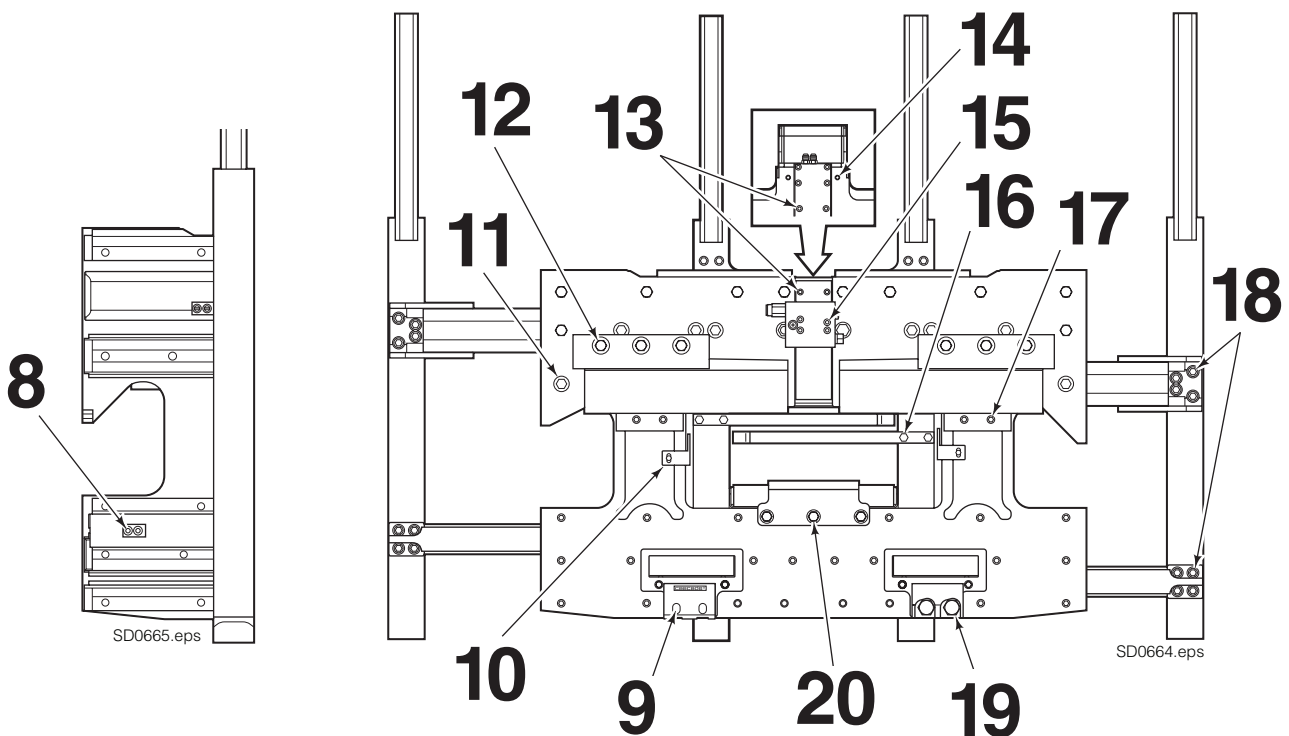


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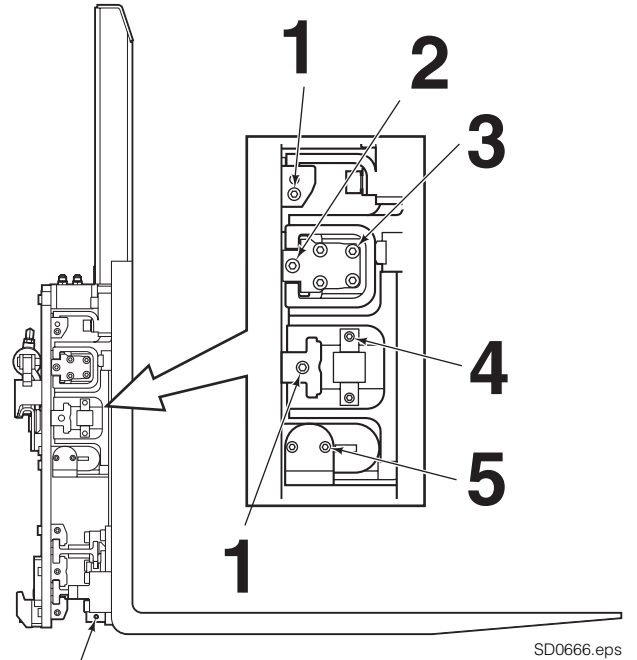
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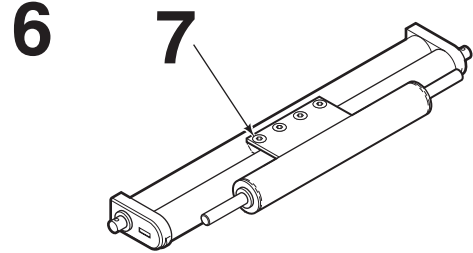
6.1-6 48F/55F/60F Torque Values

Ref.	Fastener Location	Size	N·m	Ft.-lbs.
1	Bearing Retainer Capscrews	M8	20	15 ■
2	Cylinder Retainer Capscrew	M8	25	18
3	Cylinder End Cap Capscrews	M8	25	18
4	Anchor Bar Capscrews	M10	65	48
5	Center Spring Retainer Capscrews	M8	20	15
6	Inner Lower Bearing Retainer Capscrews	M8	20	15
7	Inner Fork Control Bracket Capscrews	M10	40	30 ■
8	Fork Stop Capscrews	M10	65	48 ■
9	Quick Disconnect Guide Capscrews	M16	170	125 ▲
10	Sideshift Plate Capscrews	M6	20	15
11	Strap Capscrews	M10	20	15 ■
12	Upper Mounting Hook Capscrews	M16	170	125
13	Baseplate Bearing Capscrews	M12	100	74
14	Valve Guard Capscrews	M10	65	48
15	Manifold Capscrews	M8	20	15
16	Anchor Bracket Capscrew	M16	225	165
17	Inner/Outer Fork Capscrews	M16	300	220 ■
18	Center Spring End Cap Capscrews	M10	40	30
19	Lower Hook Capscrews	M16	170	125
20	Center Spring Bracket Capscrews	M10	40	30
21	Lower Bearing Bracket Capscrews	M10	40	30

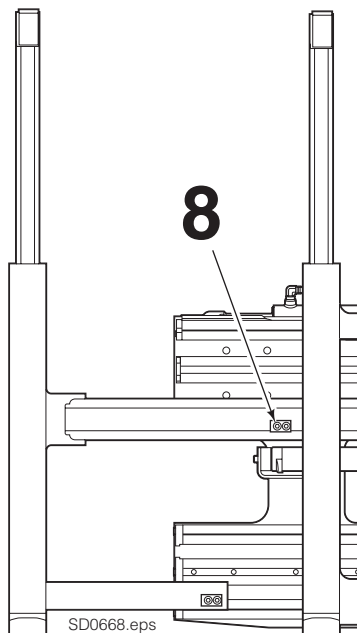
- Use Loctite 242 (Blue)
- ▲ Use Loctite 277 (Red)



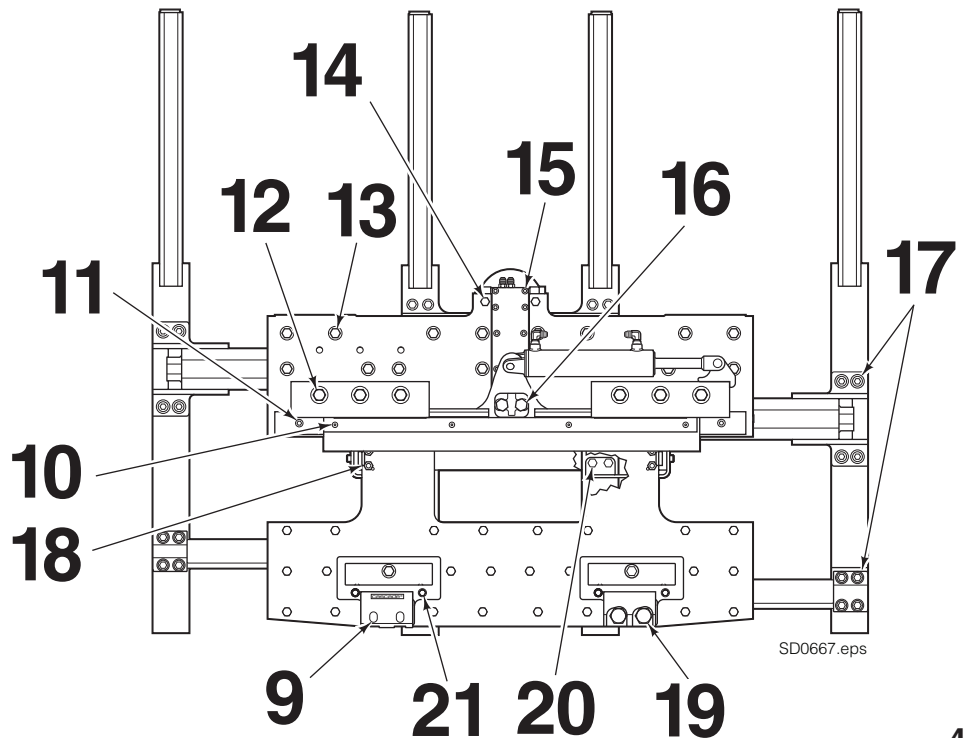
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