SERVICE MANUAL

Series 3

180 º Rotators

For All Imperial and Metric Units

Manual Number 1809015 - Rev.0

CONTENTS

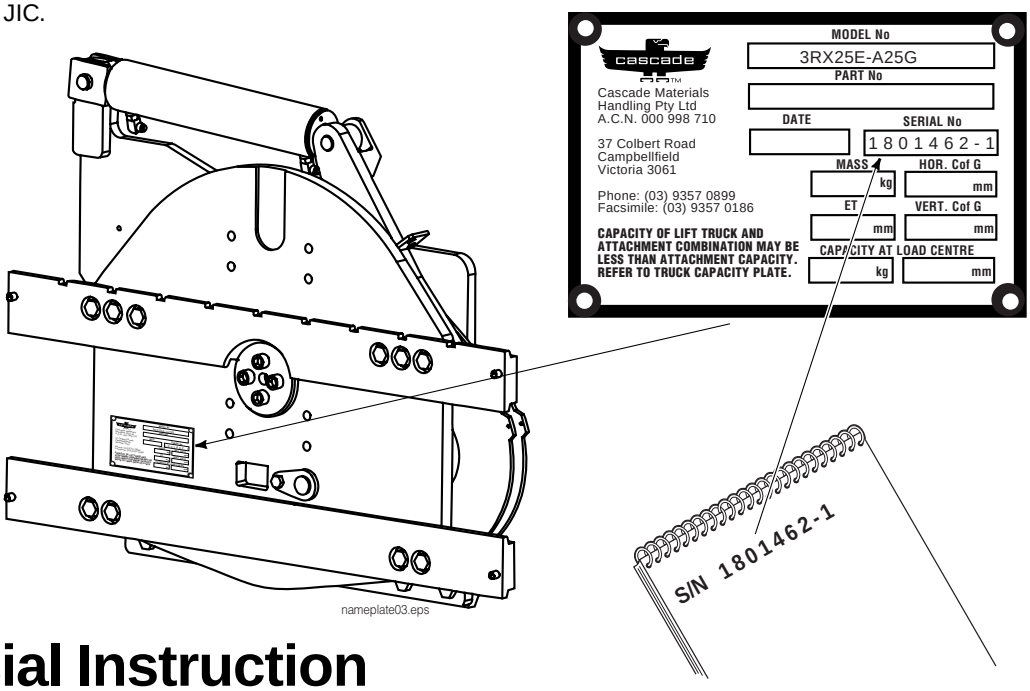
ga0359.eps

1.1 Introduction

This manual provides the installation instructions, periodic maintenance requirements, troubleshooting procedures and service guides for Series 3 180º Rotators. Series 3 180º Rotators are designed for continuous-duty operations with minimal maintenance. In any communication about these Rotators, 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 back of the baseplate.

NOTE: Specifications are shown in (Imperial) (US) and (Metric) units where applicable.

IMPORTANT: All hoses, tubes and fittings on Series 3 Rotators are JIC.



1.2 Special Instruction Definitions

CAUTION
A statement preceded by CAUTION is information that should be acted upon to prevent Machine Damage.

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.

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

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.

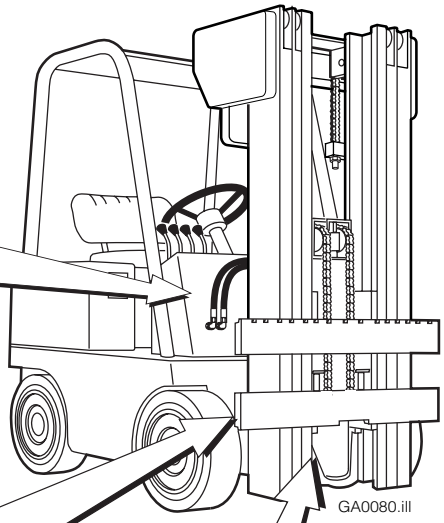
Series 3 - 180 Degree Rotators will provide maximum operating capability when the following requirements are met.

Truck Relief Valve Setting:
2300 psi (160 bar), maximum.
2000 psi (140 bar), recommended.

Truck Flow Volume ①

	Min ②	Recommended	Max ③
RX25	2.6 GPM (10 L/min)	5.3 GPM (20 L/min)	7.9 GPM (30 L/min)

box01



Carriage Mount Dimension (A) ITA (ISO)

	Minimum	Maximum
Class II	14.96 in (380.0mm)	15.00 in (381.0 mm)

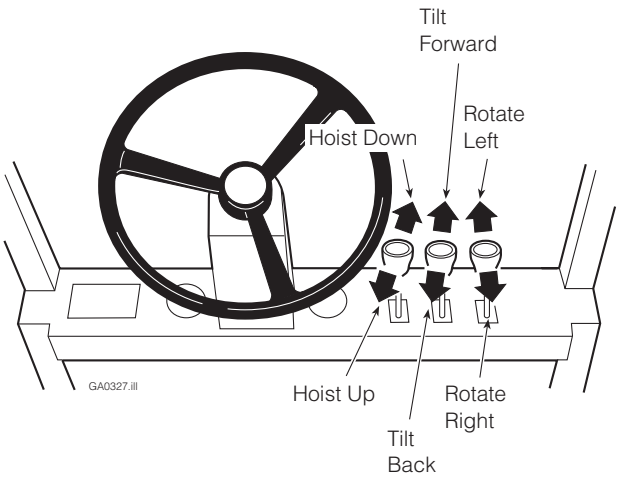
box02.eps

Clean carriage bars and inspect for damaged notches

box03.eps

Auxiliary Valve Functions

Check for compliance with ANSI standards:

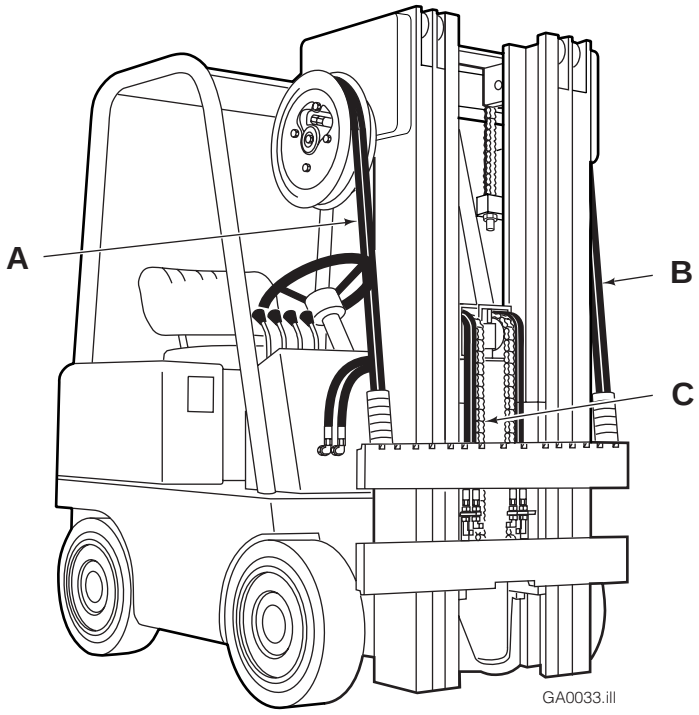


① Hydraulic Oil - Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. Mil-0-5606 or MIL-0-2104B. Use of synthetic or aqueous base hydraulic oil is not recommended. Contact cascade if fire resistant hydraulic oil must be used.
② Flow less than minimum will result in equal arm movement
③ Low greater than maximum can result in excessive heating, reduce system performance and short hydraulic system life.

2.2 Recommended Hydraulic Supply Options

Series 3 180° Rotators provide the best performance with one of the hydraulic supply arrangements shown below. Refer to Cascade *Hose and Cable Reel Selection* Guide, Part No. 212119, to select the correct hose reel for the mast and truck. The hose and fitting requirements are:

- All hoses for **rotate** functions should be at least No. 6 hose with 9/32 in. (7 mm) minimum I.D.
- All hoses for **bin hold** functions should be at least No. 6 hose with 9/32 in. (7 mm) minimum I.D.
- All **fittings** should have a minimum internal diameter of 9/32in. (7mm).



Rotate
A or B
RH or LH. THINLINE™ 2 port hose reel group.
OR
C Mast single internal hose reeving group.

Bin Hold (option)
A or B
RH or LH. THINLINE™ 2 port hose reel group.
OR
C Mast single internal hose reeving group.

2.3 Installation Procedure

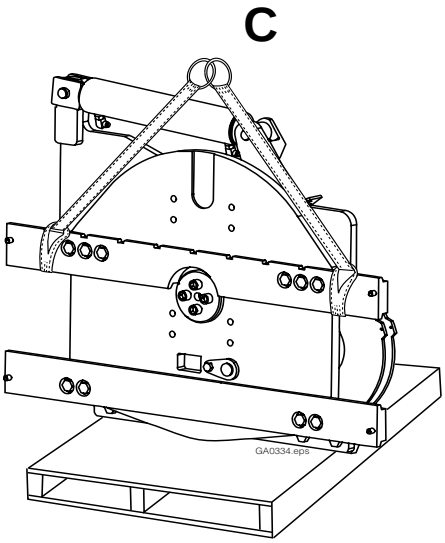
Follow the steps shown to install the Clamp on the truck. Read and understand all **WARNING** and **CAUTION** statements. If you don't understand a procedure, ask your supervisor, or call the nearest Cascade Service Department for assistance.

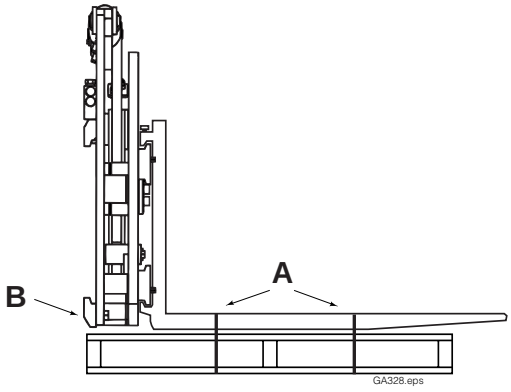
1 Prepare Attachment

A Remove banding.

B Remove bolt-on lower mounting hooks (if equipped).

C For rotators which are not shipped standing up, set rotator up as shown .





C Install two soft slings around the ends of the carriage bars as shown and attach to a suitable overhead chain hoist. Set the Rotator vertical.

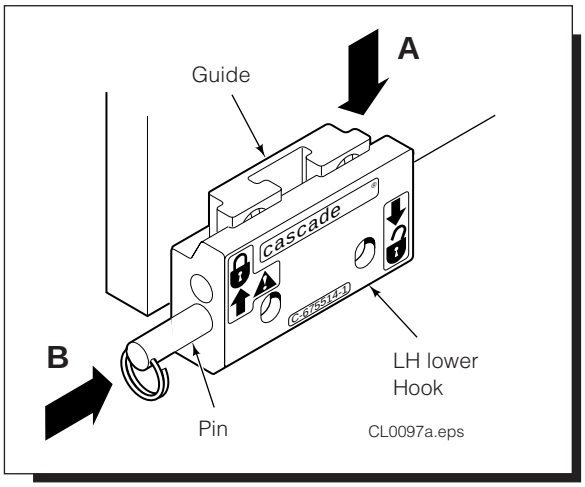
WARNING: Make sure your overhead hoist has a rated capacity of at least 1500 lbs. (700 kg).

2 Unlock Quick-Change lower mounting hooks

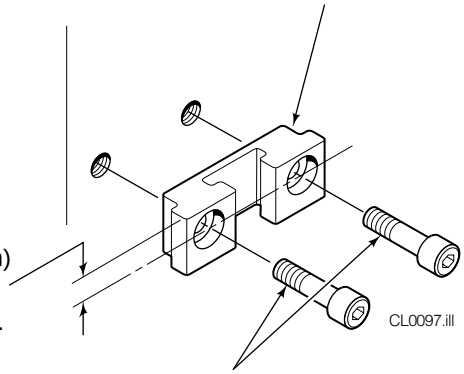
A Remove pin and drop hooks into unlocked position.

B Re-install pin in lower hole.

NOTE: Guides can be reversed to reduce hook-to-carriage clearance (See lower hook installation, Step 6).



5/8-in. (16mm) offset on top provides max. clearance.

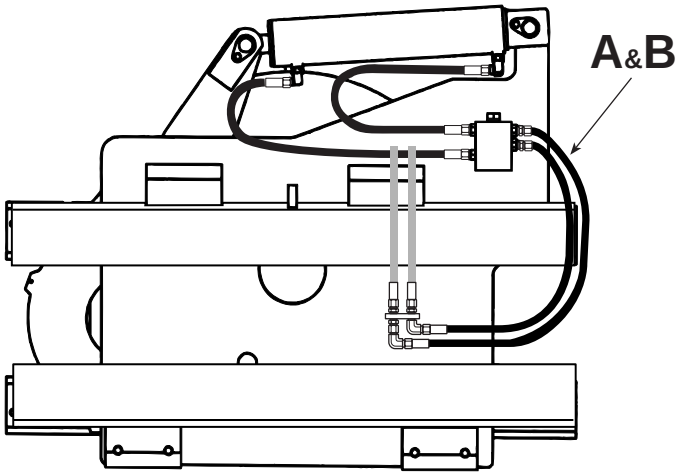


Tighten Capscrews:
Class II / III Mounting - 165 ft. - lbs. (225 Nm)

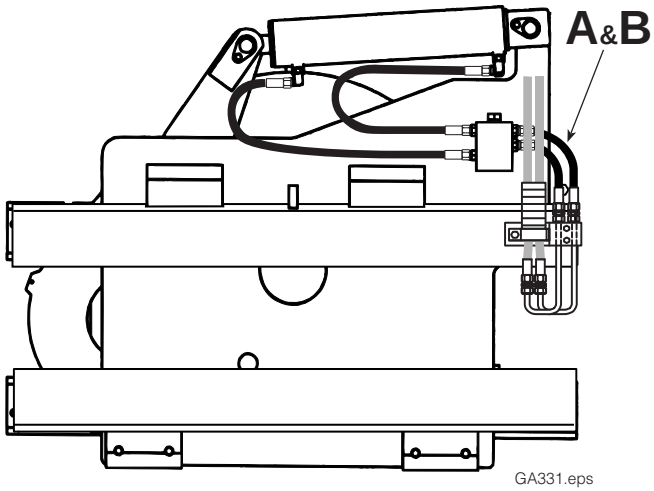
3 Prepare hoses

A Determine hose lengths required for hydraulic supply configuration of truck.

B Cut hoses to length, install end fittings or quick-disconnect kits.



Internal Hose Reeving



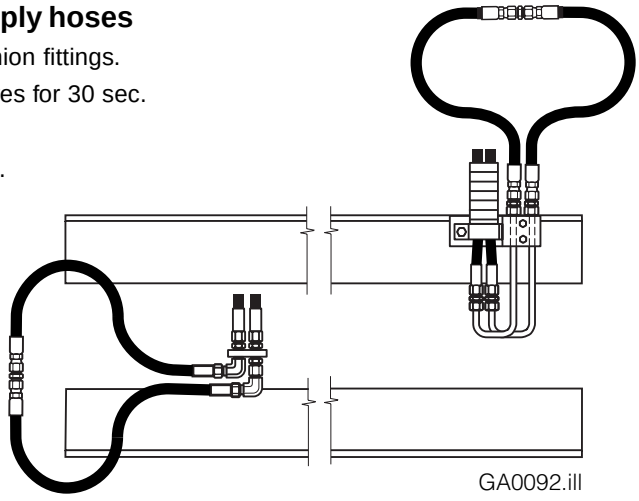
Single Hose Reel

4 Flush hydraulic supply hoses

A Install hoses using union fittings.

B Operate auxiliary valves for 30 sec. in both directions.

C Remove union fittings. (at (A))



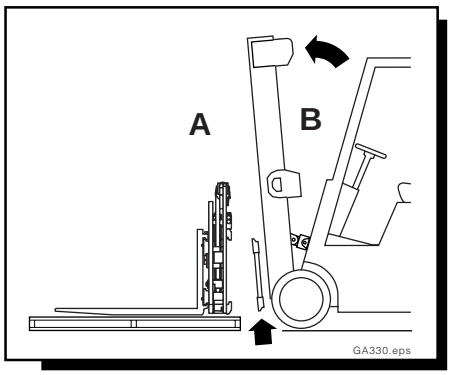
5 Mount rotator on truck carriage

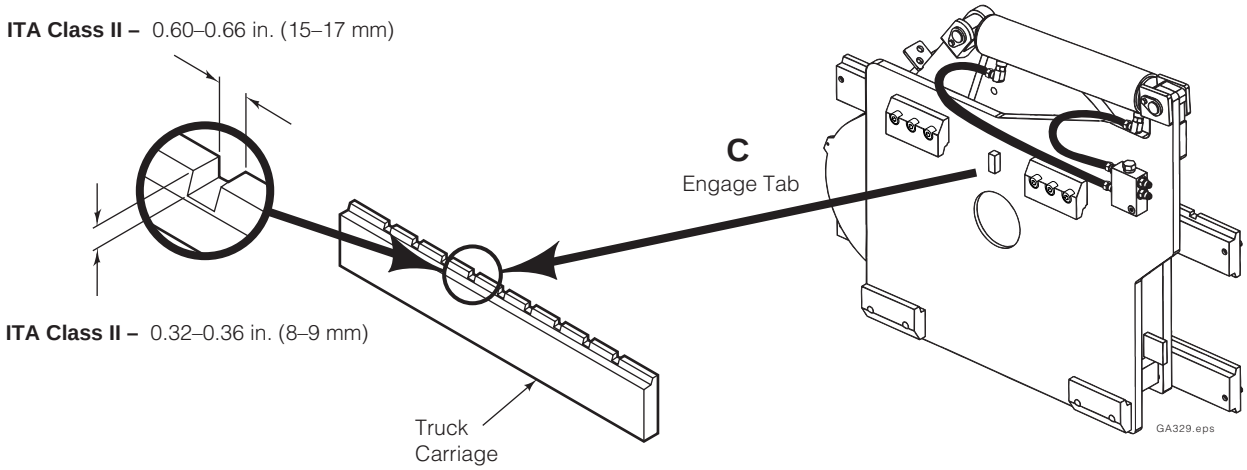
A Centre the lift truck behind the attachment.

B Tilt the mast forward.

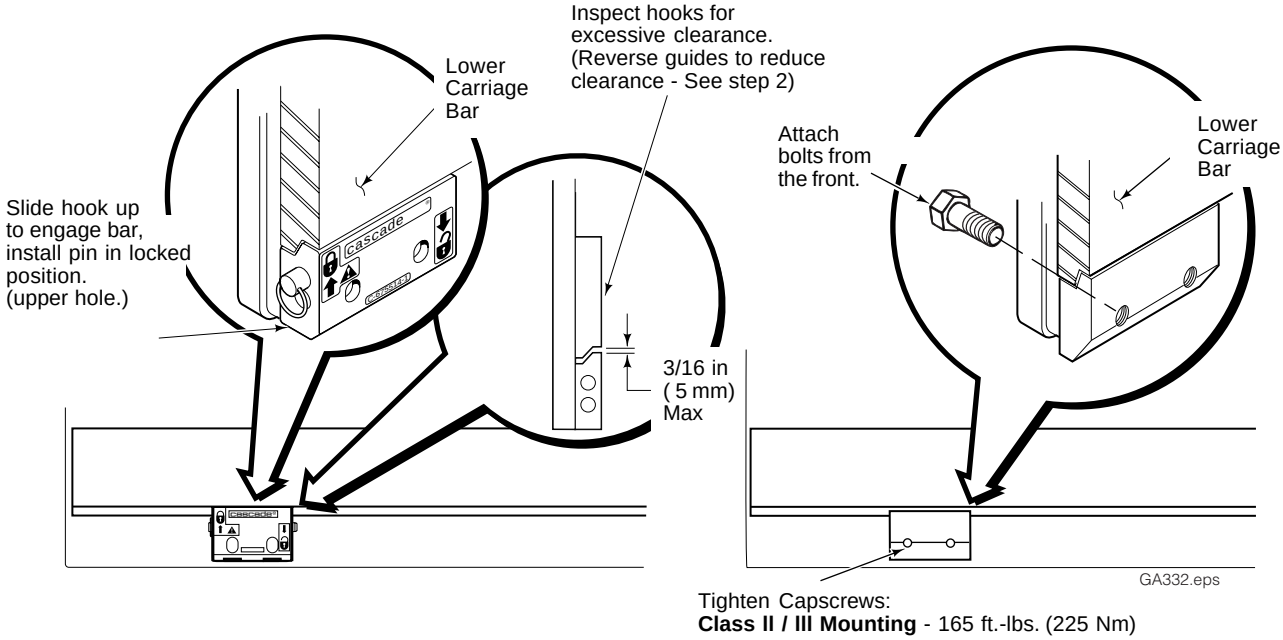
C Engage the mounting hook tab with the closest upper carriage bar notch and raise the truck carriage into position behind the attachment,

D Lift attachment 2in.(5cm) off the pallet.

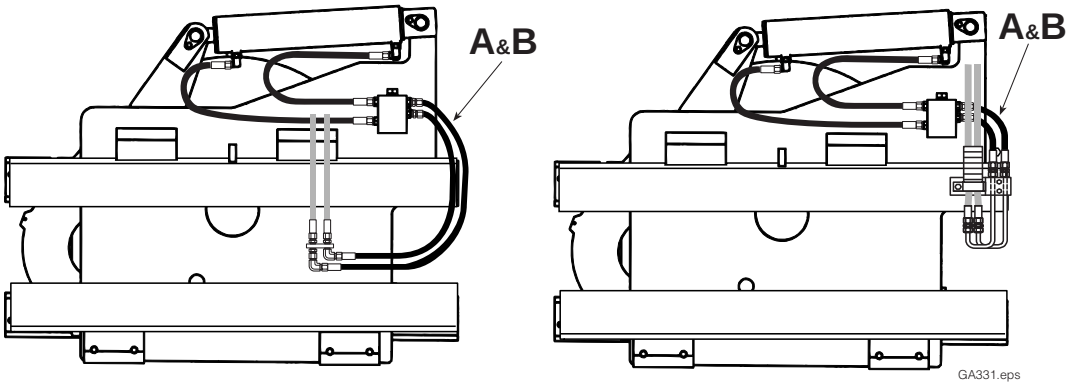




6 Install and engage lower hooks



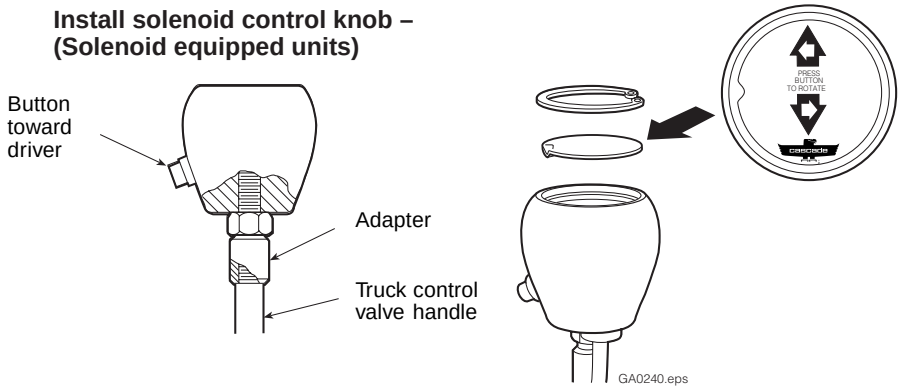
7 Connect Hoses as shown in Step 3



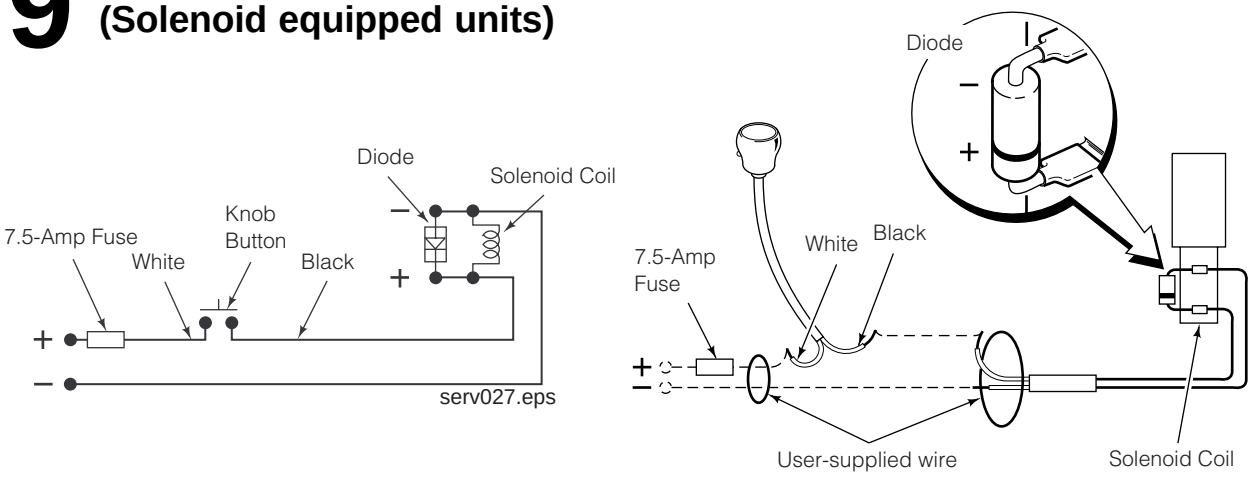
Internal Hose Reeving **Single Hose Reel**

8 Install solenoid control knob - (Solenoid equipped units)

Install solenoid control knob – (Solenoid equipped units)



9 Install wiring - (Solenoid equipped units)



10 Middle Hook Installation

A Position the middle hook using the dimensions shown.

B Mark the hook position on the fork.

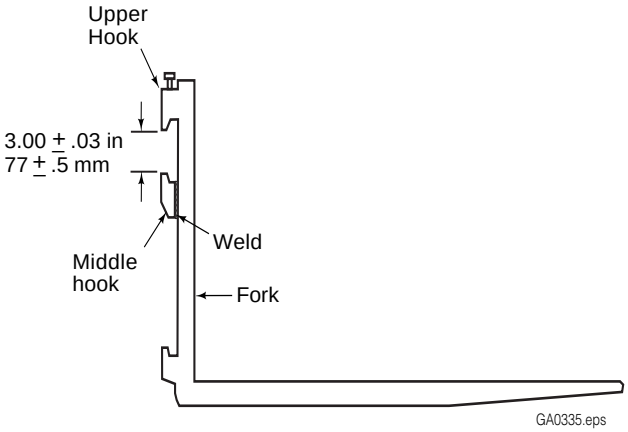
C tack weld the hook to the fork bar using FCAW* 110 T5-K3 electrode.

D Weld a .38 in (9 mm) fillet weld on all four sides of the hook using the following specifications:

- Oven pre-heat only the fork to 350° F (180°) for 1.5 hours.
- Weld using FWAC* 110 T5-K3 electrode. Use 100 CO_2 Shielding gas. Use voltage and apmerage as per manufacturers specifications.
- Cover the weldment with an insulation blanket and slow cool.

* Flux Core Arc Weld

WARNING: Each fork must have three hooks. Cascade forks for rotators are equipped with a middle hook. if the rotator is supplied wiithout forks, middle hooks are provided. They must be welded using the following proceedures.



11 How To Install and Position Forks

A Drive the roll pins located at each end of the carriage bars through to the back until they are clear of the face of the bar. It is not necessary to drive these pins completely out.

B Release the spring lock on the top of each fork.

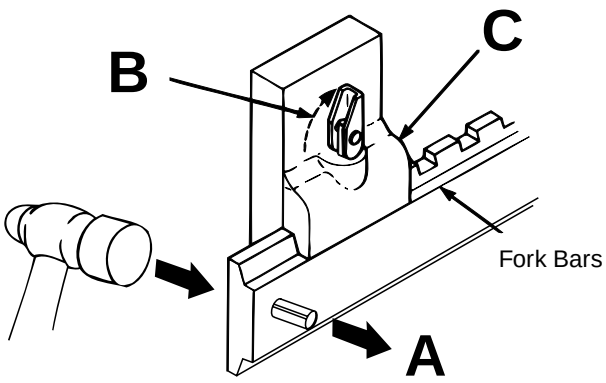
C Slide the forks into position on the fork bars.

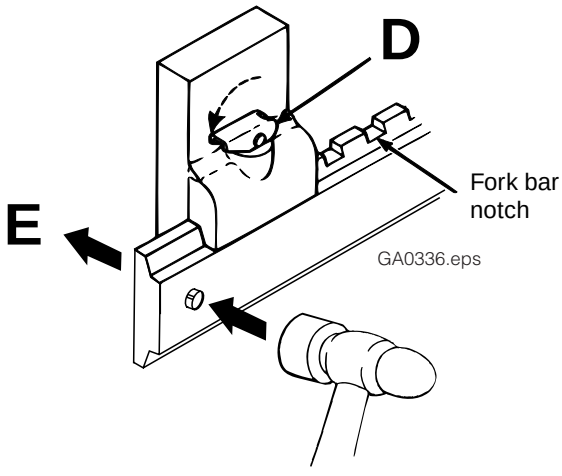
D Lock each fork into place by pushing the spring lock lever down. Make sure the pin is engaged in the fork bar notch.

E Drive home the roll pin from the rear of the carriage bar so that it is now flush with the back.

F Removal is a reversal of installation.

WARNING – When installing or removing forks, handle with care to avoid dropping. The roll pin fork keepers must be in place at all times during rotator operation.





12 Prior to Operation

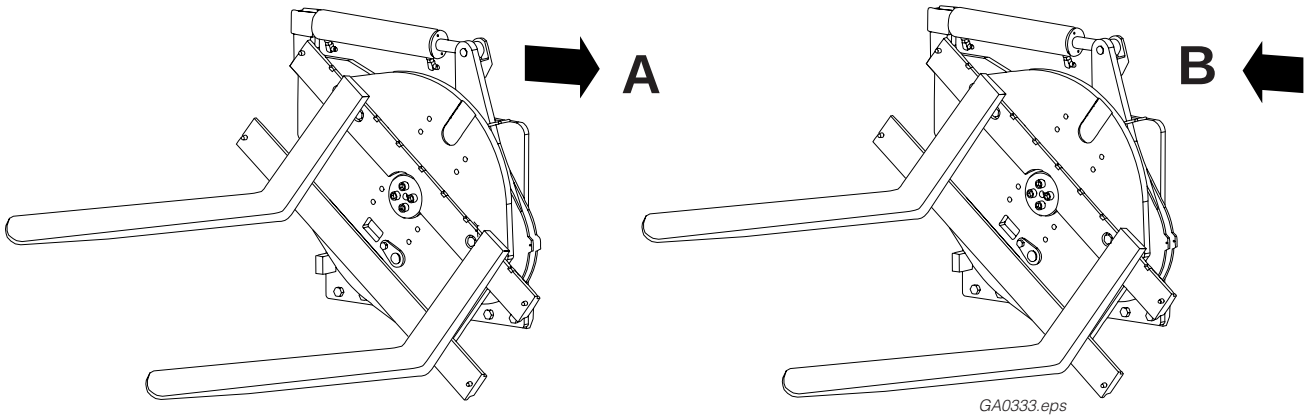
- With no load,Cycle Rotator functions several times.
- Check for operation in accordance with ITA (ISO) standards.
- Lift a maximum load, check for smooth rotation movement.
- Check for leaks at fittings, valve and cylinder.

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

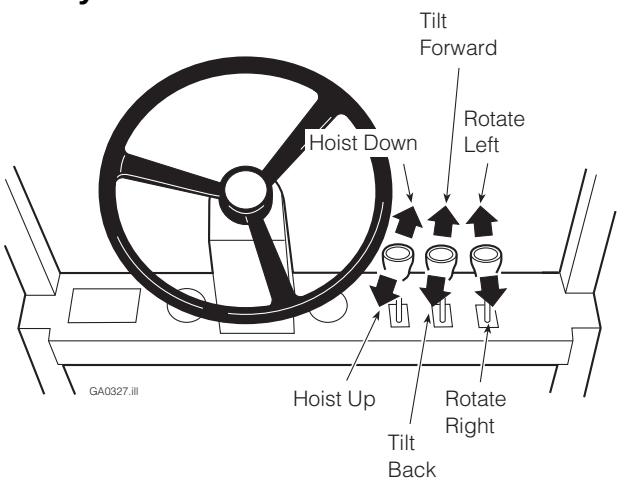
180 Degree Rotators - L.H. Rotation

A. Rotate Left (from driver seat)

B. Rotate Right (returns forks to horozontal



AuxiliaryFunctions Valve

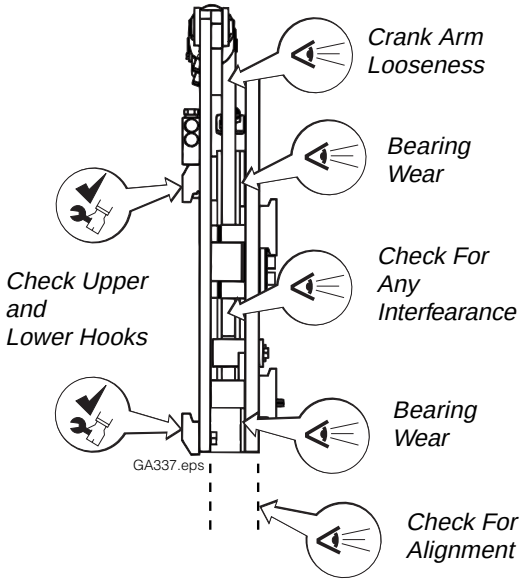


3.1 100-Hour Maintenance

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

- Inspect the cylinders for oil leaks or damage to the cylinder rod.
- Check pins attaching the cylinder to the frame and crank arm are not loose or damaged.
- Check between the front and back plate for any objects that may interfere with the mechanism.
- Check for worn, damaged or leaking hoses.
- Check the bolts holding the main thrust plate are tight and all accounted for.
- Check for any excessive looseness in the font plate.
- Check the bolts holding the bin hold assembly to the front plate (where fitted).
- Lubricate the main thrust bearing and crank arm bushing as indicated.

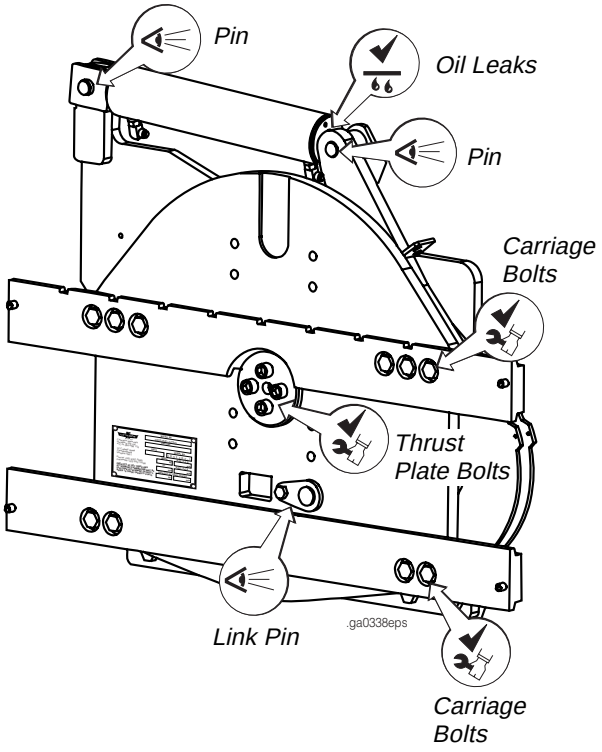
WARNING: After completing any service procedure, always test the Rotator through five complete cycles. First test the Rotator empty, then test with a load to make sure the rotator operates correctly before returning it to the job.



3.2 500-Hour Maintenance

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

- Tighten the lower mounting hooks. Use the torque specifications shown in Section 7.1-4
- Check for wear to the thrust bearing as indicated.
- Check for any damage or wear to the bin hold arm assembly.(where fitted).
- Check the spring latches on the forks for wear, they must engage the notches in the top bar.
- Check the top carriage bar notches for wear.



3.3 1000-Hour Maintenance

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

- Inspect all non lube thrust bushes. If the bushes are worn to a thickness less than 4 mm, they must be replaced. See Section 4.

3.4 2000-Hour Maintenance

After each 2000 hours of lift truck operation, in addition to the 100,500, and 1000 hour maintenance procedures, perform the following procedures.

- Replace all main and thrust bushes. See Section 4.

4.1 General Procedures

WARNING: Before servicing any hydraulic & component, relieve pressure in the system. Turn the truck off, and open the truck auxiliary valves 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 system. Then test the attachment with a load to be sure it operates correctly before returning it to the job.

Stay clear of the load while testing. Raise the load sufficiently to clear the ground while testing.

4.1-1 Truck Systems Requirements

- The lift truck must supply sufficient hydraulic pressure to handle the heaviest load. PRESSURE MUST NOT EXCEED 2300 PSI (160 BAR).
- Hydraulic flow should fall within the volume range shown in the table.
- The truck hydraulic system must supply hydraulic oil to the attachment that meets the specification shown in the table.

4.1-2 Tools Required (Metric)

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

- A flow meter capable of measuring hydraulic flow to 20 GPM (75 L/min.). The parts shown are included in Cascade Flow Meter Kit Part No. 671477.
- A pressure gauge capable of measuring pressure to 2500 psi (175 bar). The parts shown are included in Cascade Pressure Gauge Kit Part No. 671212.
- Assorted fittings and a No. 6 hose, as shown, to adapt the gauge and flow meter to the components being tested.

Hydraulic Specifications	
Pressure - Maximum	2300 psi (160 bar)
Recommended	2000 psi (140 bar)
Flow - Minimum ①	2.6 GPM (10L/min)
Recommended	5.3 GPM (20L/min)
Maximum ②	7.9 GPM (30L/min)
Supply Hose and Fitting Size	No.6
Minimum Orifice Size	9/32in. (7mm)

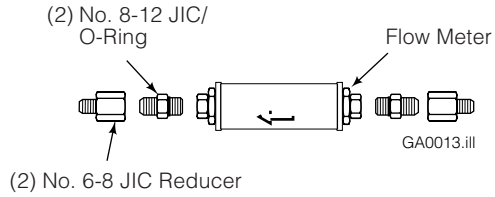
① Flow less than minimum will result in insufficient torque.

② Flow greater than maximum can result in excessive heating, reduced system performance and short hydraulic system life.

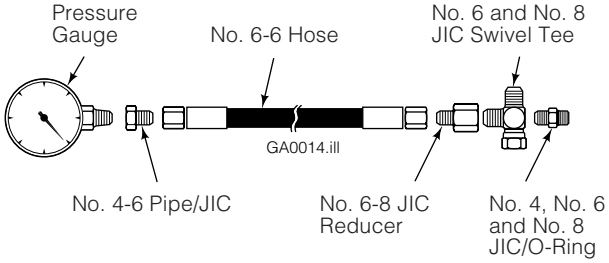
Hydraulic Oil - Cascade attachments are compatible with SAE 10W petroleum base oil per Mill Spec. MIL-0-5606 or MIL-0-2104B.

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

Flow Meter Kit 671477



Pressure Gauge Kit 671212



4.1.3 Get All The facts Before You begin Working On The Clamp

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

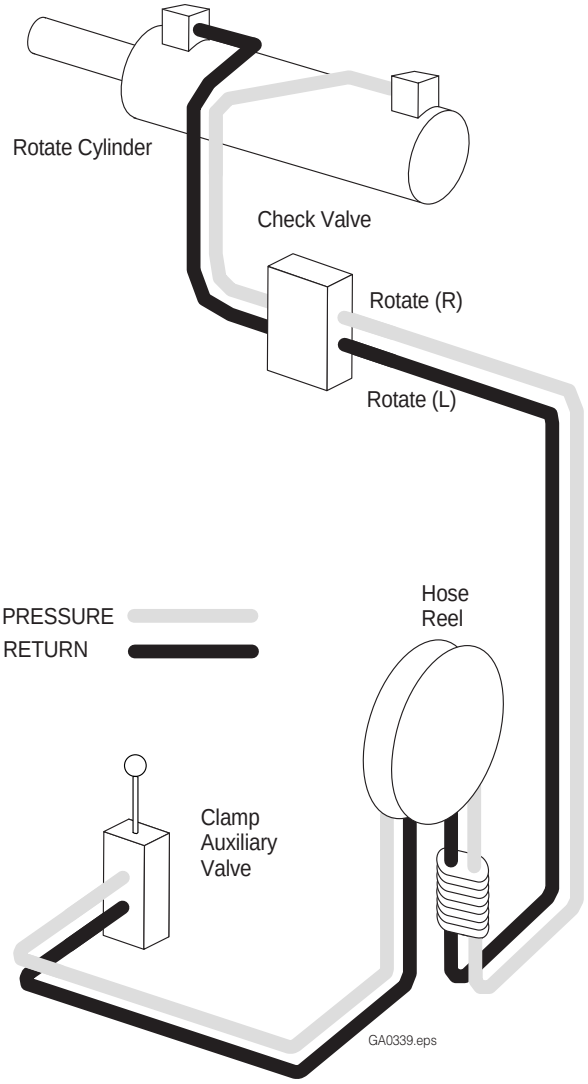
Rotate Circuit

- Attachment will not rotate.
- Attachment will not rotate up to its rated capacity.

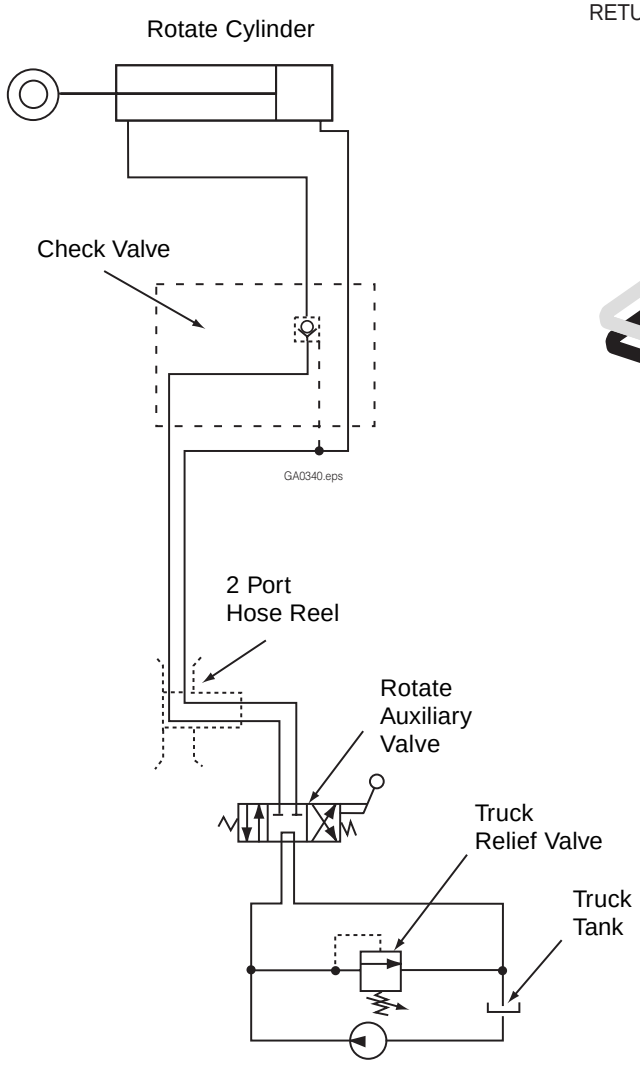
To correct these problems, see Sections 4.3-1 and 4.3-3

4.2 Plumbing

4.2-1 Hosing Diagram



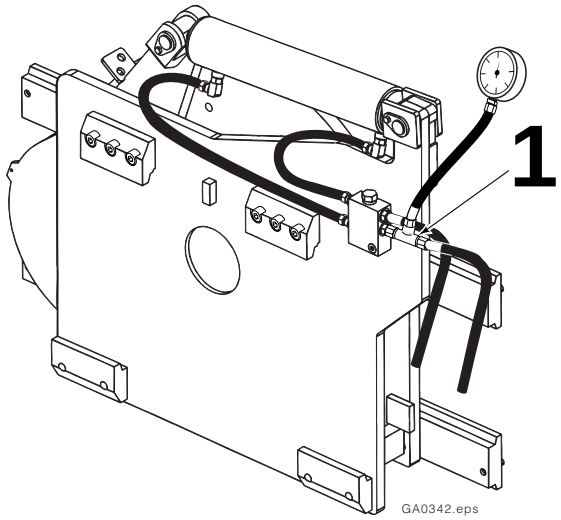
4.2-2 Circuit Schematic



4.3 Rotator Troubleshooting

There are four potential problem areas that could affect the rotate function.

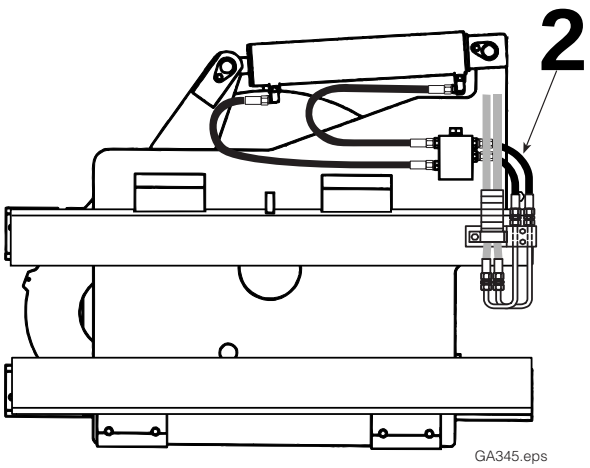
- ❒ Operator maybe handling loads beyond the capacity of the attachment. Loads rotated off centre may exceed attachment capacity.
- ❒ Insufficient hydraulic pressure and flow from the lift truck.
- ❒ Worn or defective cylinder seals.
- ❒ External leaks.
- ❒ Contaminant under bearings.



4.3-1 Supply Circuit Test

WARNING: Before servicing any hydraulics or components, relieve pressure in the system. Turn the truck off, and open the truck auxiliary valves several times in both directions.

1. Check the pressure delivered by the truck. Refer to the truck service manual. The pressure must be within 100 psi (7 bar) of specified truck pressure. TRUCK PRESSURE MUST NOT EXCEED 2300 PSI (160 Bar), measured at the junction block.
2. Check the flow volume at the hose terminal. See **Section 2.1** for the recommended flow volumes.
3. Rotators with Solenoid Adaption - Press the auxiliary valve control knob button Listen for a "click" at the solenoid valve. If the solenoid valve does not "click" when the button is pushed. Check the electrical wiring and solenoid coil.
4. Check for external leaks.

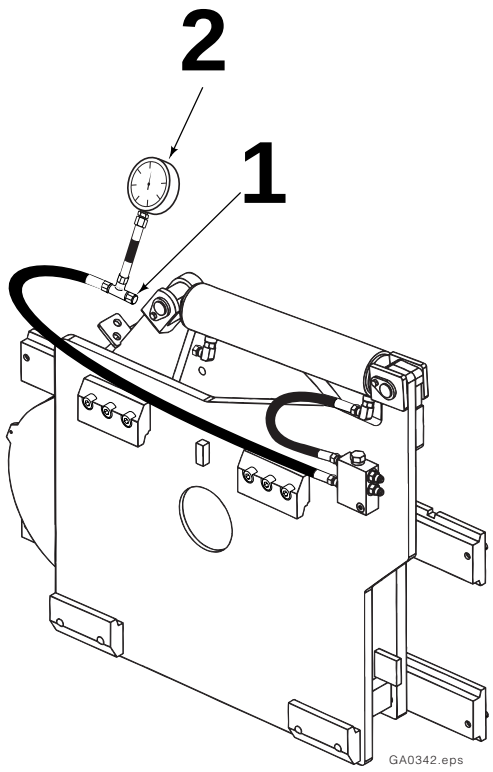


4.3-2 Check Valve Pressure Test

WARNING: Before servicing any hydraulics or components, relieve pressure in the system. Turn the truck off, and open the truck auxiliary valves several times in both directions.

1. Disconnect the hydraulic line at the rod end of the cylinder. Insert ‘T’ fitting, cap the ports.
2. Insert gauge into line as shown.
3. Start the truck. Hold the clamp control handle in the rotate position (pressurise line to gauge) for a few seconds.
4. Return the handle to neutral. Watch the gauge pressure reading.

- If the pressure drops more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the check valve is faulty and requires service. Refer to paragraph .....
- If the pressure does not drop more than 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, the cylinder requires service. Proceed with the troubleshooting check list to isolate the faulty component.

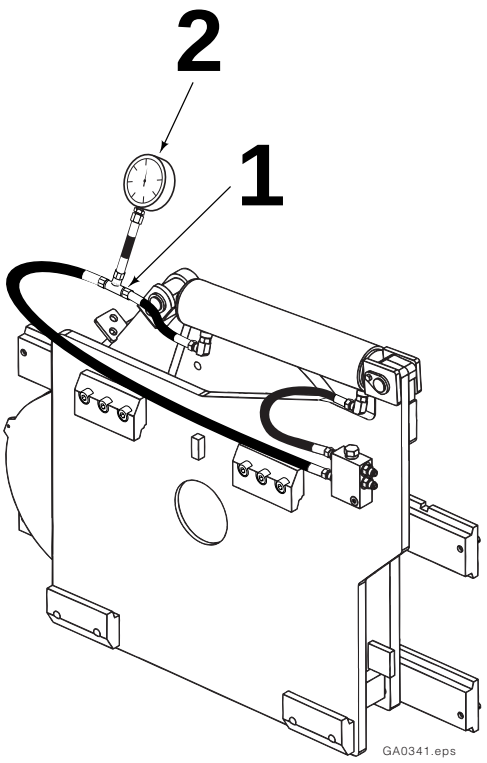


4.3-3 Cylinder Test

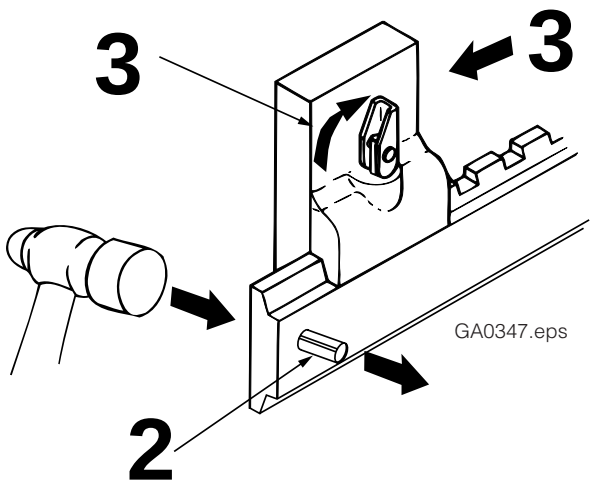
WARNING: Before servicing any hydraulics or components, relieve pressure in the system. Turn the truck off, and open the truck auxiliary valves several times in both directions.

1. Remove line to rod end fitting and insert 'T' fitting.
2. Connect gauge into the line as shown.
3. Start the truck. Hold the rotate control handle in the rotate position (pressurise line to gauge) for a few seconds.
4. Return the handle to neutral. Watch the gauge pressure reading.

- If the pressure drops more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the cylinder is faulty and requires service.



5.1 Rotator Removal



1 Rotate the attachment to position the forks parallel to the ground.

2 Drive the fork keeper roll pin from each end of the carriage. For reassembly, reverse the procedure.

3 Release the spring lock on the top of each fork. Remove the forks from the rotator.

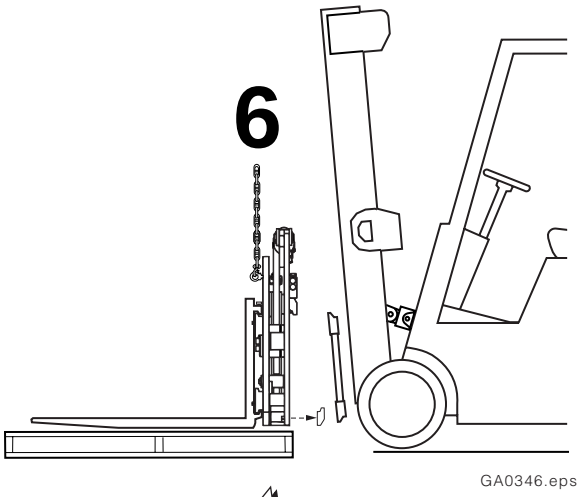
4 **Bolt On Type** - Remove the lower mounting hooks. For reassembly, tighten the cap screws to a torque of 105-115 ft.-lbs. (140-155 N m)

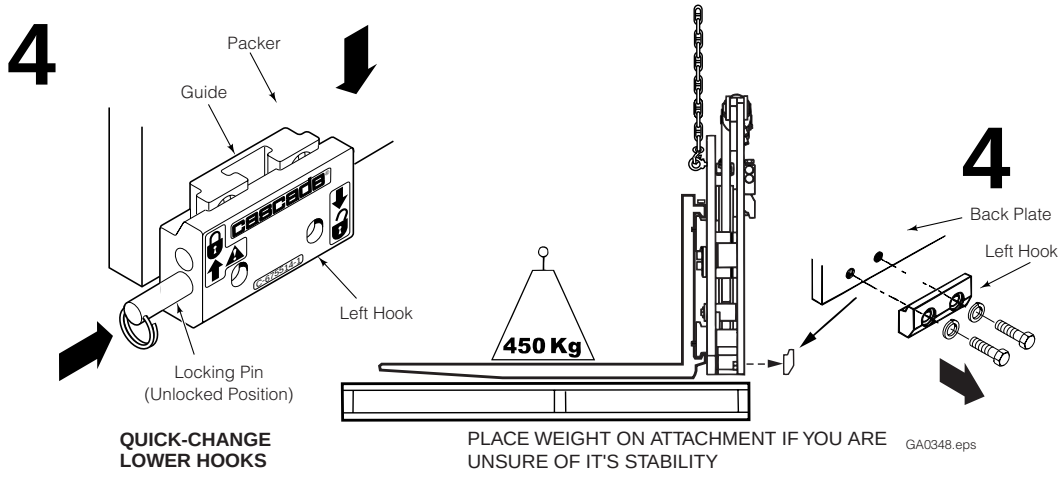
Quick Change Type - Pull out the retaining pin, slide the hook down and reinstall the pin in the lower hole. For reassembly, slide the hook up and install the pin in the top hole.

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

5 Disconnect and plug the hoses to the attachment. Tag the hoses for reassembly.

6 Install a hoist to the attachment. Tilt the mast forward and lower the carriage to disengage the upper hooks. Remove the attachment from the lift truck and place on a pallet





QUICK-CHANGE LOWER HOOKS

PLACE WEIGHT ON ATTACHMENT IF YOU ARE UNSURE OF IT'S STABILITY

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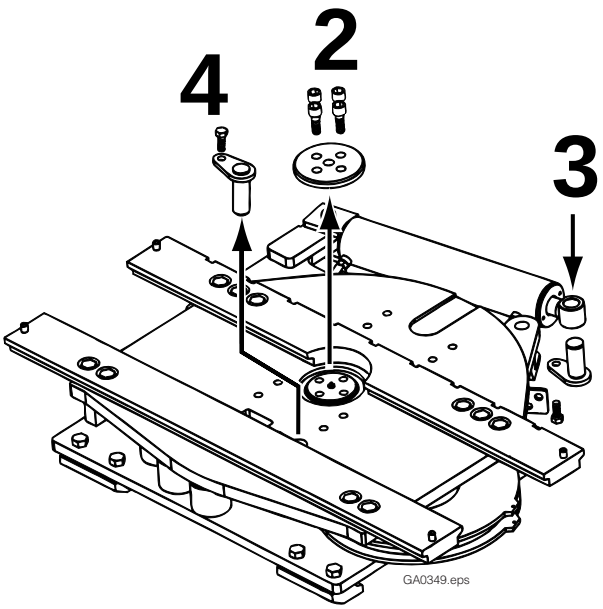
5.2 Rotator Group

5.2-1 Front Plate Removal



1 Lay rotator down on pallet or bench.

2 Remove bolts fixing thrust plate to centre boss. For reassembly, reverse the procedure.

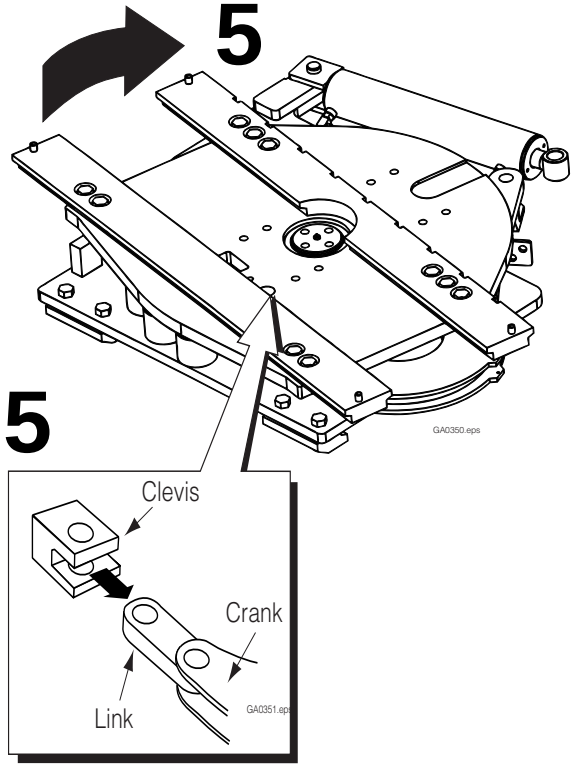
3 Remove pin at rod end of cylinder, move cylinder clear of crank arm.

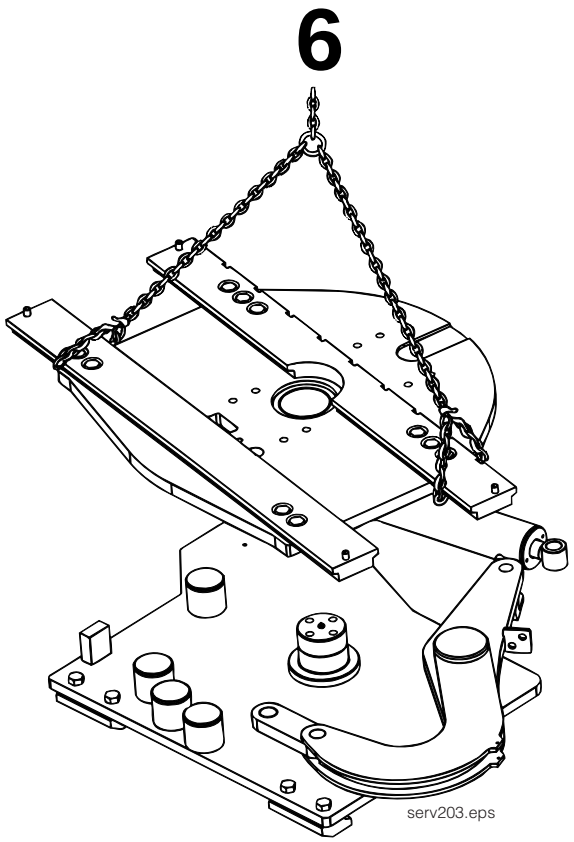
4 Remove crank arm retaining pin.

5 Manually turn the front plate 10 in (200 mm) in a clockwise direction to disengage crank link from clevis.

6 Install a hoist to the carriage bars. Remove the front plate from the attachment and place on a pallet**.**

7 For reassemly , reverse the procedure. Tighten trust plate retaining cap screws to a torque of 105-115 ft.-lbs. (140-155 N m)





5.2-2 Bearing Replacement - Back Plate

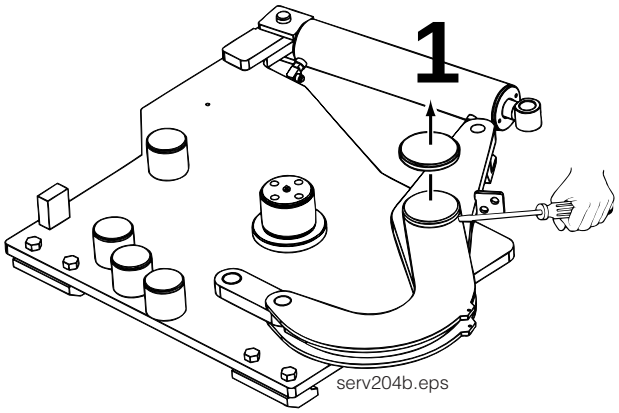
1 Remove thrust bearing situated on crank arm pin.

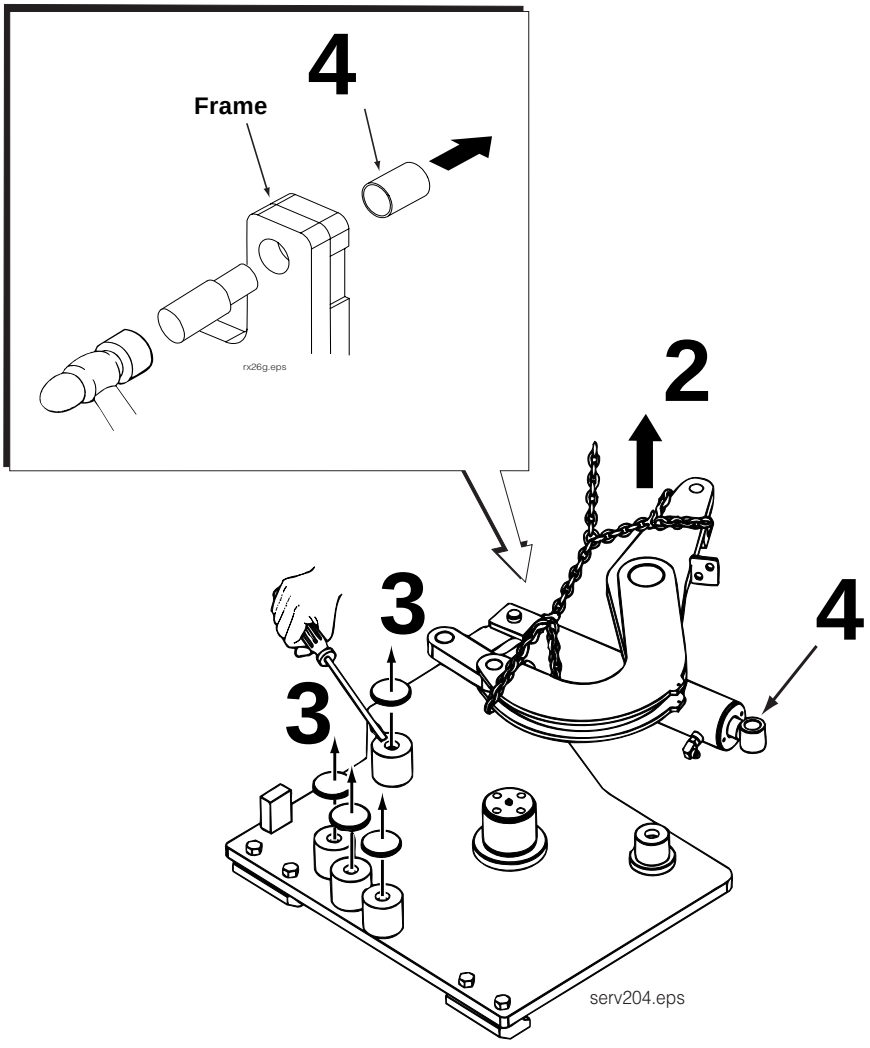
2 Install a hoist to the crank arm. Remove the crank arm from the back plate and place on a pallet**.**

3 Remove the remaining bearings as shown.
NOTE: All bearings must be replaced, **Do not** replace single bearings as this will cause misalignment with front plate.

4 Bushes located in frame and cylinder rod end should only be replaced if worn.

5 Replace bearing. For reassembly, reverse the procedure.





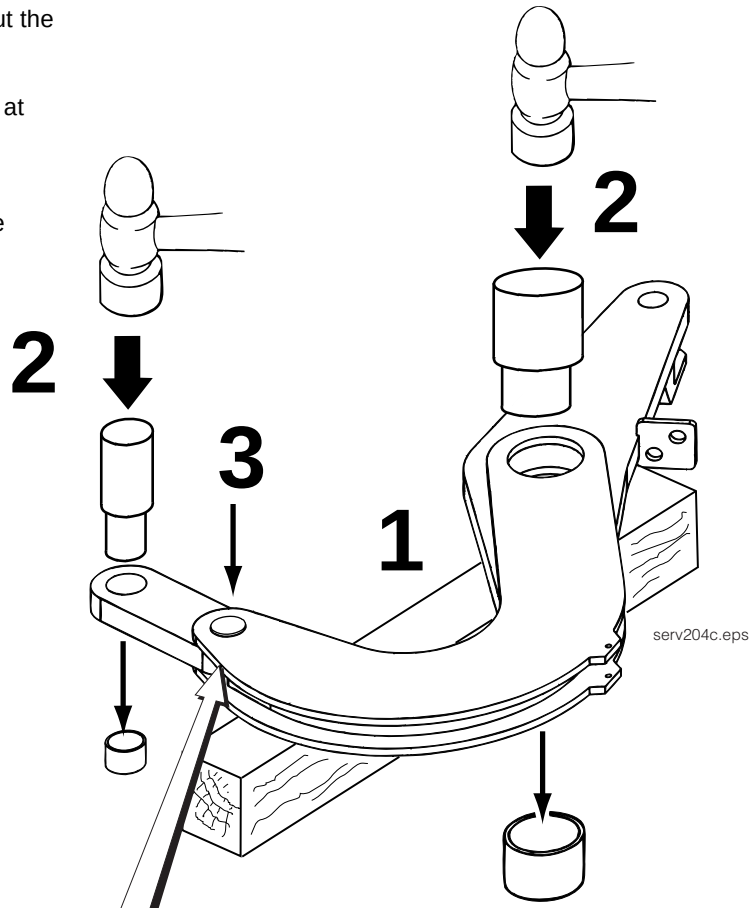
5.2-3 Bearing Replacement - Crank Arm

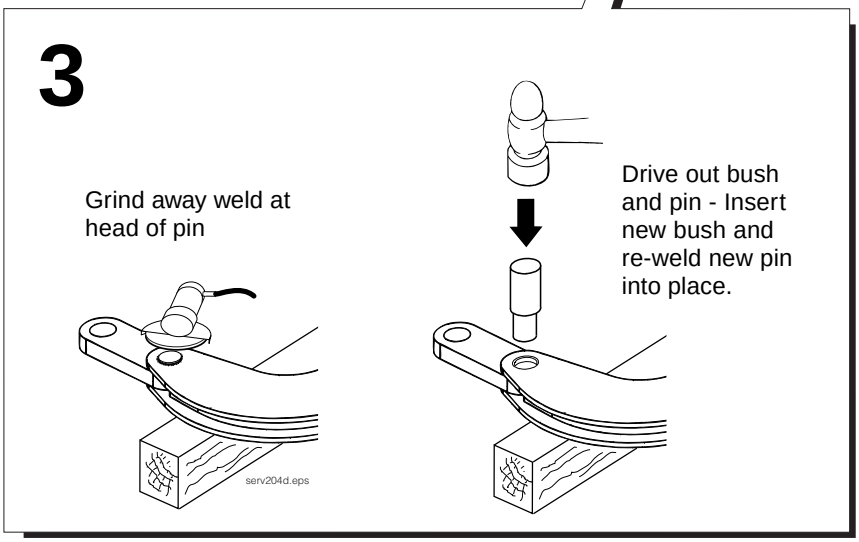
1 Support crank arm on a piece of timber with suitable under clearance.

2 With a soft hammer and stepped punch, drive out the D.U. bushes as shown.

3 To replace fixed pin and bush - Grind away weld at head of pin. Drive out pin and bush with suitable punch.

4 Replace all bushes. For reassembly, reverse the procedure.





5.3 Cylinders

5.3-1 Cylinder Service

The following procedures can be performed with the attachment mounted on the truck.

> Before removing any hydraulic lines, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

5.3-2 Cylinder Removal

1 Rotate the attachment to position the forks parallel to the ground

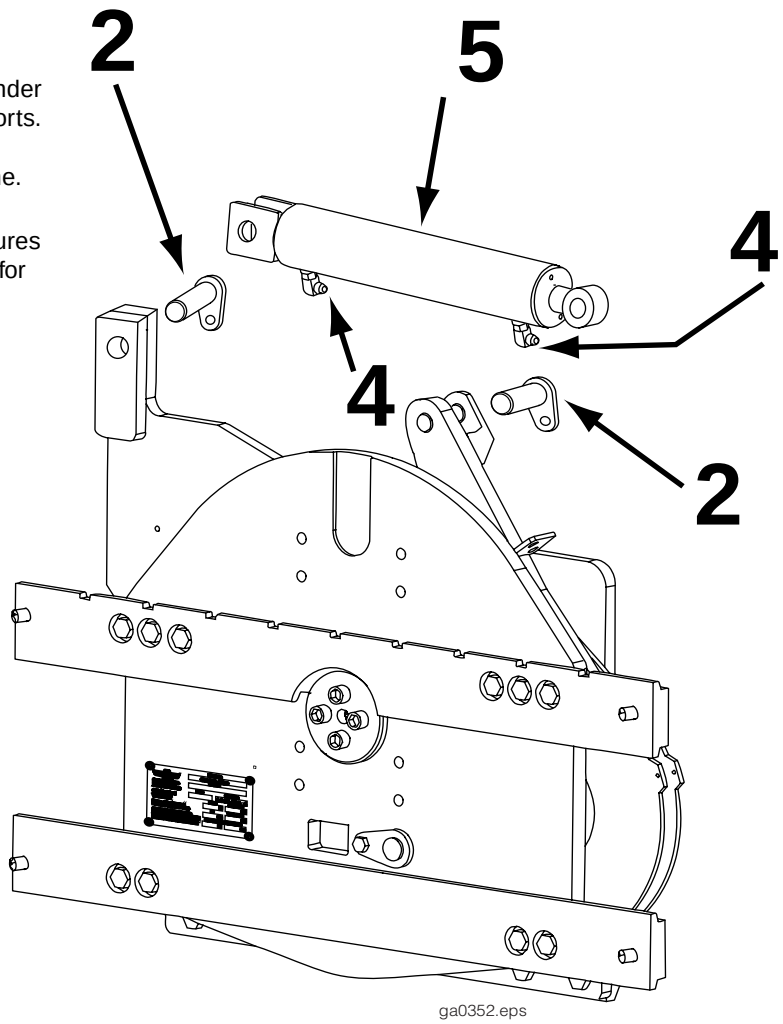
2 Remove the cylinder retaining pins from both ends of the cylinder.

3 Relieve hydraulic system pressure.

4 Disconnect the hydraulic lines from the cylinder ports. Plug the lines and cap the cylinder ports.

5 Lift the cylinders away from the rotator frame.

6 For reassembly. Reverse the above procedures except for the following special instructions for the cylinder anchor nuts.



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5.3-3 Cylinder Disassembly

1 Clamp cylinder in a soft-jawed vice. Clamp at the extreme base end only.

2 Remove the retainer by using a pin type spanner wrench. DO NOT use a punch as this may cause damage to the retainer nut.

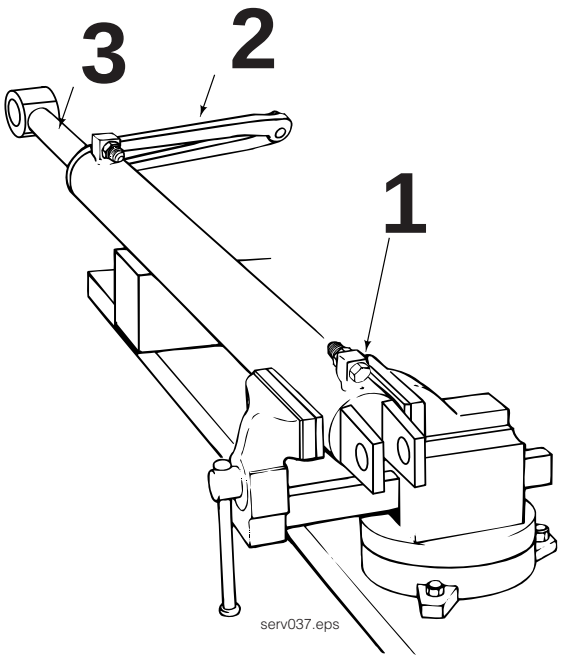
3 Remove the rod assembly from the cylinder.

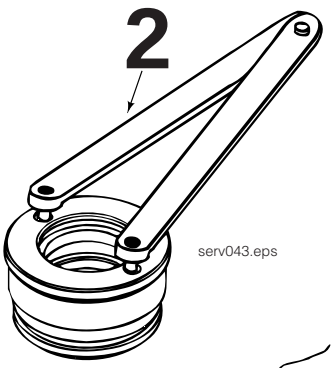
4 Clamp the rod assembly on the pin end weldment flats. Never clamp directly on the rod sealing surface.

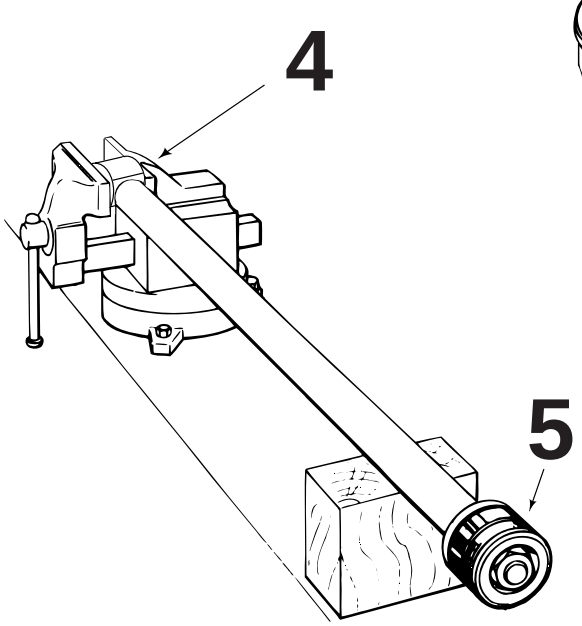
5 Remove the nut fastening the piston to the rod. Use a wrench on the rod end wrench flats to keep the rod from rotating while removing the nut.

6 Place the piston or retainer in a soft-jawed vice to remove the seals. Pry the seals up with a blunt screwdriver. Cut the seal to remove it.

CAUTION: Do not scratch the seal grooves.







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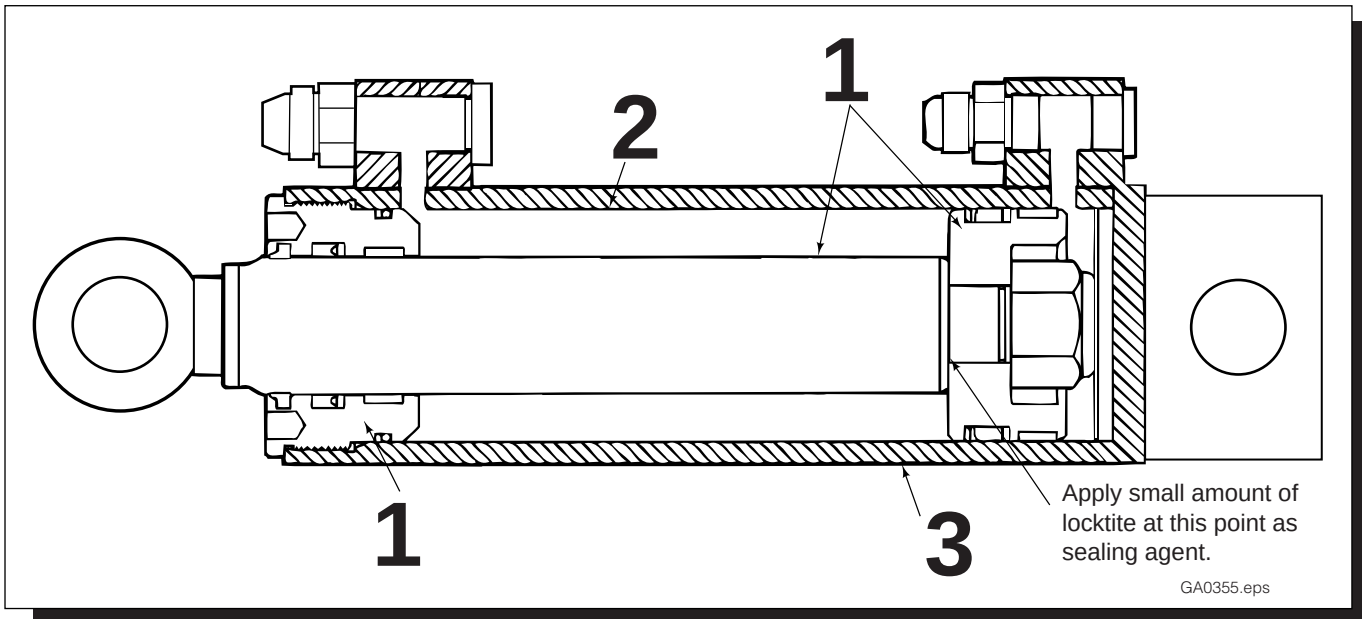
5.3-4 Cylinder Inspection

1 Inspect the rod, piston and retainer for nicks or burrs. Minor nicks and burrs can be removed with emery cloth. If they cannot be removed with emery cloth, replace the part.

2 Inspect the cylinder shell bore and remove any minor nicks or burrs with a butterfly. If they cannot be removed with the butterfly, the shell must be replaced.

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

4 Lubricate all new seals and rings with petroleum jelly or equivalent.



5.3-5 Cylinder Reassembly

1 Lubricate all new seals and rings with petroleum jelly or equivalent.

2 Note the direction of the U-cup seals. If installed backwards the seals will not work properly. For proper seal placement see illustration below.

3 Polish the piston and retainer chamfer angle with emery cloth. This allows the seal to slide over the chamfer easier.

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 as shown.

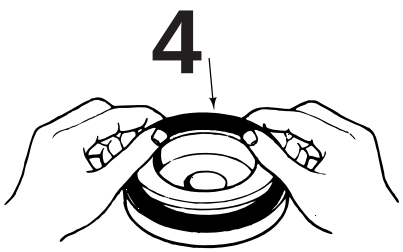
5 Install the retainer, followed by the piston on the rod and tighten the piston retaining nut. Tighten to the torque value shown below.

6 Apply a thick film of hydraulic oil to the inside of the cylinder shell and piston seals.

7 Insert the rod-piston assembly into the cylinder shell. If resistance is encountered, tap the rod end with a rubber mallet.

8 Apply a thick film of petroleum jelly to the inside of the cylinder shell and all retainer seals.

9 Tighten the retainer to the torque value shown.



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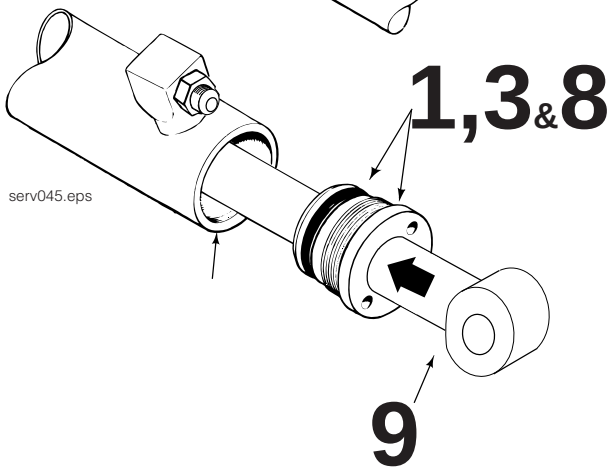

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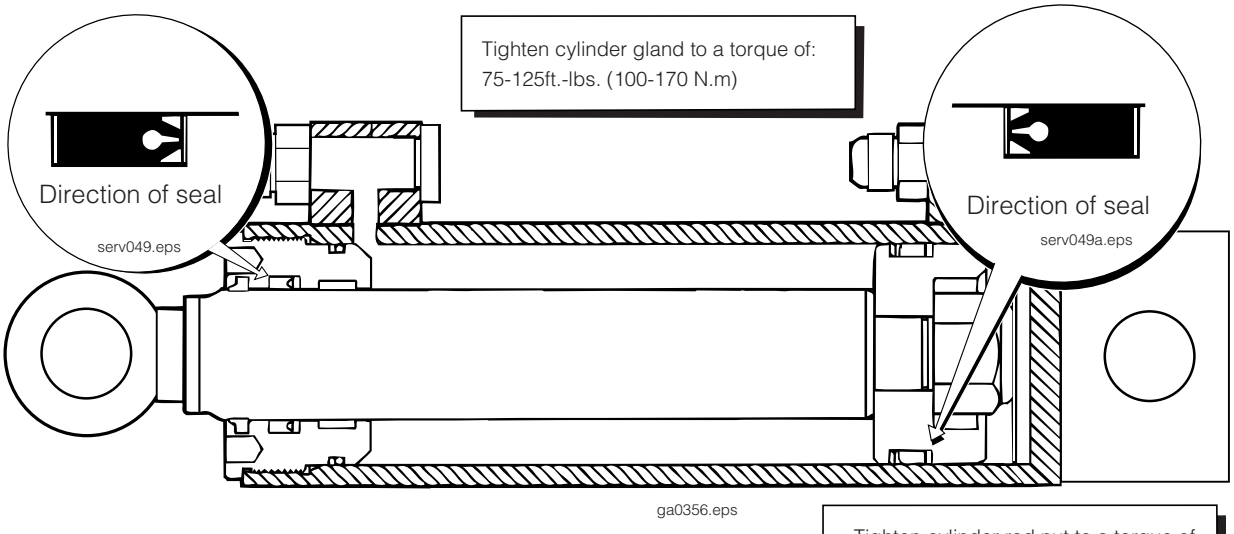


6.1 Valves

6.1-1 Check Valve Service

IMPORTANT: Service the Check Valve in a clean work area.

1 Remove the valve from the clamp.

2 Remove the cartridges from the valve body.

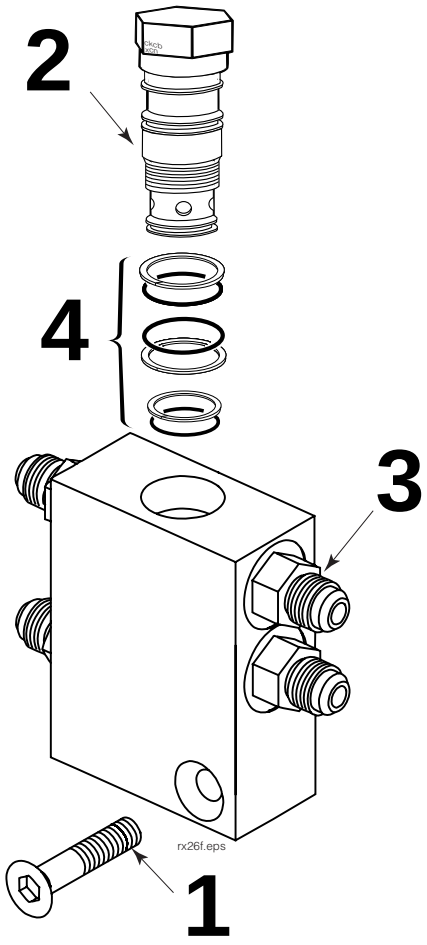
3 Remove the remaining plugs and fittings.

4 Remove the O-rings and back-up rings from the cartridges.

5 Clean all parts with kerosene or cleaning solvent.

6 For reassembly, reverse the above procedures except as follows:

- The cartridge valve back-up rings and O-rings must be installed as shown to avoid seal damage during reassembly.
- Lubricate cartridges and seals with petroleum jelly prior to reassembly.



7.1 Specifications

7.1-1 Hydraulics

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 Valve Setting:
2300 psi (160 bar), maximum.
2000 psi (140 bar), recommended.

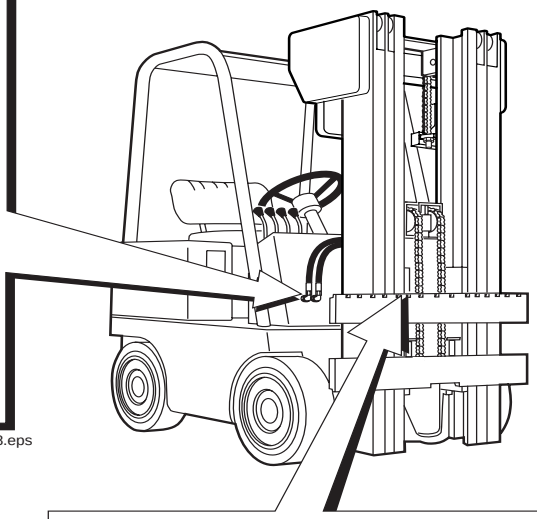
Truck Flow Volume ①

	Min ②	Recommended	Max ③
RX25	2.6 GPM (10 L/min)	5.3 GPM (20 L/min)	7.9 GPM (30 L/min)

① Cascade Series 3 Rotators 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 system performance.

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



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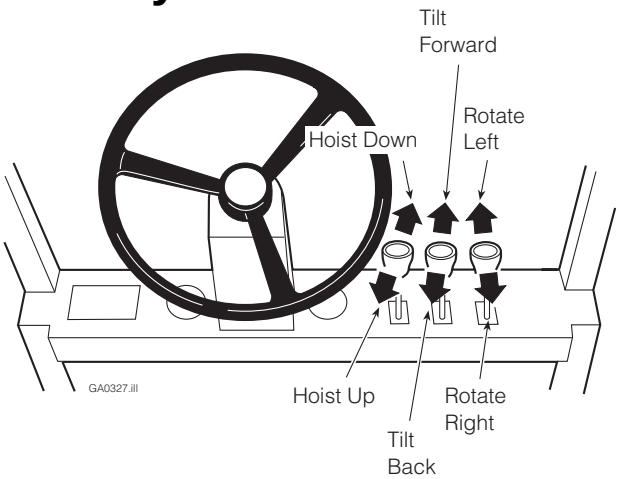
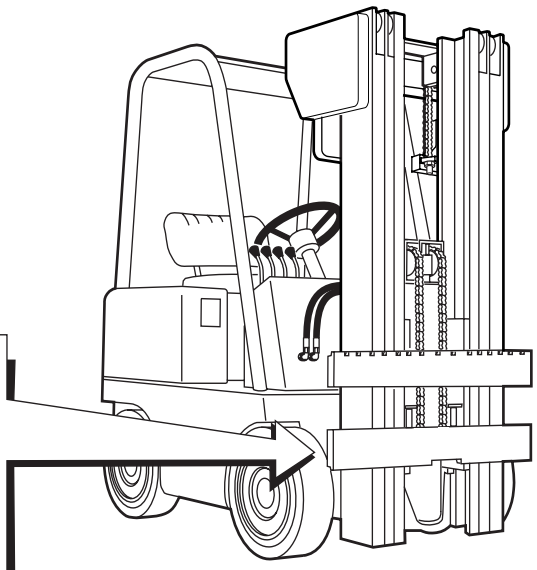
7.1-2 Auxilliary Valve Functions



Hoses and Fittings

All supply hoses must be at least No. 6 minimum. Recommended No. 8

All fittings must have an orifice size of 9/32 in. (7 mm) minimum.



7.1-3 Truck Carriage

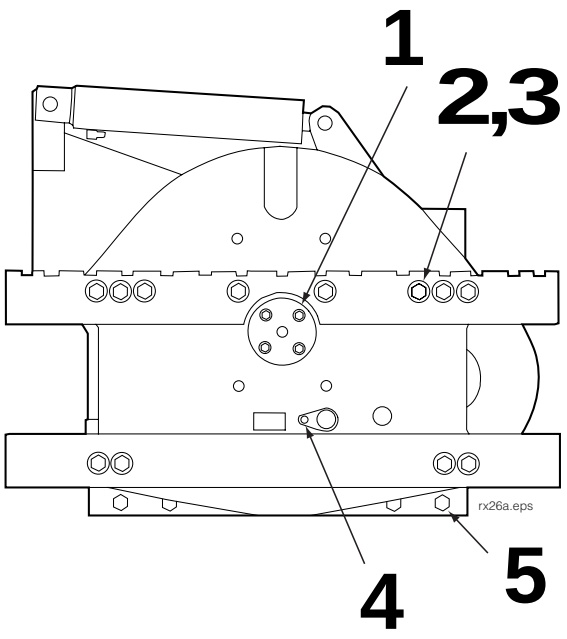
Carriage Mount Dimension (A) ITA (ISO)

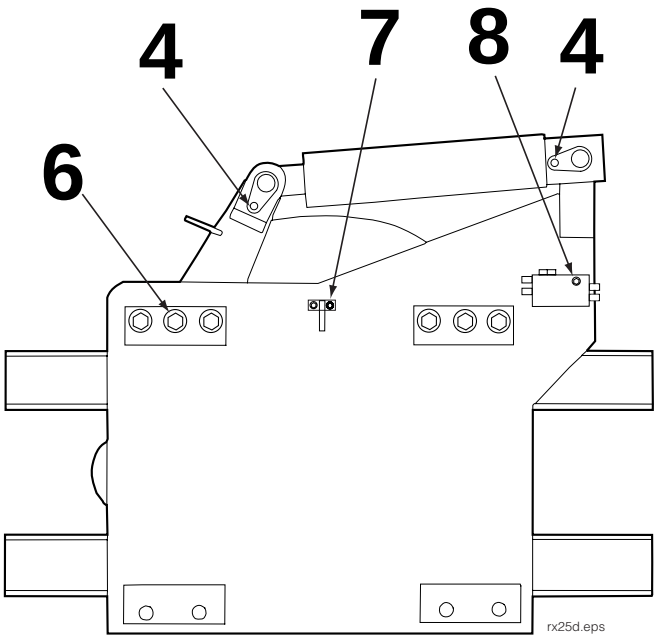
	Minimum	Maximum
Class II	14.94 in. (380.0 mm)	15.00 in. (381.0 mm)
Class III	18.68 in. (474.5 mm)	18.74 in. (476.0 mm)

7.1-4 Torque Values

Ref	Fastener	Size	Ft.-lbs	Nm	
1	Retainer	M16	242	330	■
2	Carriage Bar - Hex Bolt ★	M16	139	190	■
3	Carriage Bar - Cap Screw ★	M16	242	330	■
4	Link Pin - Bolt	M12	56	77	■
5	Lower Hooks - Hex Bolt	M16	139	190	
6	Top Hooks- Cap Screws	M16	242	330	■
7	Center Bracket -Cap Screw	M8	15	20	■
8	Valve - C.S. Cap Screw	M8	15	20	■

■ Use Loctite 242 (Blue)
★ Number and Types of fasteners varies depending on Model





7.1-5 Determining Load Torque Requirements

IMPORTANT: Positioning the load as close to the centre as possible will reduce the torque requirements and increase truck stability.

To make sure your rotator will handle a specific load, calculate the torque requirement as follows.

1 Weigh the load to be handled , Example: 1500 lbs.

2 Determine the centre point of the rotator face plate. This on a 180 degree rotator, is the centre grease fitting.

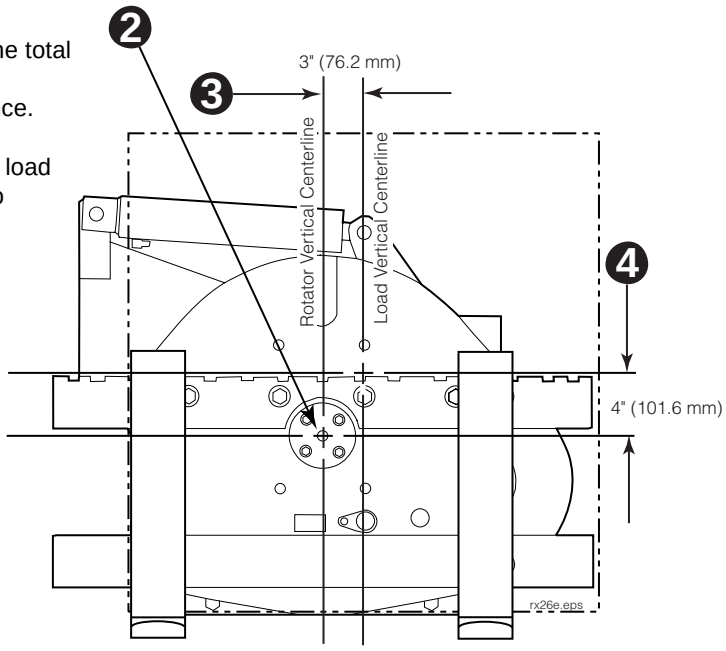
3 Determine the vertical off-centre distance of the load. Measure from the load vertical centerline to the rotator vertical centerline.

4 Determine the horizontal off-centre distance of the load. Measure from the load horizontal centerline to the rotator horizontal centerline.

5 Off-centre distance calculation.

- Square the vertical measurement.
  Example: $(3 \text{ in.})^2 = 9$ in.
- Square the horizontal measurement.
  Example: $(4 \text{ in.})^2 = 16$ in.
- Add the two figures together.
  9 in + 16 in. = 25 in.
- Determine the square root and you have the total off-centre distance.
  Example: $\sqrt{25 \text{ in.}} = 5$ in. off- centre distance.
- Multiply the total off-centre distance by the load weight and you have the torque required to handle the load. Compare this figure to the rotator specification in the chart.
  Example: 5 in. x 1500 lbs. = 7500 in. lbs

Model	Maximum Torque Capacity
3RX25	32,000 in.- lbs @ 2300 psi (3614 Nm @ 160 bar)



Do you have questions you need answered right now ? Call your nearest Cascade service Department

Cascade Corporation
2201 NE 201 st
Fairview, OR 97024-9718
Tel: 1-800-CASCADE
503-669-6300
FAX:503-669-6397

Cascade Canada Inc.
5570 Timberlea Blvd.
Mississauga, Ontario
Canada L4W-4M6
Tel: 905-629-7777
FAX: 905-629-7785

Cascade GmbH
D-41199 Monchengladbach
Klosterhofweg 52
Germany
Tel: 21-66-602091
FAX: 21-66-680947
FAX: 9-273-9137

Cascade N.V.
European Headquaters
P.O. Box 3009
1300 El Almere
The Netherlands
Tel: 31-36-5492911
FAX: 31-36-5492964

Cascade N.V.
Benelux Sales and Service
P.O. Box 3009
1300 El Almere
Damsluisweg 56
1332 ED Almere
The Netherlands
Tel: 31-36-5492950
FAX: 31-36-5492974

Cascade Hispania
S.A.91421
Avenida De La Fabregada, 7
Hospitalet De Llobregat
Barcelona
Spain
Tel: 3-335-5158
FAX: 3-335-4756

Cascade Norway
Østerliveien 37A
1153 Oslo
Norway
Tel: 47-22-743160
FAX: 47-22-743157

Cascade France S.A.R.L.
11, Rue Jean Charcot
Zone Industrielle Sud or
BP. 22
91421 Morangis Cedex
France.
Tel: 1- 64547501
FAX: 1-9790584

Cascade (UK) Ltd.
15, Orgreave
Dore House Industrial
EstateCrescent
Handsworth
Sheffield S13 9NQ
England
Tel: 742-697524
FAX: 742-695121

Cascade Korea
Room 508, Pum Yang Bldg.
Se-Cho Ku, Seoul
Korea
Tel: 2599-7131 ext. 512
FAX: 2533-8089

HYCO-Cascade Pty. Ltd.
1445 Ipswich Road
Rocklea,
Brisbane 4107
Australia
Tel: 7-3274-2722
FAX: 7-3274-3456

HYCO-Cascade (NZ) Ltd.
15 Ra Ora Drive, East Tamaki
P.O. Box 38-440
Howick, Auckland
New Zealand
Tel: 9-273-9136
FAX: 9-273-9137

Cascade-Xiamen
Wanshan No. 1 Workshop
Huli Road
Xiamen 361006
Fujian, PRC
Tel: 592-562-4600
FAX: 592-562-4671

HYCO-Cascade Pty. Ltd.
7 Industrial Avenue
Notting Hill,
Victoria 3168
Australia
Tel: 3-9548-9266
FAX: 3-9548-9255