SERVICE MANUAL

30G, 40G

360° Rotators

Manual Number 6089468-R3

cascade® corporation

CONTENTS

1.1 Introduction

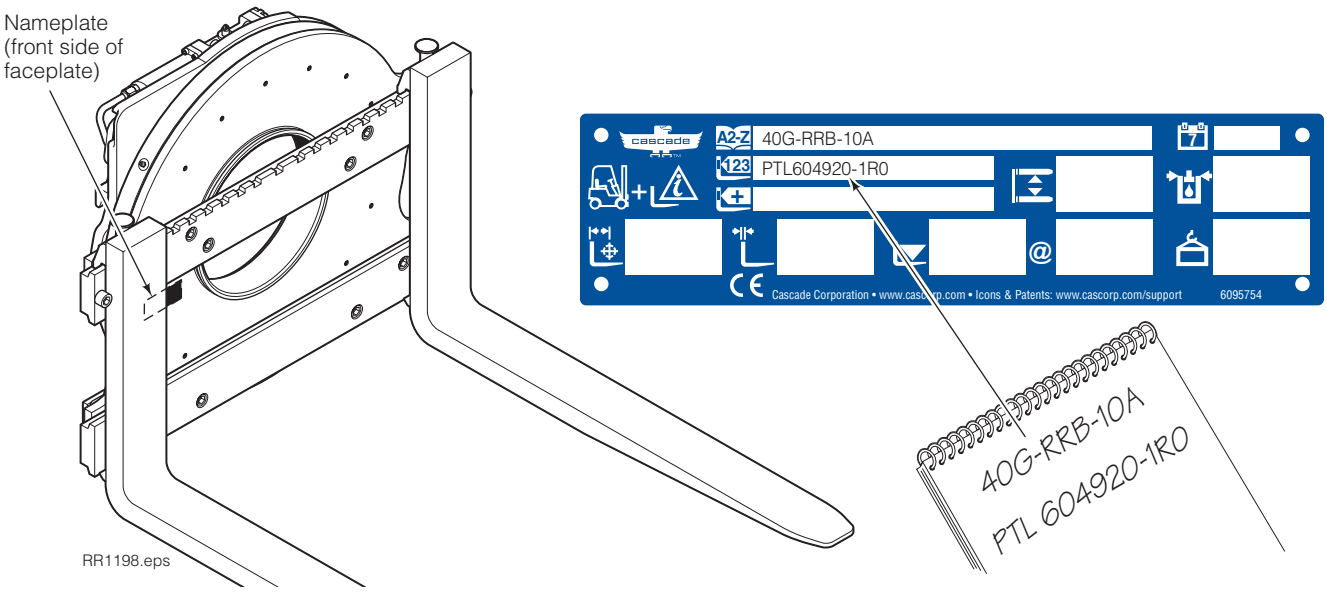
This manual provides the Periodic Maintenance, Troubleshooting, Service and Specifications for Cascade 30G, 40G 360° Rotator.

In any communication about the attachment, refer to the product ID number stamped on the nameplate as shown. If the nameplate is missing, the numbers can be found stamped on the left, front side of the faceplate between the fork bars.

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

NOTE: Specifications are shown in both US and (Metric) units. All fasteners have a torque value of ±10% of stated value.

WARNING: Fork size affects attachment capacity. Refer to Installation Instructions 6073002, installation Step 13. Verify capacity for truck nameplate.



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.

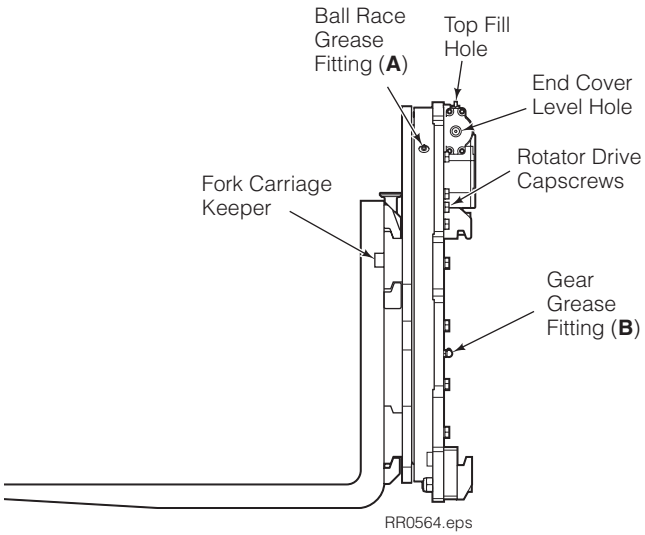
NOTE - A statement preceded by NOTE is information that is handy to know and may make your job easier.

2.1 Daily Inspection

At the beginning of each operational shift, complete the following inspections:

- Check for loose or missing bolts, worn or damaged hoses, and hydraulic leaks.
- Check that fork locking pins and end bar keepers are installed and functional.
- Check decals and nameplate for legibility.

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



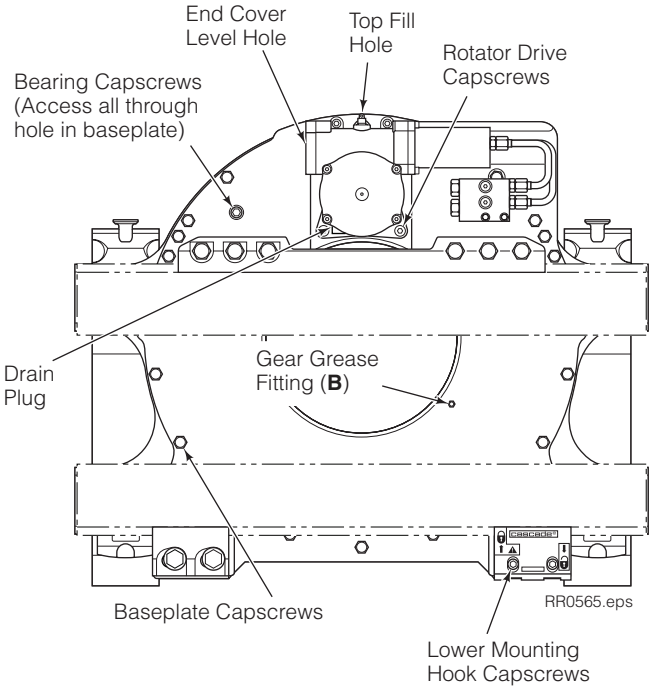
Left Side

2.2 1000-Hour Maintenance

After each 1000 hours of truck operation, in addition to the daily inspections, perform the following procedures:

WARNING: A sampling of faceplate and baseplate bearing assembly capscrews must be checked for proper torque at 1000 hours (see TB183). A complete inspection is required every 2000 hours. Failure to keep the capscrews tightened can result in attachment damage and serious injury.

- Check sample of baseplate capscrews for proper torque value. Refer to Technical Bulletin TB183 or Section 4.5-1 for checking and replacement procedures.
- Check a sample of bearing capscrews for proper torque value. Refer to Technical Bulletin TB183 or Section 4.5-1 for checking and replacement procedures.
- Tighten lower mounting hook capscrews to 120 ft.-lbs. (165 Nm).
- Tighten rotator drive capscrews to 24 ft.-lbs. (32 Nm).
- Lubricate rotation bearing assembly ball race (**A**), and gear (**B**) with EP-2 grease (Whitmore 'Omnitask' or equivalent). Rotate in 90-degree increments and grease in each position.
- Check rotator drive gearcase lubricant level. Lubricant should be up to the end cover level hole. Add lubricant to through the top fill hole. If necessary, fill with Cascade Rotator Drive Lubricant, Part No. 656300, or SAE 90 wt. gear lube (AGMA 'mild' 6 EP Gear Oil). Replace plug.
- Check rotation performance using a typical load. Refer to *Rotation Function Evaluation*, Section 2.4 of this manual.



Back (Driver's) View

2.3 2000-Hour Maintenance

After each 2000 hours of truck operation, in addition to the daily and 1000-hour maintenance, perform the following procedures:

- Check **all** rotation bearing capscrews for proper torque value. Refer to Technical Bulletin TB183 or Section 4.5-1 for checking and replacement procedures.
- **Fork Inspection –** After 2000 hours of truck operation, forks in use shall be inspected at intervals of not more than 12 months (for single shift operations) or whenever any defect or permanent deformation is detected. Severe applications will require more frequent inspection.

  Fork inspection shall be carried out by trained personnel to detect any damage that might impair safe use. Any fork that is defective shall be removed from service. Reference ANSI B56.1-2005.

  Inspect for the following defects:

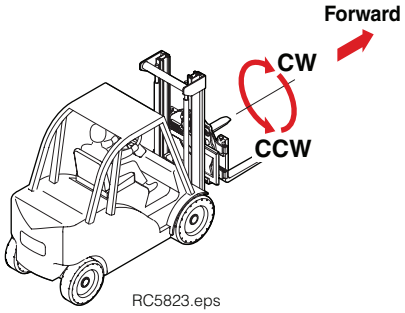
  – Surface cracks
  – Straightness of blade and shank
  – Fork angle
  – Difference in height of fork tips
  – Positioning lock
  – Wear on fork blade and shank
  – Wear on fork hooks
  – Legibility of marking

  Fork Safety Kit 3014162 contains wear calipers, inspection sheets and safety poster. Also available is fork hook & carriage wear gauge 209560 (Class II).

2.4 Rotate Function Evaluation

The following procedure should be performed every 1000 hours of truck/attachment operation:

1. Engage the forks with a typical bin load that is within the capacity of the attachment/truck combination.
2. Raise the load the minimum amount to avoid hitting the floor during rotation.
3. Rotate the load Clockwise (CW) 45° and stop. No rotational drift should be observed within 30 seconds.
4. Rotate the load Counterclockwise (CCW) 45° to return to the initial position.
5. Rotate the load Counterclockwise (CCW) 45° and stop. No rotational drift should be observed within 30 seconds.
6. Rotate the load Clockwise (CW) 45° to return to the initial position.
7. Repeat steps 3 thru 6 two times to confirm observed conditions.
   - If no rotational drift is observed during the evaluation, no action is required.
   - **CAUTION:** If rotational drift is observed during the evaluation, contact the Cascade Service Department to assist with troubleshooting and symptom resolution.



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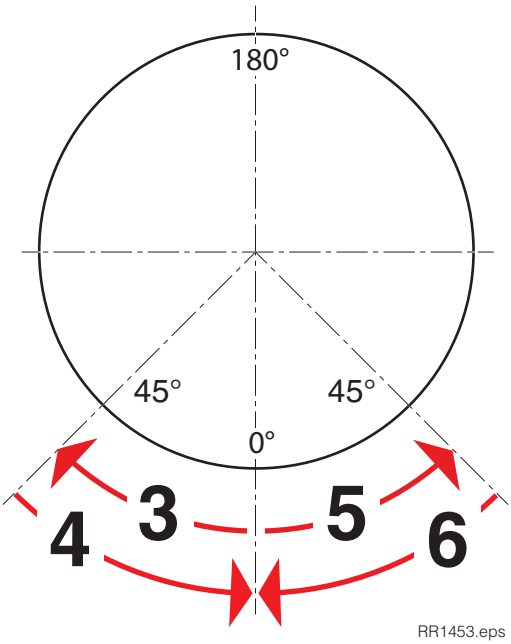
Driver's View Forward



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3.1 General Procedures

3.1-1 Truck System Requirements

- Truck hydraulic pressure should be within the range shown in Specifications, Section 5.1. **PRESSURE TO THE ATTACHMENT MUST NOT EXCEED 2300 psi (160 bar).**
- Hydraulic flow should be within the volume range as shown in Specifications, Section 5.1.
- Hydraulic fluid supplied to the attachment must meet the requirements as shown in Specifications, Section 5.1.

WARNING: Before servicing any hydraulic component, relieve system 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. Do not raise the load more than 3 in. (7 cm) off floor while testing.

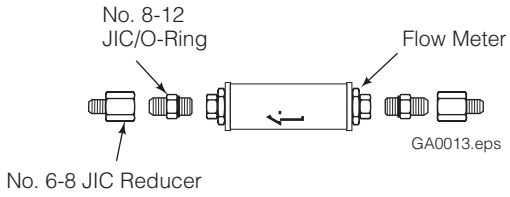
3.1-2 Tools Required

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

- Inline Flow Meter Kit:
  20 GPM (75 L/Min.) - Cascade Part No. 671477
- Pressure gauge Kit:
  5000 psi (345 bar) - Cascade Part No. 671212.
  Two kits required.
- Assorted fittings and hoses to adapt gauges and flowmeter to the components being tested

Flow Meter Kits:

671477 – 20 GPM (75 L/min)



3.1-3 Troubleshooting Chart

Get all the Facts – It is important that all the facts regarding the problem are gathered before beginning service procedures. The first step is to talk to the equipment operator. Ask for a complete description of the malfunction. The following guidelines can then be used as a starting point to begin troubleshooting procedures:

Rotator Circuit

- No rotation.
- No rotation with load at rated capacity.
- Rotation in only one direction.

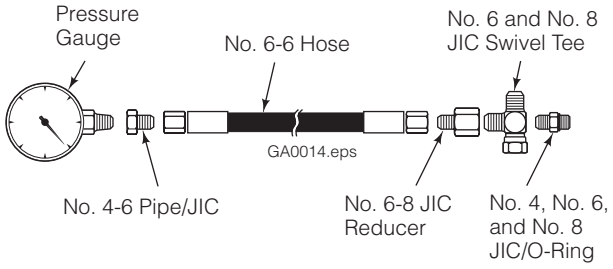
To correct one of these problems, see Section 3.3.

- The attachment drifts from its rotated position.

To correct this problem, see Section 3.3-4.

Pressure Gauge Kit:

671212



3.2 Plumbing

3.2-1 Hosing Diagram

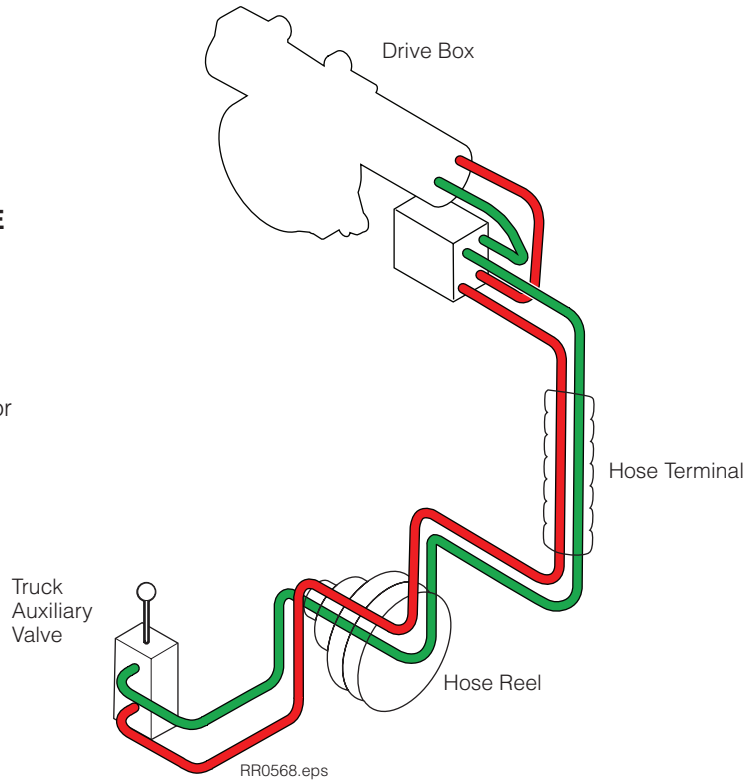
ROTATE COUNTERCLOCKWISE

PRESSURE

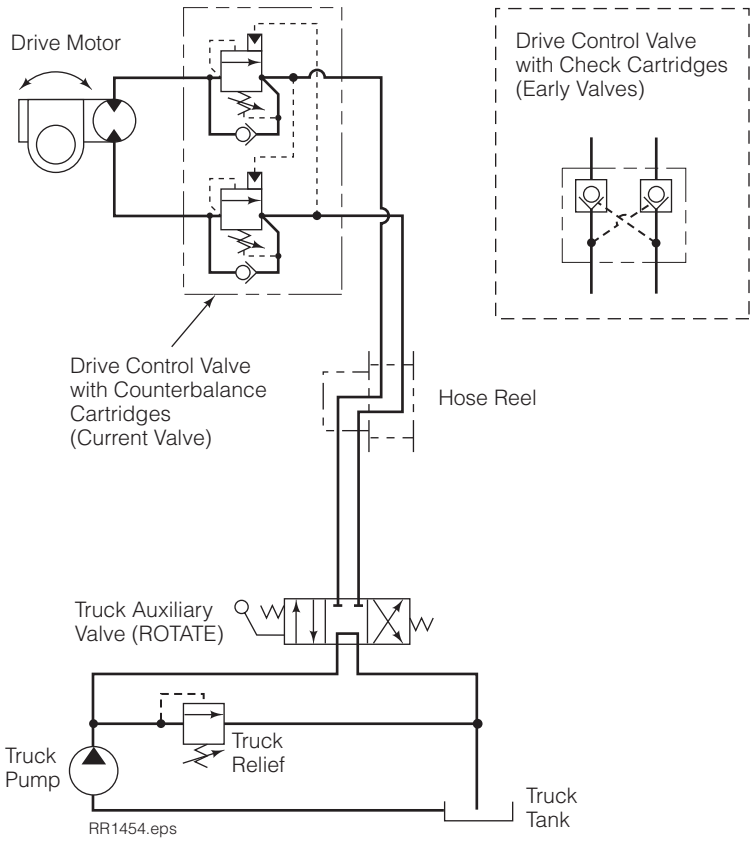
RETURN

NOTE: For ROTATE CLOCKWISE, reverse the colors shown.

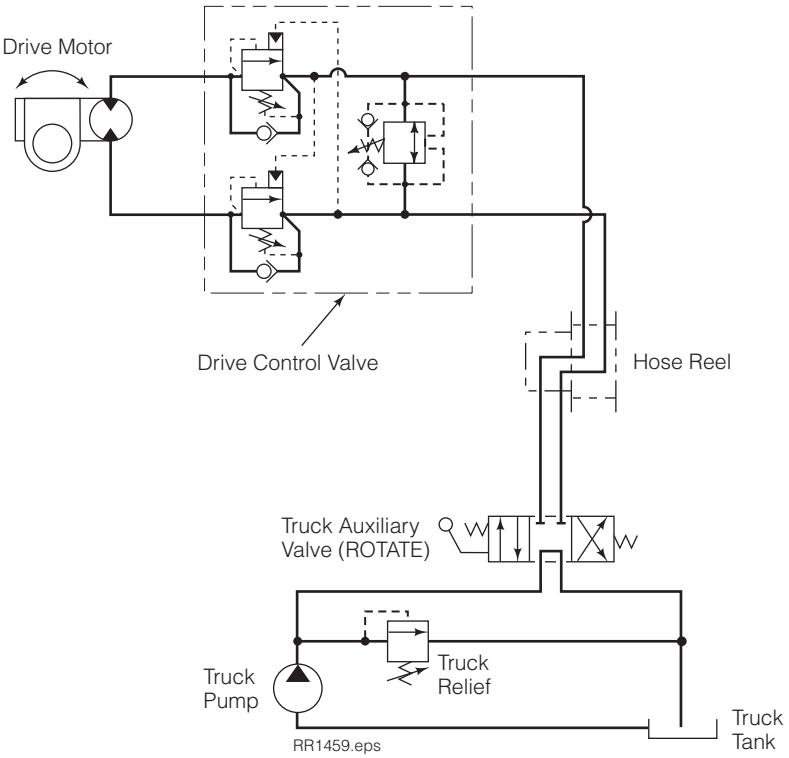
IMPORTANT: See motor end cover for identification.



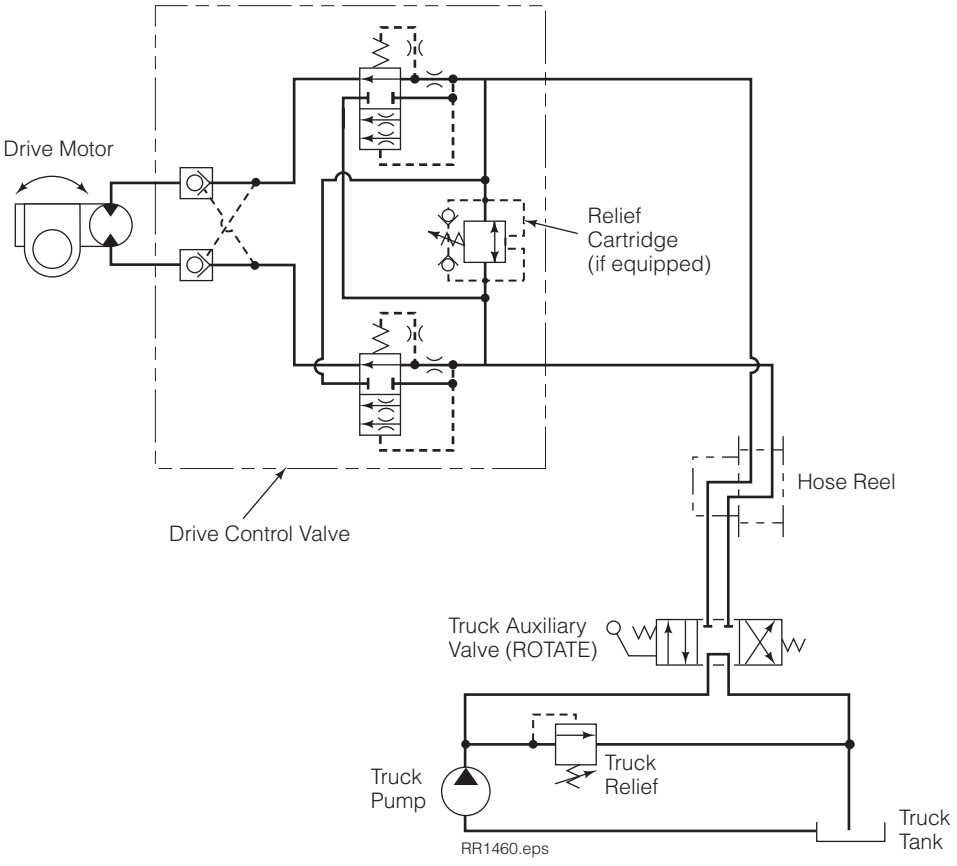
3.2-2 Circuit Schematic – Standard Valve



3.2-3 Circuit Schematic – Valve with Relief



3.2-4 Circuit Schematic – Flow Control Valve



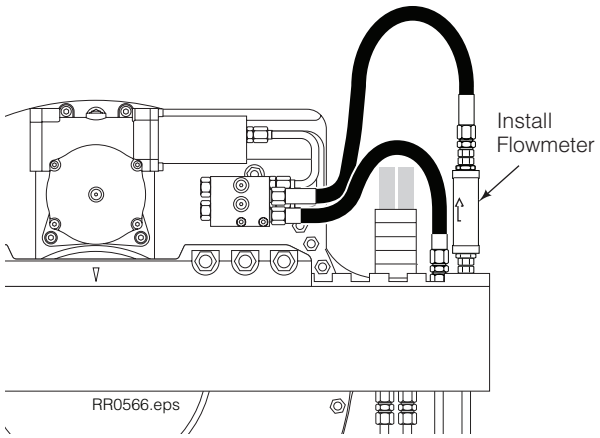
3.3 Rotation Function

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

- Operator may be handling the load incorrectly. Loads may be too heavy or rotated off-center, exceeding capacity of attachment. Refer to Operator's Guide for suggested handling procedures.
- Low hydraulic pressure and/or flow from lift truck.
- Worn or defective motor.
- Worn or defective drive assembly or frame bearing assembly.

3.3-1 Supply Circuit Test

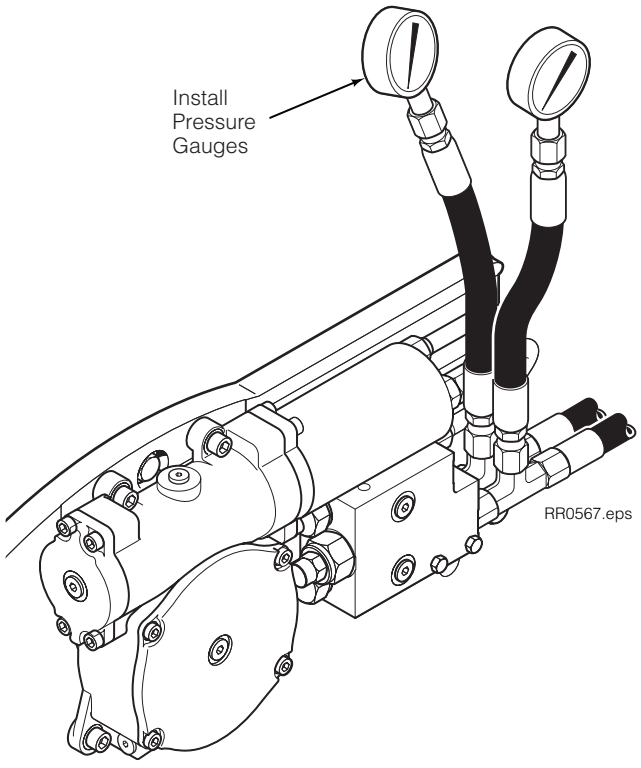
WARNING: Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valve(s) several times in both directions.



1. Check the pressure delivered by the truck. Refer to the truck Service Manual. **PRESSURE TO THE ATTACHMENT MUST NOT EXCEED 2300 PSI (160 BAR),** measured at the carriage hose terminal.
2. Check the flow volume at the carriage hose terminal. Refer to Section 5.1-1 for recommended flow volumes. If the truck pressure and flow are correct, proceed with the Rotation circuit pressure test.
3. Check for external leaks.

3.3-2 Rotation without Load

1. Install pressure gauges to the motor fittings.
2. Start the truck and rotate the attachment without a load. While rotating, note pressure readings of both gauges.
   - If the attachment rotates in one direction faster than the other, or rotates in one direction only, the check valve assembly may need repair. Refer to Section 4.4.
   - If the lower gauge reading **exceeds** 500 psi (35 bar), there is excessive back pressure in the supply circuit. Check for restrictions such as numerous fittings and hose sizes less than No. 8, etc.



3.3-3 Rotation with Load

1 Rotate a load requiring approximately 3/4 of attachment maximum torque capacity. Refer to Section 5.1-6 to determine maximum torque capacity and the load required. Note gauge readings during rotation.

- If the higher gauge reading is substantially **less** than truck pressure measured at the carriage hose terminal, the motor geroler set may need repair. Refer to Section 4.3.
- If the higher gauge is **close** to truck pressure measured at the carriage hose terminal, and no rotation occurs. The motor output shaft or drive box may need repair. Continue troubleshooting.

2 Remove the motor from the malfunctioning drive assembly as described in Section 4.3.

3 Reinstall the hoses to the motor fittings. Actuate the rotate circuit.

- If the motor shows rotational output, the drive box may require service. Refer to Section 4.2.
- If the motor shows little or no rotational output, service the motor as described in Section 4.3.

Model	Maximum Torque Capacity
30G	35,000 in. lbs. @ 2,300 psi (3,950 Nm @ 160 bar)
40G	40,000 in. lbs. @ 2,300 psi (4,520 Nm @ 160 bar)

3.3-4 Rotation Drift Test

1 Position forks parallel to the floor.

2 Place a mark at the top center of the baseplate and bearing. Place rotation limit marks at 20° (12 in., 30.5 cm) at each side of the top center on the faceplate. All marks should be viewable by the driver.

NOTE: If the faceplate is raised, mark 12 in. (30.5 cm) from center.

3 With the forks parallel to the floor, pick up a load.

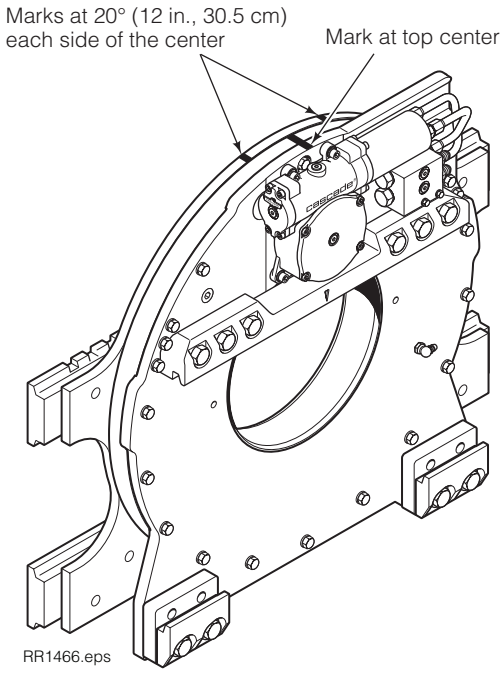
4 Lift a load 15 in. (38 cm) off the floor to provide clearance for rotation drift test.

5 Rotate load Clockwise (CW) to 20° align marks and wait 30 seconds. Observe if drift occurs.

- If drift occurs, the rotator drive components require service. Refer to Section 4.2.

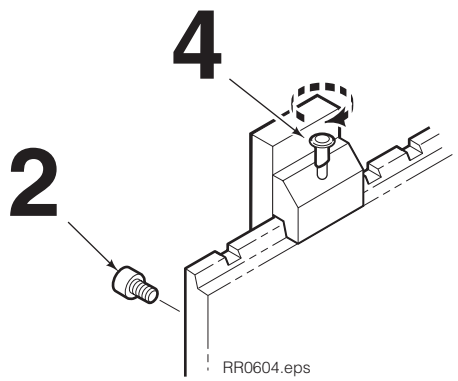
6 Rotate load Counterclockwise (CCW) to 20° align marks and wait 30 seconds. Observe if drift occurs.

- If drift occurs, the rotator drive components require service. Refer to Section 4.2.



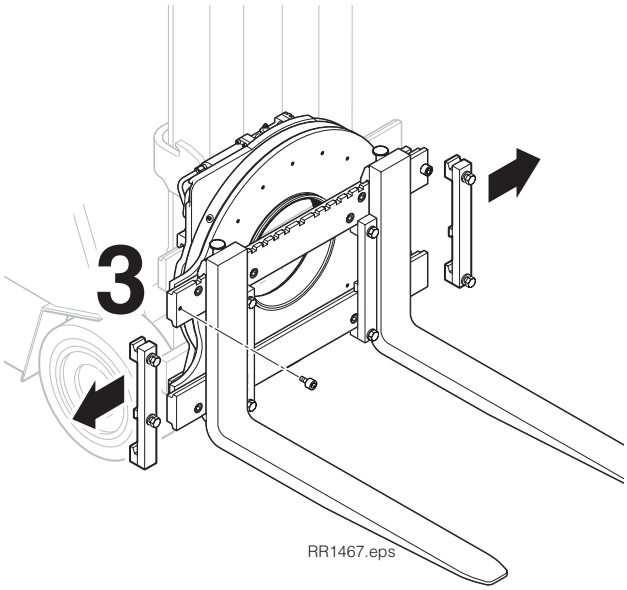
4.1 Attachment Removal

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

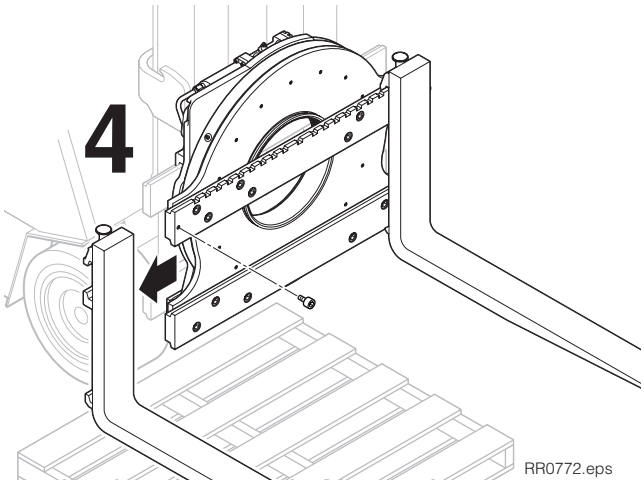


2 Remove the fork keepers at each end of the top carriage bar. For reassembly, tighten the capscrews to a torque of 200 ft.-lbs. (270 Nm).

3 If equipped with fork restraints, loosen capscrews so that restraint hooks can be rotated to remove restraint assembly from the attachment. If necessary, remove one of the capscrews from restraint assembly. For reassembly, tighten capscrews to 165 ft.-lbs. (225 Nm).



4 Release the spring lock on the top of each fork. Remove the forks from the fork bars.



4.1 Attachment Removal (Continued)

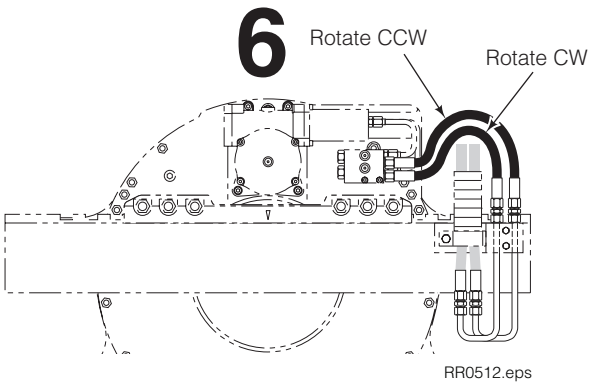
5 Disconnect the lower hooks.

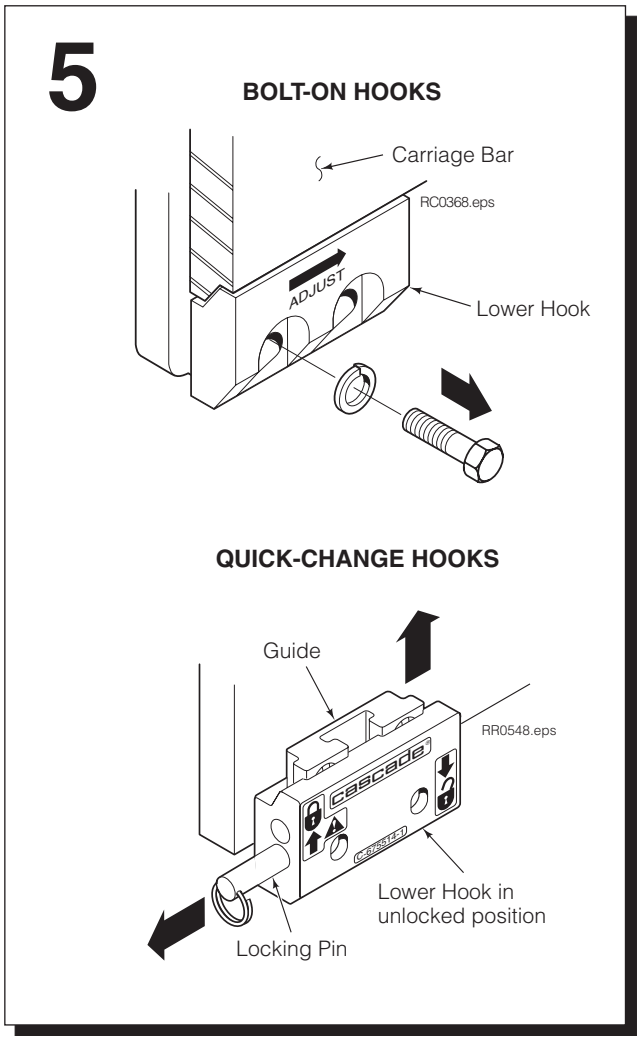
Bolt On Hooks – Remove the lower mounting hooks. For reassembly, tighten the capscrews to a torque of 122 ft.-lbs. (165 Nm).

Quick Change Hooks – Pull out the locking pins, slide the hooks down and reinstall the pins in the lower holes. For reassembly, slide the hooks up and install the pins in the top holes.

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.

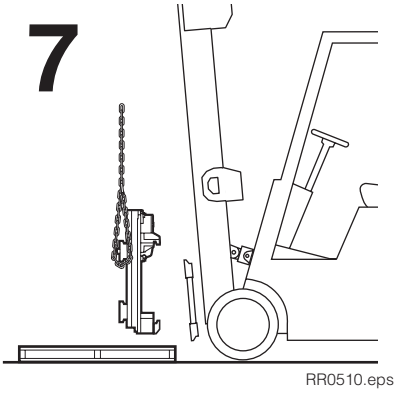
6 Disconnect the hydraulic hoses to the drive motor. Tag the hoses for reassembly.





7 Attach a suitable overhead hoist to the upper fork bar. Remove the attachment from the truck. Lay the attachment face down on a pallet with the drive group upward.

8 For installation, reverse the above procedures.



4.2 Drive Group

4.2-1 Drive Group Removal and Installation

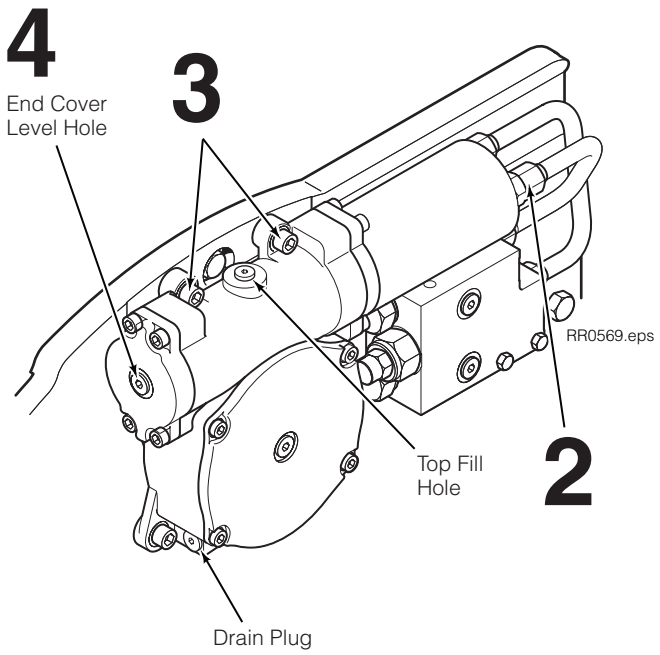
1 Remove the attachment from the truck as described in Section 4.1.

2 Remove tubes connecting the motor to the valve.

3 Remove the four capscrews fastening the drive group to the baseplate. For reassembly, tighten the capscrews to a torque of 24 ft.-lbs. (32 Nm).

4 For reassembly, reverse the above procedures with the following exceptions:

- After the drive group has been reinstalled, check the gearcase oil level. Oil must be up to the bottom of the fill plug hole. Add oil through top fill hole. If necessary, fill with Cascade Gear Lube Part No. 656300 or equivalent SAE 90 wt. lube (AGMA 'mild' 6 EP Gear Lube).



4.2-2 Drive Group Disassembly and Service

1 Drain oil out from the bottom housing hole.

2 Remove the drive group from the baseplate as described in Section 4.2-1.

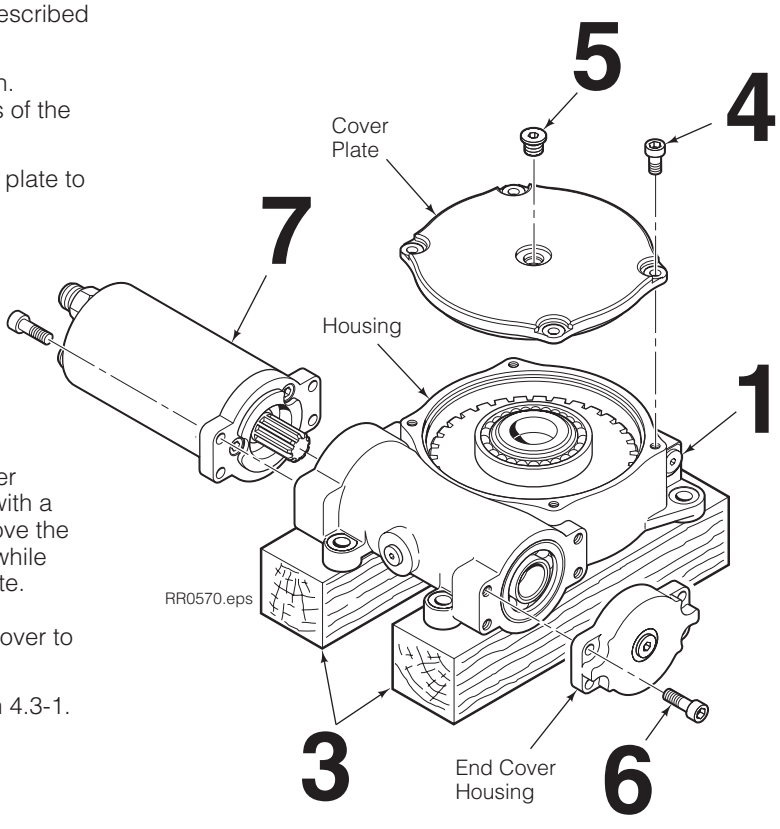
3 Lay the drive group, pinion down, on two 4 x 4 in. (10 x 10 mm) wood blocks placed on both sides of the pinion.

4 Remove the four capscrews fastening the cover plate to the housing.

5 Remove the center capscrew plug from the cover plate and install an 3/8 in.-24 thread capscrew with a minimum thread length of 5 in. (127 mm). Remove the cover plate by turning the capscrew clockwise while lightly tapping around the sides of the cover plate.

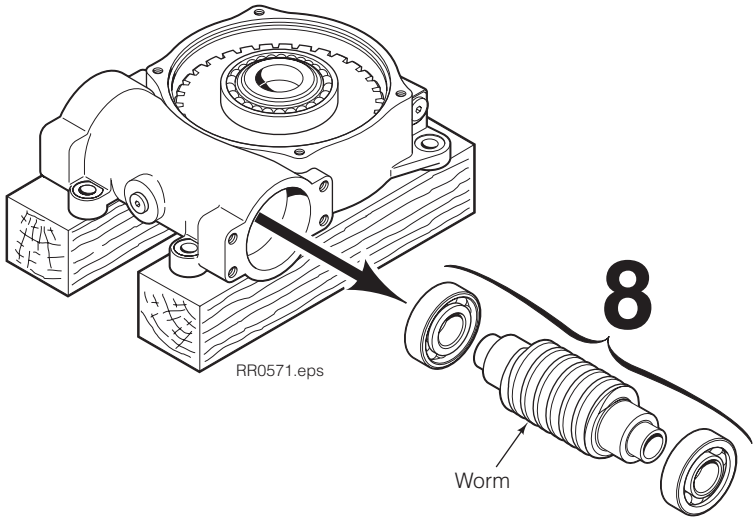
6 Remove the four capscrews fastening the end cover to the housing.

7 Remove the drive motor as described in Section 4.3-1.

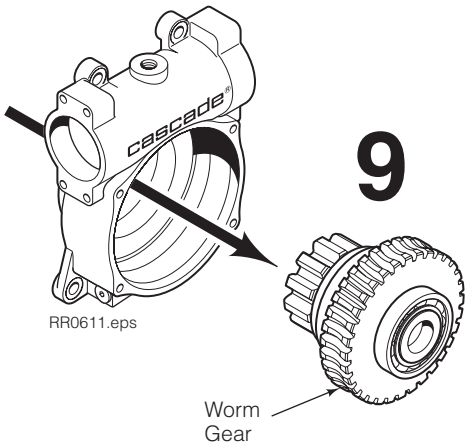


4.2-2 Drive Group Disassembly and Service (continued)

8 Tap the worm and bearing assembly out through the end-cover side of the housing. Note direction of bearings. Bearings are directional.



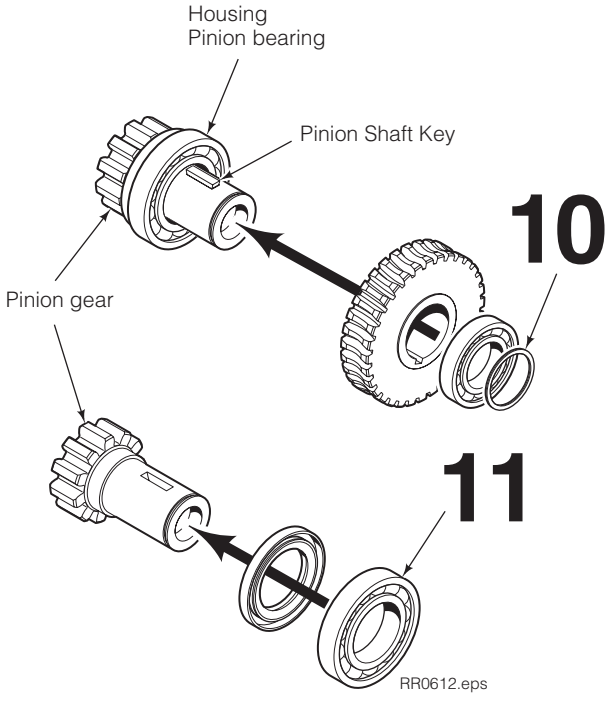
9 Press the pinion gear, seal, pinion bearings and worm gear out of the housing as an assembly.



10 Remove the retaining ring from the pinion gear shaft. Press the pinion gear bearing from the worm ring gear and cover plate pinion bearing. Remove the pinion shaft key.

11 Press the pinion gear out of the housing pinion bearing.

12 Clean and inspect all components. Remove all dried sealant residue. Replace all worn items. Remove any burrs or sharp edges with emery cloth.



4.2-3 Drive Group Reassembly

Build up the pinion/worm gear assembly vertically with the pinion gear down.

1 Install pinion seal onto seal seating area.

2 Apply Loctite 271 (red) to the bearing seating area as shown. Press housing bearing onto the pinion shaft. Remove excess Loctite.

CAUTION: Make sure Loctite does not squeeze into the seal or bearings.

3 Install the key onto the pinion shaft. Apply Loctite 271 (red) to the pinion shaft. Install the worm gear, cover plate pinion bearing and retaining ring on the pinion.

4 Apply Loctite 271 (red) to the housing seating area and shoulder for the housing pinion bearing. Install the complete pinion assembly into the housing. Remove excess Loctite.

CAUTION: Make sure Loctite does not squeeze into the seal or bearings.

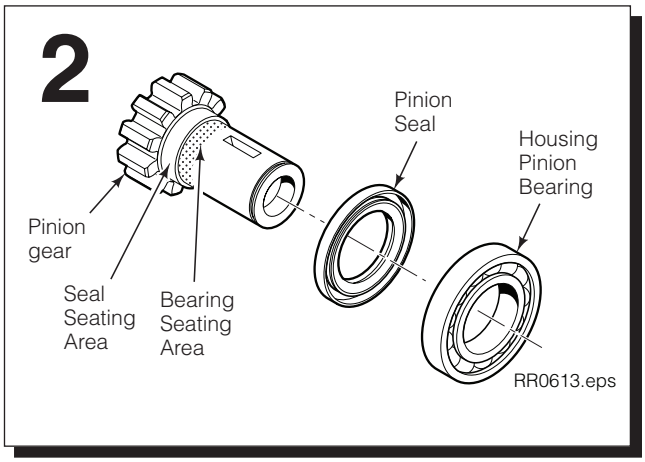
5 Install the worm's bearing in the drive motor side of the housing.

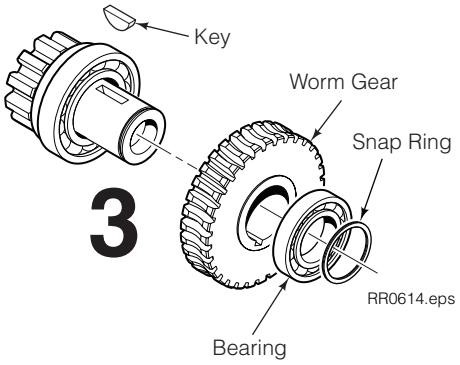
CAUTION: Bearing is directional. Install bearing with the part number side facing opposite of the motor.

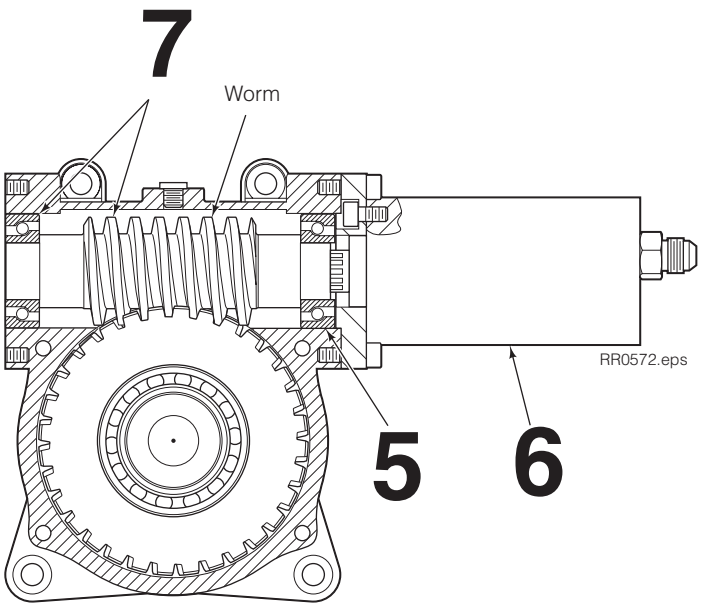
6 Install the drive motor as described in Section 4.3-1.

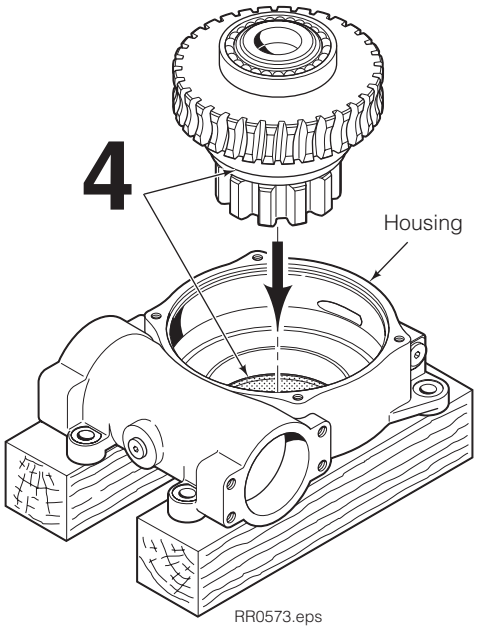
7 Install the worm and second bearing in the housing. Fully engage the worm with the drive motor shaft.

CAUTION: Bearing is directional. Install bearing with the part number side facing the end cover.









4.2-3 Drive Group Reassembly (continued)

8 Temporarily install the end cover without shims. Tighten the capscrews sequentially to 115 in.-lb. (13 Nm).

9 Measure the gap between the end cover and housing in three places with a feeler gauge or 'Plastigage' thread and determine the minimum gap.

10 Choose a combination of end cover shims equal to the minimum gap measured plus the next higher 0.005 in. (0.12 mm) increment. See examples below:

- For 0.025–0.029 in. (0.635–0.736 mm) measured gap, use 0.030 in. (0.762 mm) total shim thickness.
- For 0.010–0.014 in. (0.254–0.356 mm) measured gap, use 0.015 in. (0.381 mm) total shim thickness.
- For 0.009 in. (0.228 mm) or less, use one 0.010 in. (0.254 mm) shim. A minimum of one 0.010 in. (0.254 mm) shim is required for proper seal.

NOTE: Shim Service Kit 6089414 contains the shims listed. A minimum to one 0.010 in. (0.25 mm) shim is required to seal against leakage:

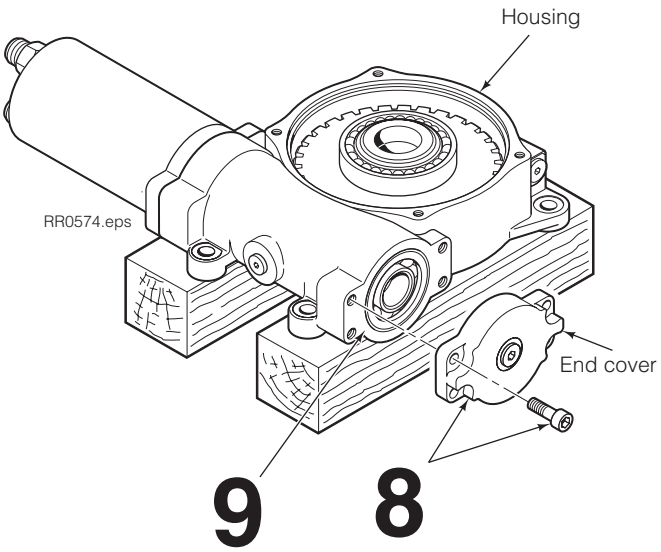
Qty	Part No.	Color	Thickness
2	6803094	Blue	0.005 in. (0.125 mm)
2	6803095	Brown	0.010 in. (0.254 mm)
2	6803096	Pink	0.015 in. (0.381 mm)
2	6803097	Yellow	0.020 in. (0.508 mm)

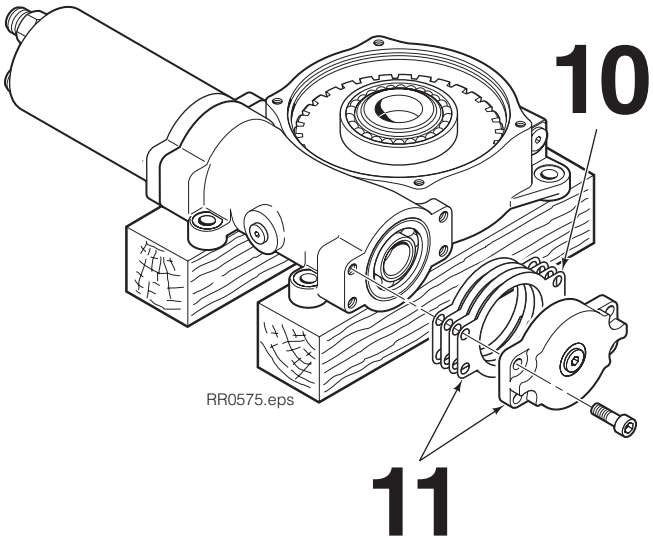
11 Remove the end cover. Apply Loctite 515 sealant (Cascade Part No. 668184) to both surfaces of the shims and end cover. Install the shim pack and end cover. Tighten the capscrews to a torque of 115 in.-lbs. (13 Nm). Remove excess sealant.

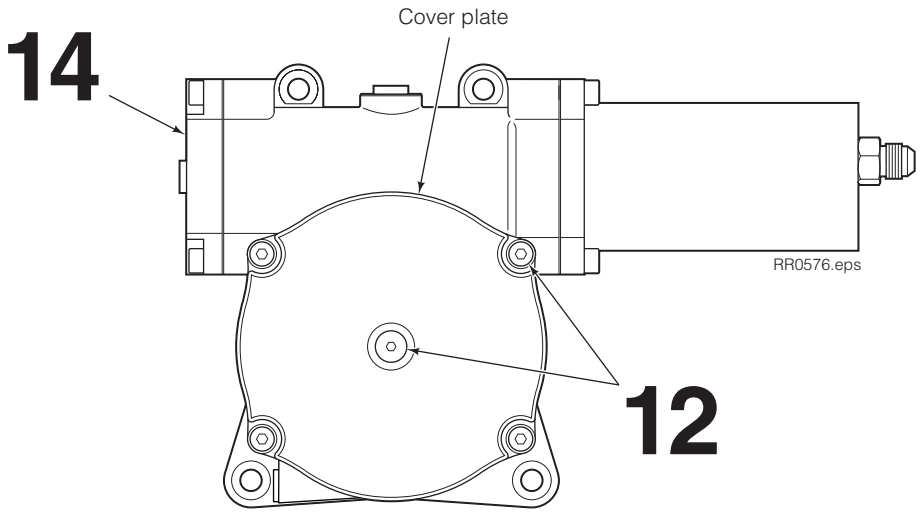
12 Install the cover plate and gasket. If the gaskets shows porosity, apply Loctite 515 sealant to cover face. Install the four cover plate capscrews and tighten to 71 in.-lbs. (8 Nm). Install the center hole plug.

13 Reinstall the drive group on the baseplate as described in Section 4.2-1.

14 Fill gearcase until oil begins to run from end cover port. Use Cascade Gear Lube Part No. 656300, or SAE 90 wt. gear lube (AGMA 'mild' 6EP Gear Lube).







4.3 Drive Motor

4.3-1 Drive Motor Removal and Installation

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

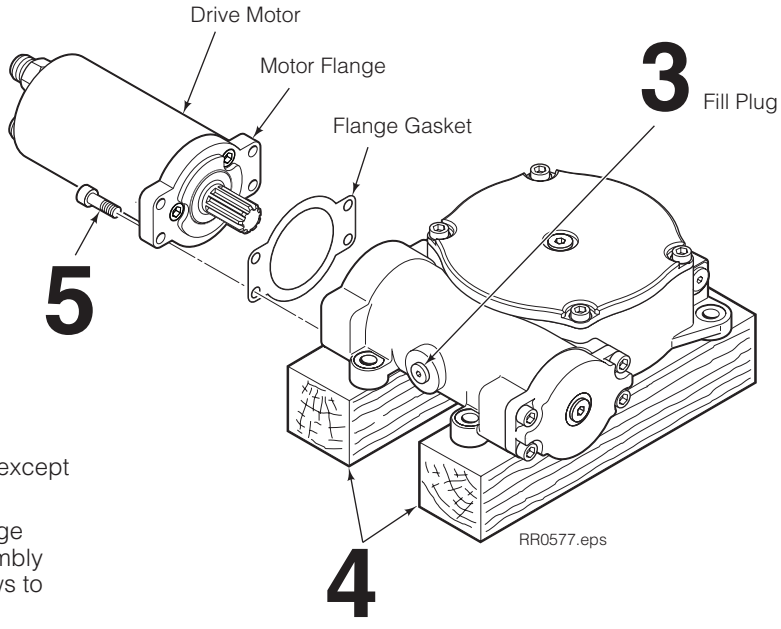
1 Remove the attachment from the lift truck as described in Section 4.1.

2 Remove the drive group from the attachment as described in Section 4.2-1.

3 Remove the fill plug and drain the lubricant from the drive group.

4 Lay the drive group, pinion down, on two 4 x 4 in. (10 x 10 cm) wood blocks placed on both sides of the pinion gear.

5 Remove the four capscrews fastening the motor flange to the gearcase housing. Tap on the drive motor with a rubber mallet to separate the drive motor assembly from the gearcase housing.



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

- Apply Loctite 242 to the threads of the four flange capscrews. Install the drive motor/flange assembly to the gearcase housing. Tighten the capscrews to 115 in.-lbs. (13 Nm).
- Fill gearcase until oil begins to run from end cover port. Use Cascade Gear Lube Part No. 656300, or SAE 90 wt. gear lube (AGMA 'mild' 6EP Gear Lube).

4.3-2 Drive Motor Disassembly

Cascade provides service replacement parts for the seals indicated with a ▲ below. Due to cost, if other parts need replacement, the complete drive motor assembly should be replaced.

1 Remove the drive motor from the drive group as described in Section 4.3-1.

IMPORTANT: Clean the outside of the drive motor and service in a clean, dust-free work area. Use a soft-jawed vise for all service procedures.

2 Make a scribe mark across the motor sections. This will help with timing and alignment for reassembly.

3 Clamp the motor in a soft jawed vise with the output shaft facing upward.

4 Remove the three capscrews from the flange. Remove the flange. Keep track of O-ring between the flange and motor.

5 Remove the five capscrews motor with a 3/16" allen wrench (hex key).

6 Disassemble the motor as shown below. The motor can be taken apart in five groups.

A Remove the bearing housing group. Remove the output shaft from the bearing housing.

CAUTION: Leave the thrust bearing and thrust washer on the output shaft. Leave the output shaft spacer in the output shaft.

B Remove spool drive and drive.

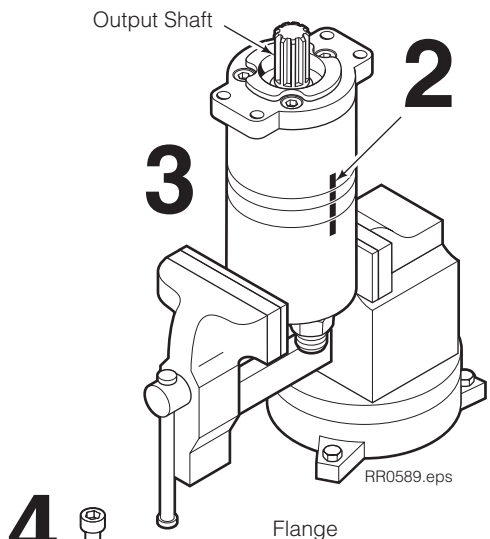
C Remove drive and spacer with O-ring.

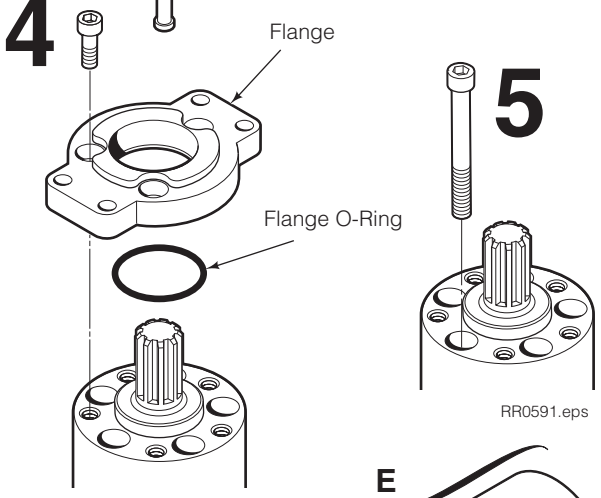
D Remove geroler set with O-ring.

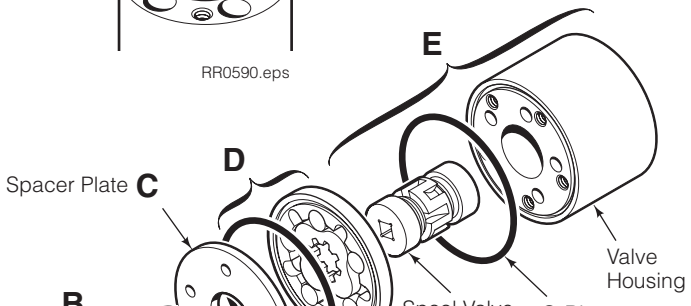
CAUTION: Geroler spacers can fall out if not handled properly.

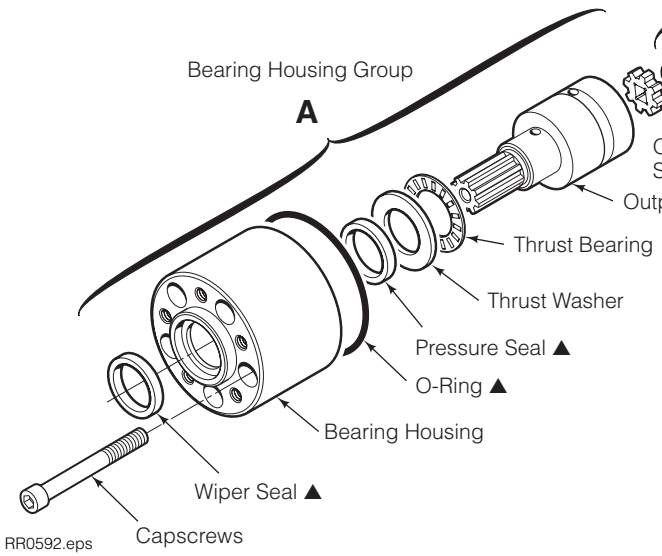
E Leave the valve housing in the vice. Remove the spool valve and O-ring from the valve housing.

CAUTION: Do not remove retaining rings and check balls from the spool valve.









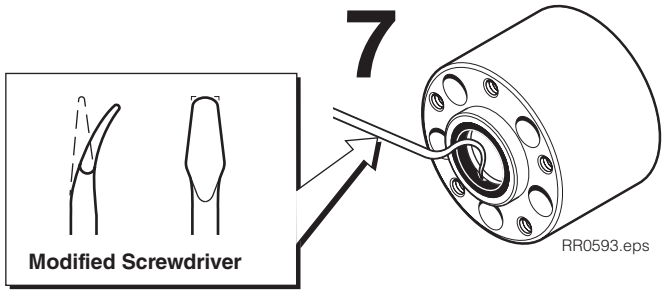
▲ Replacement parts available through Cascade.

4.3-2 Drive Motor Disassembly (continued)

7 Remove wiper seal and pressure seal from the bearing housing using a seal removal tool or modified screwdriver as shown.

IMPORTANT: Note the direction of the seals and thickness.

CAUTION: Do not scratch either of the seal cavities.



4.3-3 Drive Motor Inspection

- Clean all parts with solvent and blow dry. Do not use paper or cloth towels.
- Inspect all parts for small nicks or burrs. Remove any small nicks or burrs with emery cloth.
- Inspect the bearing housing seal seats for scratches. Check for cracks that could cause leakage.

4.3-4 Drive Motor Reassembly

IMPORTANT: Use new seals for reassembly. Lubricate new seals with petroleum jelly to help hold seals in place when installed.

1 Clamp valve housing with fittings facing down.

2 Slide spool valve into the valve housing.

3 Place spool drive into the seating area of the spool valve.

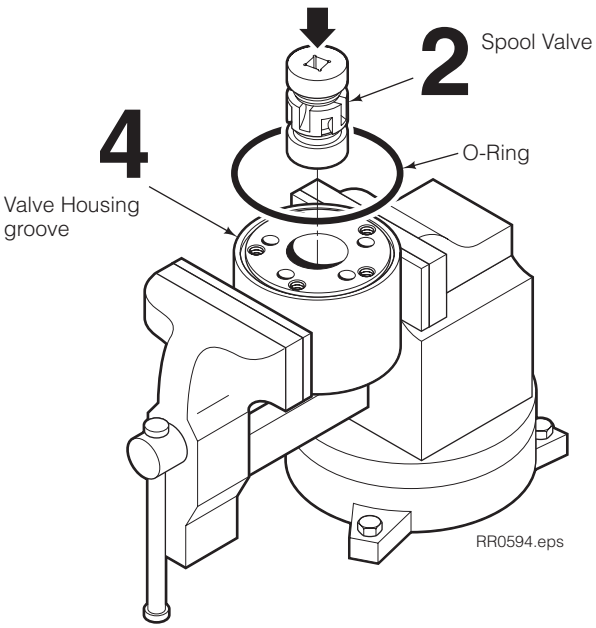
4 Lubricate O-ring and install into the groove of the valve housing.

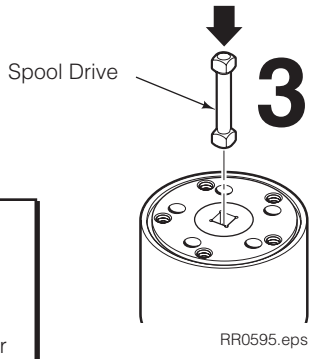
5 Lubricate O-ring and install into the groove of the geroler set. Place geroler set on valve housing while aligning the scribe mark and screw holes.

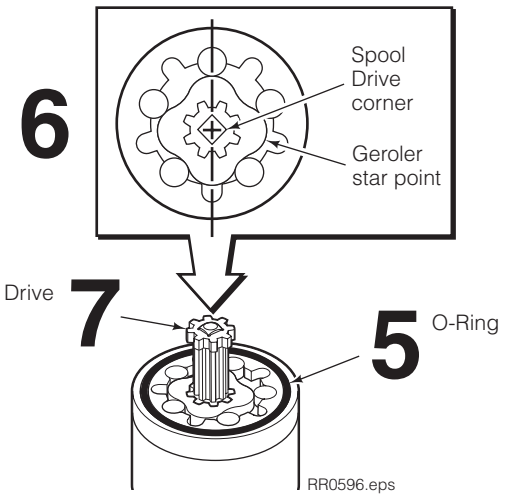
6 Align the corners of the spool drive corner to the star points as shown. Install the drive.

7 Lubricate O-ring and install into the groove of the spacer. Place the spacer on the geroler while aligning to the scribe marks and screw holes.

CAUTION: Be sure to not move the geroler.







4.3-4 Drive Motor Reassembly (continued)

8 Apply a coating of a lithium based bearing grease, such as Mobilith SCH220, to inner edges of wiper seal, pressure seal, thrust bearing and washer.

9 Install wiper seal with the u-shape facing outward from its seat. Press the wiper seal firmly into its seat.

CAUTION: Do not damage seal. If seal is damaged during installation, it must be replaced.

10 Install pressure seal with the u-shape facing outward from its seat. Press the pressure seal firmly into its seat. If needed, use a 1 inch diameter dowel to press the seal.

CAUTION: Do not damage seal. If seal is damaged during installation, it must be replaced.

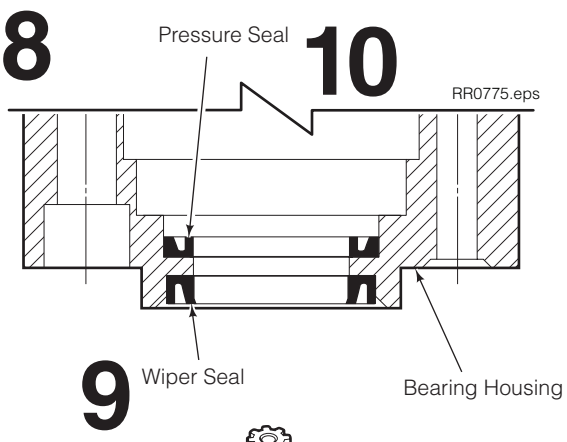
11 Place the output shaft onto the spool drive. Rock the shaft around until the spool drive engages into the output shaft spacer.

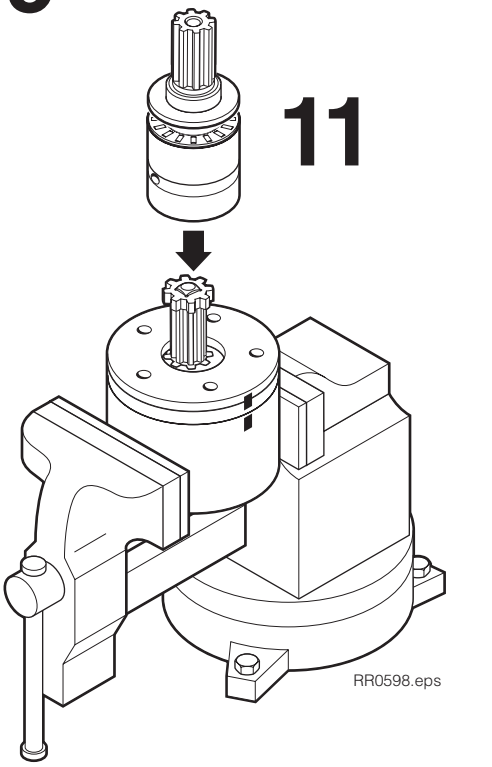
12 Install the bearing housing onto the output shaft while aligning the scribe marks and screw holes.

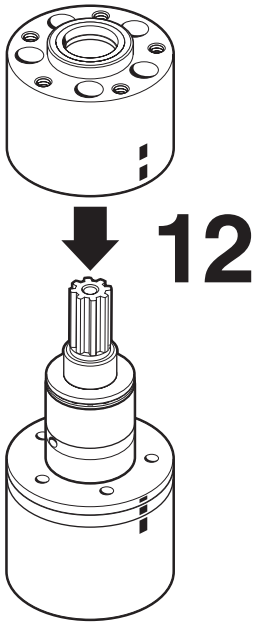
CAUTION: Do not damage seal. If seal is damaged during installation, it must be replaced.

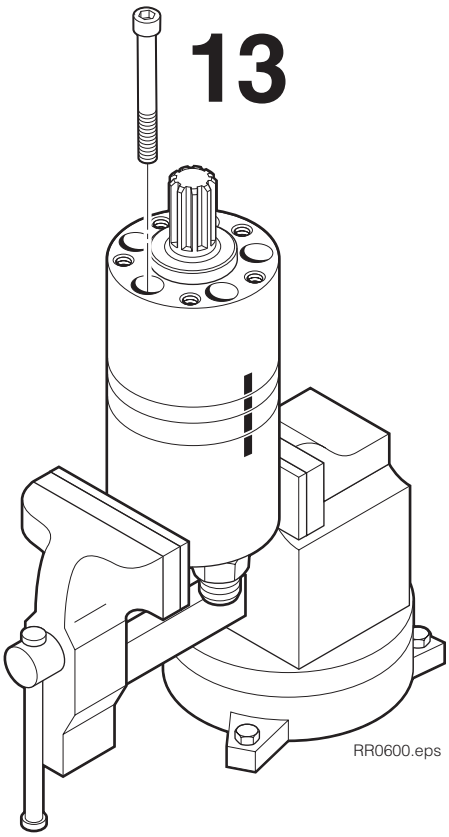
13 Install the five capscrews by pre-torquing them in a crisscross pattern to 90 in.-lbs. (10 Nm). Final torque in a crisscross pattern to 130 in.-lbs. (15 Nm).

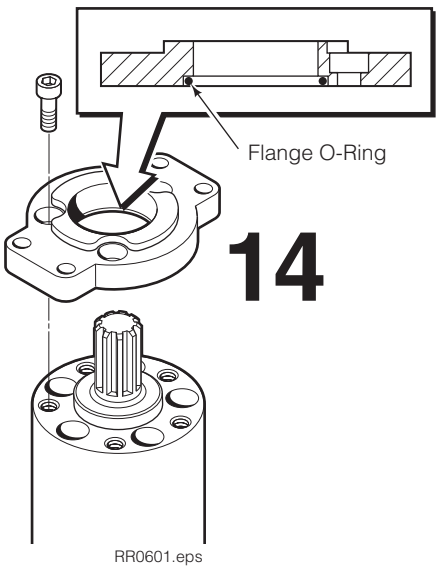
14 Lubricate the flange O-ring with petroleum jelly and press into flange. Place flange on the shaft and flush against the housing. Install capscrews and tighten to a torque of 115 in.-lbs. (13 Nm).









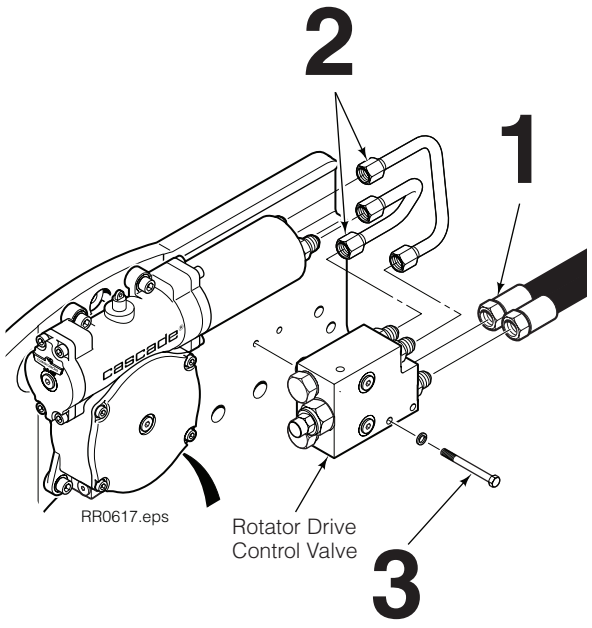


4.4 Drive Control Valves

4.4-1 Valve Removal

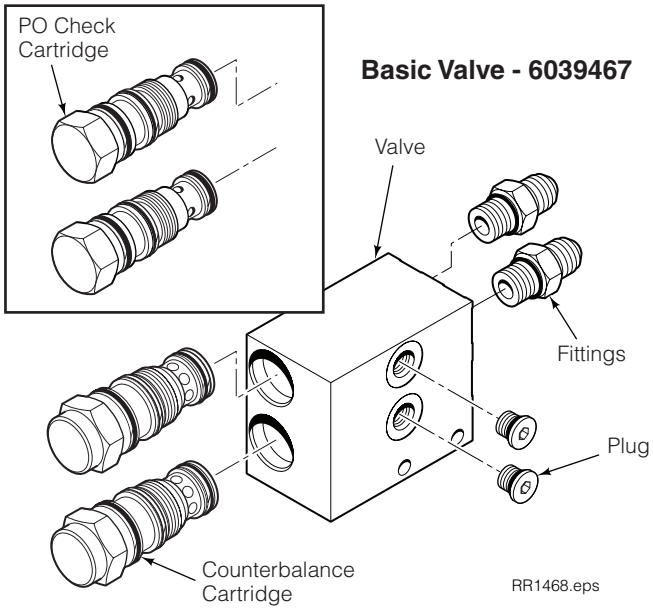
WARNING: Before removing hydraulic lines, relieve pressure in the attachment hydraulic system. Turn the truck off and move the auxiliary control valves several times in both directions.

1. Disconnect the hydraulic hoses to the drive group valve. Tag hoses for reassembly.
2. Disconnect the tubes to the drive box and valve. Tag for reassembly.
3. Remove the two capscrews fastening the valve to the baseplate. For reassembly, tighten the capscrews to 6 ft.-lbs. (8 Nm).

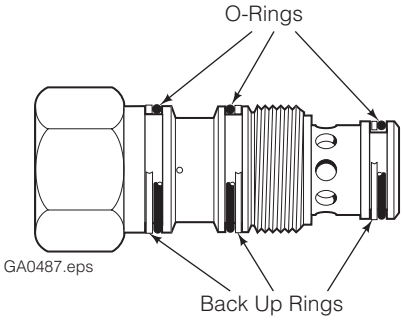


4.4-2 Valve Service – Basic Valve

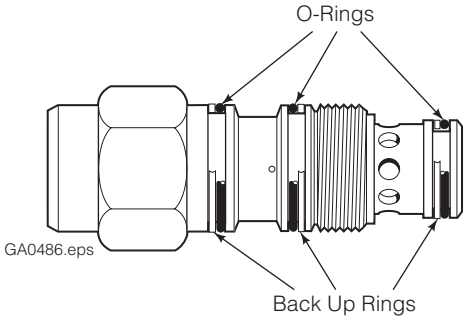
1. Remove cartridges from valve.
2. Remove the remaining fittings
3. Remove the O-rings and back-up rings from the cartridges.
4. Clean all parts with cleaning solvent.
5. For reassembly, reverse the above procedures except for the following special instructions:
   - The cartridge O-rings and back-up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



PO Check Cartridge

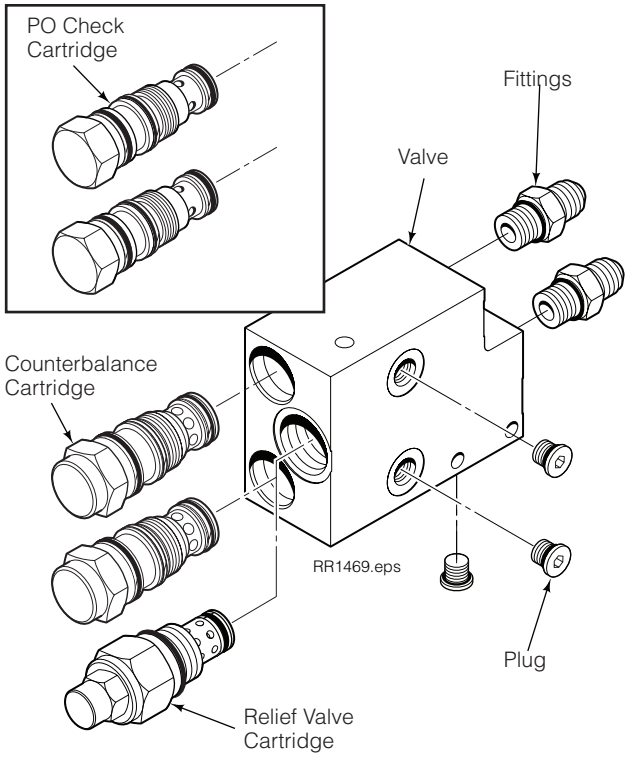


Counterbalance Cartridge

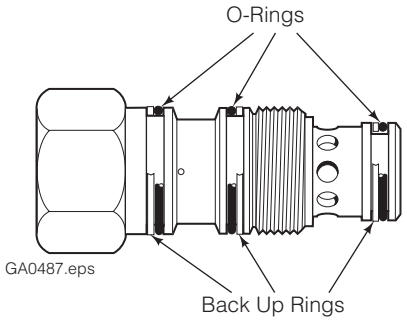


4.4-3 Valve Service – Relief Valve

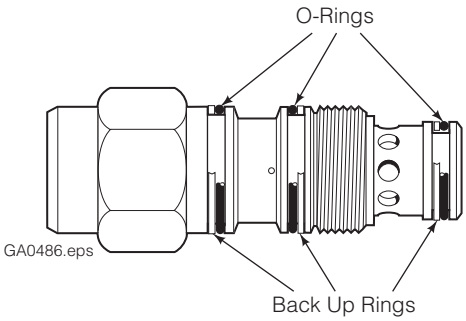
1. Remove cartridges, plugs and fittings from valve.
2. Remove the O-rings and back-up rings from the cartridges.
3. Clean all parts with cleaning solvent.
4. For reassembly, reverse the above procedures except for the following special instructions:
   - The cartridge O-rings and back-up rings must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



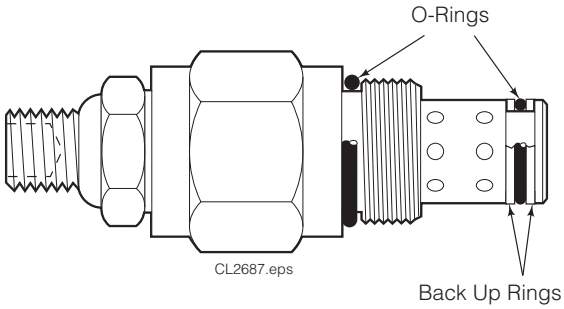
PO Check Cartridge



Counterbalance Cartridge

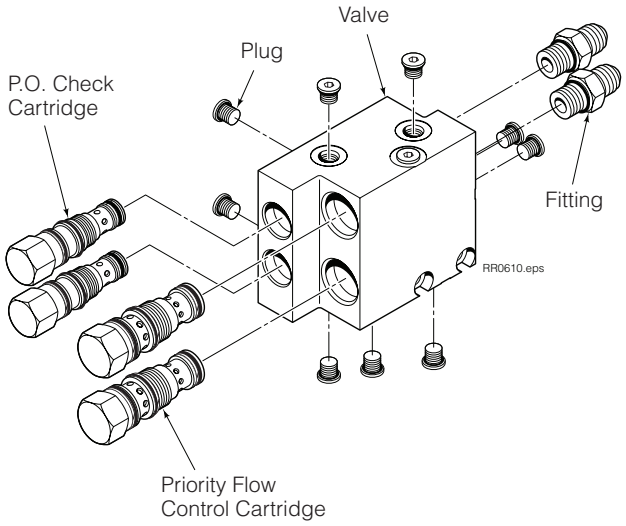


Relief Valve Cartridge

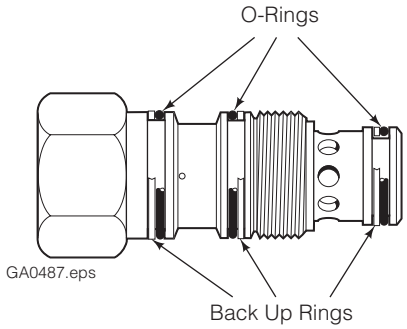


4.4-4 Valve Service – Flow Control Valve

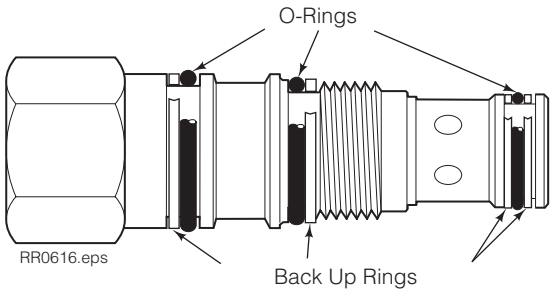
1. Remove cartridges and fittings from valve.
2. Remove the O-rings and back-up rings from the cartridges.
3. Clean all parts with cleaning solvent.
4. For reassembly, reverse the above procedures except for the following special instructions:
   - The cartridge O-rings and back-up rings must be installed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



P.O. Check Cartridge



Priority Flow Control Valve Cartridge



4.5 Base Unit

4.5-1 Bearing Assembly – Capscrew Torque Inspection

1000 Hour Inspection

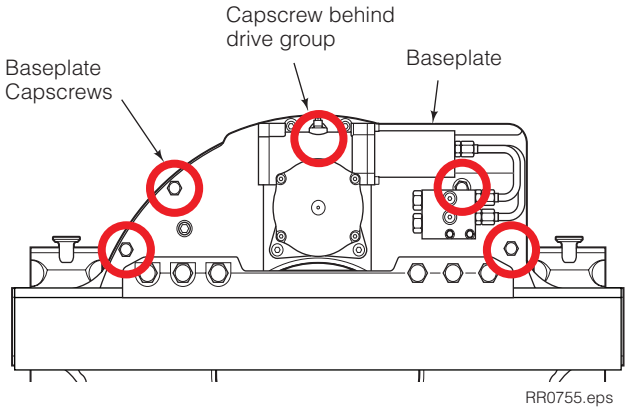
Every 1000 hours, perform the following inspection:

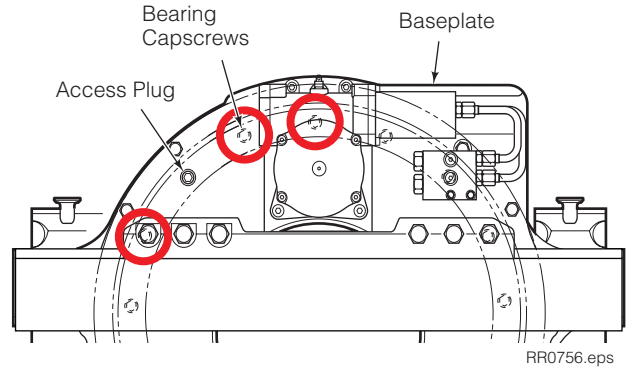
1 Check the accessible baseplate capscrews above upper mounting hooks for an initial torque of 38 ft.-lbs. (52 Nm). Tighten capscrews to 10 ft.-lbs. (14 Nm) above initial torque. Mark each capscrew after checking.

- If any baseplate capscrew are loose, rotate or broken, replace all baseplate fasteners as described in Section 4.5-2.
- If capscrews do not rotate, continue with faceplate capscrew inspection in Step 2.

2 Remove the access plug from the back of the baseplate and rotate the attachment so that forks are positioned parallel to the ground. Check three capscrews closest to the access hole for an initial torque of 47 ft.-lbs. (63 Nm). Tighten capscrews 10 ft.-lbs. (14 Nm) above initial torque. Mark each capscrew after checking.

- If any faceplate capscrews are loose, rotate or broken, replace all faceplate fasteners as described in Section 4.5-2.
- If capscrews do not rotate, inspection is complete.





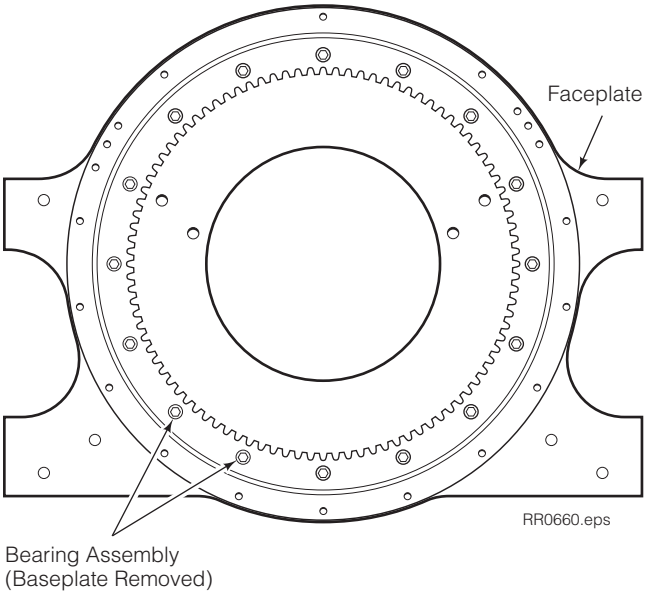
2000 Hour Inspection

Every 2000 hours, perform the following inspection:

NOTE: The attachment must be removed from truck to provide access to all bearing assembly capscrew. For faceplate capscrew, remove the baseplate (shown) or use access hole to provide access to all faceplate capscrew. Refer to Section 4.5-3.

1 Check all baseplate and faceplate capscrews fastened to the bearing assembly. Tighten until torque is 10 ft.-lbs. (14 Nm) above torque values listed above. Mark each capscrew after checking.

- If any capscrew are loose, rotate or broken, replace all capscrews as described in Section 4.5-3.
- If capscrews do not rotate, inspection is complete.



4.5-2 Bearing Assembly Removal and Installation

1 Remove the attachment from the lift truck as described in Section 4.1.

2 Remove the drive group from the attachment as described in Section 4.2-1.

3 Remove the valve assembly capscrews. Before reassembly, clean and dry capscrews and threaded holes. For reassembly, apply Loctite 252 (blue) to capscrews and tighten to 70 in.-lbs. (8 Nm).

4 Remove upper mounting hook. Before reassembly, clean and dry capscrews and threaded holes. For reassembly Apply Loctite 242 (blue) capscrews and tighten capscrews to a torque of 122 ft.-lbs. (165 Nm).

5 Remove the capscrews fastening the baseplate to the bearing assembly. For reassembly, tighten the capscrews using the following technique:

> **WARNING**: Install short capscrews in counterbored holes only. Use lockwashers if supplied in kit.

Baseplate capscrews –

A Clean and dry the capscrews and threaded holes in the bearing. Apply Loctite 242 (blue) to capscrews.

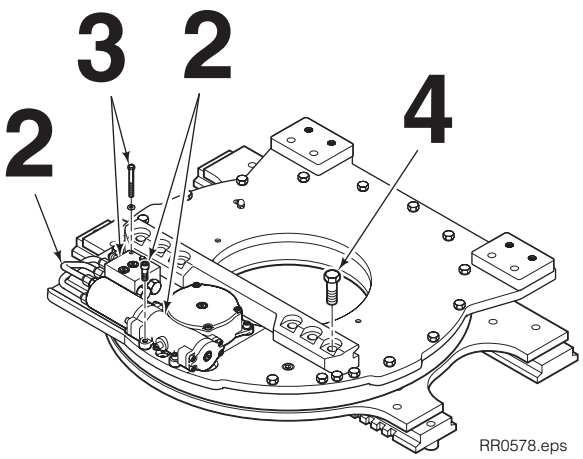
B Tighten using the alternating cross-pattern shown to half the final torque value shown below.

C Tighten using the alternating cross-pattern to the final torque value, then double-torque by backing off 1/2 turn and immediately retightening to the final torque value of 38 ft.-lbs. (52 Nm).

CAUTION: Do not reuse old capscrews or washers. Use new hardware kit when installing a new bearing assembly.

> **WARNING**: Verify that the overhead hoist and chains or straps are rated for the weight of the attachment. Refer to nameplate for attachment weight.

6 Attach two eyebolts to the baseplate as shown. Attach an overhead hoist and lift away the baseplate.



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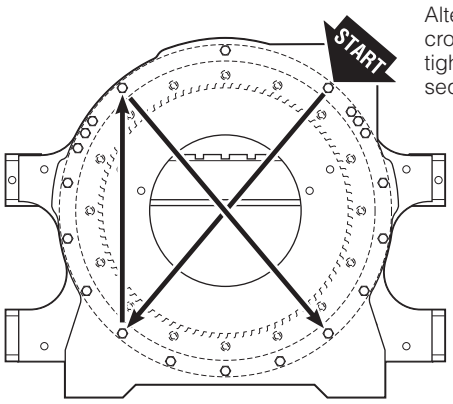

Alternating cross-pattern tightening sequence.
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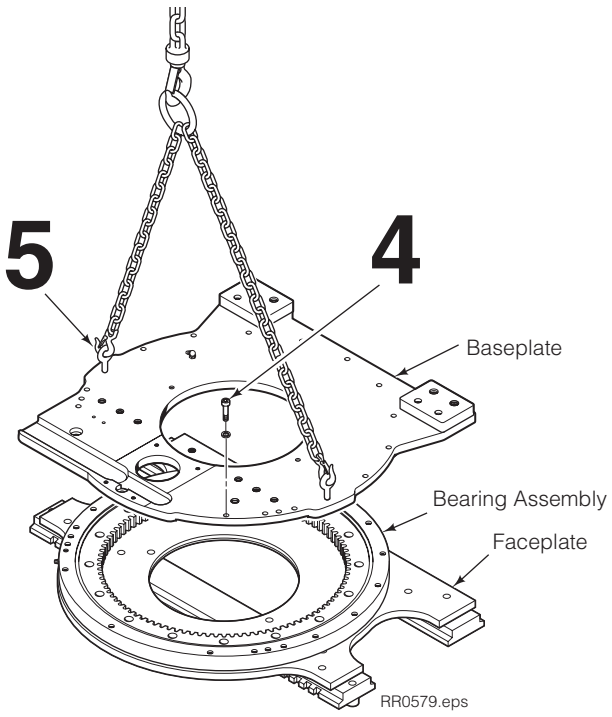


RR0579.eps

4.5-2 Bearing Assembly Removal and Installation (continued)

6 Remove the capscrews fastening the bearing assembly to the faceplate. For reassembly, tighten the capscrews using the following technique:

Baseplate capscrews –

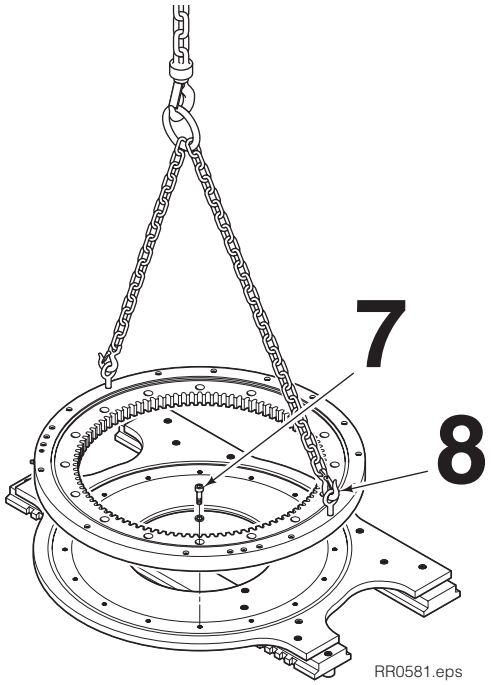
A Clean and dry the capscrews and threaded holes in the bearing. Apply Loctite 242 (blue) to capscrews.

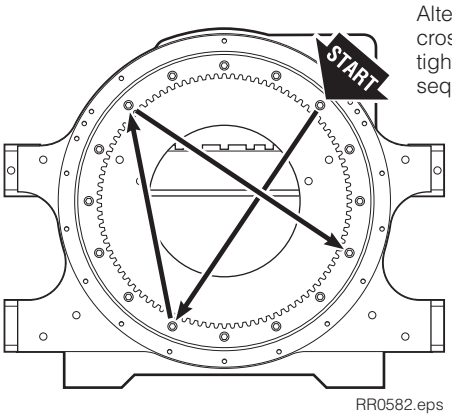
B Tighten using the alternating cross-pattern shown to half the final torque value shown below.

C Tighten using the alternating cross-pattern to the final torque value, then double-torque by backing off 1/2 turn and immediately retightening to the final torque value of 47 ft.-lbs. (63 Nm).

CAUTION: Do not reuse old capscrews or washers. Use new hardware kit when installing a new bearing assembly.

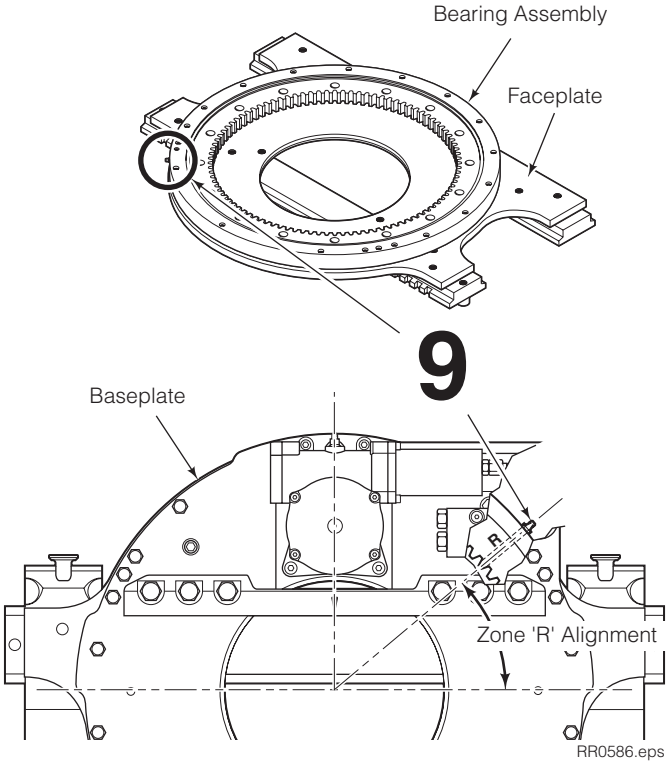
7 Attach two eyebolts to the bearing assembly as shown. Attach an overhead hoist and lift away the bearing assembly.





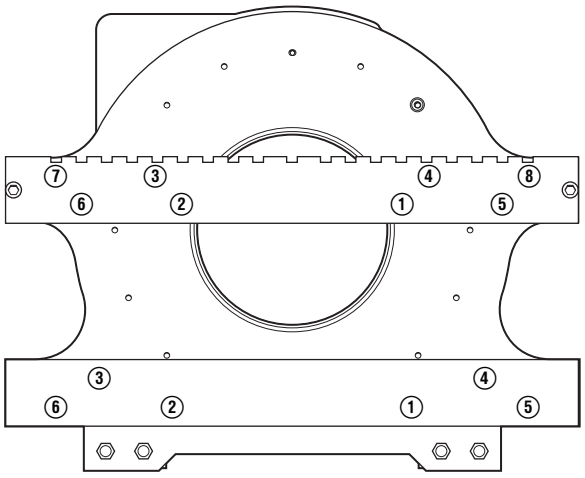
8 For reassembly, reverse the above procedures except as follows:

- When installing the rotation bearing assembly on the faceplate, align and position the heat-treated overlap zone 'R' on the ring gear with the outer race grease fitting 40° above horizontal as shown.
- Apply NLGI No. 0 Grease to the teeth of the bearing assembly ring gear
- After mounting the attachment on the lift truck, apply chassis grease to the bearing assembly grease fitting. Rotate the attachment slowly while applying grease.



4.5-3 Fork Bar Service

- Tighten the fork bar capscrews using the tightening sequence shown to a torque of 200 ft.-lbs. (270 Nm).



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5.1 Specifications

5.1-1 Hydraulics

Truck Relief Setting

2300 psi (160 bar) Maximum

Truck Flow Volume ①

	Min. ②	Recommended	Max. ③
30G, 40G	5 GPM (20 L/min.)	7.5 GPM (28 L/min.)	10 GPM (38 L/min.)

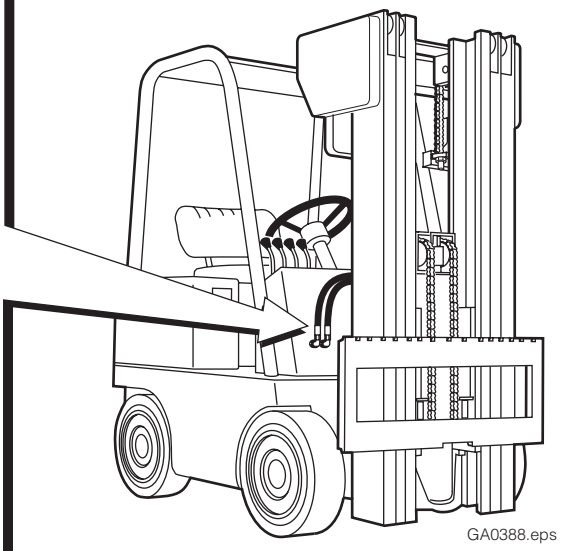
① Cascade 30G, 40G Rotators are compatible with SAE 10W petroleum base hydraulic fluid meeting Mil. Spec. MIL-0-5606 or MIL-0-2104B. Use of synthetic or aqueous base hydraulic fluid is not recommended. If fire resistant hydraulic fluid is required, special seals must be used. Contact Cascade.

② Flow less than minimum will result in a rotate speed less than 2 RPM.

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

Hoses and Fittings

No. 6 with 9/32 in. (7 mm) minimum ID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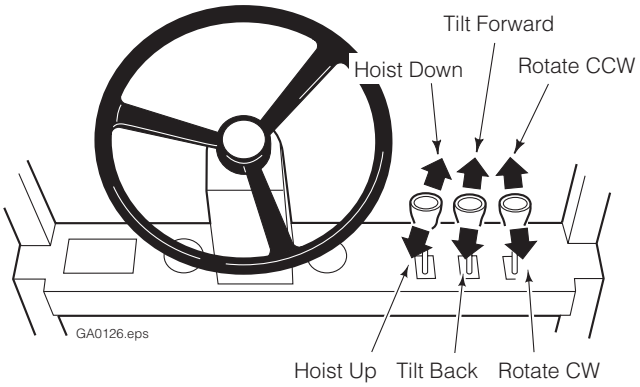
5.1-2 Auxiliary Valve Functions

Check for compliance with ANSI (ISO) standards:



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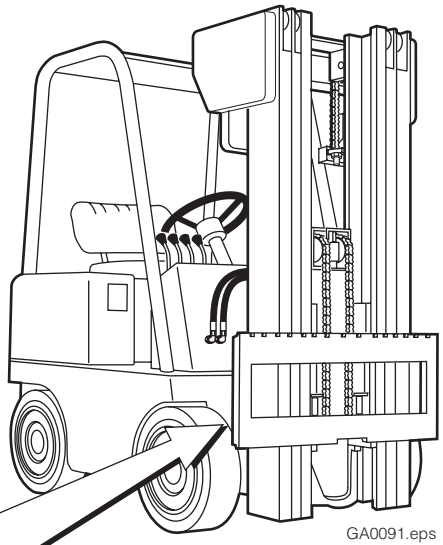
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5.1-3 Truck Carriage

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Carriage Mount Dimension (A) ANSI (ISO)

	Minimum	Maximum
Class II	14.94 in. (380.0 mm)	15.00 in. (381.0 mm)

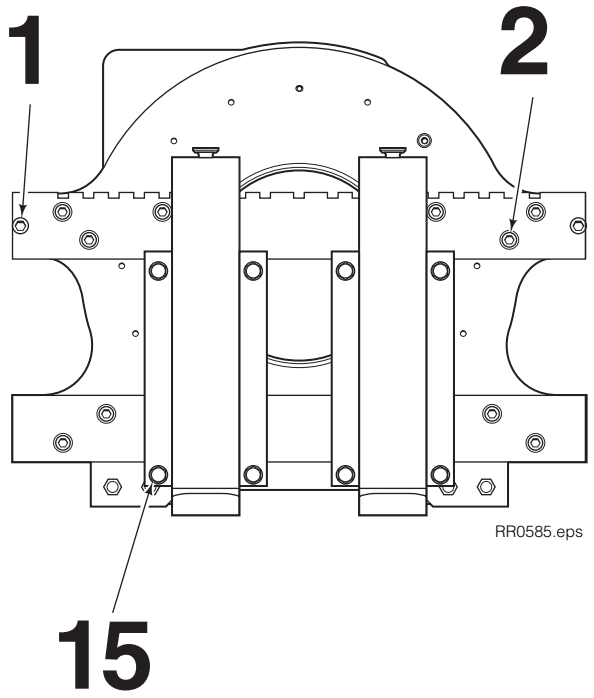
5.1-4 Torque Values

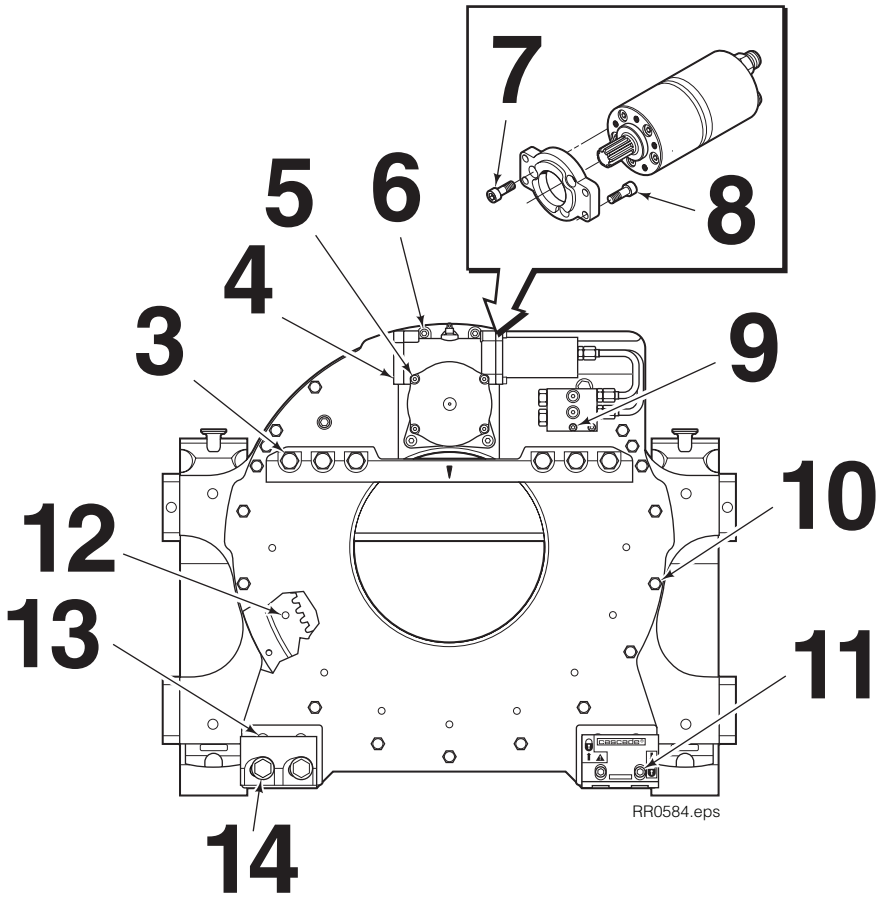
Fastener torque values for the 30G, 40G Rotators are shown in the table below in both US and Metric units. All torque values are also called out in each specific service procedure throughout this manual.

NOTE: All fasteners have a torque value range of ±10% of stated value.

Ref.	Fastener	Size	Ft.-lbs.	Nm
1	Fork Keeper Capscrew	M16	200	270
2	Fork Bar Capscrew	M16	200	270
3	Upper Hook Capscrew ▲	M16	165	225
4	End Cover Capscrew ▲	M6	115 in.-lbs.	13
5	Housing Cover Plate Capscrew ▲	M6	70 in.-lbs.	8
6	Drive Group Capscrew ▲	M8	24	32
7	Motor Flange/Motor ▲	M6	115 in.-lbs.	13
8	Motor Flange/DG Housing Capscrew ▲	M6	115 in.-lbs.	13
9	Valve Capscrew ▲	M6	70 in.-lbs.	8
10	Baseplate Capscrew ✚ ▲	M10	38	52
11	Quick Mount Capscrew	M16	122	165
12	Bearing Capscrew ✚ ▲	M10	47	63
13	Lower Hook Spacer Capscrew ▲	M16	122	165
14	Lower Hook Capscrew	M16	122	165
15	Fork Restraint Capscrews	M16	166	225

▲ Apply Loctite 242
✚ Double Torque





5.1-5 Determining Load Torque Requirements

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

To check that an attachment will handle a specific load, calculate the torque requirements as follows:

1. Weigh the load to be handled. **Example:** 1500 lbs.
2. Determine the center of the faceplate. Tape newspaper or cardboard over the hole of the attachment. Draw a line between a set of faceplate holes that are 180˚ apart. Repeat for a second set of holes. Where they cross is the center point of the rotator.
3. Determine the vertical off-center distance of the load. Measure from the load vertical centerline to the attachment vertical centerline.
4. Determine the horizontal off-center distance of the load. Measure from the load horizontal centerline to the attachment horizontal centerline.
5. Off-center distance calculation.
   - Square the vertical measurement.

     Example: $(3 \text{ in.})^2 = 9$ in.
   - Square the horizontal measurement.

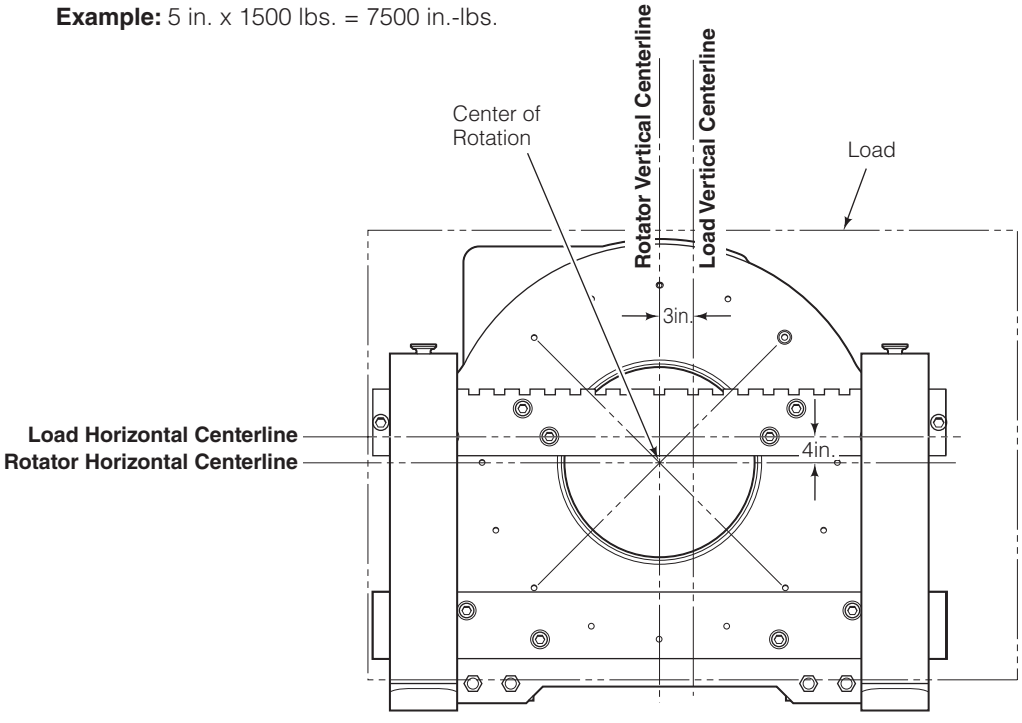
     Example: $(4 \text{ in.})^2 = 16$ in.
   - Add these two figures together.

     Example: 9 in. + 16 in. = 25 in.
   - Determine the square root and you have the total off-center distance.

     Example: $\sqrt{25 \text{ in.}} = 5$ in. off-center distance
   - Multiply the total off-center distance by them load weight and you have the torque required to handle the load. Compare this figure to the attachment specifications in the chart.

     Example: 5 in. x 1500 lbs. = 7500 in.-lbs.

Model	Maximum Torque Capacity
30G	35,000 in.-lbs. @ 2,300 psi (3,950 Nm @ 160 bar)
40G	40,000 in.-lbs. @ 2,300 psi (4,520 Nm @ 160 bar)



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