

# ***SERVICE MANUAL***

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## ***20H-55H***

### ***Fixed Frame Pivot Arm Paper Roll Clamps***

***Manual Number 6078255-R5***

**cascade<sup>®</sup>  
corporation**

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# INTRODUCTION

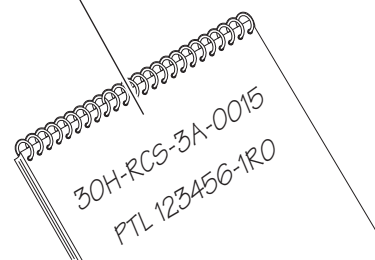
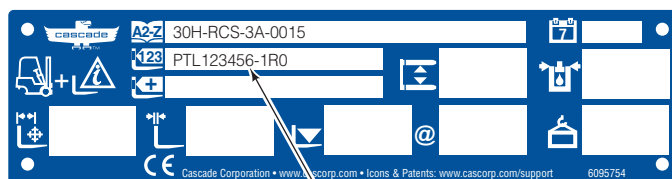
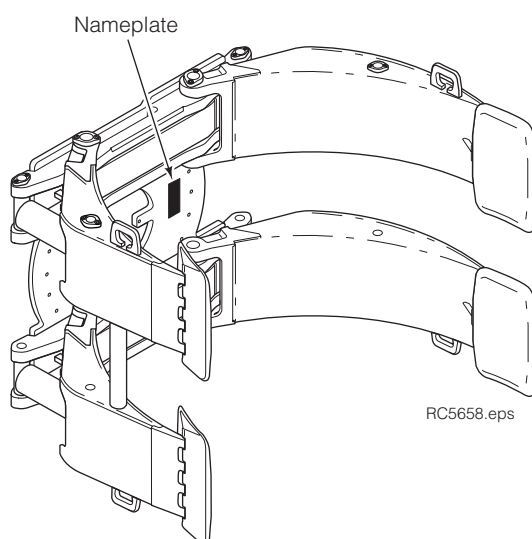
## 1.1 Introduction

This manual provides the Periodic Maintenance, Troubleshooting, Service and Specifications for Cascade H-Series Fixed Frame Paper Roll Clamps.

In any communication about the attachment, refer to the product catalog and serial numbers stamped on the nameplate, as shown. If the nameplate is missing, the numbers can be found stamped on the front of the faceplate top or side

**IMPORTANT:** Supply input fittings are JIC.

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



## 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.

# PERIODIC MAINTENANCE

## 2.1 Daily Inspection

Prior to each shift of truck operation, complete the following procedures:

- Check for loose or missing bolts, worn or damaged hoses and hydraulic leaks.
- Remove tap, glue and wrapper/paper fibers from contact pads.
- Check edges of contact pads for wear or sharp nicks that could damage or tear paper rolls. Grind edges smooth.
- Check decals and nameplate for legibility.

## 2.2 1000-Hour Maintenance

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

- Check sample of baseplate capscrews for proper torque value. See Technical Bulletin TB183 or Section 4.9-2 for checking and replacement procedures.
- Check sample of bearing capscrews for proper torque value. See Technical Bulletin TB183 or Section 4.9-2 for checking and replacement procedures.
- Check the torque on the stop block capscrews and tighten to 80 ft.-lbs. (110 Nm), if necessary.
- Check that load-holding hydraulic system is functioning properly. Test using a Cascade Clamp Force Indicators.
- Tighten lower mounting hook capscrews:
  - Class II/III** – 122 ft.-lbs. (165 Nm)
  - Class IV** – 236 ft.-lbs. (320 Nm)
- Lubricate rotation bearing assembly ball race (A) and gear (B) with EP-2 grease (Whitmore 'Omnitask' or equivalent). Rotate attachment in 90 degree increments and grease in each position.
- Check rotator drive gearcase lubricant level. Lubricant should be up to bottom of fill plug 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 the plug.
- Check rotation performance using a typical load. Refer to Technical Bulletin TB365 or Section 2.5.
- Inspect all arm, frame and cylinder pivot bushings for wear. Replace as necessary.
- Inspect all load-bearing structural welds on arms, arm pivots and cylinder pivot areas for visual cracks. Replace components as required.
- Inspect arm tips, wear tiles and contact pads for wear. Repair or replace as needed. Refer to Section 4.2.



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

### Cascade Clamp Force Indicators

#### Digital

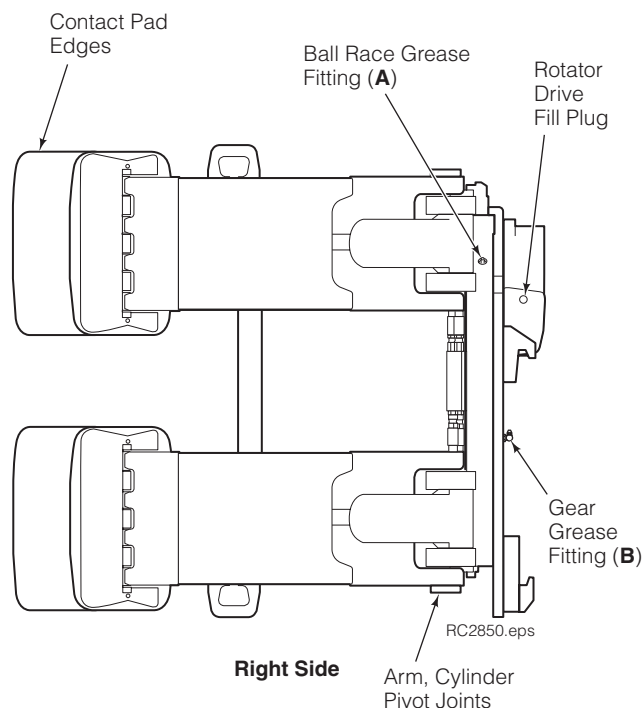
**300G-DFI-324C** – Split Arm Clamps, 8 x 12 in. Radiused Pads

**300G-DFI-812C** – Solid Arm Clamps, 8 x 24 in. Radiused Pads

#### Analog

**300G-CFI-324C** – Split Arm Clamps, 8 x 12 in. Radiused Pads

**300G-CFI-812C** – Solid Arm Clamps, 8 x 24 in. Radiused Pads

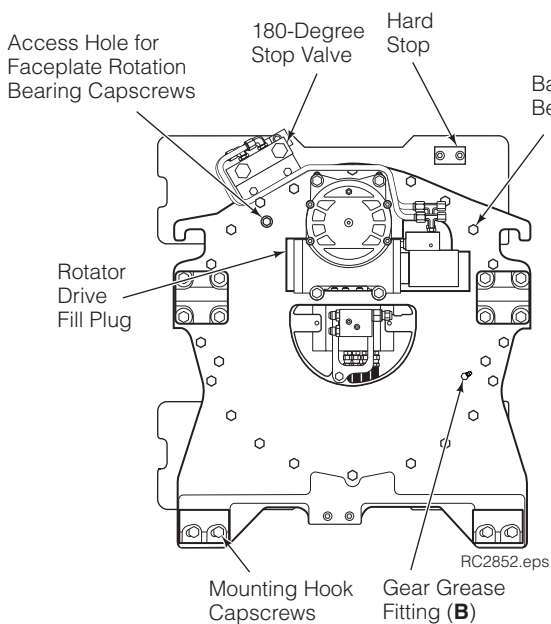


**WARNING:** A sampling of baseplate and bearing capscrews must be checked for proper torque at 1000 hours (see TB183). A complete inspection is required every 2000 hours. Failure to keep the capscrews tightened can result in attachment damage and serious injury.

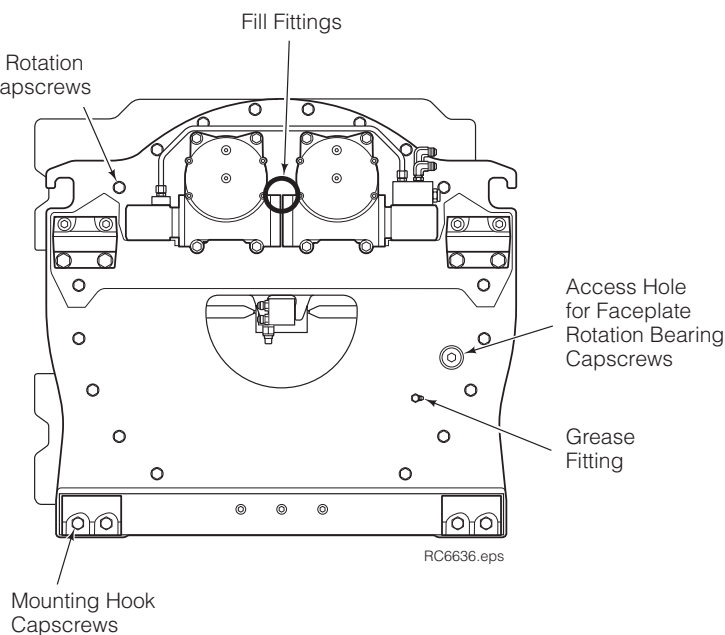
## 2.3 2000-Hour Maintenance

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

- Check **all** rotation bearing capscrews for proper torque value. See Technical Bulletin TB183 or Section 4.9-2 for checking and replacement procedures.
- Inspect all arm and cylinder pivot pins for wear and replace, if necessary.



Back (Driver's) View



Back (Driver's) View

## 2.4 4000-Hour Maintenance

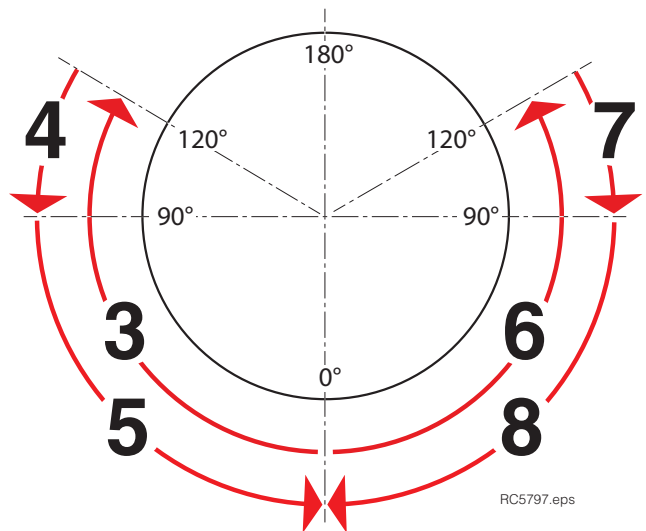
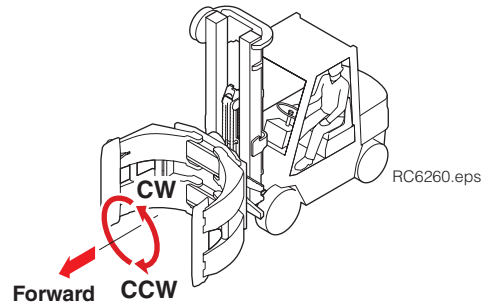
After each 4000 hours of truck operation, in addition to the daily inspection, 1000 and 2000-hour maintenance, perform the following procedures:

- Due to normal mechanical wear and component service life, cylinder seals should be replaced to maintain performance and safe operation. Refer to Section 4.8 for cylinder service.

## 2.5 Rotate Function Evaluation

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

- 1 Clamp a typical 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) 120° and stop. No rotational drift should be observed within 30 seconds.
- 4 Rotate the load Counterclockwise (CCW) 30° to horizontal and stop. No rotational drift should be observed within 30 seconds.
- 5 Rotate the load Counterclockwise (CCW) 90° to return to the initial position.
- 6 Rotate the load Counterclockwise (CCW) 120° and stop. No rotational drift should be observed within 30 seconds.
- 7 Rotate the load Clockwise (CW) 30° to horizontal and stop. No rotational drift should be observed within 30 seconds.
- 8 Rotate the load Counterclockwise (CCW) 90° to return to the initial position.
- 9 Repeat Steps 3 – 8 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.



## 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.

### 3.1-2 Tools Required

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

- 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 are required.

#### OR

Wireless Pressure Monitor:  
Pressure transducers monitor the hydraulic pressure and wirelessly transmit the data to the receiver then shown on a digital display.

Two Pressure Transducers	
Voltage	Kit Part No.
12V	6803615, 6815673 ★
24-48V	6803618, 6815676 ★

Four Pressure Transducers	
Voltage	Kit Part No.
12V	6803616, 6815674 ★
24-48V	6803619, 6815677 ★

★ Includes alarm assembly 6815696.

- Assorted fittings and hoses to adapt the gauges and flowmeter to the components being tested.



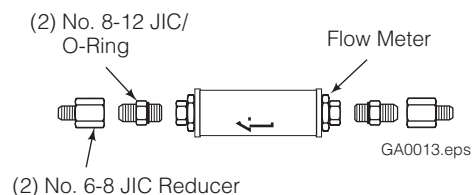
**WARNING:** Before servicing any hydraulic component, relieve pressure in the system. Turn the truck off and move the truck auxiliary control valves several times in both directions.

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

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

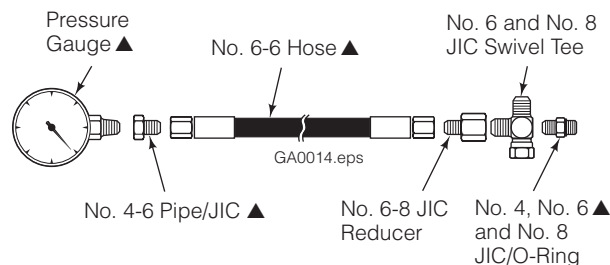
#### Flow Meter Kit

671477 – 20 GPM (75 L/min)

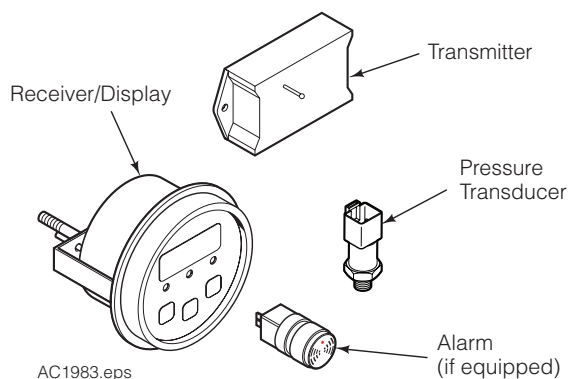


#### Pressure Gauge Kit

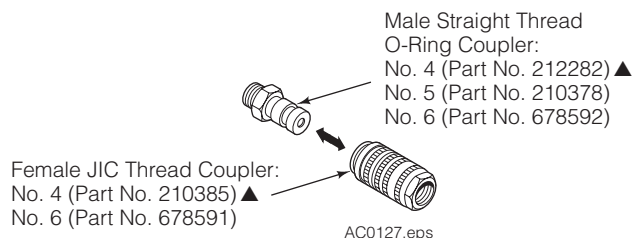
671212



#### Wireless Pressure Monitor Kits



#### Diagnostic Quick-Disconnects



▲ Included in Diagnostics Kit 394382.

## 3.1-3 Troubleshooting Chart

### **Determine All The Facts –**

It is important that all the facts regarding the problem are gathered before beginning service procedures. First, talk to the equipment operator. Then ask for a complete description of the malfunction. The following guidelines can then be used as a starting point to begin troubleshooting procedures:

### **CLAMP Circuit**

- Attachment drops roll after it has been picked up.
- Attachment will not carry rolls to its rated capacity.
- Attachment arms will not function properly.

To correct one of these problems, see Section 3.3.

### **ROTATE Circuit**

- Attachment will not rotate.
- Attachment will not rotate rolls up to its rated capacity.
- Attachment rotates in one direction only.

To correct one of these problems, see Section 3.4.

- Attachment drifts from its rotated position.

To correct this problem, see Section 3.4-4.

- Attachment will not stop properly with 180-degree stop valve or electronic rotational control.

To correct this problem, see Section 4.10.



## 3.2 Plumbing

### 3.2-1 Hosing Diagram

#### CLOSE ARMS

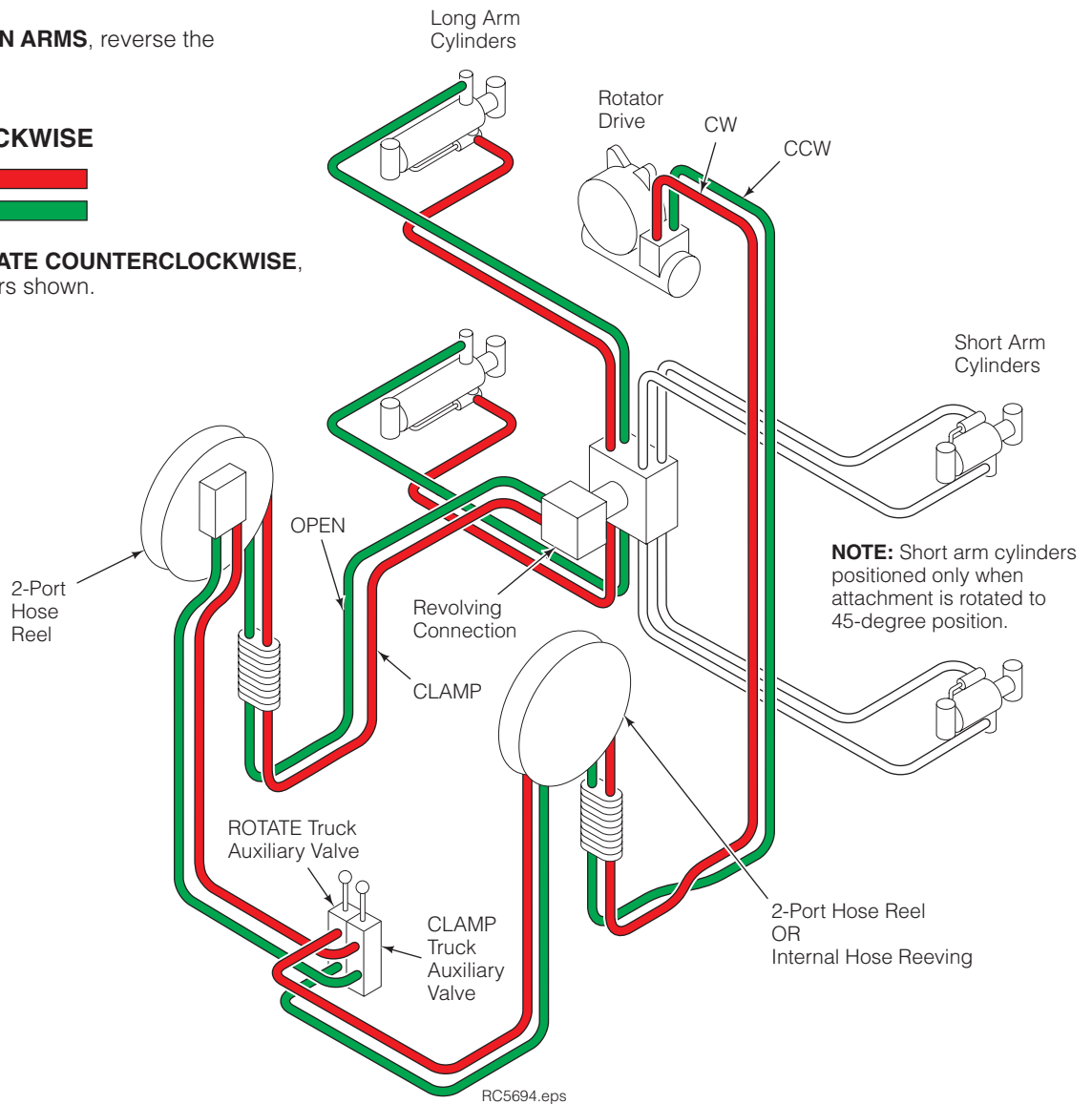
**PRESSURE**   
**RETURN** 

**NOTE:** For **OPEN ARMS**, reverse the colors shown.

#### ROTATE CLOCKWISE

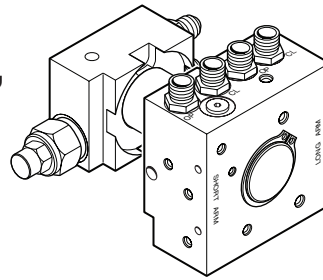
**PRESSURE**   
**RETURN** 

**NOTE:** For **ROTATE COUNTERCLOCKWISE**, reverse the colors shown.

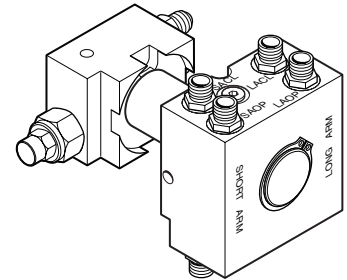


# TROUBLESHOOTING

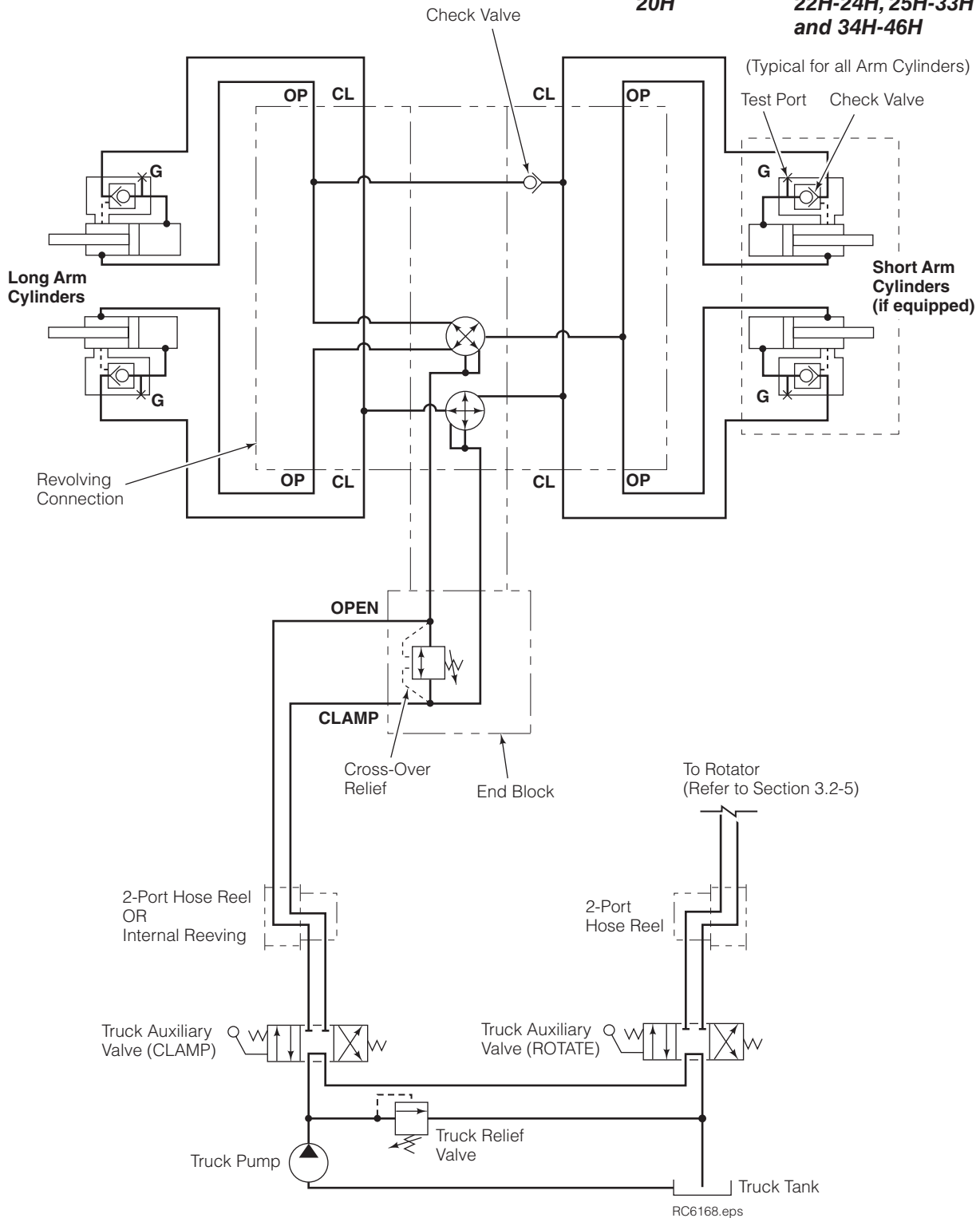
## 3.2-2 Hydraulic Schematic – Solid Long Arm 20H, 22H-24H, 25H-33H (current models), 34H-55H



20H

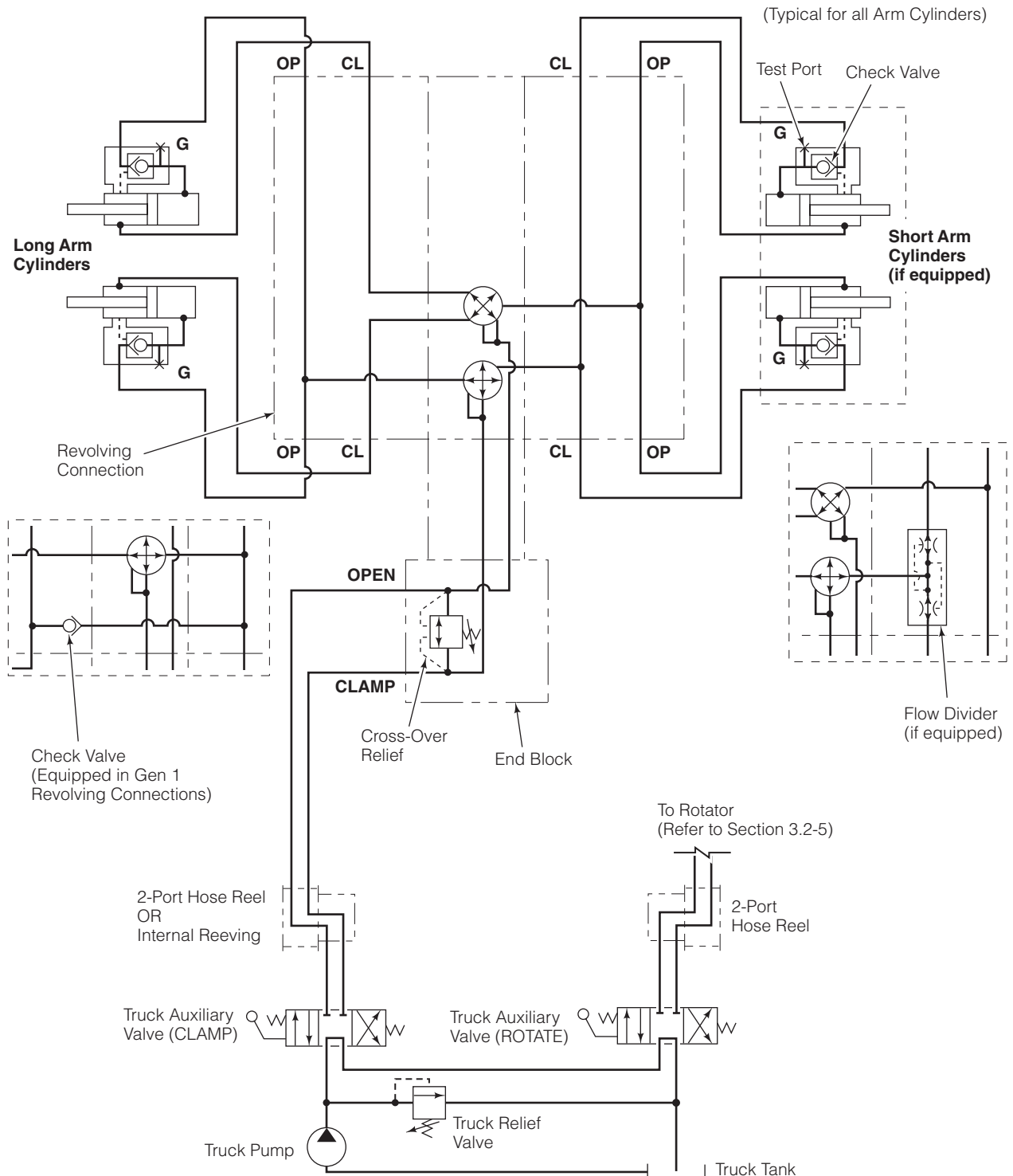
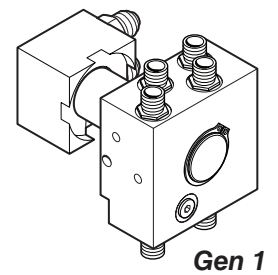
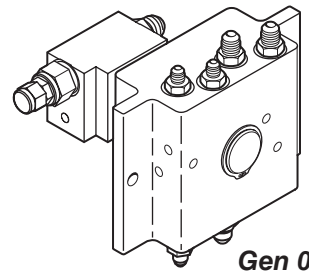


22H-24H, 25H-33H (Gen 2)  
and 34H-46H



# TROUBLESHOOTING

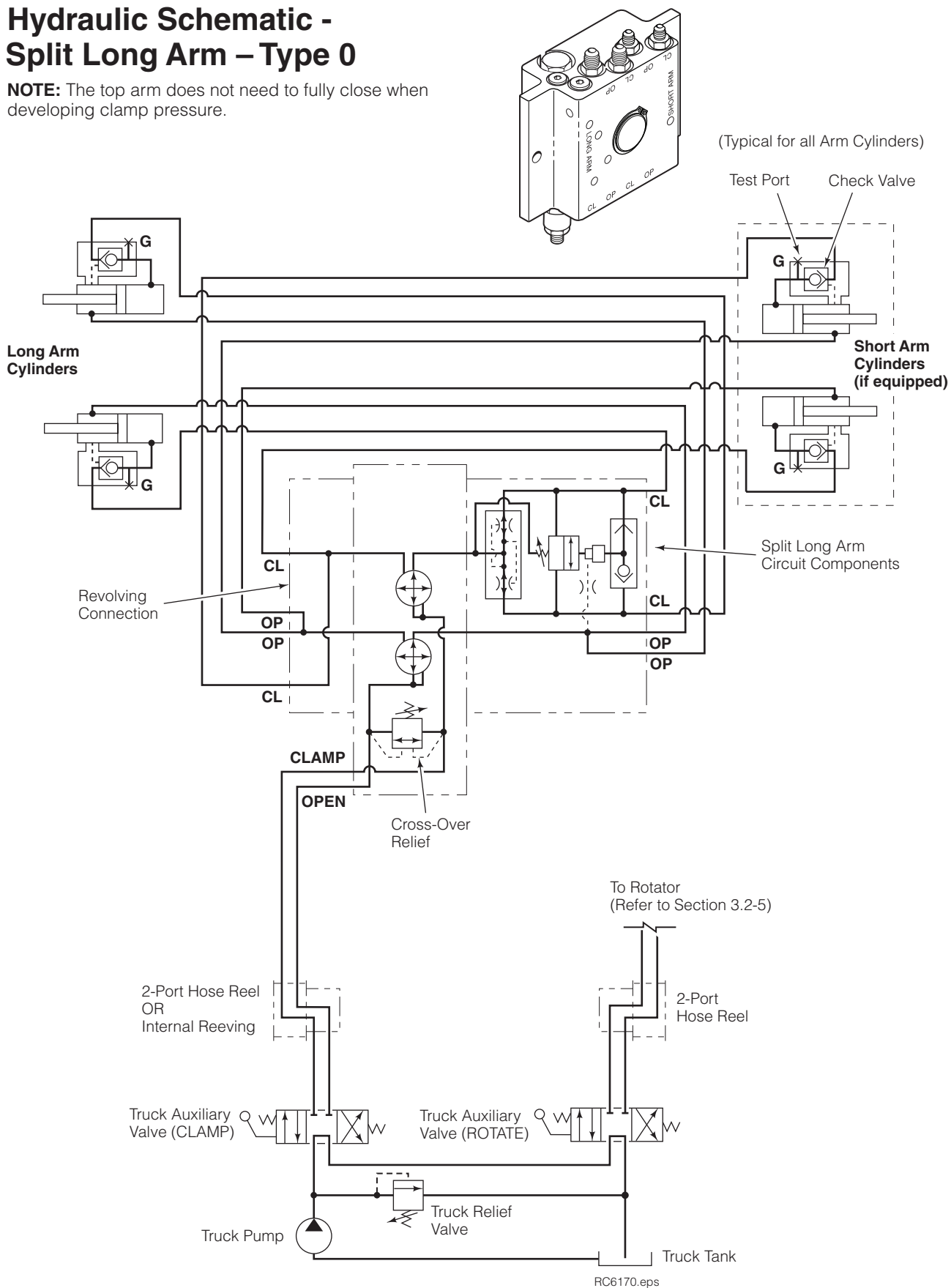
## 3.2-3 Hydraulic Schematic - Solid Long Arm 25H-33H (early models)



RC6169.eps

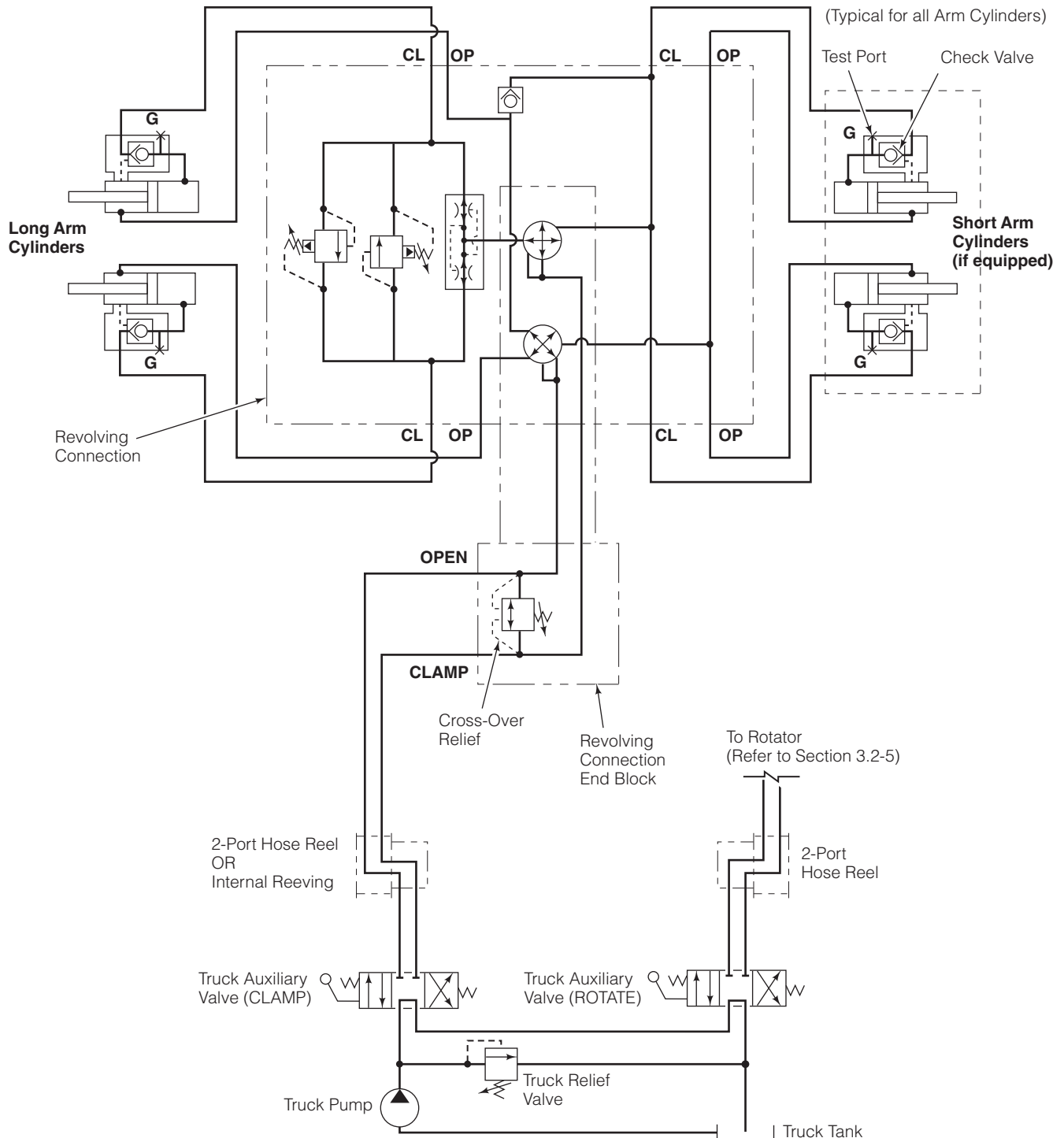
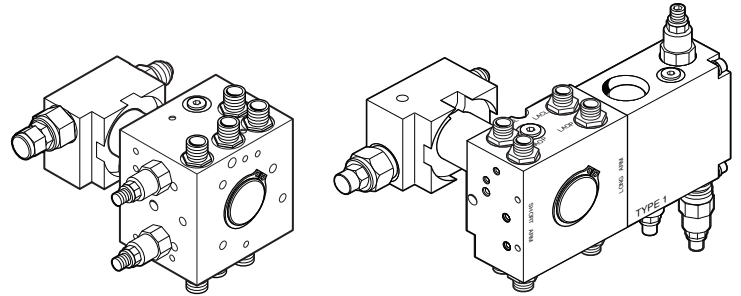
### 3.2-3 Hydraulic Schematic - Split Long Arm – Type 0

**NOTE:** The top arm does not need to fully close when developing clamp pressure.

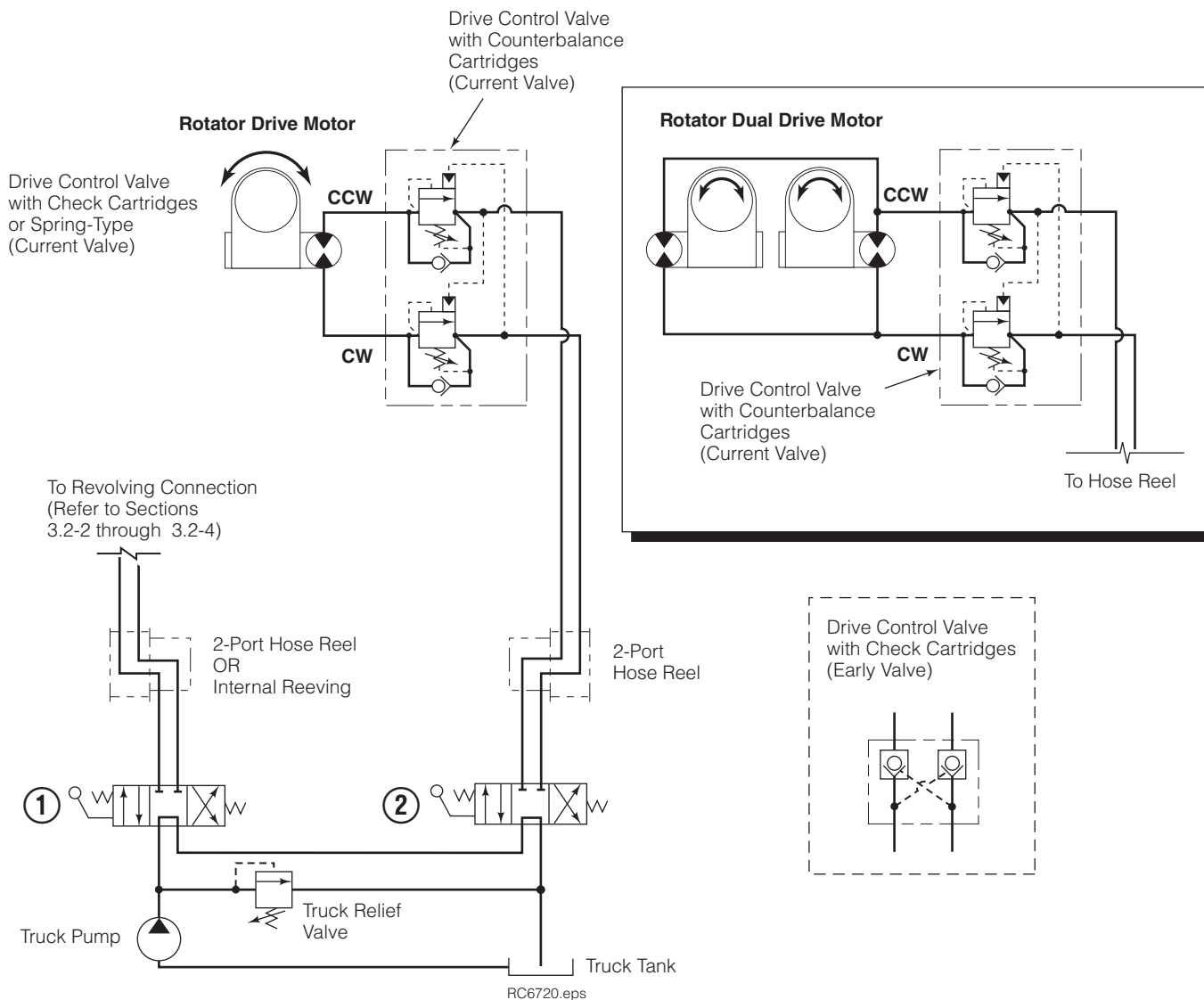


## 3.2-4 Hydraulic Schematic - Split Long Arm – Type 1

**NOTE:** Wait for the top arm to fully close before developing clamp pressure.



## 3.2-5 Rotate Hydraulic Schematic



### Truck Auxiliary Valve

- ① CLAMP
- ② ROTATE

## 3.3 Clamp Function

There are five potential problem areas that can affect the clamp function:

- Operator may be handling roll incorrectly. Loads may be too heavy, exceeding capacity of attachment. Refer to Operator's Guide (Cascade part no. 210135) for suggested procedures.
- Low hydraulic pressure or flow from lift truck.
- External leaks.
- Defective solenoid coil or valve (solenoid equipped attachments).
- Worn/defective revolving connection shaft seals, cartridge valves, cylinder seals or check valves.

### 3.3-1 Supply Circuit Test



**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 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. **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. See Section 5.1 for recommended flow volumes. If the truck pressure and flow are correct, proceed with the clamp circuit pressure test.

### 3.3-2 Clamp Circuit Test



**WARNING:** Before removing hydraulic lines, position both arms at midstroke to relieve cylinder pressure. Turn the truck off and open the truck auxiliary control valves several times in both directions.

- 1 Check for external leaks at the cylinders and revolving connection.
- 2 **Long Arm Cylinders** – Install a pressure gauge to each long arm cylinder's test port. Close the long arm fully and hold the handle in the CLAMP position a few seconds to develop full truck system pressure. Watch the gauge pressure readings.  
**Short Arm Cylinders** – Install a pressure gauge on each short arm cylinder's gauge port. Rotate the attachment to the 45° position. Close the short arm fully and hold the handle in the CLAMP position a few seconds to develop full truck system pressure. Watch the gauge pressure readings.
  - If the initial gauge pressures are not within 100 psi (7 bar) of system pressure measured at the hose terminal, the revolving connection may be faulty and require service. Refer to Section 4.6.

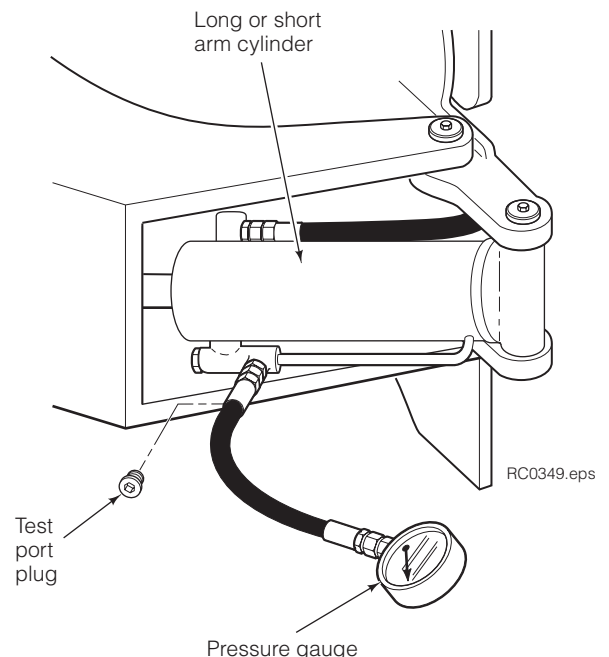
- If one of the gauge pressures **drops more than** 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the cylinder check valve cartridge or piston seals may be faulty. Continue troubleshooting.
- If both gauge pressures **do not drop more than** 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, the problem is not hydraulic. Refer to the list of potential problems, Section 3.3.

**3** Position both arms at midstroke to relieve cylinder pressure. Remove, swap and reinstall the cylinder check valve cartridges.

**4 Long Arm Cylinders** – Close the long arm fully and hold the handle in the CLAMP position a few seconds to develop full truck system pressure. Watch the gauge pressure readings.

**Short Arm Cylinders** – Rotate the attachment to the 45 degree position. Close the short arm fully and hold the handle in the CLAMP position a few seconds to develop full truck system pressure. Watch the gauge pressure readings.

- If the gauge pressure on the cylinder **continues to drop more than** 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the cylinder piston seals are faulty. Refer to Section 4.7 for cylinder service.
- If the gauge pressure on the cylinder **does not drop more than** 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, the check valve (now in the other cylinder) is faulty and requires replacement. Refer to Section 4.7-3.



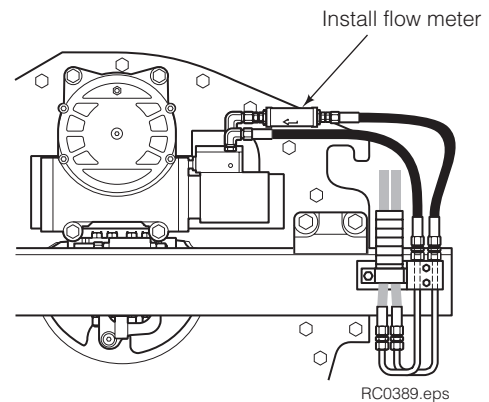
## 3.4 Rotation Function

There are four potential problem areas that can affect the rotation function:

- Operator may be handling roll incorrectly. Loads may be too heavy or rotated off-center, exceeding capacity of attachment. Refer to Operator's Guide (Cascade part no. 210135) for suggested handling procedures.
- Low hydraulic pressure or flow from lift truck.
- Worn or defective hydraulic rotator motor.
- Worn or defective drive assembly or rotator frame bearing assembly.

### 3.4-1 Supply Circuit Test

- 1 Check for external leaks.
- 2 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. **PRESSURE TO THE ATTACHMENT MUST NOT EXCEED 2300 psi (160 bar)**, measured at the carriage hose terminal.
- 3 Check the flow volume at the carriage hose terminal. See Section 5.1 for recommended flow volumes. If the truck pressure and flow are correct, proceed with the rotation circuit pressure test.

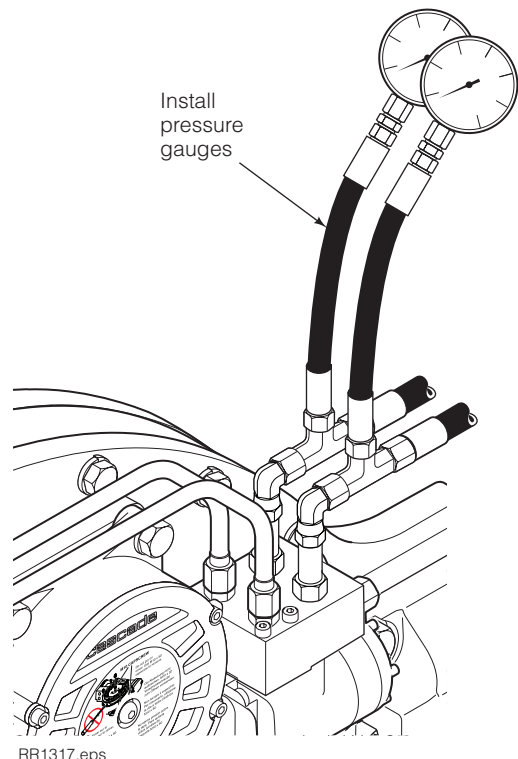
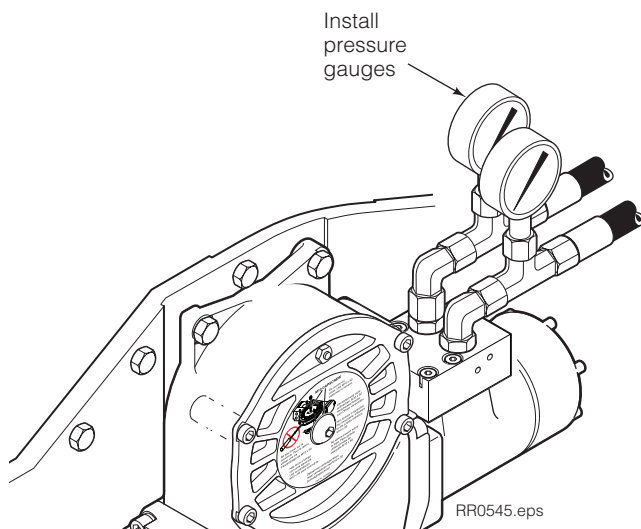


### 3.4-2 Rotation without Load

- 1 Install pressure gauges on the rotator motor fittings.
  - 2 Rotate the attachment without a load and 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 service. Refer to Section 4.5.
  - 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, 90 degree fittings, or hose sizes less than No. 8.



**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.





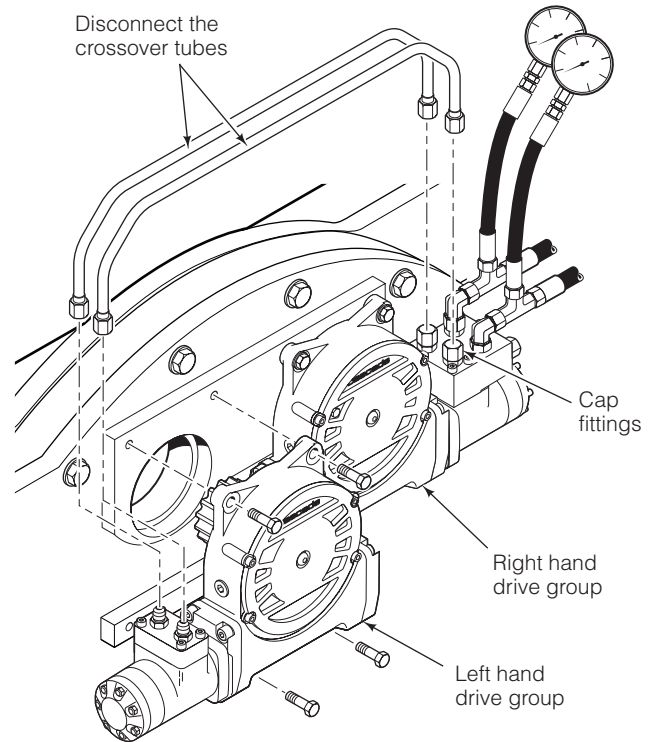
## 3.4-3 Rotation with Load

- 1 Attachments with Single Drive** – Rotate a load requiring approximately 3/4 of attachment maximum torque capacity. Note gauge readings during rotation:
  - If the higher gauge reading is substantially less than the truck pressure as measured at the carriage hose terminal, the rotator motor gerotor/geroler set may need repair. Refer to Section 4.3.
  - If the higher gauge reading is close to truck pressure as measured at the carriage hose terminal and no rotation occurs, the rotator motor output shaft or drive box may need repair. Continue troubleshooting.

**Attachments with Dual Drive** – Remove the left drive group from the attachments as described in Section 4.3-1. Cap the connector fittings on the right hand drive group. Rotate a load requiring approximately 1/3 of attachment maximum torque. Note gauge readings during rotation:

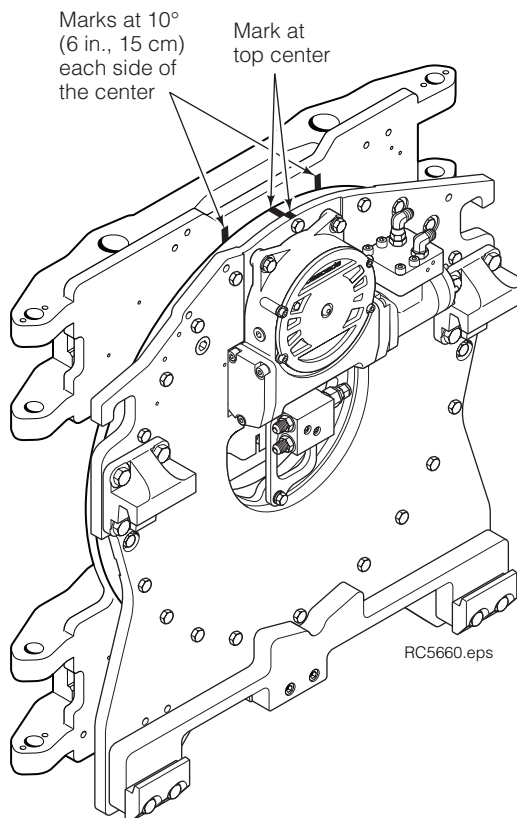
- If the higher gauge reading is substantially less than truck pressure measured at the junction block/hose terminal, the RH motor may need repair.
  - If the higher gauge reading is close to truck pressure measured at the junction block/hose terminal, and no rotation occurs, the RH motor output shaft or drive may need repair. Continue troubleshooting.
  - If the higher gauge is close to truck pressure, measured at the junction block/hose terminal, and rotation occurs, the LH motor output shaft or drive may need repair. Continue troubleshooting.
- 2** Remove the motor from the drive box assembly as described in Section 4.3-1.
  - 3** Reinstall the hoses to the rotator fittings. Actuate the ROTATE circuit.
    - If the rotator motor shows rotational output, the drive box may require service. See Section 4.3.
    - If the rotator motor shows little or no rotational output, the rotator motor requires service. See Section 4.4.

Model	Maximum Torque Capacity
<b>20H-33H</b>	63,000 in.-lbs. @ 2300 psi (7,087 Nm @ 160 bar)
<b>34H-46H</b>	118,000 in.-lbs. @ 2300 psi (13,330 Nm @ 160 bar)
<b>55H</b>	145,000 in.-lbs. @ 2300 psi (16,380 Nm @ 160 bar)



## 3.4-4 Rotation Drift Test

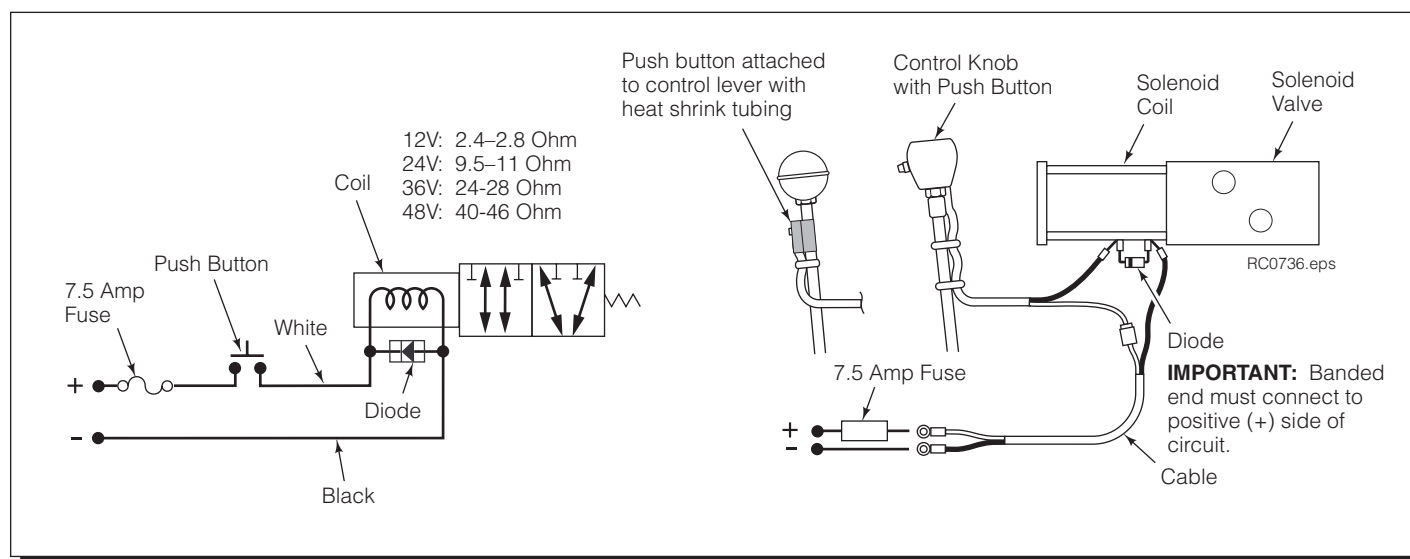
- 1** Rotate the attachment to the vertical roll handling position.
- 2** Place a mark at the top center of the baseplate and bearing. Place rotation limit marks at 10° (6 in., 5 cm) from each side of the top center on the faceplate. All marks should be viewable by the driver.  
**NOTE:** If the faceplate is raised, mark 6 in. (5 cm) from center.
- 3** Clamp a roll with pads at bottom of roll.
- 4** Lift a load 15 in. (38 cm) off the floor to provide clearance for rotation drift test.
- 5** Rotate load 10° CW to align marks and wait 30 seconds. Observe if drift occurs.
  - If drift occurs, the rotator drive components require service. Refer to Section 4.3.
- 6** Rotate load 10° CCW to align marks and wait 30 seconds. Observe if drift occurs.
  - If drift occurs, the rotator drive components require service. Refer to Section 4.3.



## 3.5 Electrical Circuit (Solenoid-equipped attachments)

Use the schematic shown and follow the steps below.

- 1 Check the control knob circuit fuse. Replace if necessary.
- 2 Check for loose electrical connections at the truck ignition switch, control knob button, solenoid coil terminals and diode.
- 3 Remove the diode from the solenoid coil terminal. Test with an ohmmeter for high resistance in one direction and no resistance in the other direction. If there is no resistance in both directions, replace the diode.  
**NOTE:** When replacing the diode, the banded (+) end must be connected to the coil and wiring as shown.
- 4 Use a voltmeter to determine if correct voltage is present at the electrical leads when the button is pressed.
  - If there is **no** voltage to the solenoid, troubleshoot the electrical circuit for shorts or open circuits.
  - If there is **insufficient** voltage to the solenoid, check the circuit for excessive voltage drop.
  - If there is **sufficient** voltage to the solenoid, test for coil continuity. Continue to Step 5.
- 5 Test the coil continuity by placing an ohmmeter test lead on each solenoid coil terminal (ohmmeter on Rx1 scale).
  - If there is an ohmmeter reading, the coil is good.
  - If the coil is good, but the solenoid does not 'click' when the control knob button is pressed, the solenoid cartridge may be jammed. Refer to Section 4.12.
  - If there is no ohmmeter reading, the coil is defective and should be replaced. Refer to Section 4.12.



## 4.1 Attachment Removal

- 1 Rotate the attachment to the vertical roll handling position. Extend the arms outside the frame width.



**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.

- 2 Disconnect and plug the hydraulic supply hoses to the attachment. Tag hoses for reassembly.
- 3 Disconnect the lower hooks:

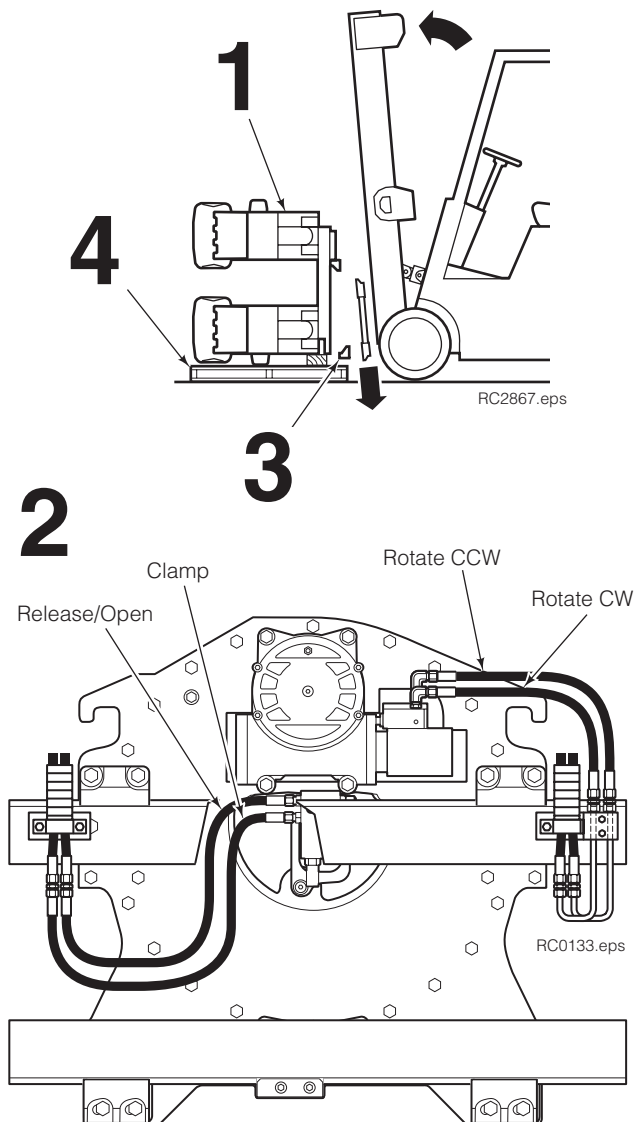
**Bolt-On Hooks** – Remove the lower mounting hooks. For reassembly, tighten the capscrews to:

**Class II/III** – 122 ft.-lbs. (165 Nm)

**Class IV** – 236 ft.-lbs. (320 Nm)

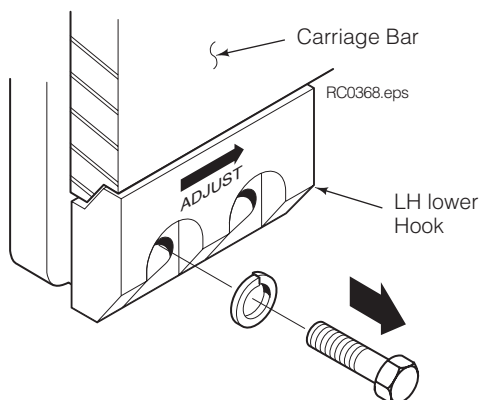
**Quick-Change Hooks** – Pull out the locking pins and drop the lower hooks to the unlocked position. Reinstall the pins in the lower holes. For reassembly, slide the hooks up to the locked position and install the locking pins in the top holes.

- 4 Set the attachment on a pallet. Tilt the mast forward and lower the carriage to remove the attachment from the truck.
- 5 For installation, reverse the above procedures with the following exceptions:
  - Refer to Installation Instructions 6077316, for complete installation procedures.

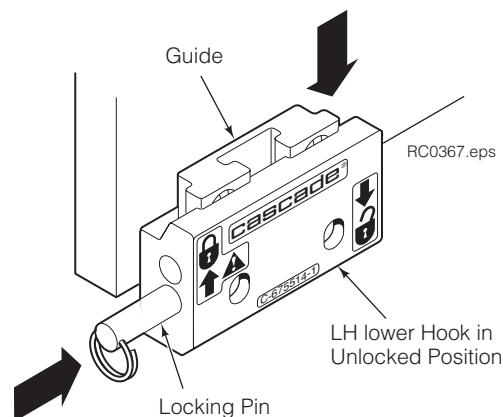


### 3

#### BOLT-ON HOOKS



#### QUICK-CHANGE HOOKS



## 4.2 Arms

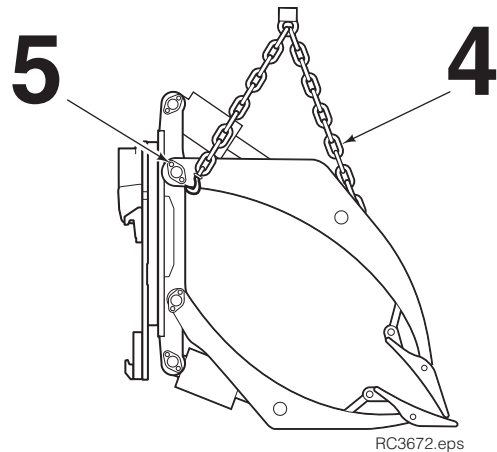
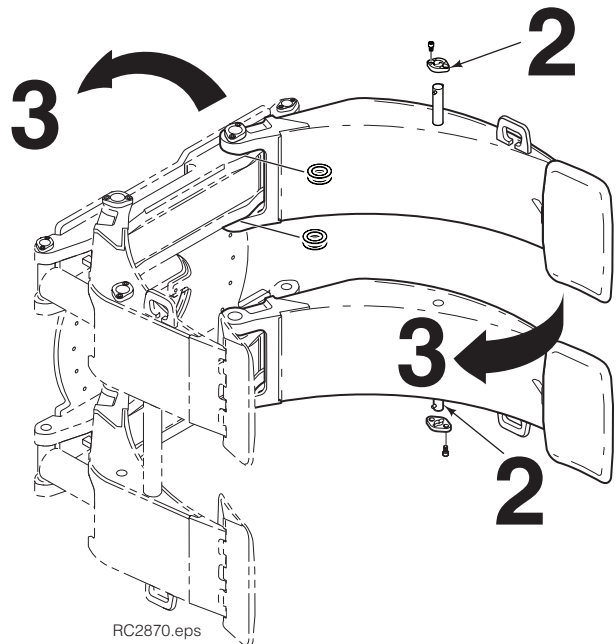
### 4.2-1 Arm Assembly – Removal and Installation

- 1 Open the arm to be removed to mid-range position. Rotate the attachment to the vertical roll handling position.
- 2 Remove the retainers and cylinder rod anchor pins from both cylinder rods. Retract the cylinders. For reassembly, tighten the retainer capscrews to 28 ft.-lbs. (38 Nm).
- 3 Swing the arm being removed inward to contact the other arm. Rotate the attachment 90 degrees to position the arm being removed on top.



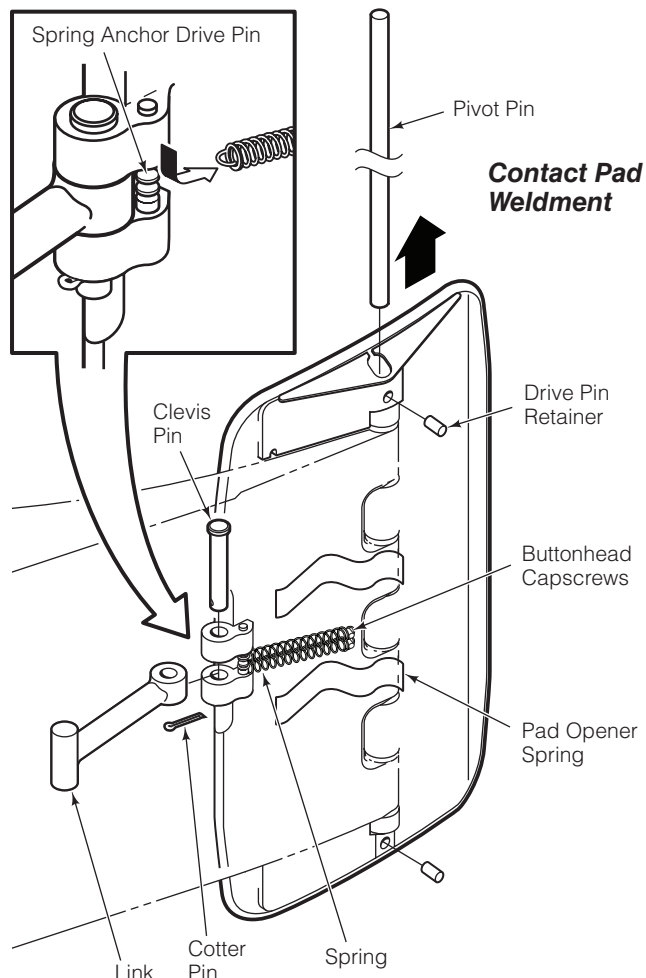
**WARNING:** Check the attachment weight (located on the nameplate) to make sure the overhead hoist and chains or straps are at least the rated capacity of the attachment.

- 4 Attach an overhead hoist to the arm and take up slack in the chain.
- 5 Remove the retainers and arm pivot pins. Note location of shims. Lift away arm assembly. For reassembly, tighten the pivot pin retainer capscrews to 28 ft.-lbs. (38 Nm).
- 6 For reassembly, reverse the above procedures.

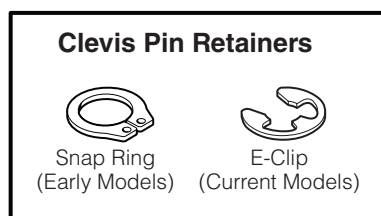
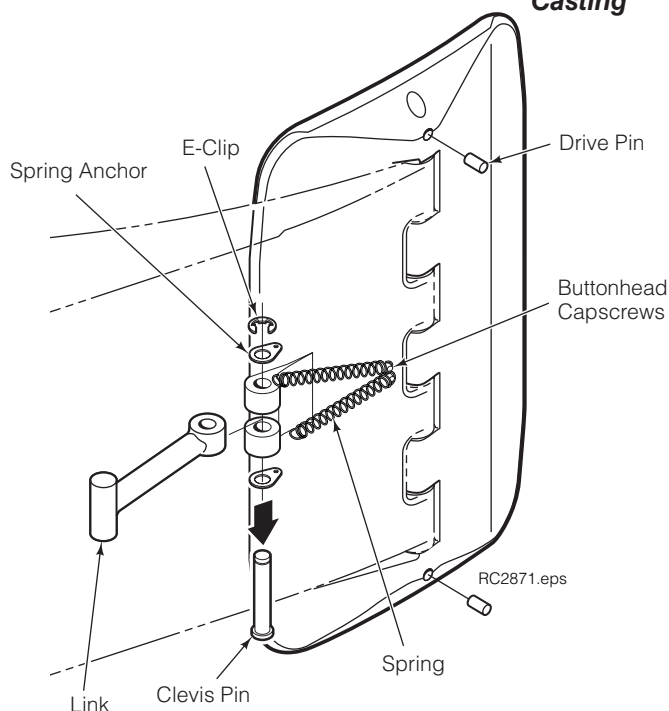


## 4.2-2 Contact Pad – Removal and Installation

- 1** Rotate the attachment to the vertical roll handling position. Lower the unit until the contact pads are approximately 1 in. (25 mm) off the ground.
- 2 Contact Pad Weldment** – Remove cotter pins from the clevis pins that fasten the links to the contact pad. Remove the clevis pins from the links. Unhook the springs from the anchor drive pins. Springs will remain fixed to the arms.
- 3 Contact Pad Casting** – Remove the E-clips from the clevis pins. While removing the clevis pins, unhook the spring anchors. Spring will remain fixed to the arms.  
**IMPORTANT:** Earlier designs are equipped with snap rings. Cascade recommends upgrading to E-clips. Use upgrade kit 682345 and refer to TB 319 (Part No. 6823454).
- 4** Remove the drive pins from the contact pad pivot points and remove the pivot pins.
- 5** Remove the contact pad and pad opener springs. Pad links can be removed from the arm by rotating 90 degrees and pulling out.
- 6** For reassembly, reverse the above procedures with the following exceptions:
  - Inspect the arm tips and pivot pins for wear and repair/replace as necessary.
  - Install bottom drive pin to contact pad. Install pivot pin and top drive pin. Make sure drive pins are an interference fit. Pin is 0.312 in. dia. x 1.250 in. long.
  - Make sure pad opener springs are installed as shown. Replace as required.
  - Check the condition of the springs. Replace as required.



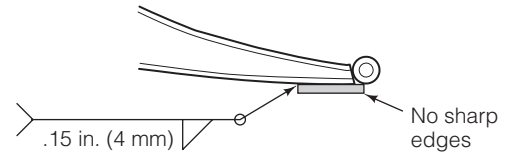
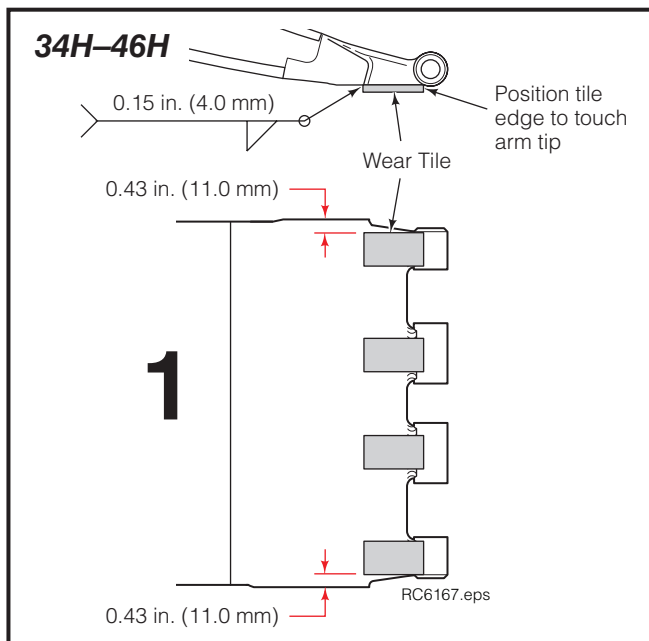
### Contact Pad Casting



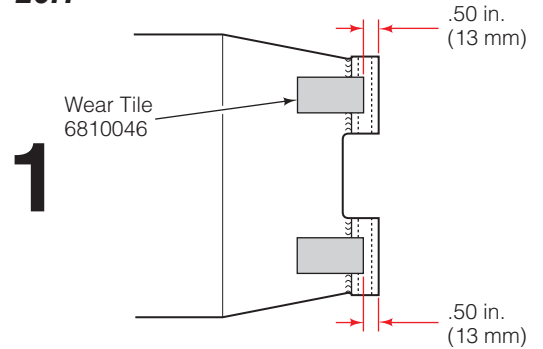
## 4.2-3 Wear Tile Replacement

The following procedure describes installing wear tiles for on arm tips using kit 6810076. The kit includes eight replacement wear tiles.

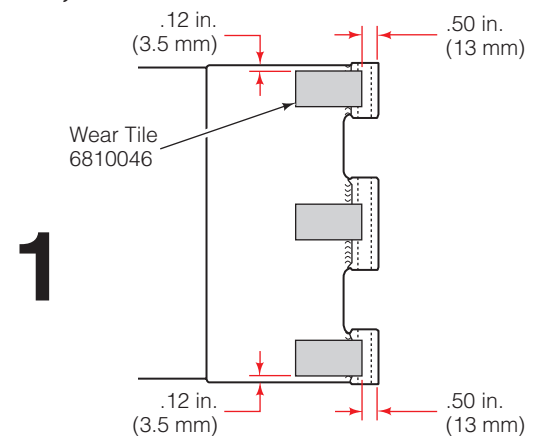
- 1 Remove contact pad as described in Section 4.2-2.
- 2 Preheat arm tip base metal to 70°F (21°C) minimum.
- 3 Position the wear tiles on the back of short arm using the dimensions shown. **NOTE:** For 34H-46H units, the wear tile edge should touch the arm tip.  
Tack, then weld the wear tiles using the weld procedures as described:
  - Protect the tube holes from splatter.
  - Preheat arm tip base metal to 150°F (66°C). Monitor and maintain arm tip heat at locations shown using suitable temperature-indicating devices.
  - **WELD METHOD A – FCAW (Flux-Cored Arc Weld).** Attach ground wire to arm. Weld using AWS E70T-1 1/16 in. (1.6 mm) or 5/64 in. (2 mm) diameter wire with 100% CO<sub>2</sub> shielding gas at 35-50 CFH. Set welding amp per manufacturers recommendations. Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - **WELD METHOD B – SMAW (Stick Welding).** Attach ground wire to arm. Weld using E-7015 low hydrogen 1/8 in. (3.2 mm) or 5/32 in. (4 mm) diameter electrodes. Set welding amps per manufacturer's recommendations. **Do not use electrode exposed to moisture without first re-drying them at 200°F (75°C) for 2 hours.** Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - Cool arm tip base metal at normal air cool.
- 4 Remove slag after each weld and inspect for defects. **NOTE:** Arc craters, undercut, overlap and porosity are not permitted. Repair any defect as required.
- 5 Grind all welds to smooth transitions between parts.
- 6 Install contact pads by reversing steps in Section 4.2-2.



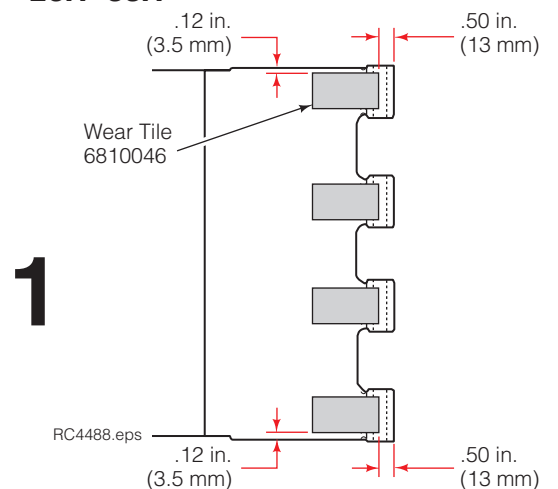
### 20H



### 22H, 24H



### 25H-33H

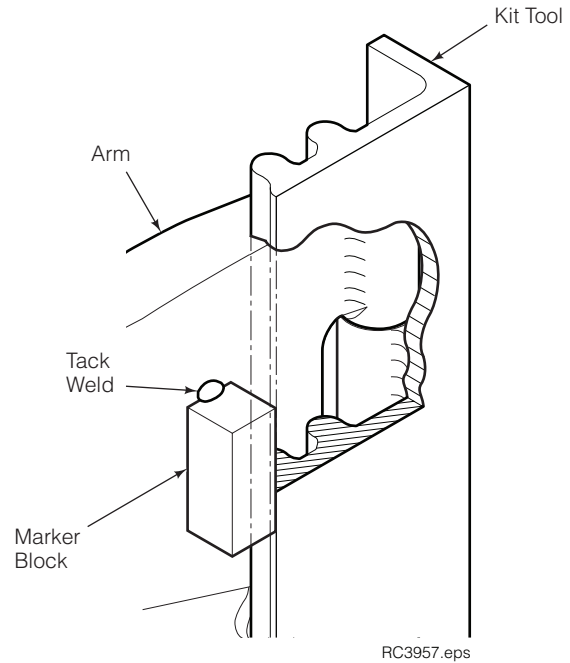
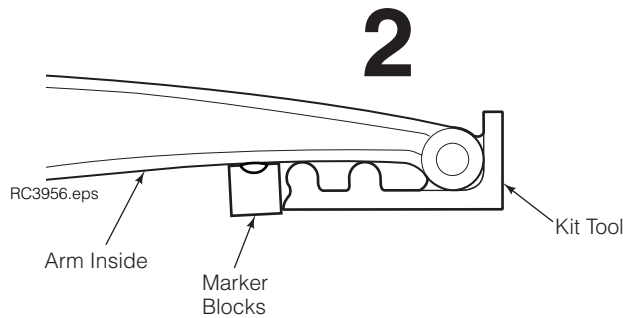


## 4.2-4 Arm Tip Repair – 20H-33H

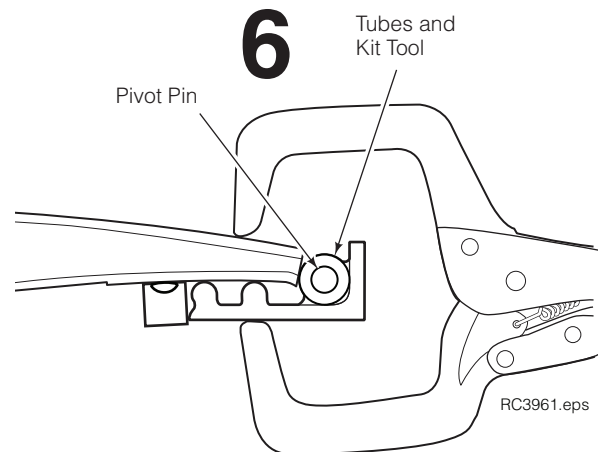
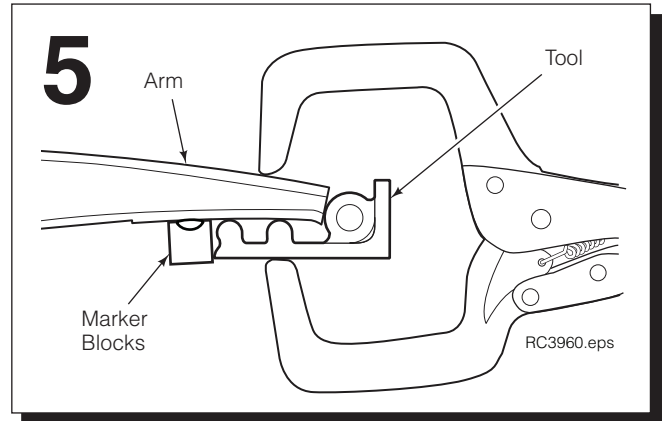
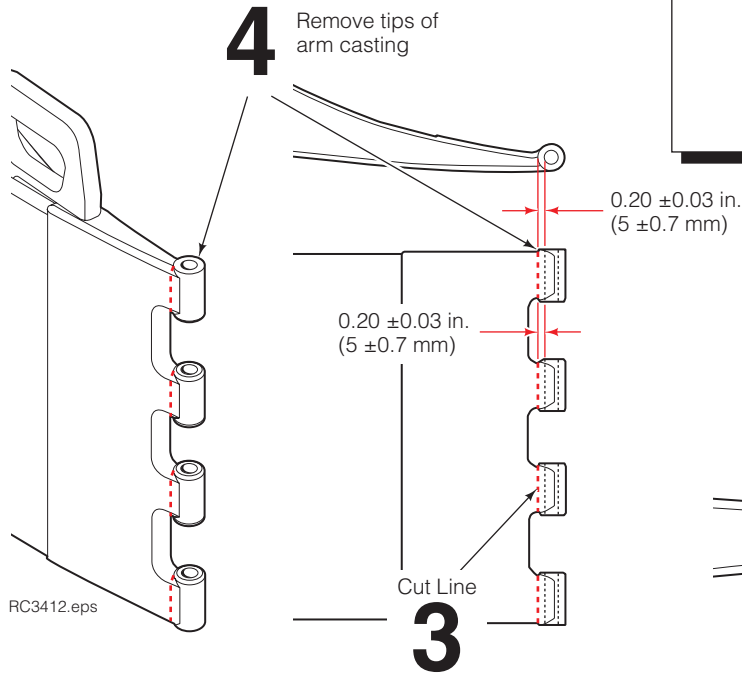
The following procedure describes installing wear tiles for on arm tips using kits 6047539 (20H), 6814054 (22H,24H), 6814103 (25H, 30H, 33H). The kits repair one arm.

- 1 Remove contact pad as described in Section 4.2-2.
- 2 Place the tool against the tip with raised ribs on the inner arm surface and the spacers in between each tip. Tack weld two blocks (user equipped) to the inside of the arm as a marker at the edge of the tool. Remove the tool.

**IMPORTANT:** Avoid damage to machined features and threaded holes.



- 3 Scribe a cut line  $0.20 \pm 0.03$  in. ( $5 \pm 0.7$  mm) back from the inner surface of the existing tip holes on both sides of the arm tips.
- 4 Remove defective tip area entirely at the cut line by grinding, sawing, torch or arc gouging. Remove any paint contamination from around the repair area. If arc gouging is used, make sure all carbon particles are completely removed.



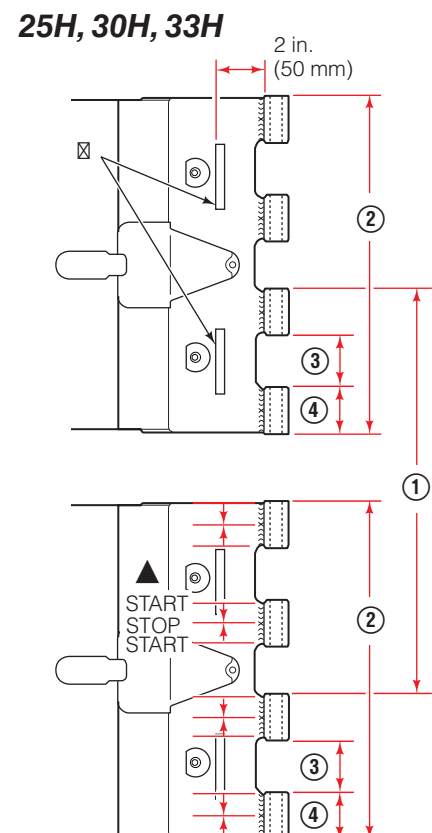
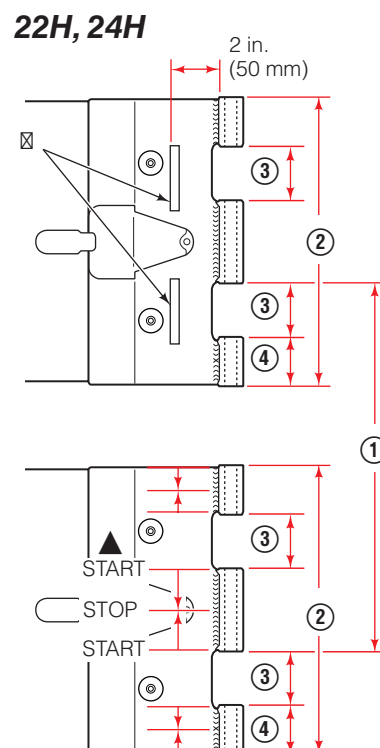
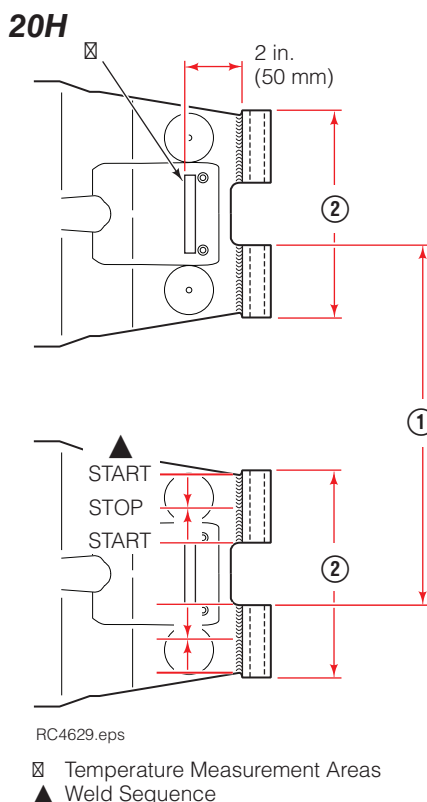
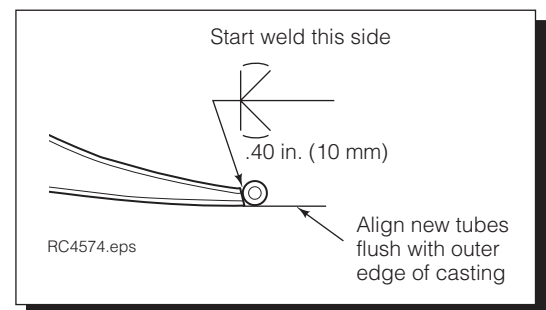
- 5 Clamp the kit tool against the marker blocks.
- 6 Position the new tubes on the arm tips using the kit tool. Place existing pivot pin through all tubes and kit tool for alignment. All repairs should be done in the flat position.



## 4.2-4 Arm Tip Repair – 20H-33H (Continued)

- 7 Preheat arm tip base metal to 70°F (21°C) minimum. Tack weld new tubes to the tips. Use the recommended weld procedures listed in Step 8. Remove kit tool.
- 8 Install the contact pad and pivot pin on the arm. Check the tube alignment, realign as required. Remove the contact pad and pin.
- 9 Finish-weld the tubes to the arm tips and wear tiles using the following weld procedures:
  - Protect inside of tubes from weld spatter.
  - Preheat arm tip base metal to 150°F (66°C). Monitor and maintain arm tip heat at locations shown using suitable temperature-indicating devices.
  - **Weld Sequence** – Start weld on side indicated. Terminate each weld at center of tube.
  - **WELD METHOD A – FCAW (Flux-Cored Arc Weld).** Attach ground wire to arm. Weld using AWS E70T-1 1/16 in. (1.6 mm) or 5/64 in. (2 mm) diameter wire with 100% CO<sub>2</sub> shielding gas at 35-50 CFH. Set welding amp per manufacturers recommendations. Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - **WELD METHOD B – SMAW (Stick Welding).** Attach ground wire to arm. Weld using E-7015 low hydrogen 1/8 in. (3.2 mm) or 5/32 in. (4 mm) diameter electrodes. Set welding amps per manufacturer's recommendations. **Do not use electrode exposed to moisture without first re-drying them at 200°F (75°C) for 2 hours.** Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - Cool arm tip base metal at normal air cool.
  - Remove marker blocks. Smooth out tack weld spots.

Model	Dimensions			
	①	②	③	④
20H	17.70 in. (450 mm)	7.77 in. (182.3 mm)	—	—
22H, 24H	19.70 in. (500 mm)	9.50 in. (243.0 mm)	1.77 in. (45 mm)	1.63 in. (41.5 mm)
25H, 30H, 33H	23.60 in. (600 mm)	11.50 in. (291.5 mm)	1.61 in. (41 mm)	1.57 in. (40 mm)



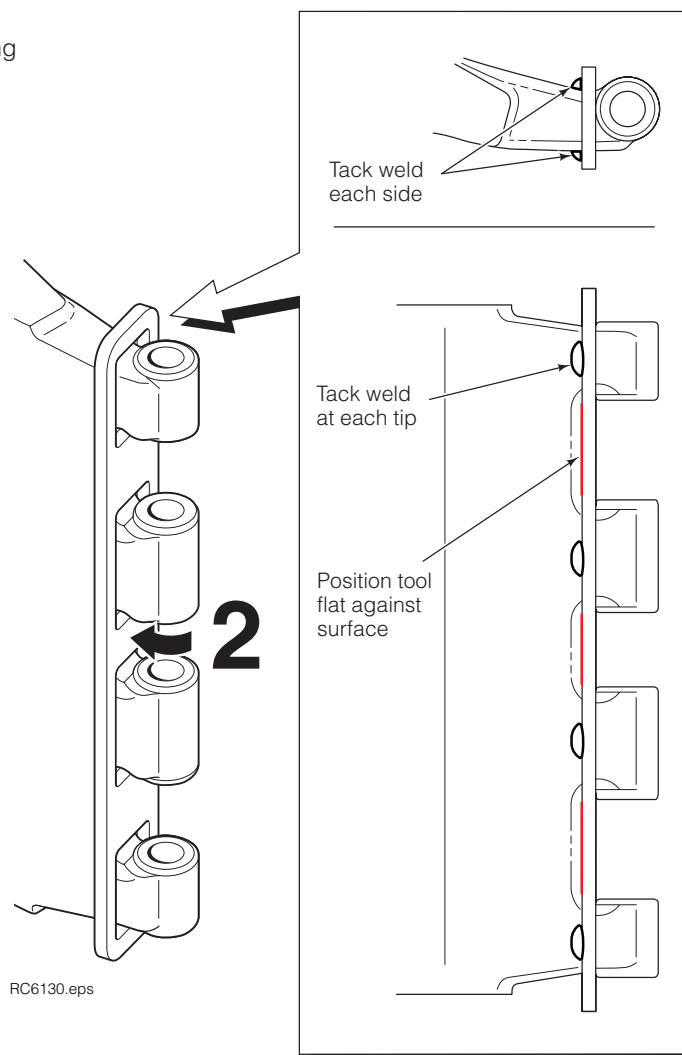
## 4.2-5 Arm Tip Repair – 34H-55H

The following procedure describes installing arm tips using kit 6903358. The kit repairs one arm.

- 1 Remove contact pad as described in Section 4.2-2.

- 2 Slide the tool (Part No. 6903545) over the tips and hold flat against the surface between the tips. Tack weld the tool to both sides of the arm, as shown.

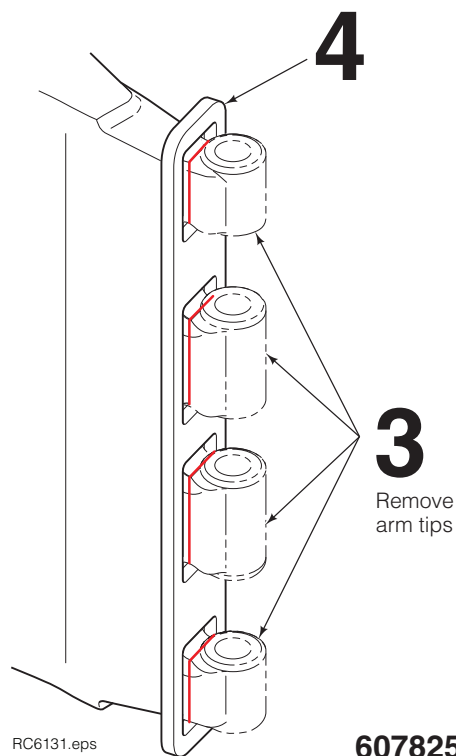
**IMPORTANT:** Avoid damage to machined features and threaded holes.



- 3 Remove defective tip area flush with the tool by using a cut-off wheel. Use the kit tool as a guide for the cut-off wheel.

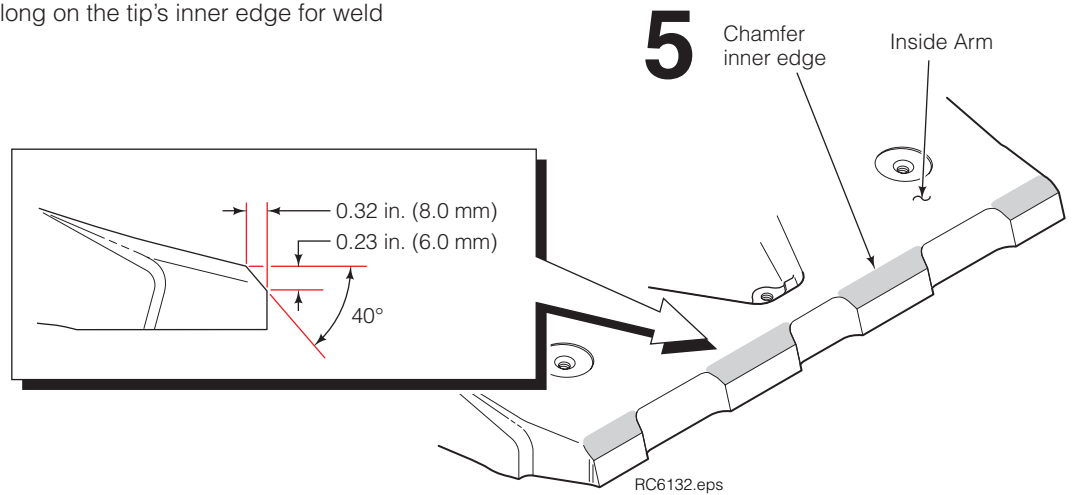
**NOTE:** Grinding, sawing, torch or arc gouging is not recommended. Contact Cascade if one of these methods will be used.

- 4 Remove the tool.

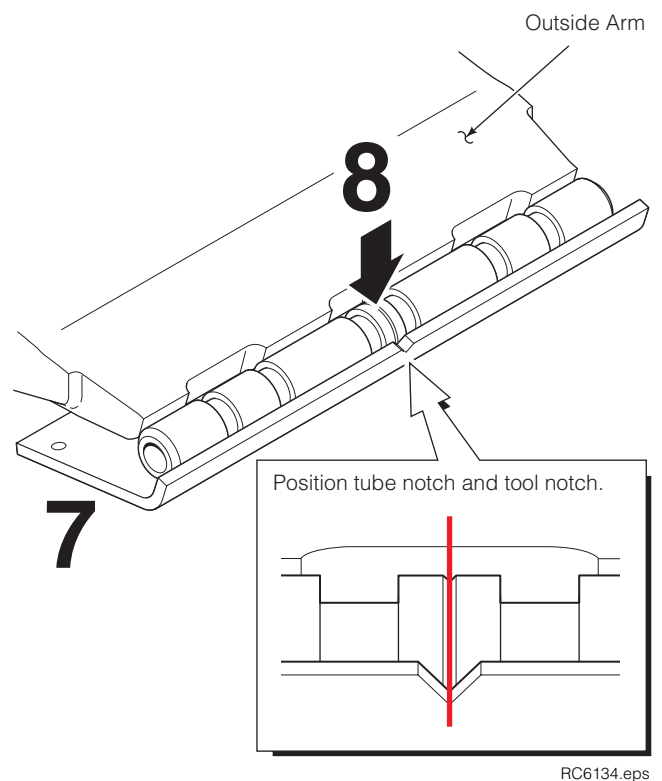
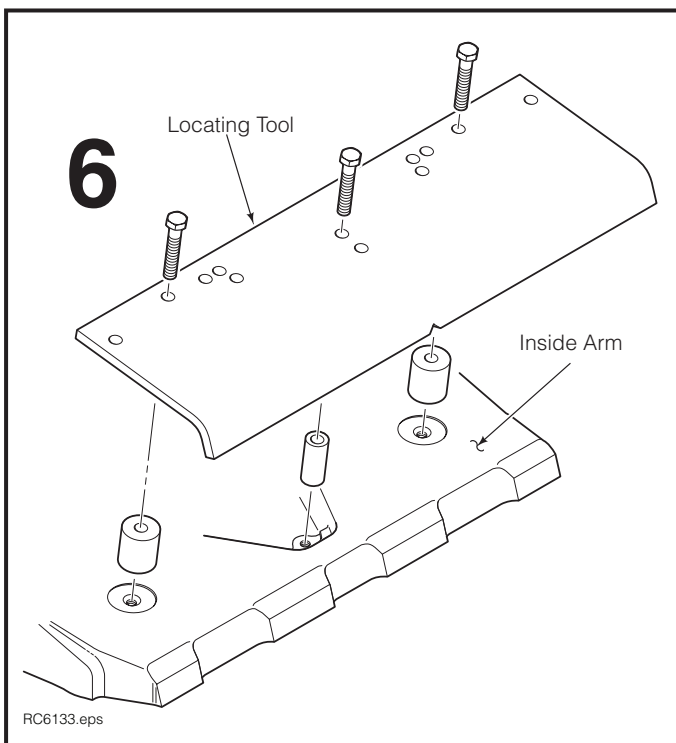


## 4.2-5 Arm Tip Repair – 34H-55H (Continued)

- 5 Grind a chamfer along on the tip's inner edge for weld prep.

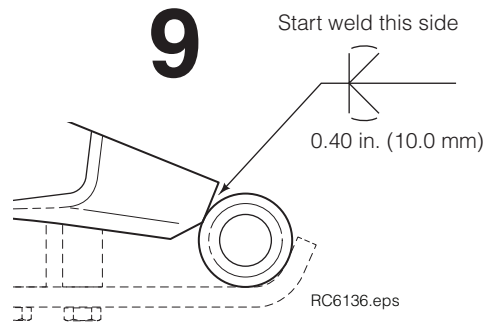
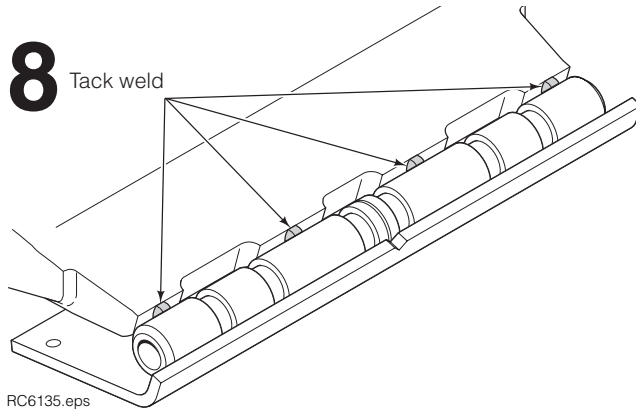


- 6 Position locating tool (Part No. 6903360) and provided hardware to existing arm tip threaded holes.
- 7 Reposition the arm tip, so that the locating tool is under the arm tip, as shown.
- 8 Place the tube (Part No. 6903364) into the locating tool. Position the tube's centering notch with the tool notch.

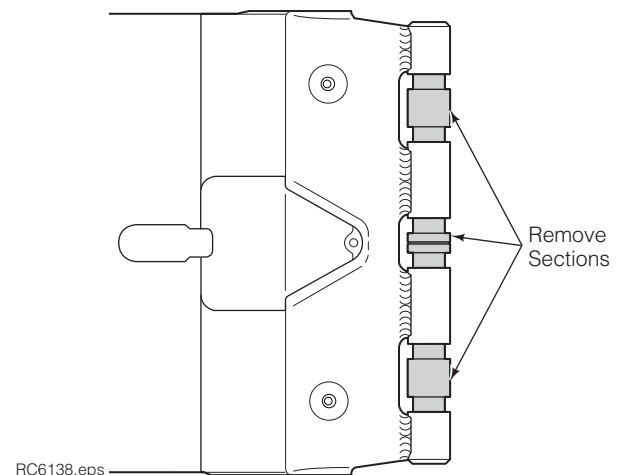
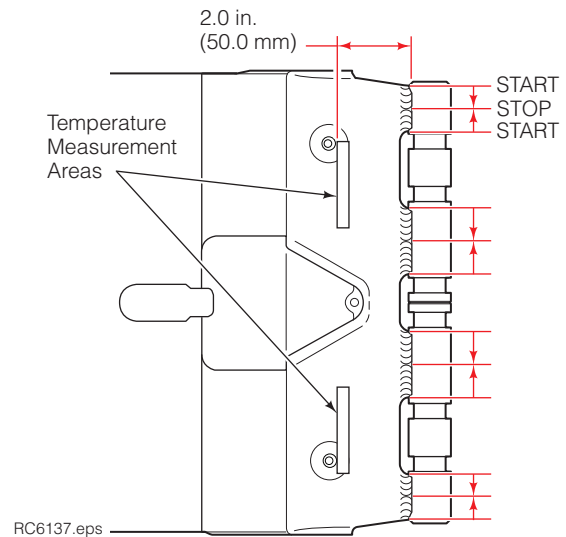


## 4.2-5 Arm Tip Repair – 34H-55H (Continued)

- 8** Preheat arm tip base metal to 70°F (21°C) minimum. Tack weld new tube in place with 0.40 in. (10 mm) welds on four places. Reposition arm tip so that the locating tool is above the arm tip. Remove locating tool. Apply tack welds.



- 9** Finish-weld the tube to the arm tip base using the following weld procedures:
- Protect inside of tube from weld spatter.
  - Preheat arm tip base metal to 150°F (66°C). Monitor and maintain arm tip heat at locations shown using suitable temperature-indicating devices.
  - **Weld Sequence** – Start weld on side indicated. Terminate each weld at center of each tube section.
  - **WELD METHOD A** – FCAW (Flux-Cored Arc Weld). Attach ground wire to arm. Weld using AWS E70T-1 1/16 in. (1.6 mm) or 5/64 in. (2 mm) diameter wire with 100% CO<sub>2</sub> shielding gas at 35-50 CFH. Set welding amp per manufacturers recommendations. Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - **WELD METHOD B** – SMAW (Stick Welding). Attach ground wire to arm. Weld using E-7015 low hydrogen 1/8 in. (3.2 mm) or 5/32 in. (4.0 mm) diameter electrodes. Set welding amps per manufacturer's recommendations. **Do not use electrode exposed to moisture without first re-drying them at 200°F (75°C) for 2 hours.** Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - Let arm tip and base air cool to room temperature.



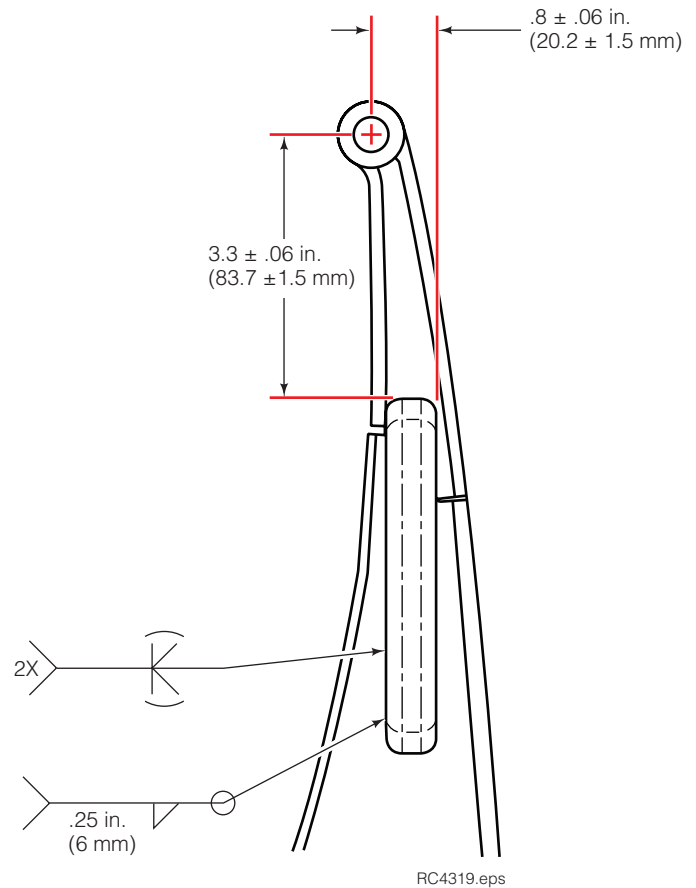
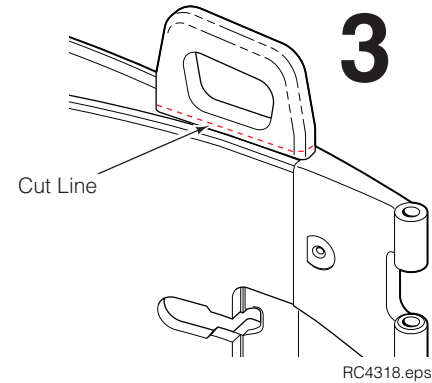
- 10** Remove the sections between the tips using a cut-off wheel. Remove sharp edges.

## 4.2-6 Pad Protector Replacement

The following procedure describes replacing pad protectors on arms using kit 6826253. The kit includes two replacement pad protectors.

- 1 Remove contact pad as described in Section 4.2-2.
- 2 Remove existing pad protector(s) by grinding, sawing, torch or arc gouging. Level the cut line with the inner and outer arm flanges. Remove any paint contamination from around the repair area. If arc gouging is used, make sure all carbon particles are completely removed.
- 3 Position pad protector with the dimensions shown.
- 4 Preheat arm area to 70°F (21°C) minimum. Tack weld new pad protector. Use the recommended weld procedures listed below.
- 5 Finish-weld the pad protector using the following weld procedures:
  - Protect arm tip holes from weld spatter.
  - Preheat arm tip base metal to 150°F (66°C).
  - **Weld Sequence** – Start weld on side indicated. Terminate each weld at center of weld joint.
  - **WELD METHOD A** – FCAW (Flux-Cored Arc Weld). Attach ground wire to arm. Weld using AWS E70T-1 1/16 in. (1.6 mm) or 5/64 in. (2 mm) diameter wire with 100% CO<sub>2</sub> shielding gas at 35-50 CFH. Set welding amp per manufacturers recommendations. Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - **WELD METHOD B** – SMAW (Stick Welding). Attach ground wire to arm. Weld using E-7015 low hydrogen 1/8 in. (3.2 mm) or 5/32 in. (4 mm) diameter electrodes. Set welding amps per manufacturer's recommendations. **Do not use electrode exposed to moisture without first re-drying them at 200°F (75°C) for 2 hours.** Apply weld holding a close arc. Do not oscillate or use a wash bead pattern.
  - Cool weld area at normal air cool.
- 6 Remove slag after each weld pass and inspect for defects.
 

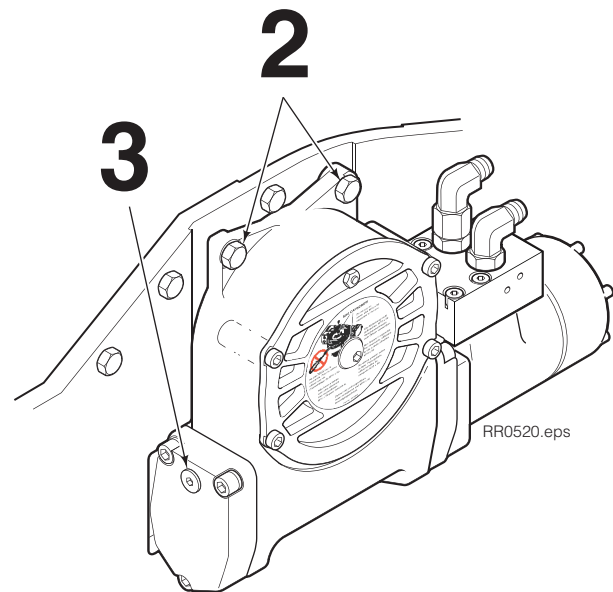
**NOTE:** Stress cracks, porosity, undercuts and overlaps are not permitted. Repair any defects as required.
- 7 Grind all welds to smooth transitions between parts.
- 8 Reassemble contact pads to arm.



## 4.3 Drive Group

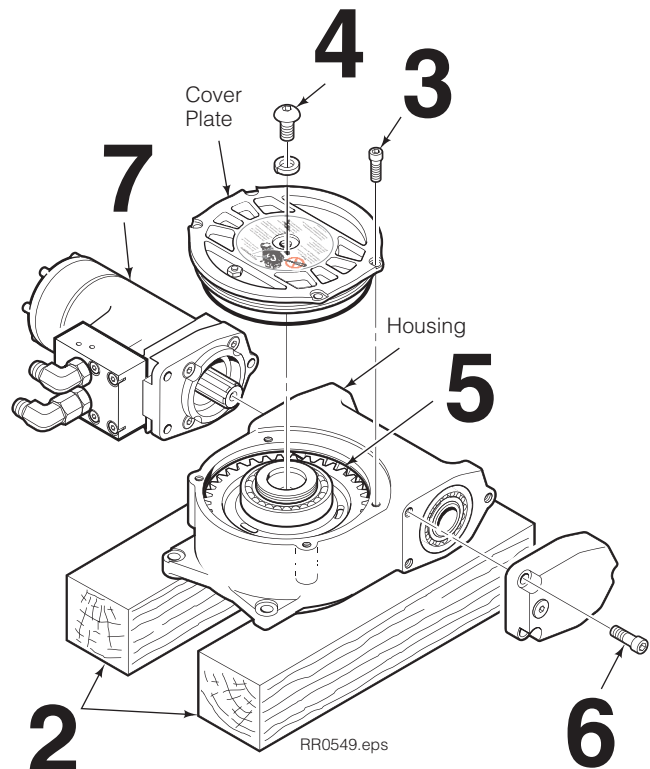
### 4.3-1 Drive Group Removal and Installation

- 1 Remove the attachment from the truck as described in Section 4.1.
- 2 Remove the four capscrews fastening the drive group to the baseplate. For reassembly, tighten the capscrews to:
  - 20H, 22H, 24H** – 48 ft.-lbs. (66 Nm)
  - 25H – 55H** – 66 ft.-lbs. (90 Nm)
- 3 For reassembly, reverse the above procedures with the following exceptions:
  - After the drive group has been reinstalled, check the gearcase lubricant level. Lubricant must be up to the bottom of the fill plug hole. If necessary, fill with Cascade Gear Lube Part No. 656300, or SAE 90 wt. gear lube (AGMA 'mild' 6 EP Gear Lube).



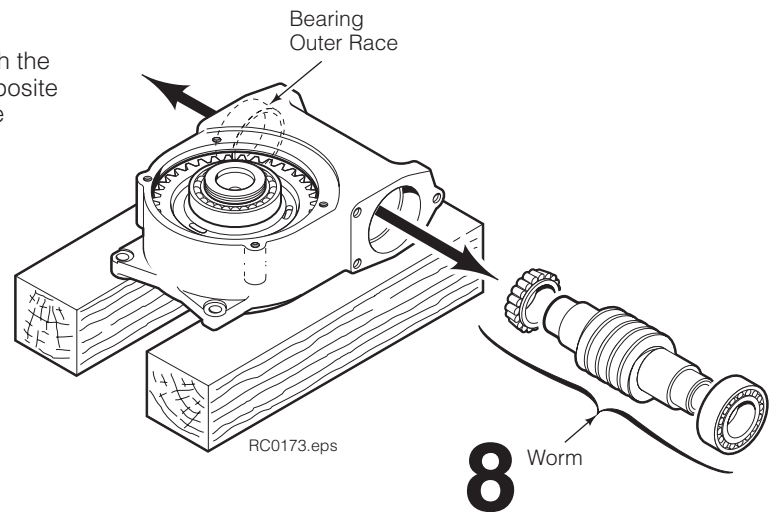
### 4.3-2 Drive Group Disassembly and Service

- 1 Remove the drive group from the baseplate as described in Section 4.3-1.
- 2 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.
- 3 Remove the four capscrews fastening the cover plate to the housing.
- 4 Remove the center capscrew plug from the cover plate and install a M10 capscrew with a minimum thread length of 2 in. (50 mm). Remove the cover plate by turning the capscrew clockwise while lightly tapping around the sides of the cover plate.
- 5 Drain the lubricant from the housing.
- 6 Remove the three capscrews fastening the end cover to the housing.
- 7 Remove the drive motor as described in Section 4.4-1.

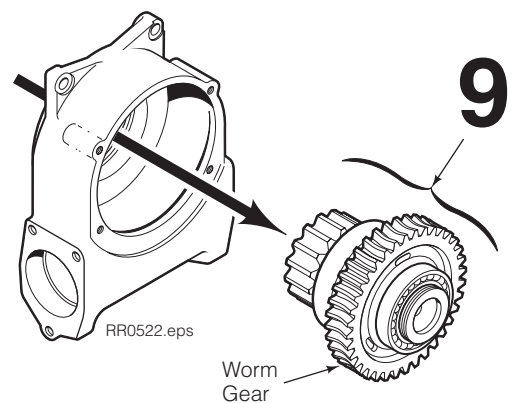


## 4.3-2 Drive Group Disassembly and Service (Continued)

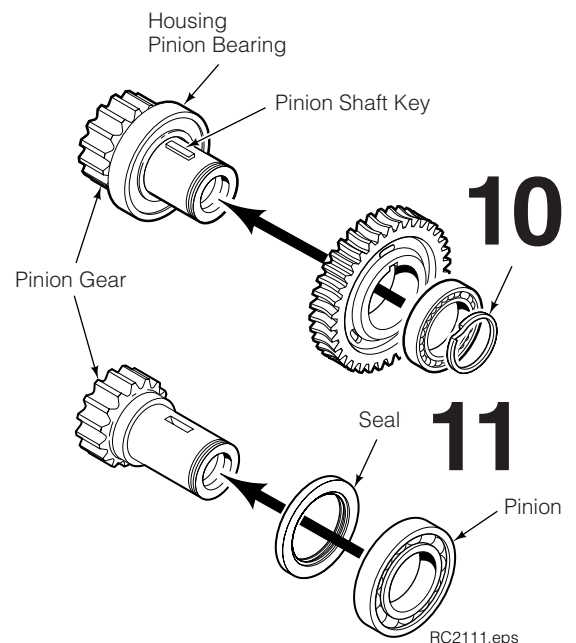
- 8** Tap the worm and bearing assembly out through the end-cover side of the housing. Remove the opposite outer bearing race through the motor side of the housing.



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



- 10** Remove the snap ring from the pinion gear shaft. Press the pinion gear 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. Remove seal.

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



## 4.3-3 Drive Group Reassembly

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

- 1 Position the seal against the pinion gear, spring-side facing housing. Apply Loctite 271 (red) to clean and dry bearing seating area on shaft as shown. Press a non-sealed housing bearing onto the pinion shaft. Remove excess Loctite.

**IMPORTANT:** If housing bearing is sealed, pry out bearing deals when using external seal.

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

- 2 Preheat worm gear to 200 °F (93 °C). Install the key, worm gear, cover plate pinion bearing and snap ring on the pinion.

- 3 Apply Loctite 271 (red) to housing seating area and shoulder for the housing pinion bearing and seal.

**NOTE:** Pinion Gear must be clean and dry prior to Loctite 271 application. Install the complete pinion assembly into the housing. Remove excess Loctite.

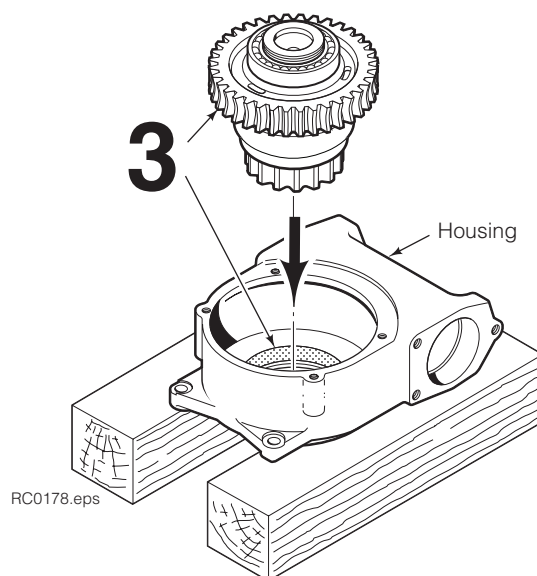
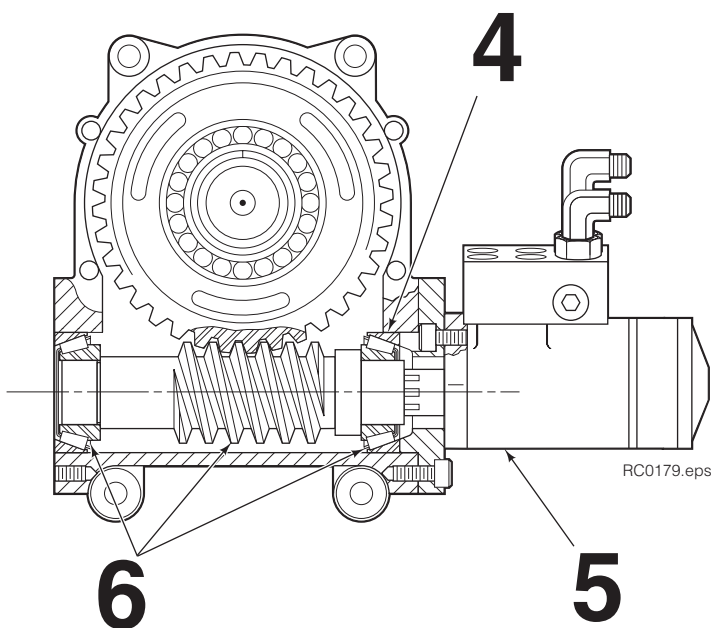
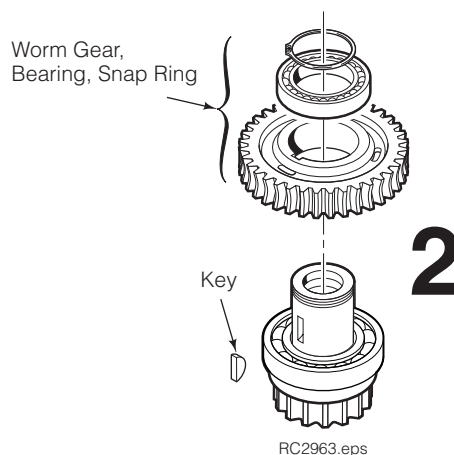
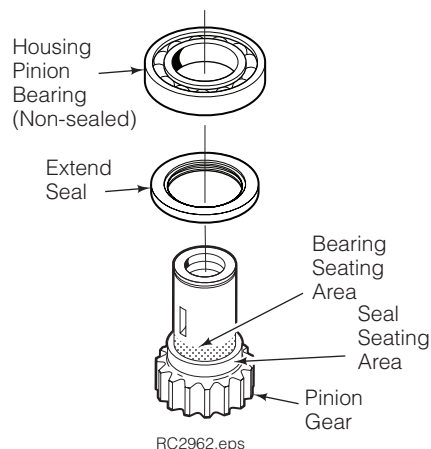
**CAUTION:** Make sure Loctite does not squeeze into the seal or bearings.

- 4 Press the worm's outer bearing race in the drive motor side of the housing. Make sure the race taper is inward, as shown.

- 5 Install the drive motor as described in Section 4.4-1.

- 6 Install the worm and bearings in the housing. Fully engage the worm with the drive motor shaft. Press the remaining outer bearing race into the housing. Make sure the race taper is inward, as shown.

### 1 PINION AND BEARING WITH EXTERNAL SEAL





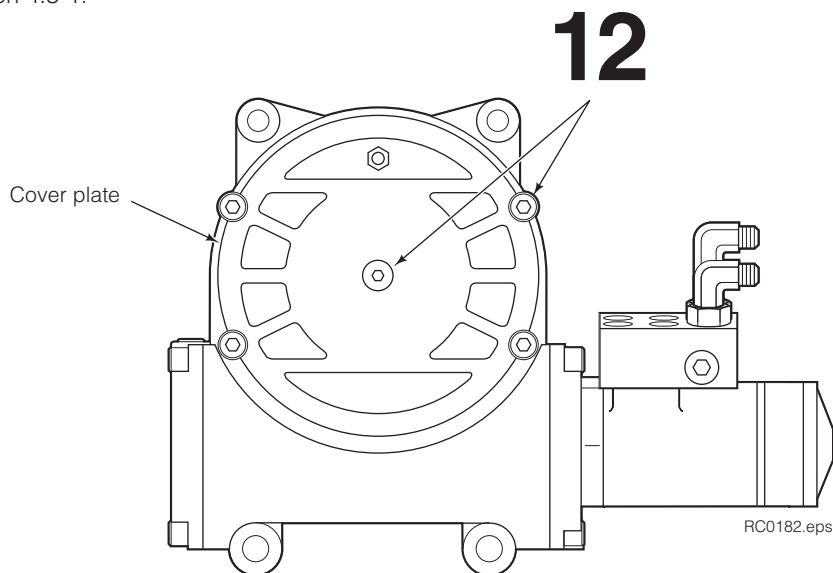
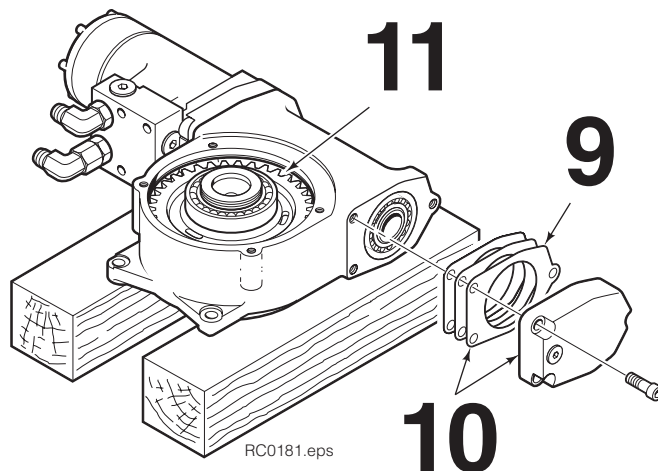
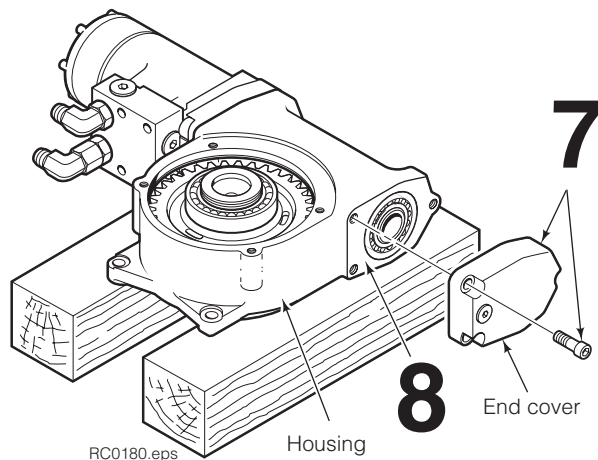
## 4.3-3 Drive Group Reassembly (Continued)

- 7 Temporarily install the end cover without shims. Tighten the capscrews sequentially in 10 ft.-lbs. (15 Nm) increments to 20 ft.-lbs. (30 Nm).
- 8 Measure the gap between the end cover and housing in three places with a feeler gauge or 'Plastigage' thread and determine the minimum gap.
- 9 Choose a combination of end cover shims equal to the minimum gap measured plus the next higher .005 in. (0.12 mm) increment. See examples below:  
(For 0.025–0.029 in. measured gap, use 0.030 in. total shim thickness.)  
(For 0.010–0.014 in. measured gap, use 0.015 in. total shim thickness.)  
(For 0.009 or less, use one 0.010 in. shim, since a minimum of one 0.010 in. shim is required for proper seal.

**NOTE:** Shim Service kit 670578 contains the shims listed. A minimum of one 0.010 shim is required to seal against leakage:

Qty	Part No.	Color	Thickness
1	671758	Yellow	0.020 in. (0.50 mm)
1	671757	Pink	0.015 in. (0.39 mm)
1	670574	Brown	0.010 in. (0.25 mm)
1	674513	Blue	0.005 in. (0.13 mm)

- 10 Remove the end cover. Apply Loctite 515 sealant (Cascade Part No. 668184) to both surfaces of the shims and the capscrews. Install the shim pack and end cover. Tighten the capscrews to a torque of 65 ft.-lbs. (90 Nm). Remove excess sealant.
- 11 With the gearcase laying flat, fill with 56 fluid ounces (540 ml) of Cascade Gear Lube Part No. 656300, or SAE 90 wt. gear lube (AGMA 'mild' 6EP Gear Lube).
- 12 Install the cover plate with O-ring seal. Install the four cover plate capscrews. Tighten equally by using a cross pattern to 15 ft.-lbs. (20 Nm). Install the center hole plug.
- 13 Reinstall the drive group on the rotator baseplate as described in Section 4.3-1.



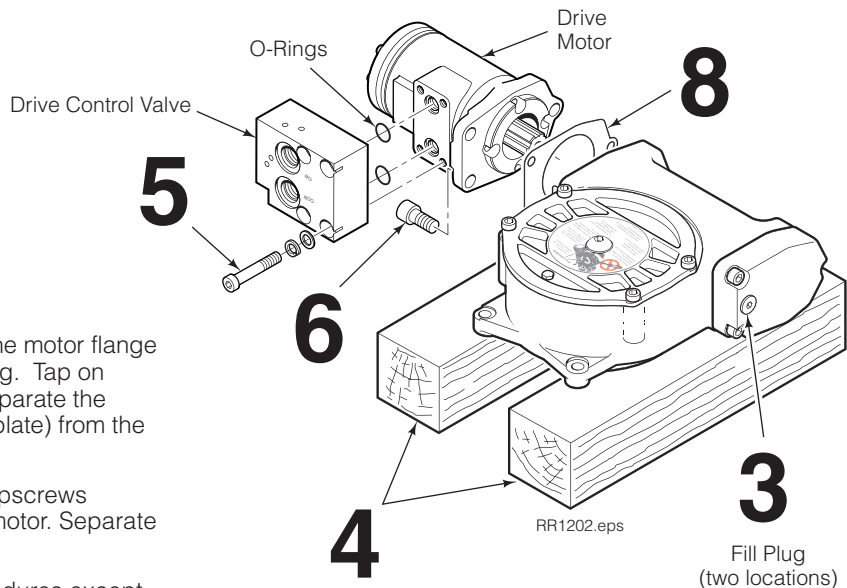
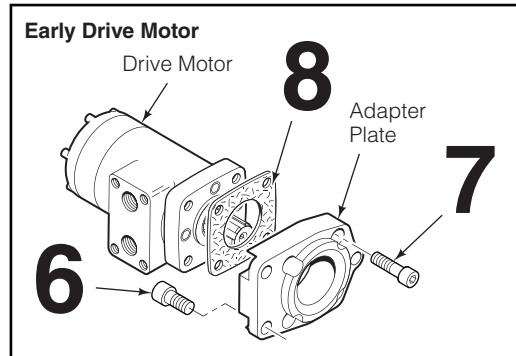
## 4.4 Drive Motor

### 4.4-1 Drive Motor 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 4.3-1.
- 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, washers and special lockwashers fastening the drive control valve assembly to the drive motor. Keep track of the two O-rings between the check valve assembly and drive motor. For reassembly, tighten the capscrews to 15 ft.-lbs. (20 Nm).



**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.



- 6 Remove the three capscrews fastening the motor flange (or adapter plate) to the gearcase housing. Tap on the drive motor with a rubber mallet to separate the drive motor (or drive motor with adapter plate) from the gearcase housing.
- 7 **Early Drive Motor** – Remove the four capscrews fastening the adapter plate to the drive motor. Separate the motor from the adapter plate.
- 8 For reassembly, reverse the above procedures except as follows:
  - **Early Drive Motor** – Apply Loctite 515 sealant (Cascade Part No. 668184) to both sides of the drive motor/adapter plate gasket. Apply sealant to the threads of the four drive motor capscrews. Install the gasket and adapter plate to the drive motor. Tighten capscrews to 40 ft.-lbs. (55 Nm).
  - Apply Loctite 515 sealant to both sides of the motor/gearcase (or adapter plate/gearcase) gasket. Apply sealant to the threads of the three motor flange (or adapter plate) capscrews. Install the motor (or motor with adapter plate) and gasket to the gearcase housing. Tighten the capscrews to 65 ft.-lbs. (90 Nm).
  - Fill the drive group with fill with 18 fluid ounces (540 ml) Cascade Gear (Lube Part No. 656300), or SAE 90 wt. gear lube (AGMA 'mild' 6 EP Gear Lube).

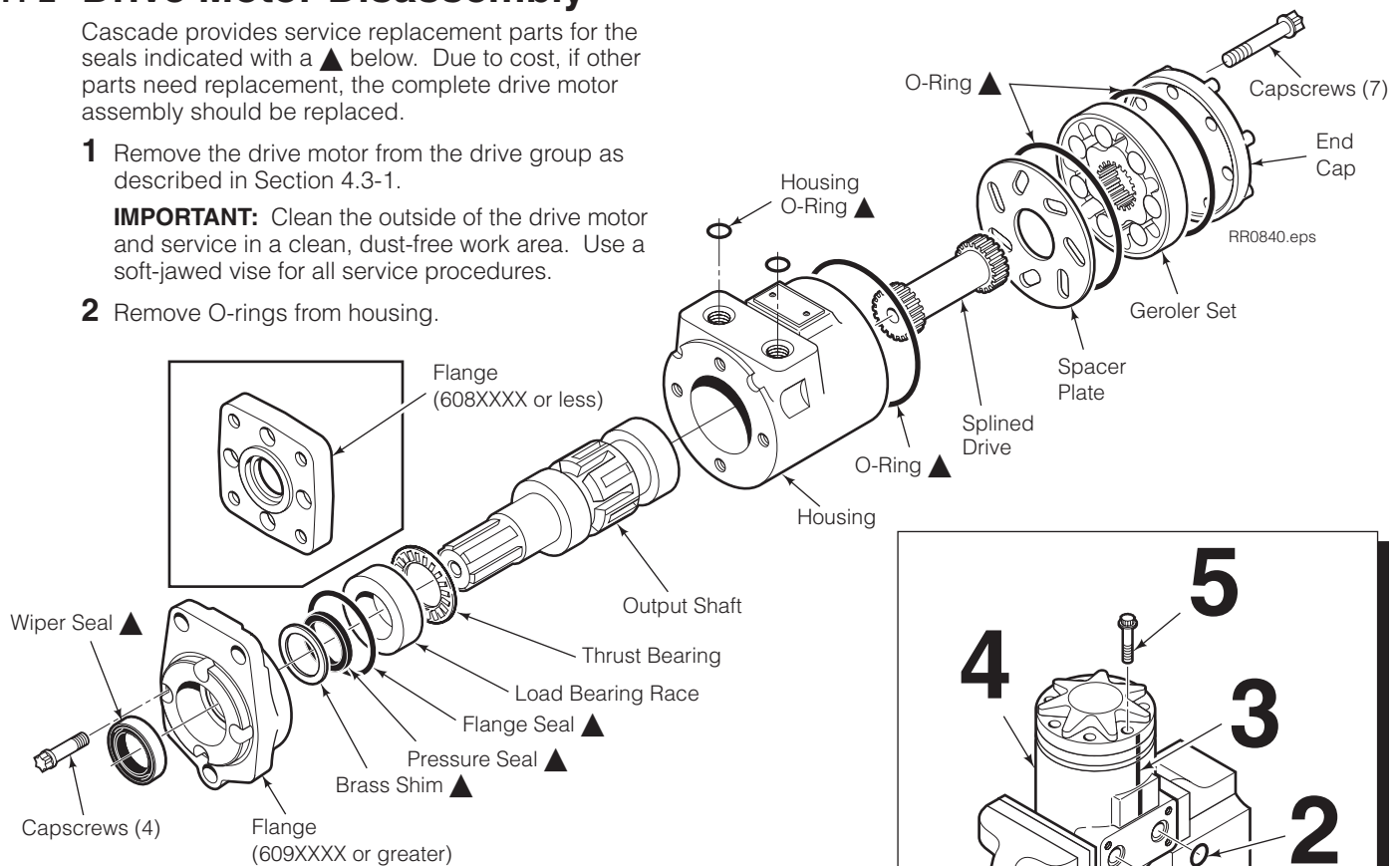
## 4.4-2 Drive Motor Disassembly

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.

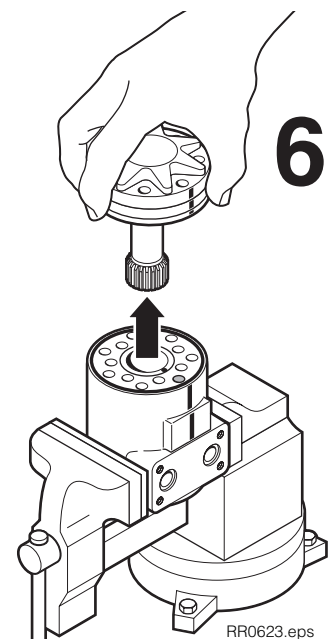
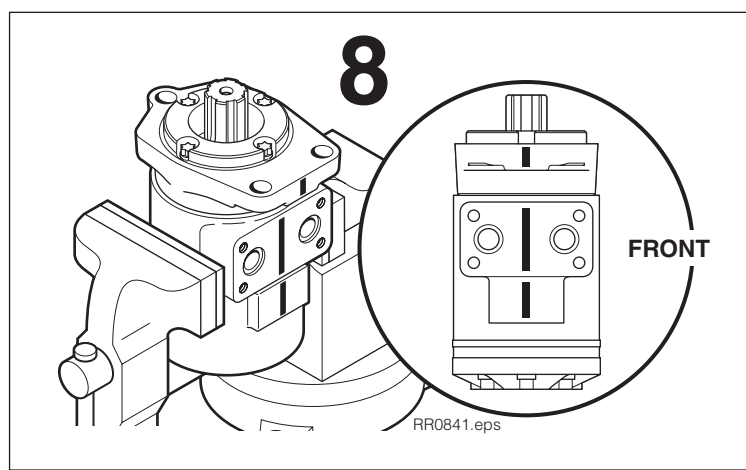
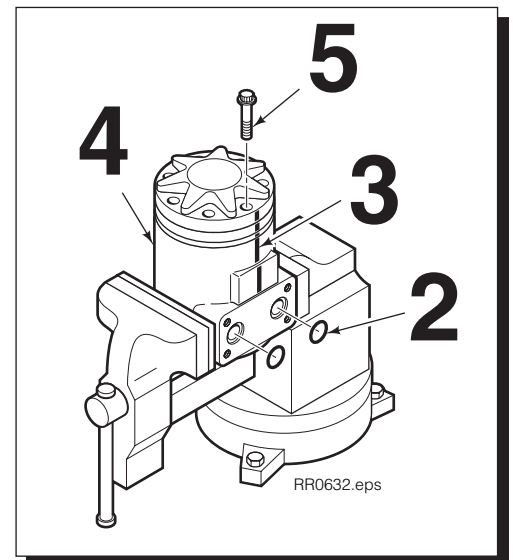
- 1 Remove the drive motor from the drive group as described in Section 4.3-1.

**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 Remove O-rings from housing.



- 3 Make a scribe across the drive motor, inline with the capscrew and drive motor's port surface.
- 4 Clamp drive motor in a soft-jawed vise across the flange with the output shaft downward.
- 5 Remove all capscrews from the end cap.
- 6 Remove altogether the end cap, geroler set and spacer plate. The splined drive should remain in place with this group.
- 7 Remove the O-rings from the end cap, geroler set and housing.
- 8 Turn the drive motor over, clamping the housing across the port area with the flange upward.



## 4.4-2 Drive Motor Disassembly (Continued)

- 9** Remove the four Loctited capscrews from the flange with a X10 Torx Socket. Do not use an impact wrench.

**CAUTION:** Thread sealant used on the capscrews may require a small amount of heat to the housing to remove the capscrews. Use a temperature indicator to prevent overheating the housing.

- 10** Turn the flange 45 degrees clockwise.

- 11** Remove the flange and output shaft by pushing the output shaft from under the housing and pulling up on the tapered portion of the output shaft.

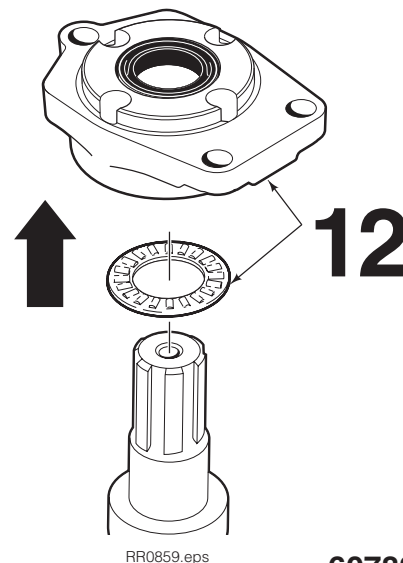
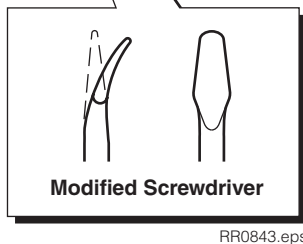
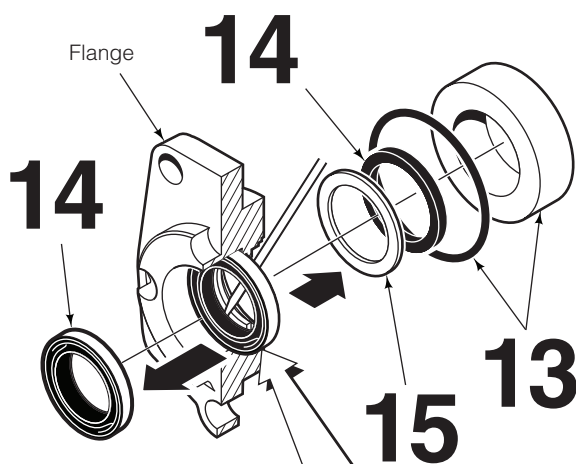
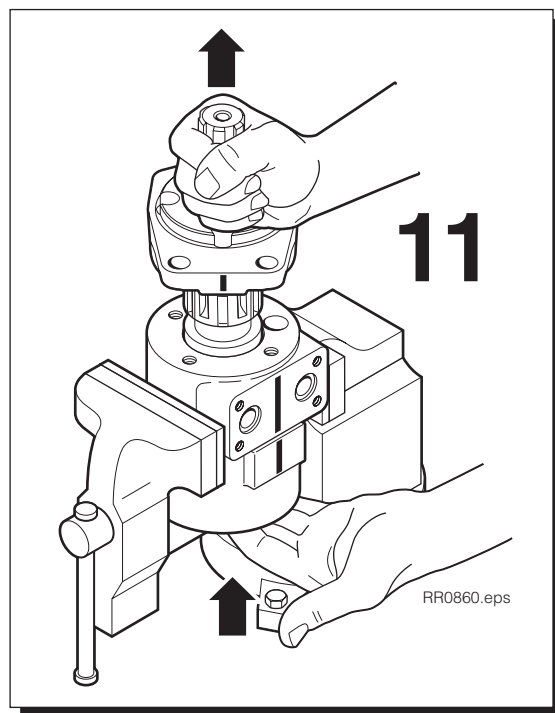
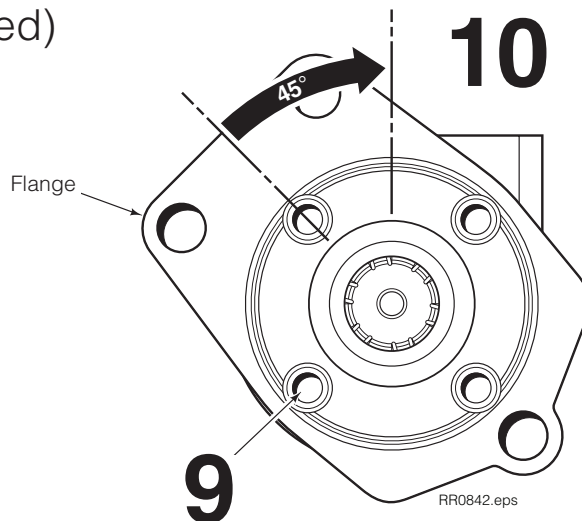
- 12** Remove the flange and thrust bearing from the output shaft.

- 13** Remove the load bearing race and flange seal from the flange.

- 14** Remove the wiper seal and pressure seal from the flange using a seal removal tool or modified screwdriver as shown.

**NOTE:** Remove the seals by pushing from the back side, as shown.

- 15** Remove the brass shim from the flange.



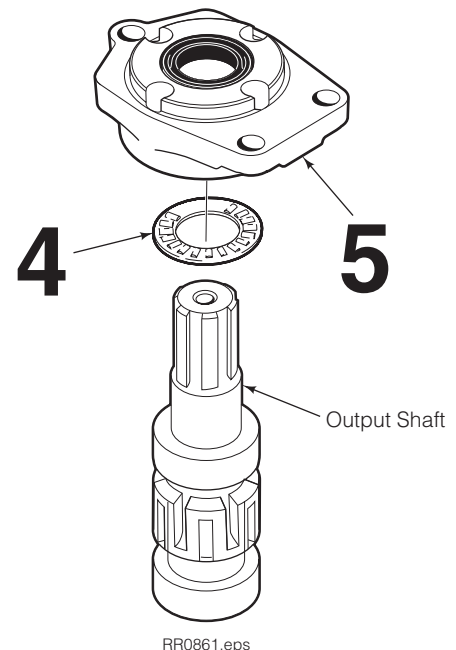
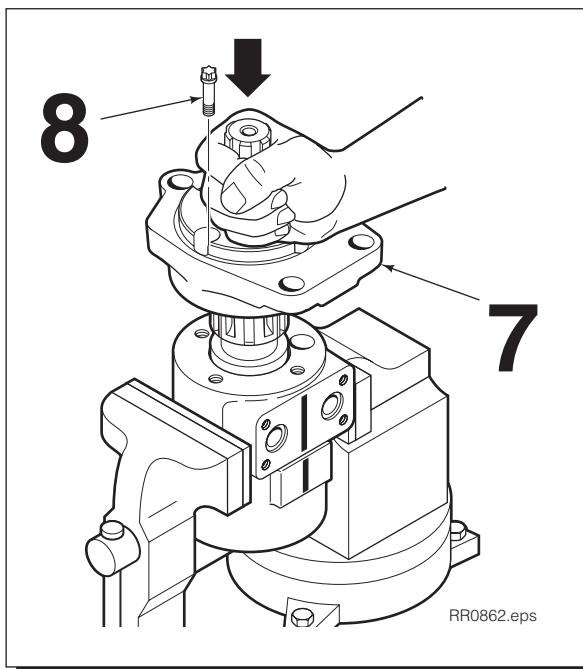
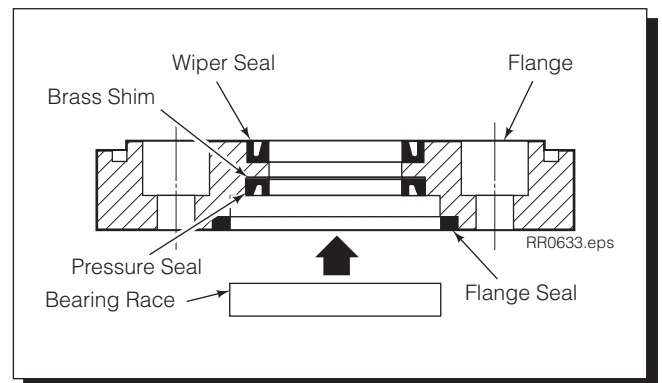
## 4.4-3 Drive Motor Inspection

- Remove all Loctite residue from the threaded holes.
- Clean all parts with solvent and blow dry. **Do not use paper or cloth towels.**
- Inspect all parts for small nicks, burrs or scratches. Remove imperfections with emery cloth. Replace parts where imperfections could not be removed.
- Inspect the flange seal seats for scratches. Check for cracks in the flange area that could cause leakage.

## 4.4-4 Drive Motor Reassembly

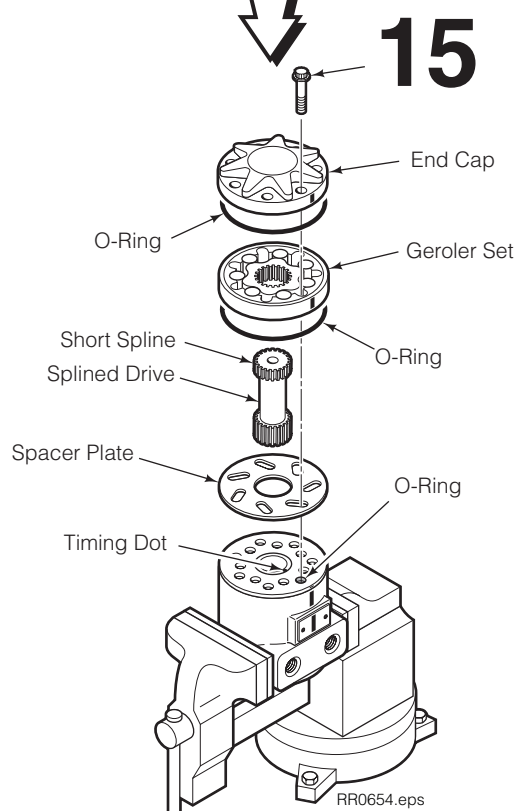
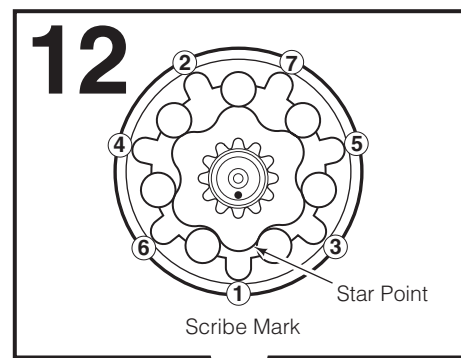
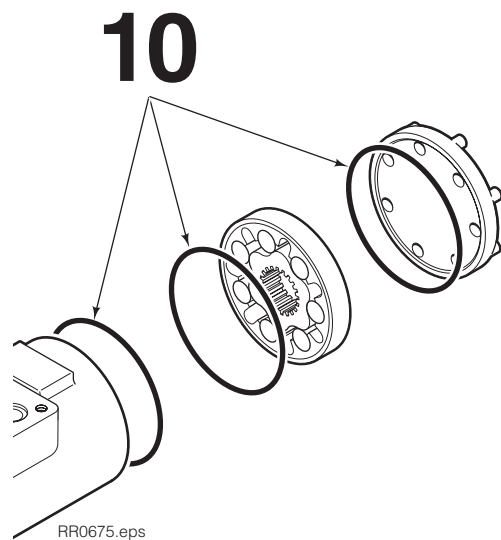
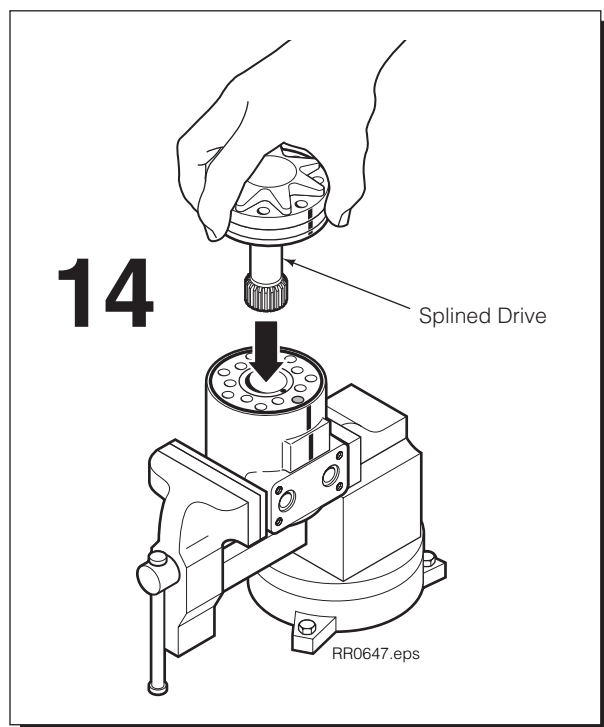
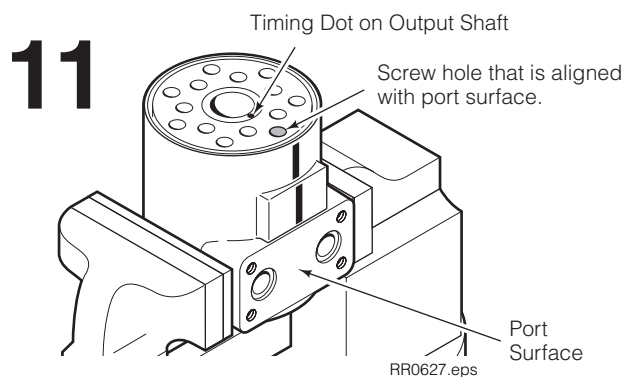
- 1 Install the brass shim into the pressure seal side of the flange. Install wiper seal and pressure seal into the flange. The pressure seal must be seated evenly.
- 2 Place the bearing race in the flange seated evenly with the pressure seal and flange.
- 3 Lubricate the flange seal with petroleum jelly and seat in lip of flange on the pressure seal side, as shown.
- 4 Install thrust bearing onto the output shaft.
- 5 Install the flange onto the output shaft with the pressure seal side against the output shaft.
- 6 Clamp housing into the vise with the flange side facing upward.
- 7 Install the output shaft/flange assembly into the housing.
- 8 Apply Loctite sealant 242 (blue) or equivalent to the four holes of the housing and the four capscrews. Wipe away any excess sealant. Install the four capscrews and tighten in a cross pattern to 250 in.-lbs. (28 Nm).

**IMPORTANT:** Capscrews must be clean and dry.



## 4.4-4 Drive Motor Reassembly (Continued)

- 9 Turn the housing over and clamp across the flange with the output shaft taper facing down.
- 10 Lubricate the O-rings and install into the housing, geroler set and end cap grooves.
- 11 Align the output shaft timing dot with the screw hole that is aligned to the port surface. Use the scribe mark to help with the alignment.
- 12 Use the drive splines to align the geroler star point with the capscrew hole, as shown.  
**CAUTION:** Geroler spacers can fall out.
- 13 Assemble together the end cap with O-ring, geroler set with O-ring, drive (short spline end into geroler set and spacer.
- IMPORTANT:** Make sure O-rings are properly seated.
- 14 Install end cap assembly onto housing while aligning the scribe marks and capscrew holes. Make sure the drive engages with output shaft.
- 15 Install the capscrews into the end cap. Tighten the capscrews using an alternating cross pattern to 240 in.-lbs. (27 Nm).





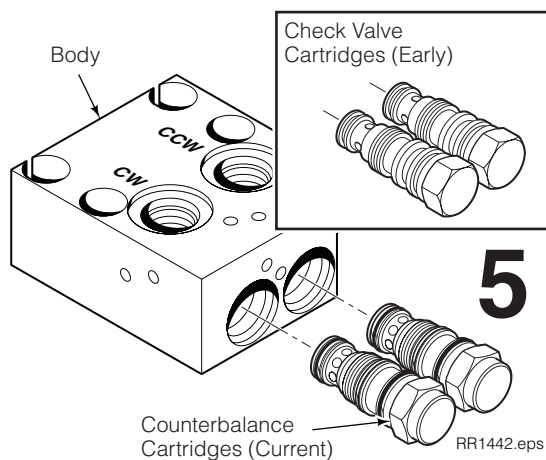
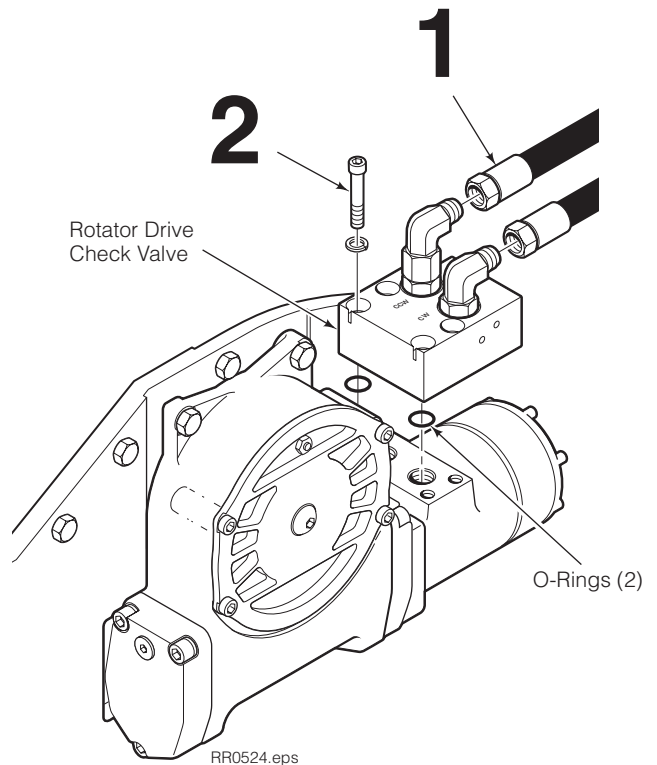
## 4.5 Drive Control Valve

### 4.5-1 Drive Control Valve Service

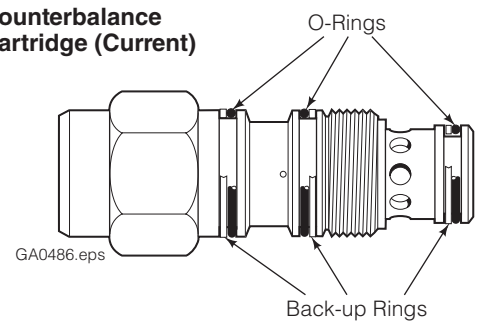


**WARNING:** Before removing hydraulic lines, relieve pressure in the hydraulic system. Turn the truck off and open the truck auxiliary control valves several times in both directions.

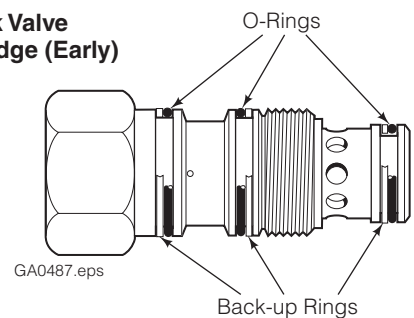
- 1 Disconnect the hydraulic hoses to the drive group valve. Tag hoses for reassembly.
- 2 Remove the four capscrews fastening the check valve to the drive group. Keep track of the two O-rings between the drive control valve and drive motor. For reassembly, tighten the capscrews to 15 ft.-lbs. (20 Nm).
- 3 Remove the plug fittings and cartridges.
- 4 Clean all parts with clean solvent. Remove any burrs or sharp edges with emery cloth.
- 5 For reassembly, reverse the above procedures except as follows:
  - Install new O-rings and backup rings on the cartridges, as shown.



#### Counterbalance Cartridge (Current)



#### Check Valve Cartridge (Early)



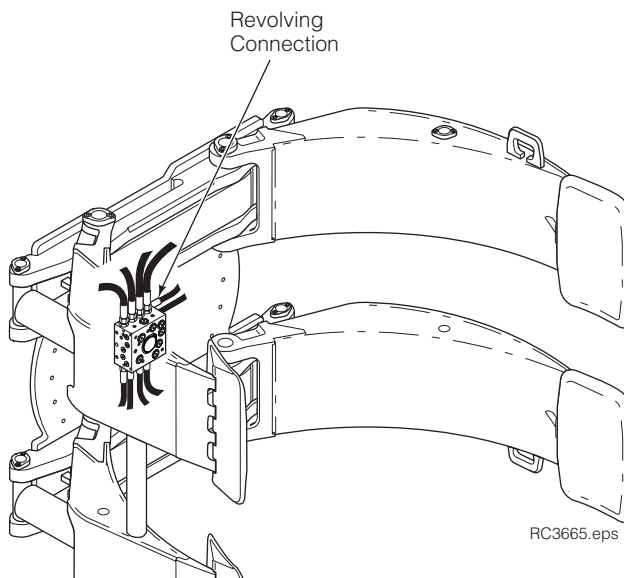
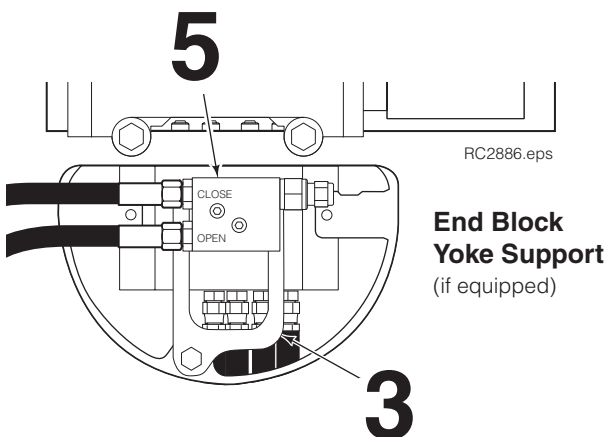
## 4.6 Revolving Connection

### 4.6-1 Revolving Connection Removal and Installation



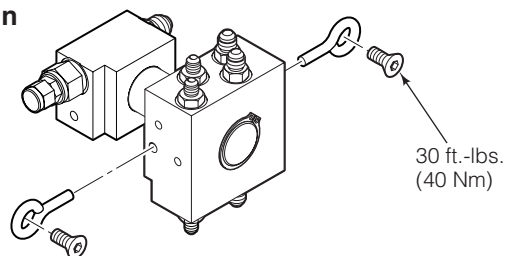
**WARNING:** Before removing any hydraulic lines, relieve pressure in the hydraulic system. Turn the truck off and open the truck auxiliary control valves several times in both directions.

- 1 Remove the attachment from the lift truck as described in Section 4.1.
- 2 Disconnect the hoses from the front and rear of the revolving connection. Tag for reassembly.
- 3 If equipped, remove the yoke supporting the end block on the rear of the revolving connection. For reassembly, tighten the capscrews to 30 ft.-lbs. (40 Nm).
- 4 Remove the four capscrews fastening the revolving connection to the faceplate.
- 5 For reassembly, reverse the above procedures except as follows:
  - Position the revolving connection on the faceplate where the stamps 'SHORT ARM' and 'LONG ARM' are facing the appropriate arms.
  - Position the end block/shaft assembly so that the stamping 'CLOSE' is on top.
  - Service revolving connection in a clean work area.

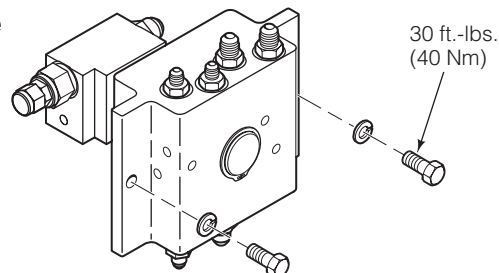


#### Revolving Connection Mountings (Front Views)

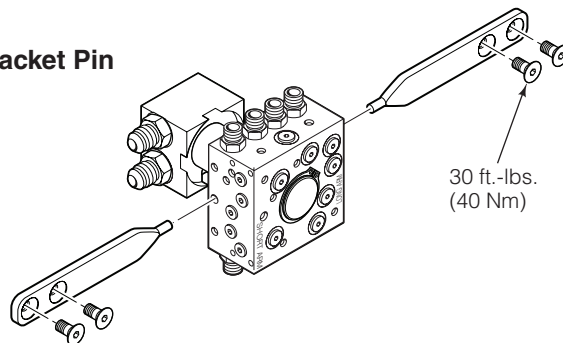
##### Eye Pin



##### Flange



##### Bracket Pin



RC3783.eps



## 4.6-2 Revolving Connection Service

- 1 Remove the revolving connection from the attachment as described in Section 4.6-1.

**NOTE:** If equipped with additional valve assembly, after removing revolving connection, remove additional valve assembly. For reassembly, tighten capscrews to 12 ft.-lbs. (16 Nm).

- 2 Remove the spiral snap ring from the front of the shaft.

**CAUTION:** Remove all burrs and paint from the exposed shaft surface prior to removal from the body. Burrs or paint chips pulled through the bore may permanently damage the valve body.

- 3 Remove the shaft from the body.

- 4 Remove the end block from the shaft and remove the relief cartridge (if equipped). For reassembly, use O-ring lube or petroleum jelly to hold the O-rings in place between the shaft and end block. Apply Loctite 242 (blue) to the capscrews and tighten to 15 ft.-lbs. (20 Nm).

- 5 Remove the two-piece seals from the revolving connection body using brass hook-type tools (Cascade Part No. 674424).

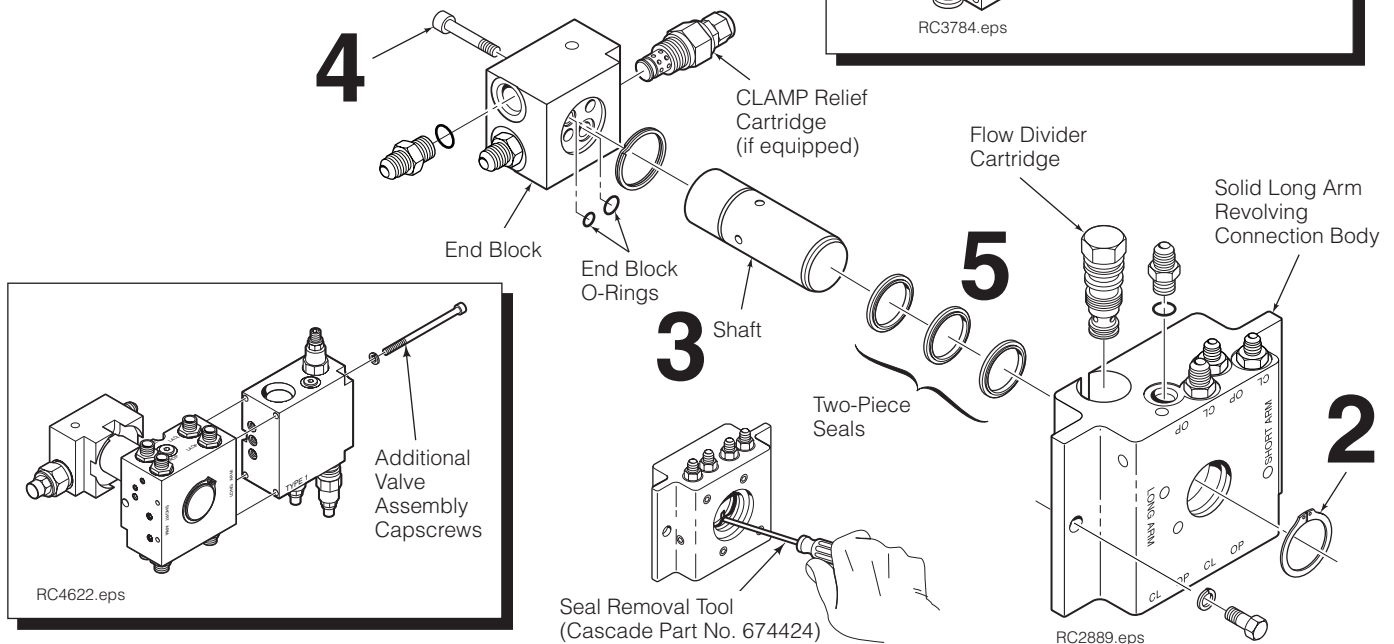
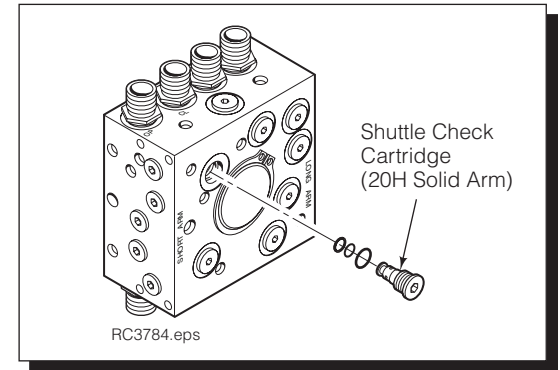
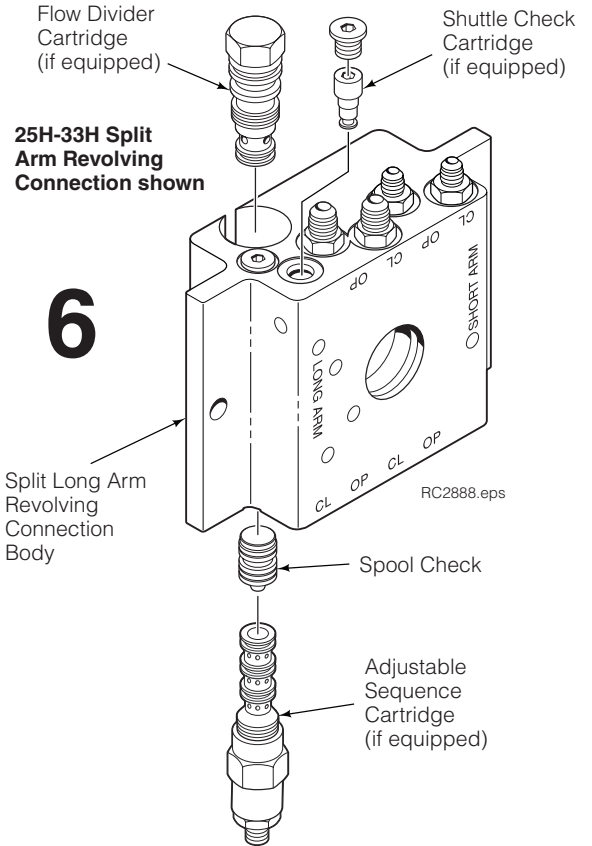
**NOTE:** Do not scratch or damage the grooved surfaces.

- 6 **Split Arm Clamps** – Remove the cartridges from the revolving connection body.

- 7 Remove the cartridge O-rings and back-up rings.

- 8 Clean all parts with clean solvent and inspect the following areas:

- Check the sealing surface of the shaft for minor surface imperfections. Remove with 320-grit emery paper. Sand the shaft radially (around), not along the length. Break the edges on the outer end of the shaft and the snap ring grooves with 320-grit emery paper. If severely worn, replace the shaft.
- Check the seal grooves in the body for sharp nicks or projections. Remove minor imperfections with 320-grit emery paper. If severely worn, replace the body.



## 4.6-2 Revolving Connection Service (Continued)

9 For reassembly, reverse the previous procedures with the following exceptions:

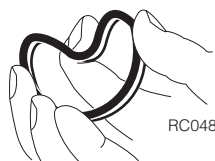
- Clean all traces of oil and moisture from the 2-piece seal grooves inside the revolving connection body using a non-petroleum based cleaner. (Example: electronic contact cleaner)
- Clean hands thoroughly to remove all traces of oil and moisture prior to 2-piece seal installation.
- A) Install the square rubber rings into the revolving connection body grooves.

B) Install the Teflon rings on top of the rubber rings.

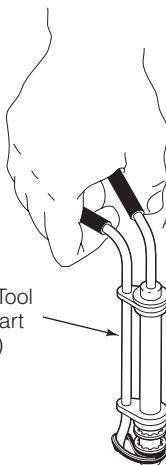
**IMPORTANT:** Form the seals into a 'kidney' shape as shown to install. Avoid sharp bends. Press the seals into the grooves using finger pressure.

- Lubricate the shaft and body with hydraulic fluid prior to reassembly.
- Rotate the body and apply gentle pressure when installing the shaft to prevent damage to the seals.
- Install new O-rings and back-up rings on the cartridges (if equipped) as shown.

Form Teflon ring into 'kidney' shape to install



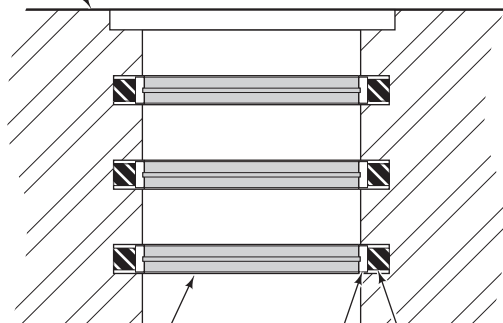
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AC0044.eps

Seal Install Tool  
(Cascade Part  
No. 599514)

Revolving Connection Body



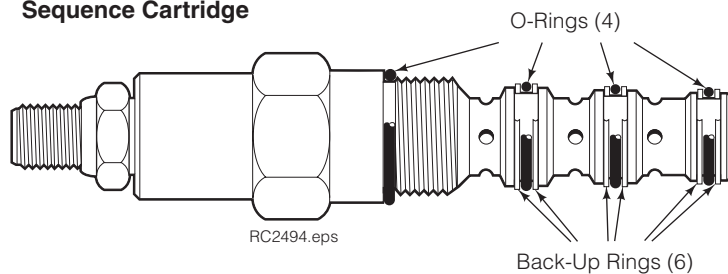
RC0372.eps

Two-Piece Seals (3)

Teflon  
Ring

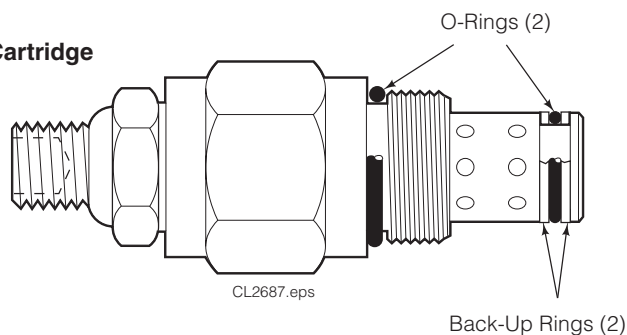
Square  
Rubber  
Ring

### Sequence Cartridge



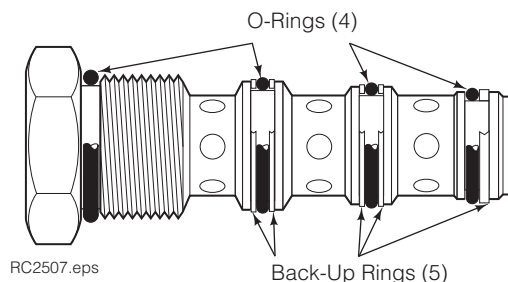
RC2494.eps

### Relief Cartridge



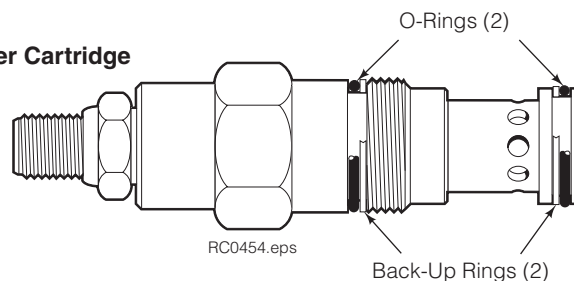
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### Flow Divider Cartridge



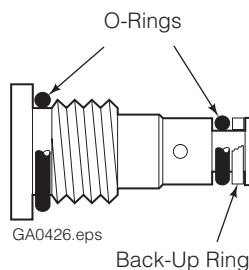
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### Flow Divider Cartridge



RC0454.eps

### Shuttle Check Cartridge



GA0426.eps

Back-Up Ring

## 4.7 Cylinders

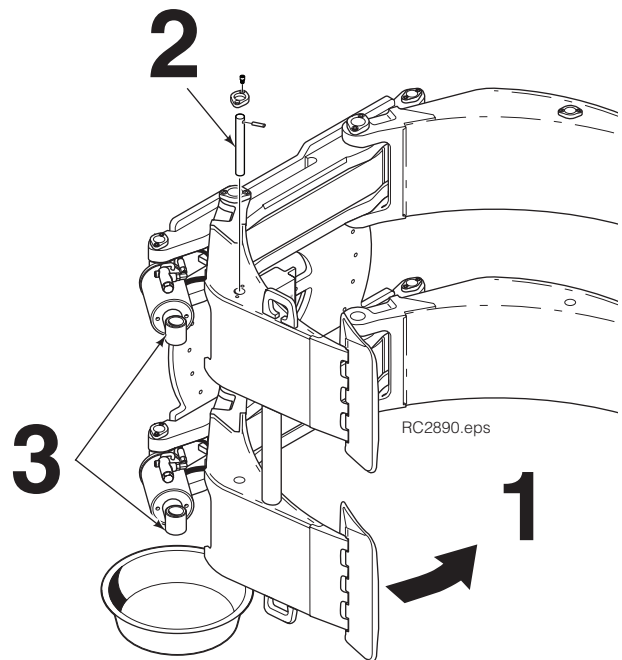
### 4.7-1 Servicing Cylinders on the Attachment

- 1 Close the arm attached to the cylinder being serviced. Rotate the attachment to the vertical roll handling position.
- 2 Remove the cylinder rod anchor pins from both cylinders. For reassembly, tighten anchor pin retainer capscrews to 28 ft.-lbs. (38 Nm).
- 3 Retract the cylinder rods. Swing the cylinder to be serviced outward to expose the cylinder rod and retainer.



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

- 4 Place a drip pan under the cylinder and disconnect the hoses from the cylinders ports. Plug the hose ends and tag for reassembly.
- 5 Service the cylinder as described in Section 4.8.



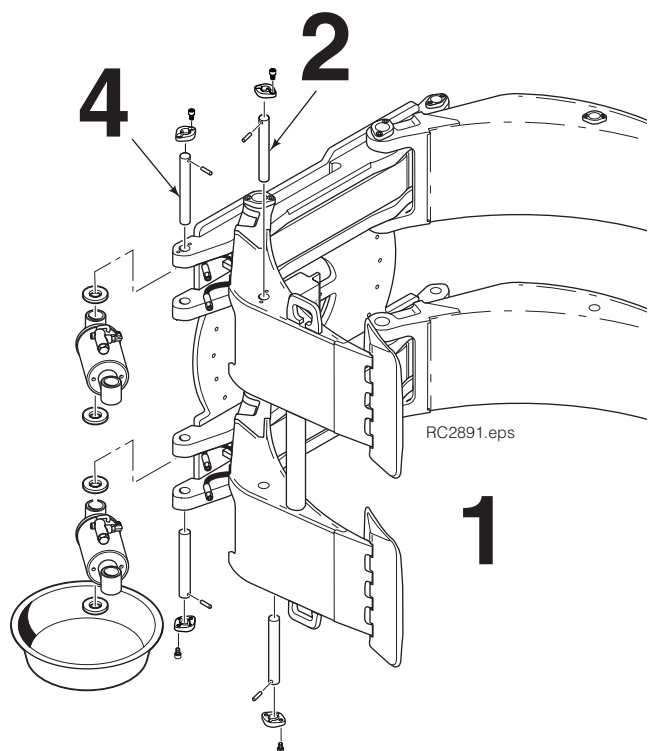
### 4.7-2 Cylinder Removal, Long or Short Arm

- 1 Position the arm attached to the cylinder being removed to mid-range. Rotate the attachment to the vertical roll handling position.
- 2 Remove the cylinder rod anchor pin from the cylinder to be removed.
- 3 Swing the arm inward.



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

- 4 Place a drip pan under the cylinder. Disconnect the hoses from the cylinder ports. Plug the hose ends and tag for reassembly.
- 5 Remove the cylinder base anchor pin. Note location of shims. For reassembly, tighten the anchor pin retainer capscrews to 28 ft.-lbs. (38 Nm).
- 6 Service the cylinder as described in Section 4.8.



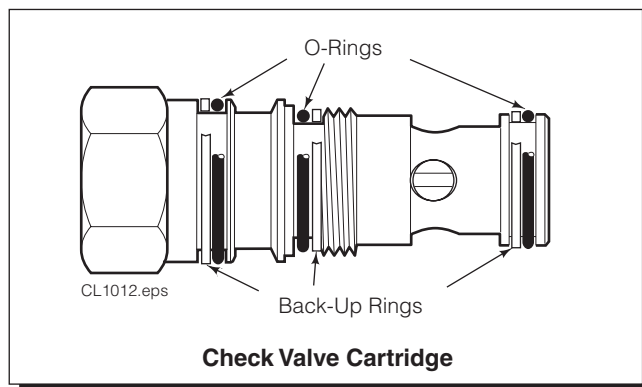
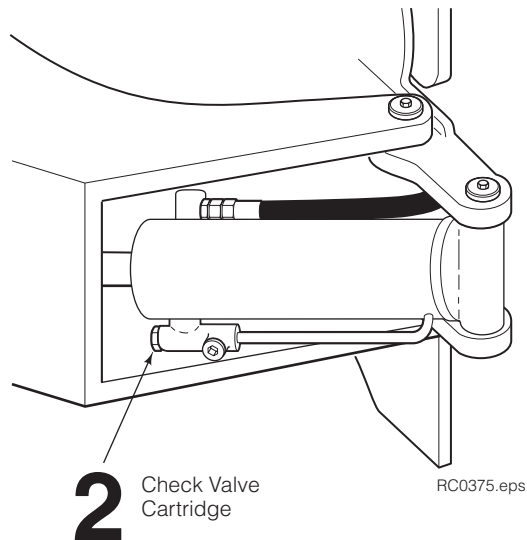
## 4.7-3 Cylinder Check Valve Service

- 1 Rotate the attachment to the vertical roll handling position. Close the arm attached to the cylinder being serviced to gain access to the cylinder check valve.



**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.

- 2 Remove the check valve cartridge from the cylinder port.
- 3 Remove the O-rings and back-up rings. Clean the check valve cartridge with kerosene or solvent.
- 4 Install new O-rings and back-up rings, as shown.
- 5 Lubricate the check valve cartridge with petroleum jelly prior to reassembly. Tighten the check valve cartridge to 35 ft.-lbs. (50 Nm).



## 4.7-4 Cylinder Bushing Service

**NOTE:** Bushings require replacement if bushing-to-pin clearance exceeds 1/16 in. (1.6 mm).

**1** Remove the cylinder from the attachment as described in section 4.7-2.

**2** Remove the bushings from the cylinder using a bushing driver.

**NOTE:** Bushing drivers can be machined using the dimensions shown below.

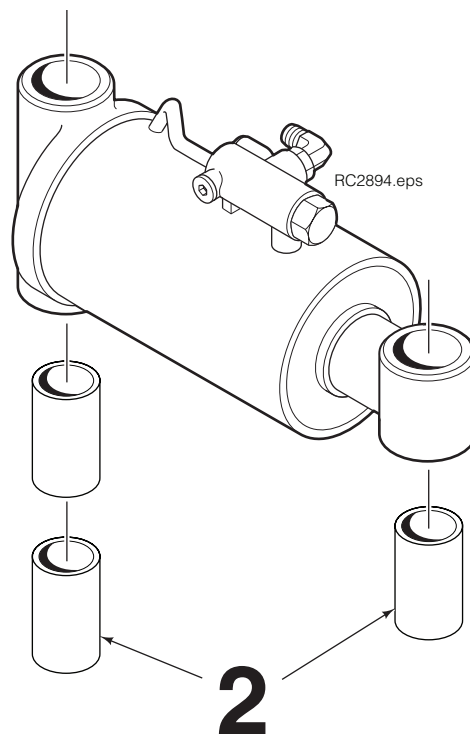
**3** Install new bushings in the cylinder. Replace with the same number of bushings removed.

**CAUTION:** Bushings may be damaged if installed without a proper bushing driver.

Bushings Driver Dimensions		
	A Bushing ID	B Driver OD
<b>20H-33H</b>	1.18 in. (30.0 mm)	1.38 in. (35.0 mm)
<b>34H-46H</b>	1.57 in. (40.0 mm)	1.77 in. (45.0 mm)
<b>55H</b>	1.77 in. (45.0 mm)	1.97 in. (50.0 mm)

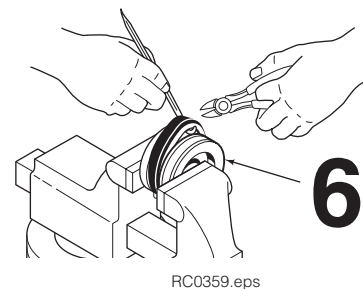
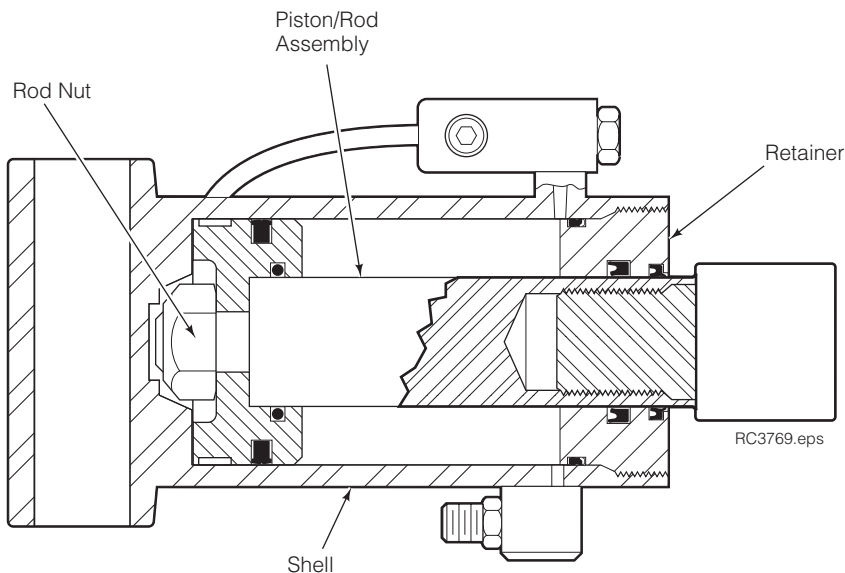
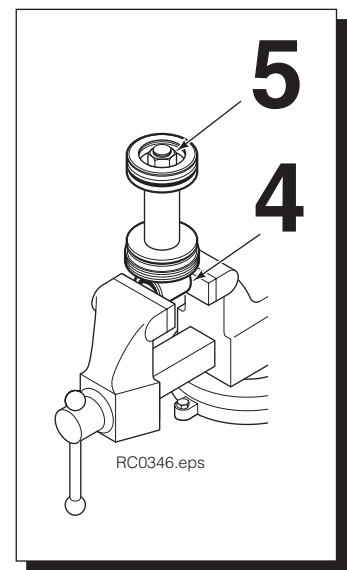
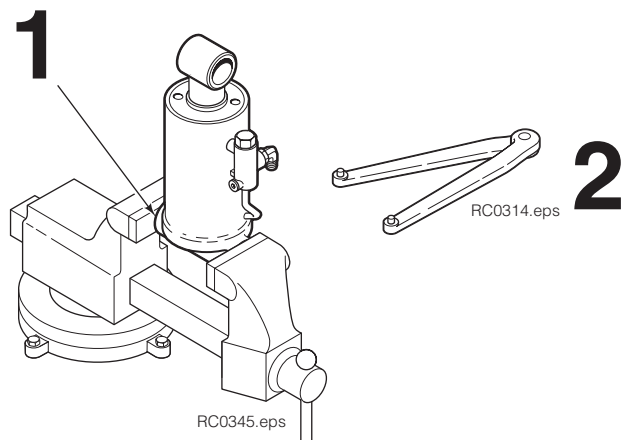
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## 4.8 Cylinder Service

### 4.8-1 Cylinder Disassembly

- 1 Clamp the cylinder so that the vise jaws contact only the extreme end of the cylinder base.
  - NOTE:** Use a soft-jawed vise for all cylinder disassembly and assembly procedures.
  - 2 Remove the cylinder retainer by unscrewing it with a pin-type spanner wrench.
  - 3 Remove the piston/rod/retainer as an assembly from the cylinder shell.
  - 4 Clamp the piston/rod/retainer assembly across the rod end. Never clamp directly on the rod sealing surface.
  - 5 Remove the piston nut from the rod.
  - 6 Clamp the piston on the top and bottom in a soft-jawed vise. Pry seals up with a dental tool and cut to remove.
- CAUTION:** Do not scratch the seal grooves.



### 4.8-2 Cylinder Inspection

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

## 4.8-3 Cylinder Reassembly

- 1 Lubricate all new seals and O-rings with petroleum jelly.
- 2 Note the direction of the U-cup seals. Pressure seals must always be installed with the lip toward the high pressure side of the cylinder.
- 3 Polish the piston and retainer chamfer angle with emery cloth to facilitate seal installation.
- 4 Install new seals on the piston and retainer. Hook one side of the seal in the groove and carefully work it over the piston or retainer as shown.
- 5 Install the retainer and then the piston on the cylinder rod. Tighten the piston retaining nut to a torque of:

**20H-24H** – 260 ft.-lbs. (350 Nm)

**25H-33H (Early Cylinders ①)** – 330 ft.-lbs. (450 Nm)

**25H-33H (Current Cylinders ②)** – 400 ft.-lbs. (540 Nm)

**34H-55H** – 400 ft.-lbs. (540 Nm)

① For cylinders stamped with part numbers 609XXXX and 68XXXXX.

② For cylinders stamped with part numbers 606XXXX and 607XXXX.

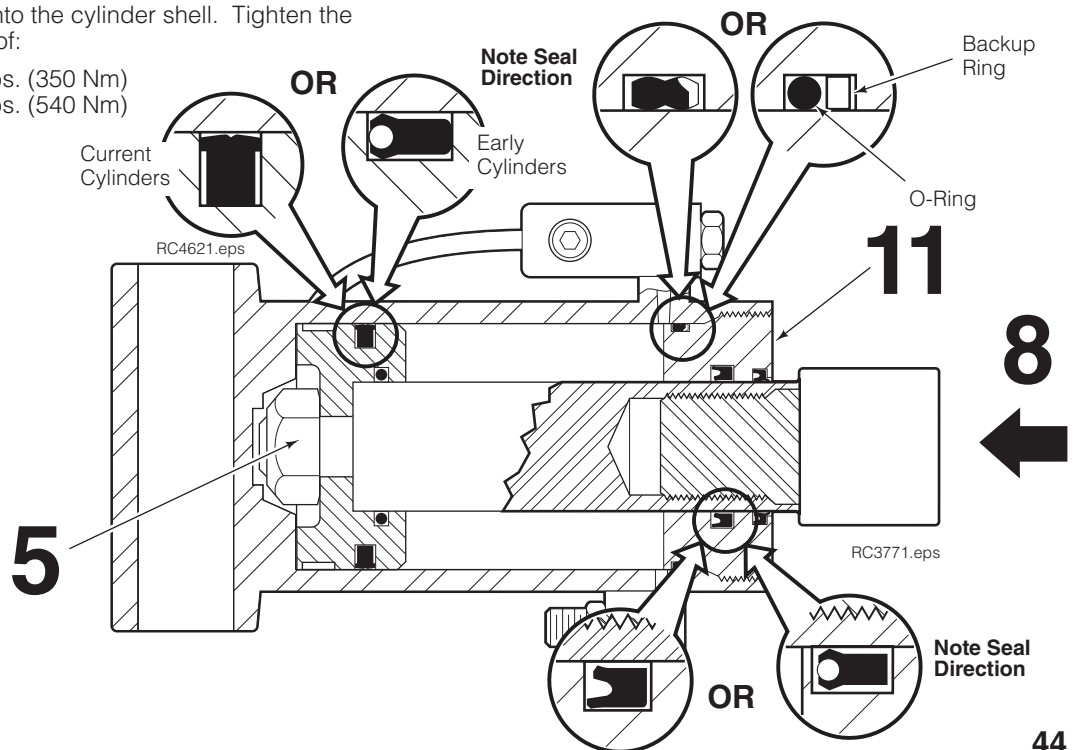
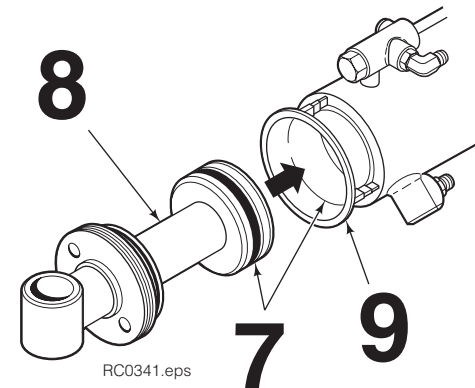
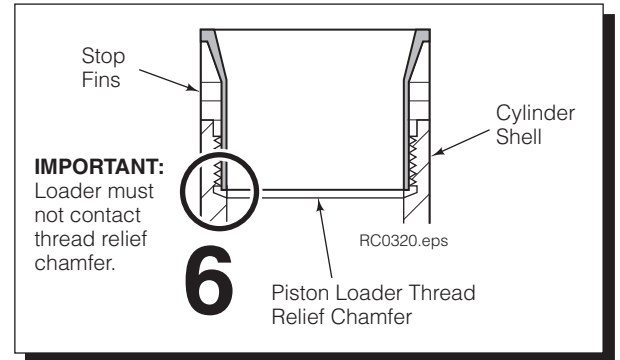
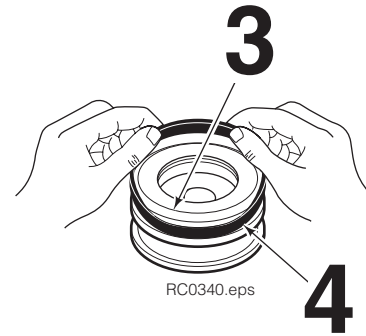
- 6 Place the piston loader furnished with the seal kit into the cylinder shell. Make sure that the loader covers all the cylinder shell threads but does not contact the thread relief chamfer. Trim the loader stop fins if more engagement is needed.

**CAUTION:** The piston will not enter the cylinder shell properly if the loader contacts the thread relief chamfer.

- 7 Apply a thick film of petroleum jelly to the inside of the cylinder shell, piston loader and piston seals.
- 8 Using a rubber mallet, tap the piston/rod assembly through the loader into the cylinder shell.
- 9 Remove the loader by cutting down one side and pulling it out of the cylinder bore.
- 10 Apply a thick film of petroleum jelly to the inside of the cylinder shell, and to the retainer and seal.
- 11 Screw the retainer into the cylinder shell. Tighten the retainer to a torque of:

**20H-24H** – 260 ft.-lbs. (350 Nm)

**25H-55H** – 400 ft.-lbs. (540 Nm)



4.9 Base Unit

4.9-1 Frame Bushing Service

- 1 Remove the arms from the attachment as described in Section 4.2-1.
- 2 Remove the arm pivot bushings from the frame using a bushing driver.

**NOTE:** Bushing drivers can be machined using the dimensions shown in the chart below.
- 3 For reassembly, reverse the above procedures with the following exceptions:

- Install new arm pivot bushings and spacer.

**CAUTION:** Bushings may be damaged if installed without a proper bushing driver.

**Bushing Driver Dimensions**

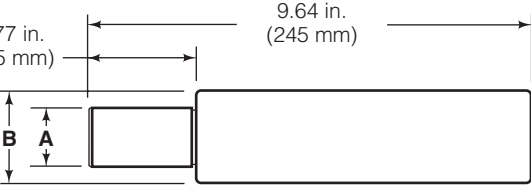
	<b>A</b> Bearing ID	<b>B</b> Driver OD
<b>20H</b>	1.18 in (30.0 mm)	1.38 in. (35.0 mm)
<b>22H, 24H</b>	1.38 in (35.0 mm)	1.57 in. (40.0 mm)
<b>25H, 30H, 33H</b>	1.57 in (40.0 mm)	1.77 in. (45.0 mm)
<b>34H, 38H, 42H, 46H</b>	1.77 in (45.0 mm)	2.00 in. (50.0 mm)
<b>55H</b>	1.96 in. (50.0 mm)	2.17 in. (55.0 mm)

1.77 in.  
(45 mm)

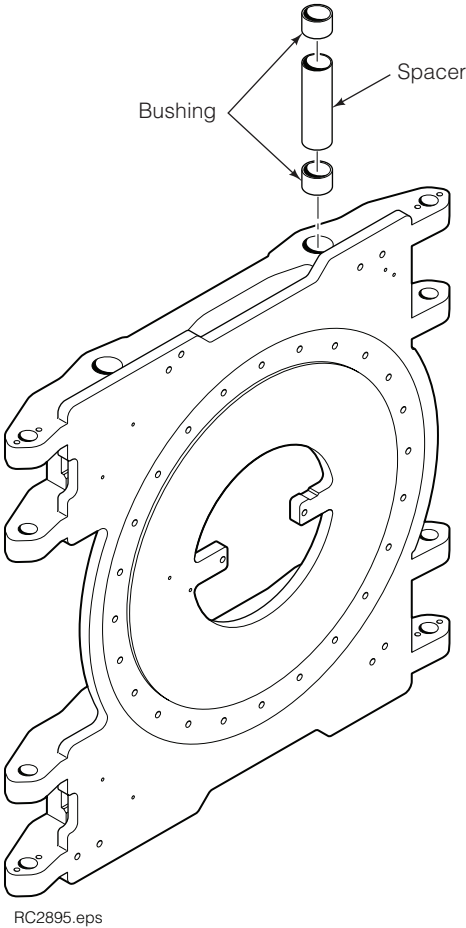
9.64 in.  
(245 mm)

B

A



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## 4.9-2 Rotation Bearing Assembly – Capscrew Torque Inspection

### 500-Hour Inspection

Every 500 hours perform the following inspection:

- 1 Check the accessible baseplate capscrews above upper mounting hooks for an initial torque of:

**20H-24H** – 66 ft.-lbs. (90 Nm)

**25H-33H Socket Capscrews** – 80 ft.-lbs. (110 Nm)

**25H-33H Hex Capscrews** – 66 ft.-lbs. (90 Nm)

**34H-46H** – 66 ft.-lbs. (90 Nm)

**55H** – 166 ft.-lbs. (225 Nm)

Tighten capscrews to 10 ft.-lbs. (14 Nm) above initial torque. Mark each capscrew after checking.

- If any baseplate capscrews are loose, rotate or broken, replace all baseplate fasteners as described in Section 4.9-3.
- If capscrews do not rotate, continue with faceplate capscrew inspection in Step 2.

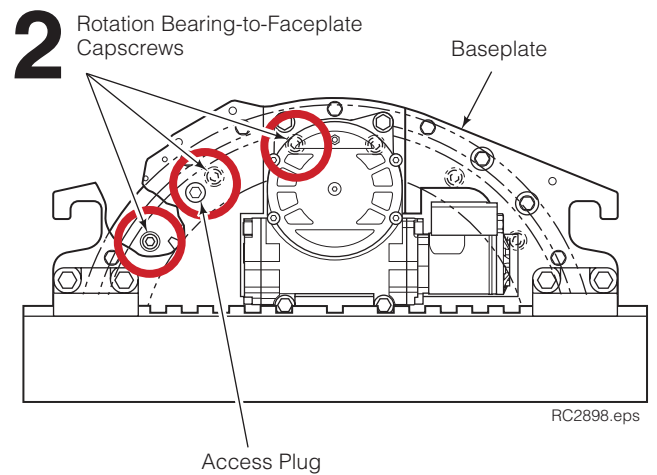
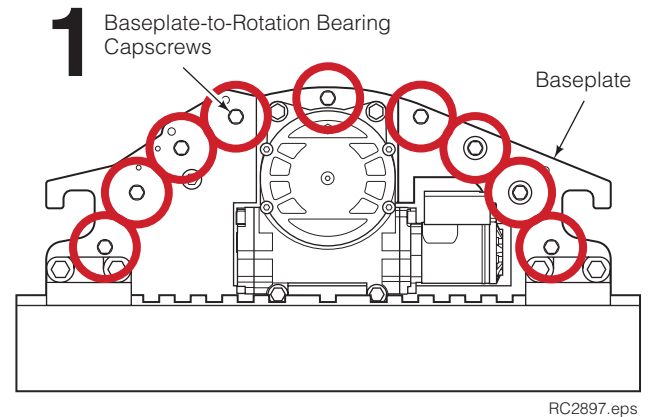
- 2 Remove the access plug from the back of the baseplate and rotate the attachment to the vertical roll handling position. Check three capscrews closest to the access hole for an initial torque of:

**20H-46H** – 80 ft.-lbs. (110 Nm)

**55H** – 202 ft.-lbs. (274 Nm)

Tighten capscrews 10 ft.-lbs. (14 Nm) above initial torque. Mark each capscrew after checking.

- If any bearing capscrews are loose, rotate or broken, replace all capscrews as described in Section 4.9-3.
- If capscrews do not rotate, inspection is complete.



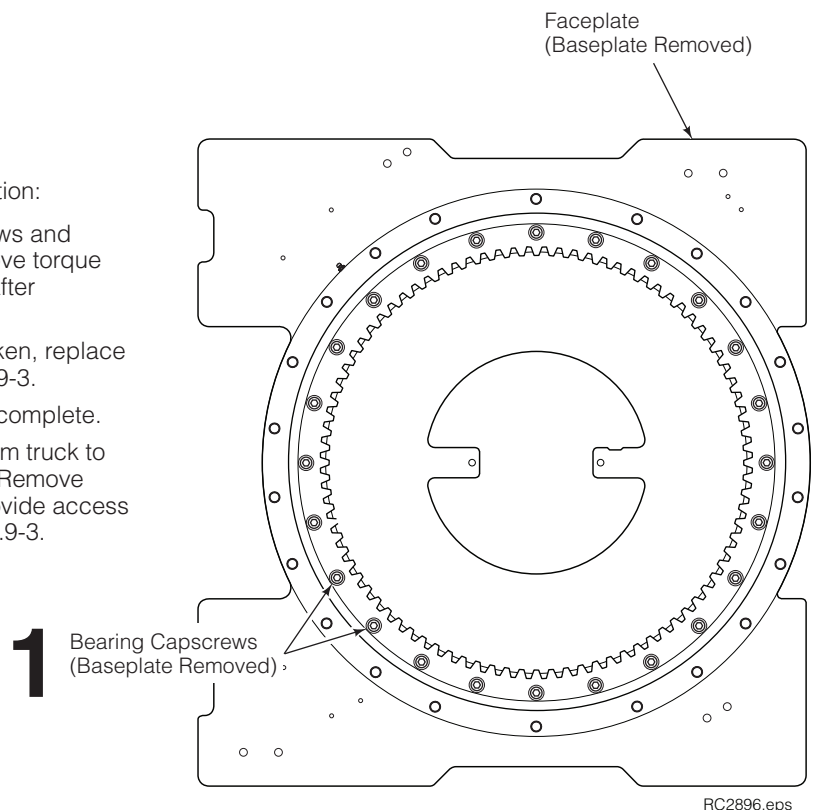
### 2000-Hour Inspection

Every 2000 hours perform the following inspection:

- 1 Check **all** baseplate and faceplate capscrews and tighten until torque is 10 ft.-lbs. (14 Nm) above torque values listed above. Mark each capscrew after checking.

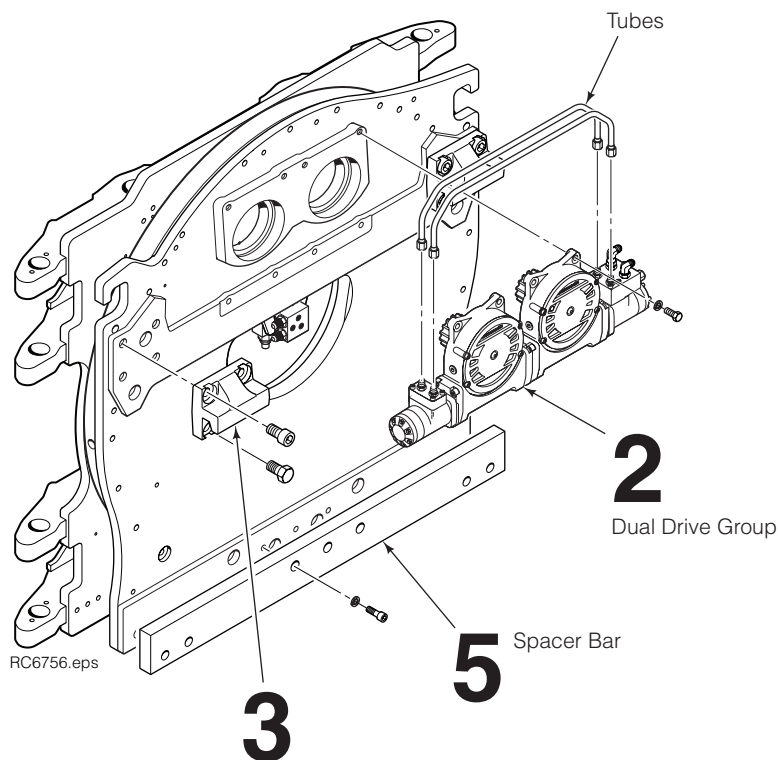
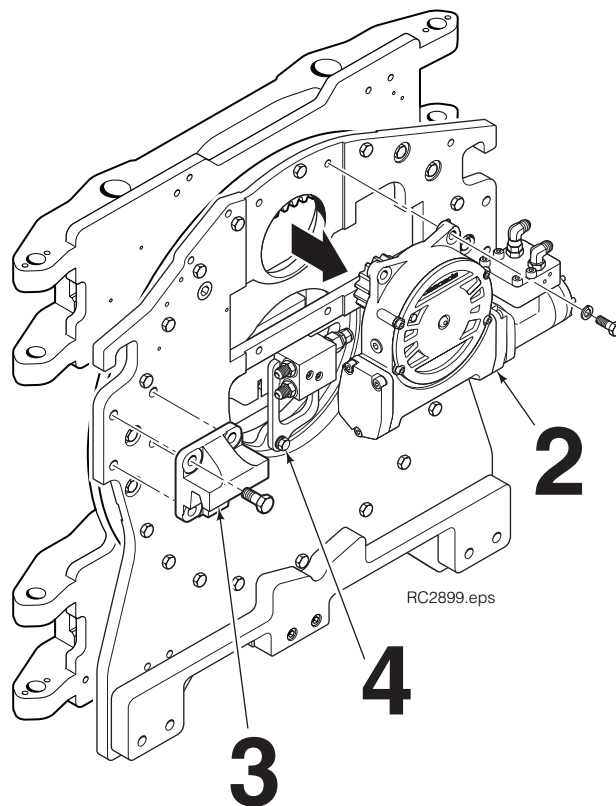
- If any capscrews are loose, rotate or broken, replace all capscrews as described in Section 4.9-3.
- If capscrews do not rotate, inspection is complete.

**NOTE:** The attachment must be removed from truck to provide access to all baseplate capscrews. Remove baseplate (shown) or use access hole to provide access to all bearing capscrews. Refer to Section 4.9-3.



## 4.9-3 Rotation Bearing Assembly – Removal and Installation

- 1 Remove the attachment from the lift truck as described in Section 4.1.
- 2 Remove the drive group as described in Section 4.3-1.
- 3 Remove the upper mounting hooks. For reassembly, tighten the capscrews to:
  - Class II/III** – 121 ft.-lbs. (165 Nm) ♦
  - Class III, M20 Capscrew** – 200 ft.-lbs. (270 Nm) ♦
  - Class IV** – 236 ft.-lbs. (320 Nm)
  - ♦ 20H-24H – Clean and dry capscrews. Apply Loctite 242 (blue) to capscrews.
- 4 Remove the end block support yoke or bracket. For reassembly, tighten the capscrew to 30 ft.-lbs. (40 Nm).
- 5 If lower center spacer or lower spacer bar covers rotation bearing capscrews, remove spacer. For reassembly, tighten capscrews to:
  - Lower Center Spacer** – 48 ft.-lbs. (65 Nm)
  - Lower Spacer Bar** – 77 ft.-lbs. (105 Nm)



## 4.9-3 Rotation Bearing Assembly – Removal and Installation (Continued)



**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. Attach an overhead hoist and take up the slack in the chain.

**7 Baseplate Capscrews** – 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.

A) Clean and dry capscrews. Apply Loctite, type referenced below, to capscrew threads and threaded holes in the baseplate. Threads must be clean and dry for new Loctite to cure properly.

**20H** – Loctite 242 (Blue)

**22H-55H** – Loctite 262 (Purple)

B) Tighten using the alternating cross pattern shown to one-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 one-half turn and immediately retightening to a final torque of:

**20H-24H** – 66 ft.-lbs. (90 Nm)

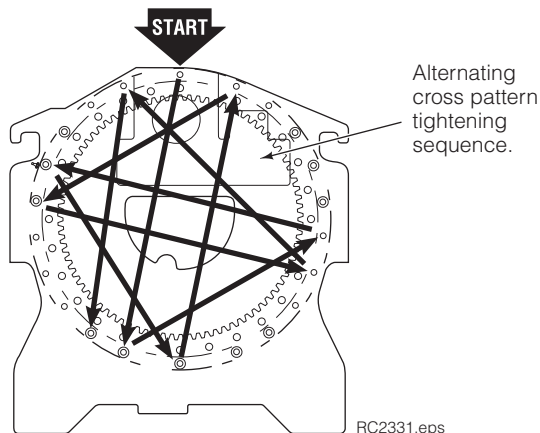
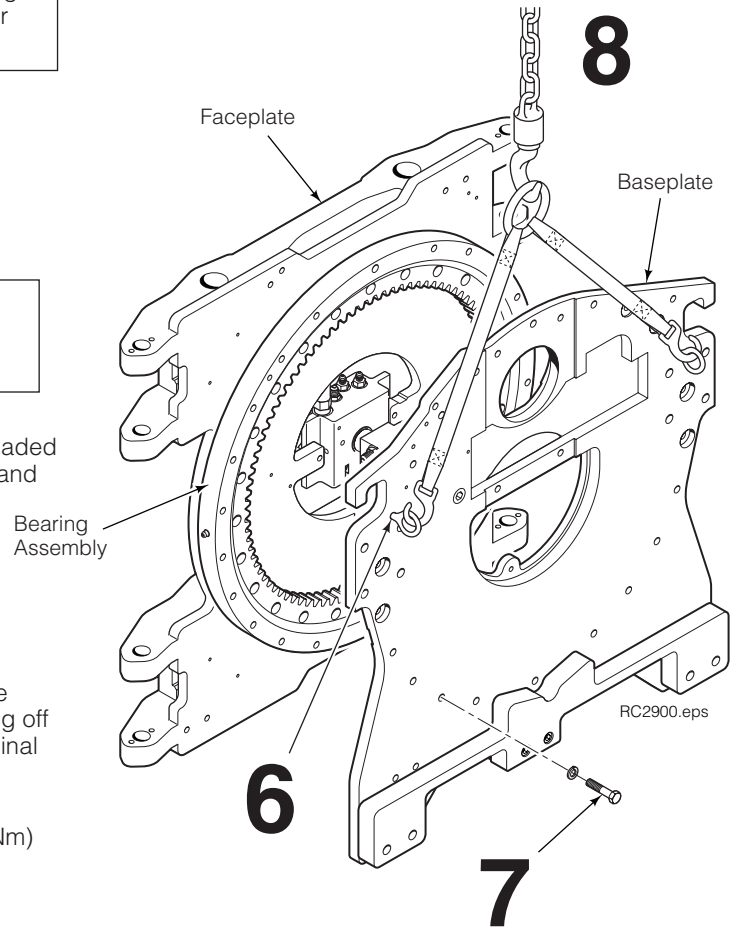
**25H-33H Socket Capscrews** – 80 ft.-lbs. (110 Nm)

**25H-33H Hex Capscrews** – 66 ft.-lbs. (90 Nm)

**34H-46H** – 66 ft.-lbs. (90 Nm)

**55H** – 166 ft.-lbs. (225 Nm)

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



**8** Lift the baseplate away from the faceplate/bearing assembly.

## 4.9-3 Rotation Bearing Assembly – Removal and Installation (Continued)

**9** Attach two eyebolts to the bearing assembly. Attach an overhead hoist and take up the slack in the chain.

**10 Bearing Capscrews** – Remove the capscrews fastening the bearing assembly to the faceplate. For reassembly, apply threadlocker and tighten the capscrews using the following technique:

A) Clean and dry capscrews. Apply Loctite, type referenced below, to capscrew threads and threaded holes in the faceplate. Threads must be clean and dry for new Loctite to cure properly.

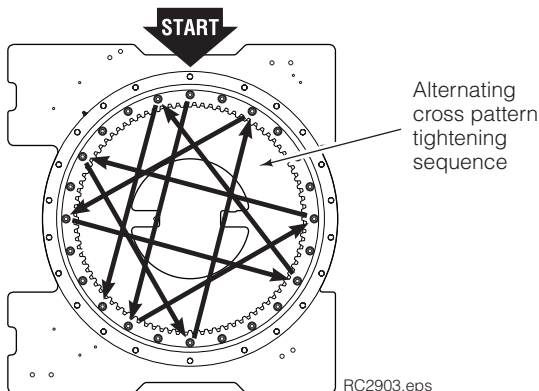
**20H** – Loctite 242 (Blue)

**22H-55H** – Loctite 262 (Purple)

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

C) Tighten using the alternating cross pattern to the final torque value, then double-torque by backing off one-half turn and immediately retightening to a final torque of 80 ft.-lbs. (110 Nm).

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



**11** Lift the bearing away from the faceplate.

**12** For reassembly, reverse the above procedures with the following exceptions:

- 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 as shown:

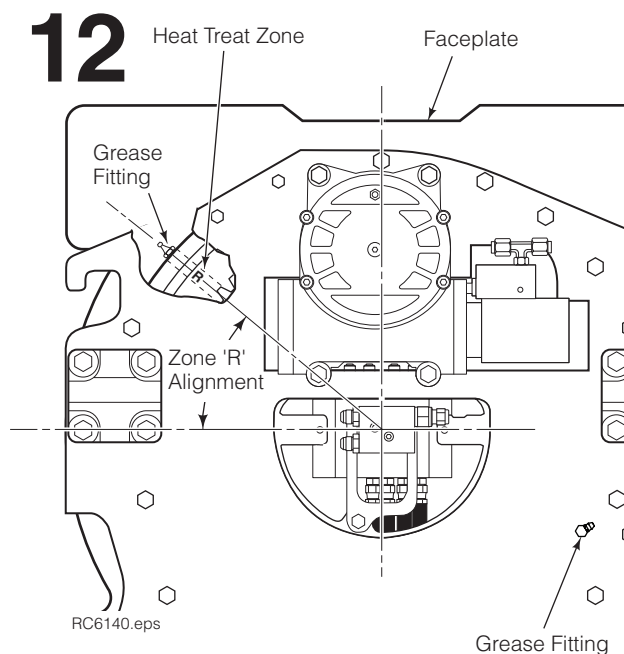
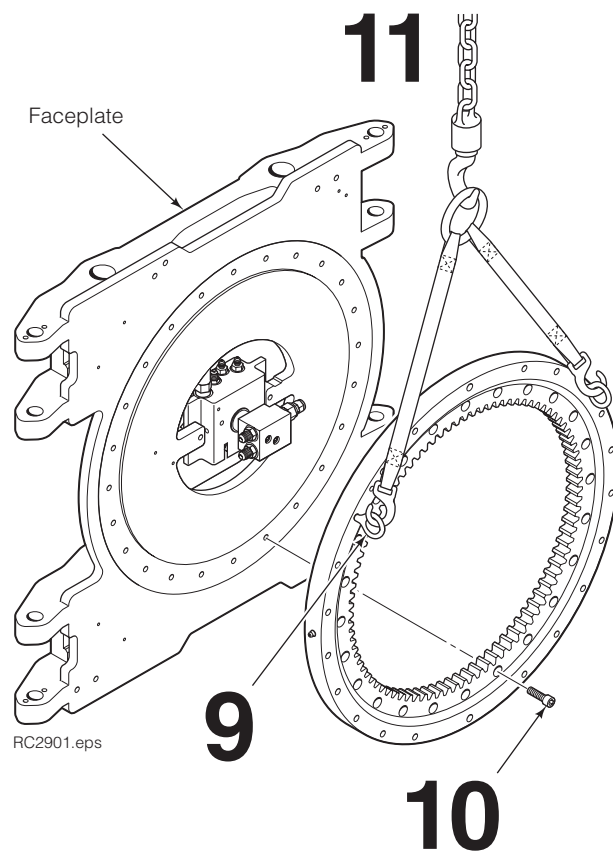
**20H-33H** – 45° above horizontal

**34H, 38H** – 5.5° below horizontal

**42H, 46H** – 37.5° below horizontal

**55H** – 15° above horizontal

- Check the condition of the faceplate center hole seal. Replace if necessary.
- Apply NLGI No. 0 grease to grease fitting on baseplate.
- After remounting the attachment, apply chassis grease to the bearing assembly grease fitting. Rotate the attachment slowly during the procedure.



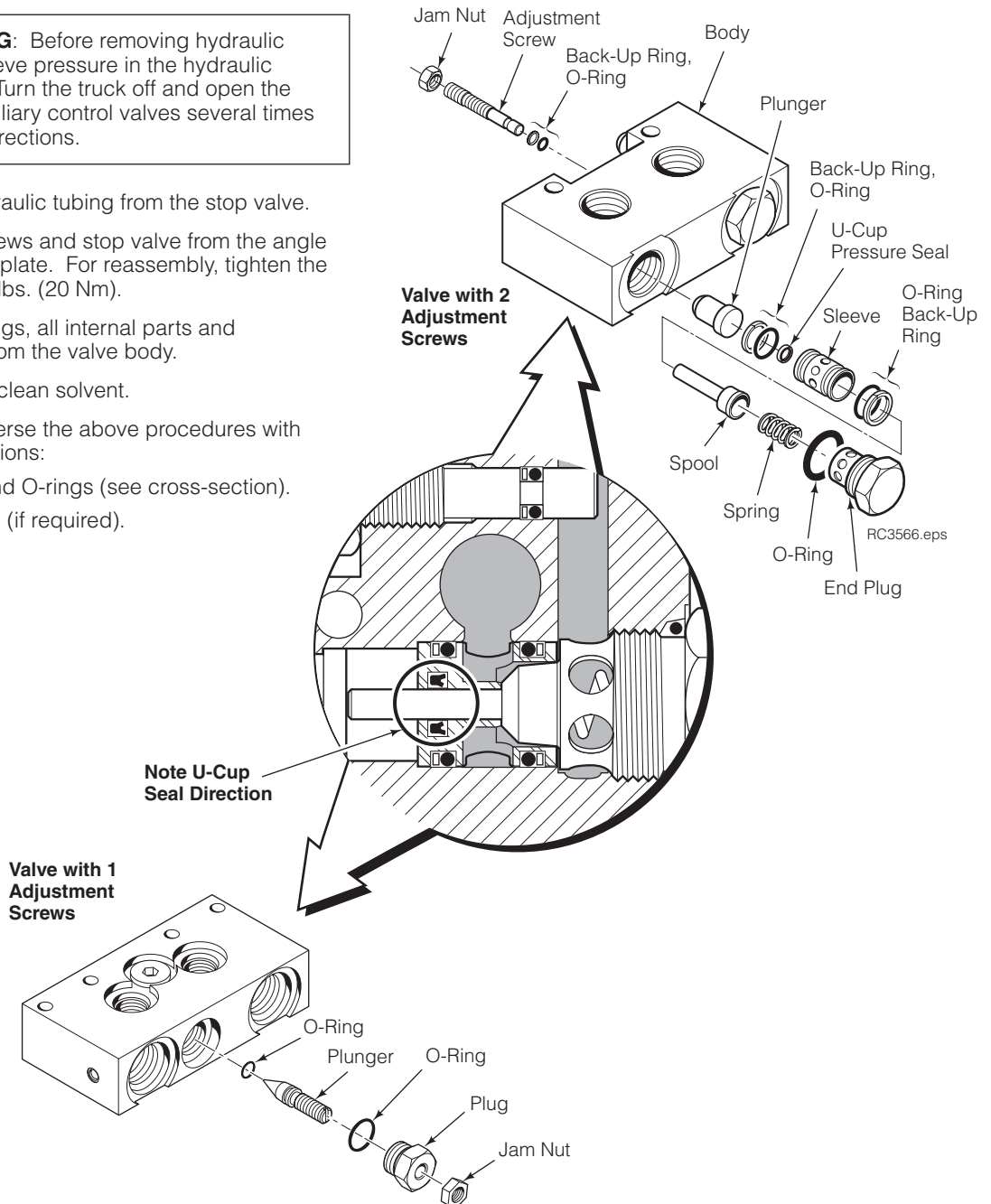
## 4.10 180-Degree Hydraulic Stop Group

### 4.10-1 Stop Valve Service



**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 Disconnect the hydraulic tubing from the stop valve.
- 2 Remove the capscrews and stop valve from the angle bracket on the baseplate. For reassembly, tighten the capscrews to 15 ft.-lbs. (20 Nm).
- 3 Remove the end plugs, all internal parts and adjustment screw from the valve body.
- 4 Clean all parts with clean solvent.
- 5 For reassembly, reverse the above procedures with the following exceptions:
  - Replace seals and O-rings (see cross-section).
  - Adjust stop valve (if required).



## 4.10-2 Stop Valve Adjustment



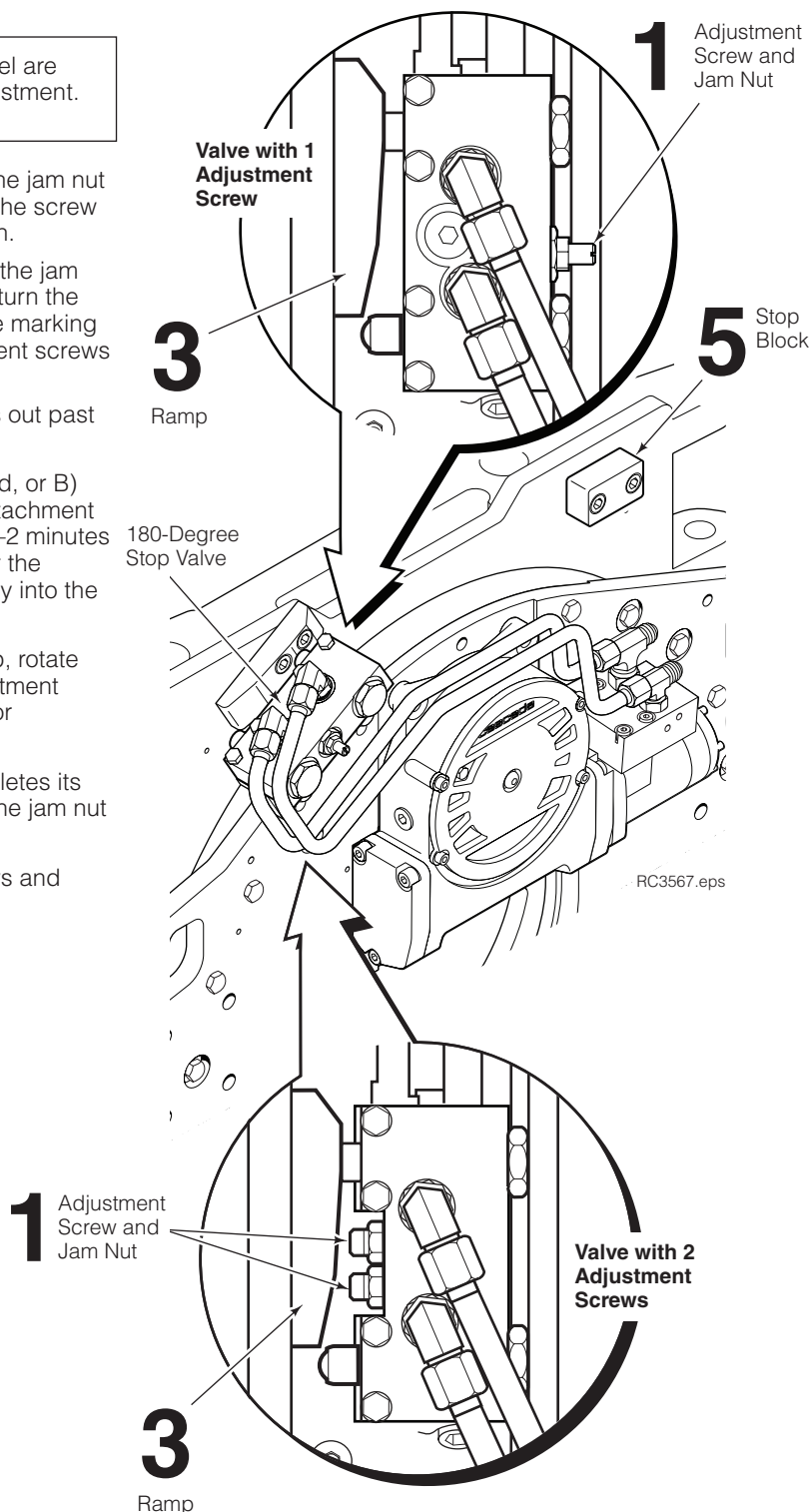
**WARNING:** Make sure all personnel are clear of the attachment during adjustment.

- 1 Valves with 1 Adjustment Screw** – Loosen the jam nut on the stop valve adjustment screw and turn the screw IN (clockwise) until it stops. Back out one turn.

**Valves with 2 Adjustment Screws** – Loosen the jam nut on the stop valve adjustment screws and turn the screws OUT (counterclockwise) until a groove marking the maximum-out position is visible. Adjustment screws should be adjusted equally.

**IMPORTANT:** Backing the adjustment screws out past the groove will cause hydraulic leakage.

- 2** Using a load that: A) is the heaviest to be lifted, or B) requires maximum motor torque, rotate the attachment back and forth to the stops at full speed for 1–2 minutes before making adjustments. Observe whether the attachment fully completes its rotation properly into the hard stop.
- 3** If rotation does not continue into the hard stop, rotate the stop valve off the ramp and turn the adjustment screw IN (clockwise) one-quarter turn. Test for complete rotation slowly into the hard stop.
- 4** Repeat Step 3 until the attachment fully completes its rotation properly into the hard stop. Tighten the jam nut on the adjustment screw.
- 5** Check the torque on the stop block capscrews and tighten to 80 ft.-lbs. (110 Nm), if necessary.





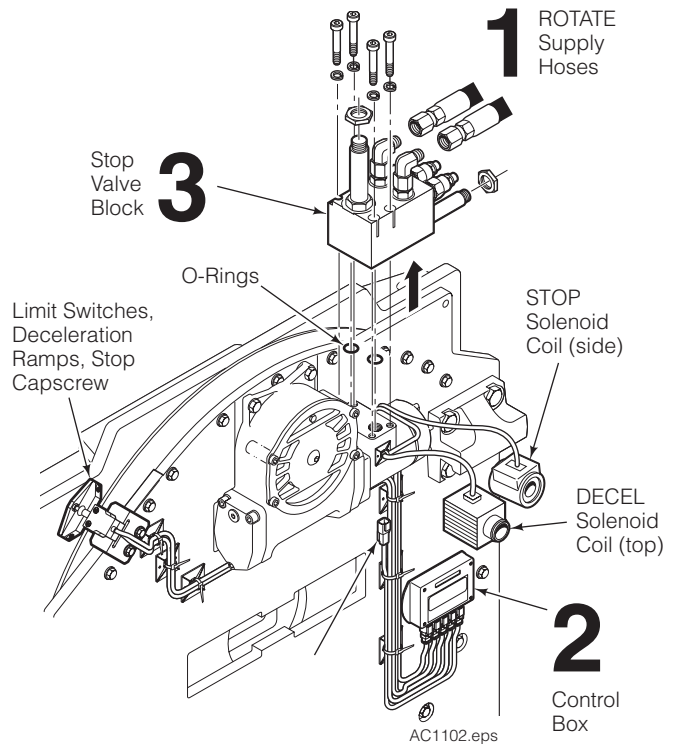
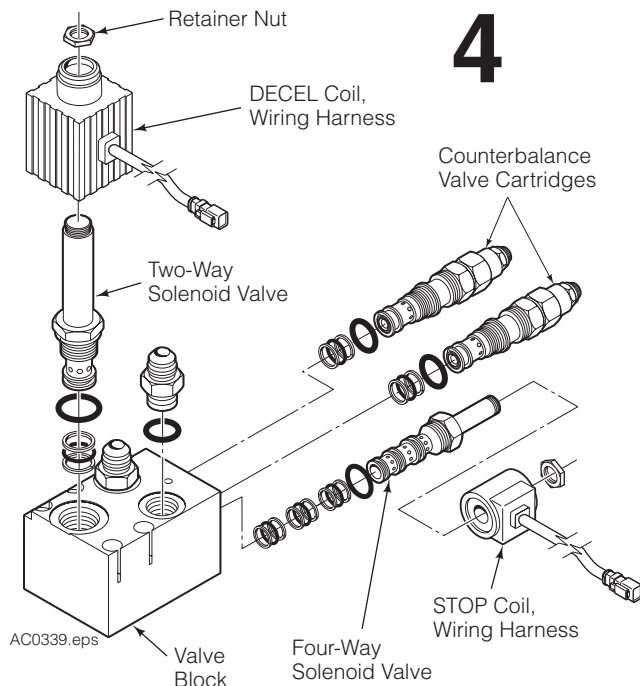
## 4.11 Electronic Rotational Control (ERC)

### 4.11-1 ERC Stop Valve Service



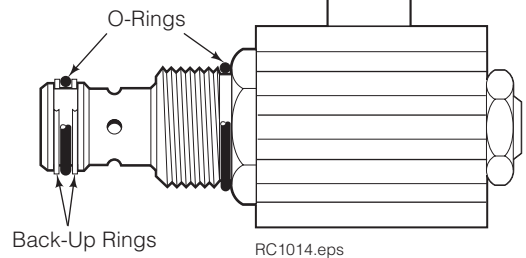
**WARNING:** Before removing hydraulic lines, relieve pressure in the hydraulic system. Turn the truck off and open the truck auxiliary control valves several times in both directions.

- 1** Disconnect the ROTATE hydraulic hoses from the stop valve fittings and tag for reassembly.
- 2** Remove the solenoid coils by unscrewing the mounting nut and sliding the coil off the valve cartridge. For reassembly, tighten the nut lightly to 5 ft.-lbs. (7 Nm).
- 3** Remove the four capscrews and remove the stop valve from the rotator drive assembly. Keep track of the two O-rings. For reassembly, tighten the capscrews to 35 ft.-lbs. (50 Nm).
- 4** Service the valve in a clean work area. Remove the solenoid and cartridge valves. Remove all fittings from the valve block. Clean all parts with solvent.
- 5** For reassembly, reverse the above procedures with the following exceptions:
  - Install new O-rings and back-up rings on cartridge valves and valve block as shown.
  - Tighten solenoid cartridges as follows:
    - Two-Way Solenoid Valve** – 80 ft.-lbs. (110 Nm)
    - Four-Way Solenoid Valve** – 18 ft.-lbs (25 Nm)
  - For complete installation procedures refer to Electronic Rotational Control Installation Instructions 6048228.

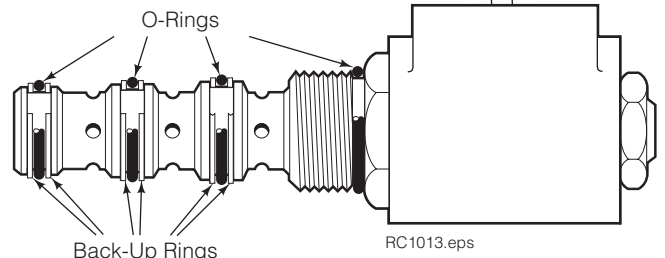


## 5

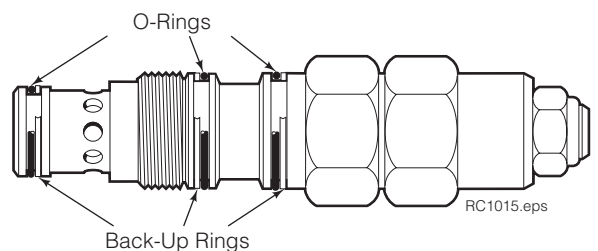
### TWO-WAY SOLENOID VALVE



### 4-WAY SOLENOID VALVE

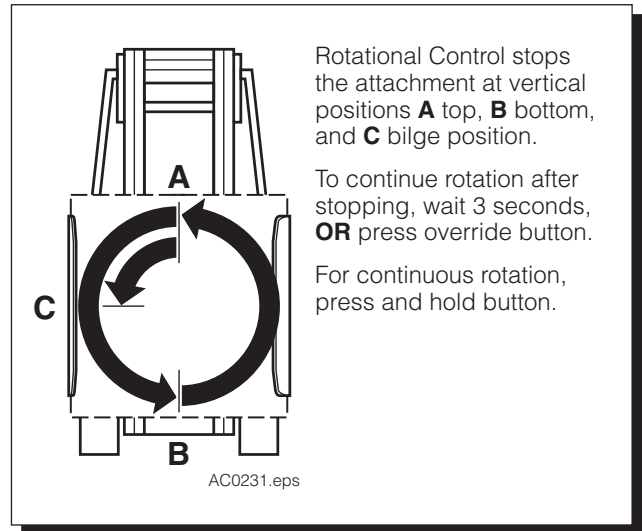


### COUNTERBALANCE VALVE



## 4.11-2 Stop Position Adjustment

- 1 Rotate the attachment in each direction to verify it stops in vertical and horizontal (bilge) positions.
  - If rotation does not stop at vertical or bilge positions, proceed to Troubleshooting, Section 4.11-3.
  - If attachment stops in vertical and horizontal (bilge) positions, proceed to Step 2.
  - If rotation does not stop at exact vertical or bilge positions, limit switches may be adjusted as described in Step 4.
- 2 Wait 3 seconds to rotate attachment again, verifying it again stops in the vertical or horizontal (bilge) positions.
- 3 Press and hold override push button and verify that the attachment will rotate continuously without stopping.
  - If continuous rotation does not occur when holding push button, proceed to Troubleshooting, Section 4.11-3.
- 4 Inspect limit switch end rollers for full engagement on deceleration ramps and stop capscrews. If required, adjust limit switch position and/or stop capscrew to precisely locate stop position within  $\pm 0.5$  in. (13 mm).



## 4.11-3 Stop Troubleshooting

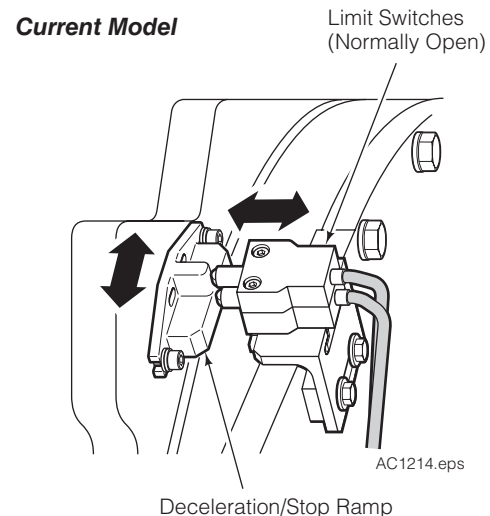
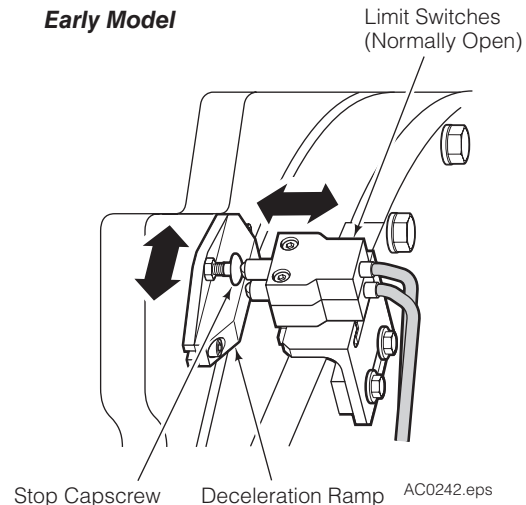
**NOTE:** Reference schematic in Section 4.11-4.

- 1 Check ERC main power fuse/relay, control lever push button.
 

**NOTE:** Push button is normally closed (NC), providing power to ERC. Verify the 12V-96V is reaching ERC control box when truck key is turned on.
- 2 Inspect all electrical cables. Look for and correct loose connections, pinched wiring, or wrongly-connected cables.
 

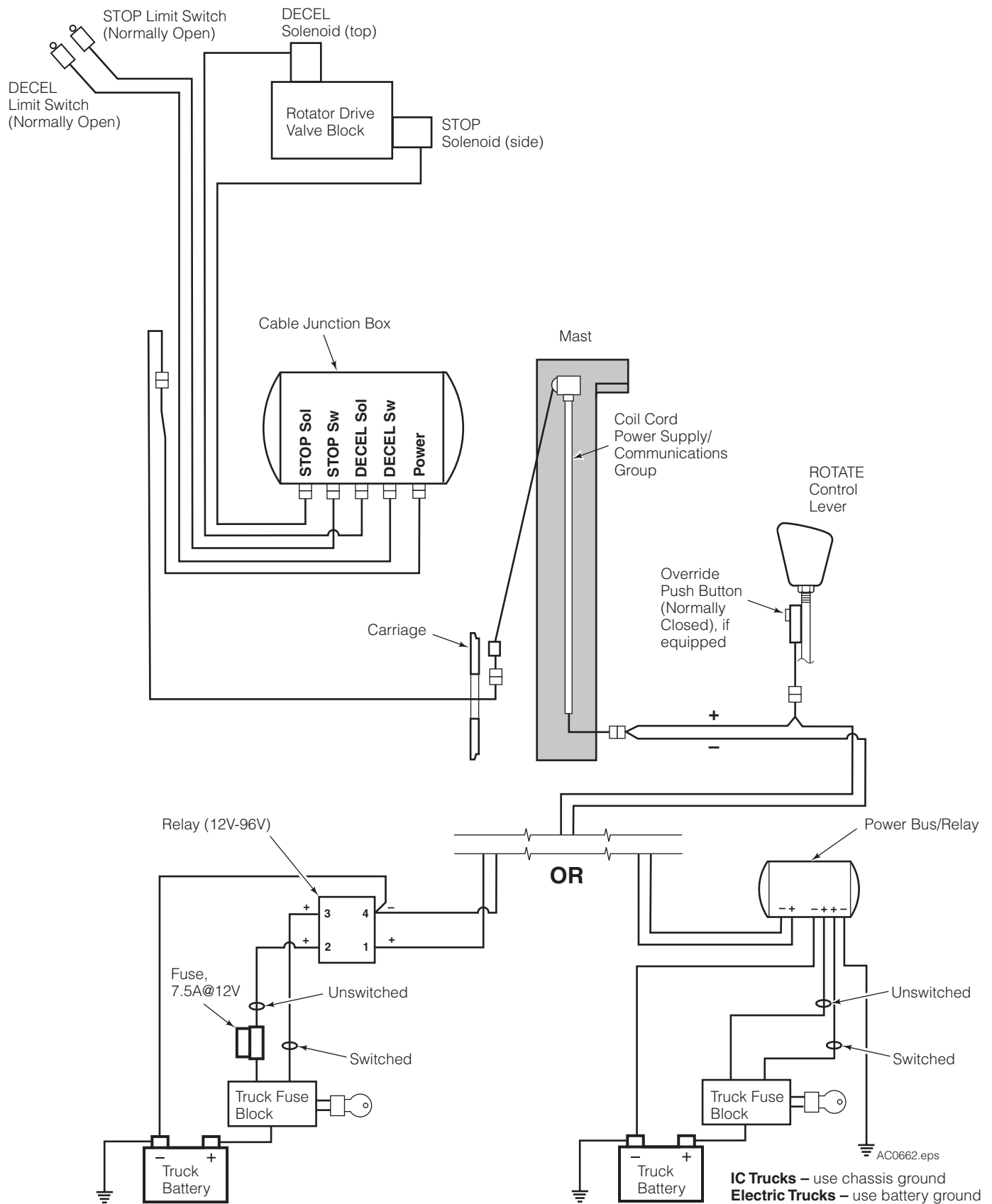
**NOTE:** Cable connectors and control box are labeled to show proper connections.
- 3 Check continuity of solenoid/cable assemblies and limit switch/cable assemblies and replace if needed.
- 4 With truck key on, manually operate limit switches and listen for 'clicks' at solenoids, indicating solenoid coil operation. Or, rotate Clamp into ramps and check for voltage at control box solenoid output connectors.
- 5 Look for three second time delay between rotation decelerating and ability to restart rotation. If there is no delay, or Clamp will not rotate continuously with push button depressed, replace ERC control box.
 

**NOTE:** Control box contains adjustable time delay, contact Cascade for adjustment procedure.





## 4.11-4 ERC Schematic



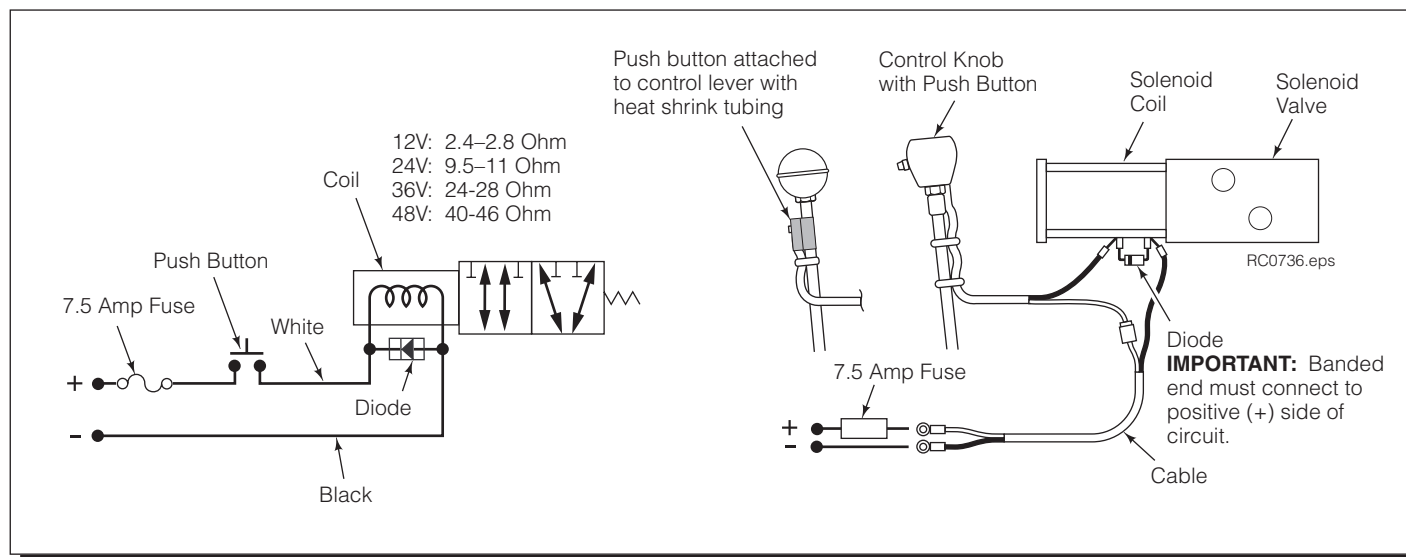
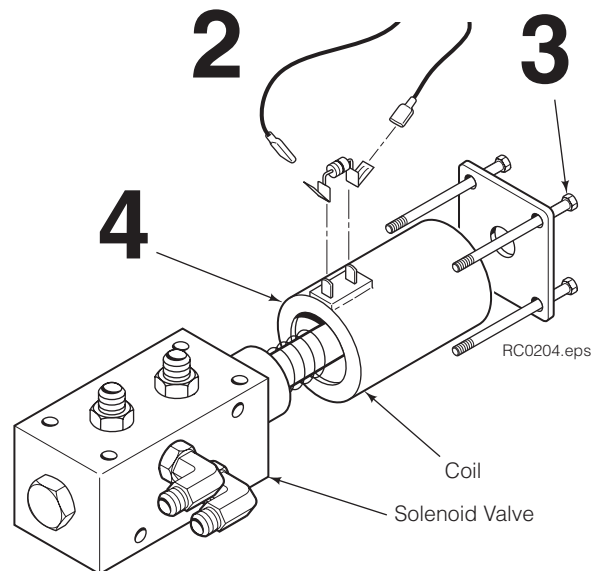
## 4.12 Solenoid Valve

### 4.12-1 Coil Service

- 1 Disconnect the wires and diode from the coil terminals.
- 2 Remove the end cover capscrews and remove the end cover and coil. Note the position of the coil terminals.
- 3 Install the new coil and end cover. Verify that the terminals are positioned correctly.
- 4 For reassembly, reverse the above procedures except as follows:
  - Refer to electrical schematic, below, for correct wire and diode installation.

### 4.12-2 Valve Service

- Check the plunger within the valve body for freedom of movement. Press end button on coil to assure that valve is not jammed or damaged. If problems are found, replace solenoid valve as a complete assembly.



## 5.1 Hydraulics

### Truck Relief Setting

2300 psi (160 bar) Maximum

### Truck Flow Volume <sup>①</sup>

	Min. <sup>②</sup>	Recommended	Max. <sup>③</sup>
<b>20H–33H</b>	5 GPM (19 L/min.)	10 GPM (38 L/min.)	15 GPM (57 L/min.)
<b>34H, 38H, 42H, 46H – Single Drive</b>	10 GPM (38 L/min.)	15 GPM (57 L/min.)	20 GPM (76 L/min.)
<b>42H, 46H – Dual Drive</b>	15 GPM (57 L/min.)	20 GPM (76 L/min.)	25 GPM (95 L/min.)
<b>55H</b>	15 GPM (57 L/min.)	20 GPM (76 L/min.)	25 GPM (95 L/min.)

① Cascade Roll Clamps are compatible with SAE 10W petroleum base hydraulic fluid meeting Mil. Spec. MIL-O-5606 or MIL-O-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.

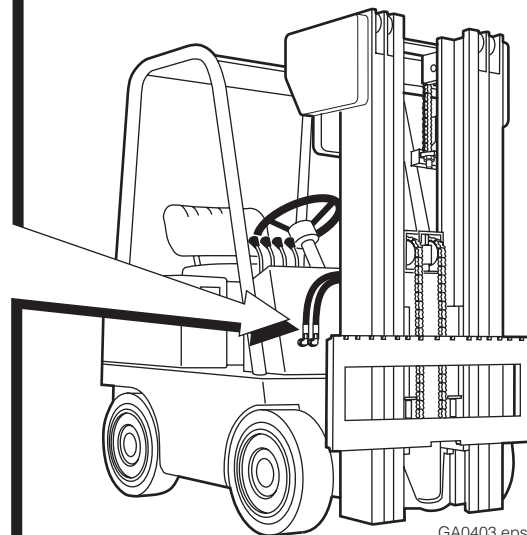
② Flow less than recommended will result in a rotate speed less than 2 RPM.

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

### Hoses and Fittings

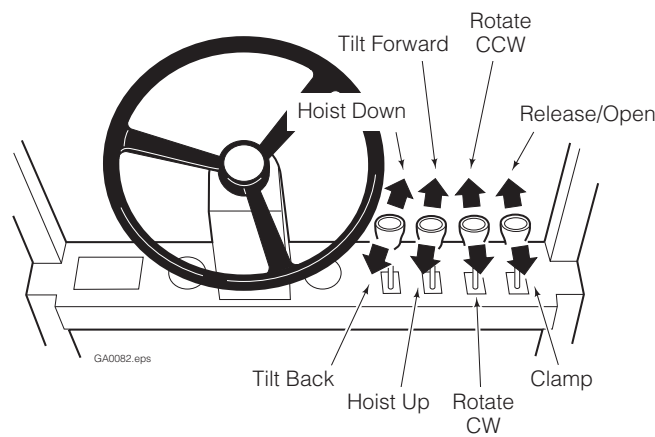
All supply hoses should be No. 8.

All fittings should have a minimum orifice size of 13/32 in. (10 mm).



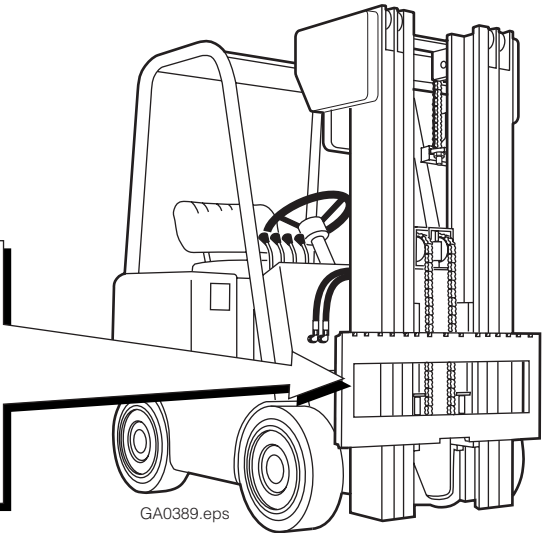
5.2 Auxiliary Valve Functions

Check for compliance with ANSI (ISO) standards:



5.3 Truck Carriage

A	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)
Class IV	23.44 in. (595.5 mm)	23.50 in. (597.0 mm)



# SPECIFICATIONS

## 5.4 Torque Values

Fastener torque values for the H-Series Roll Clamps 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

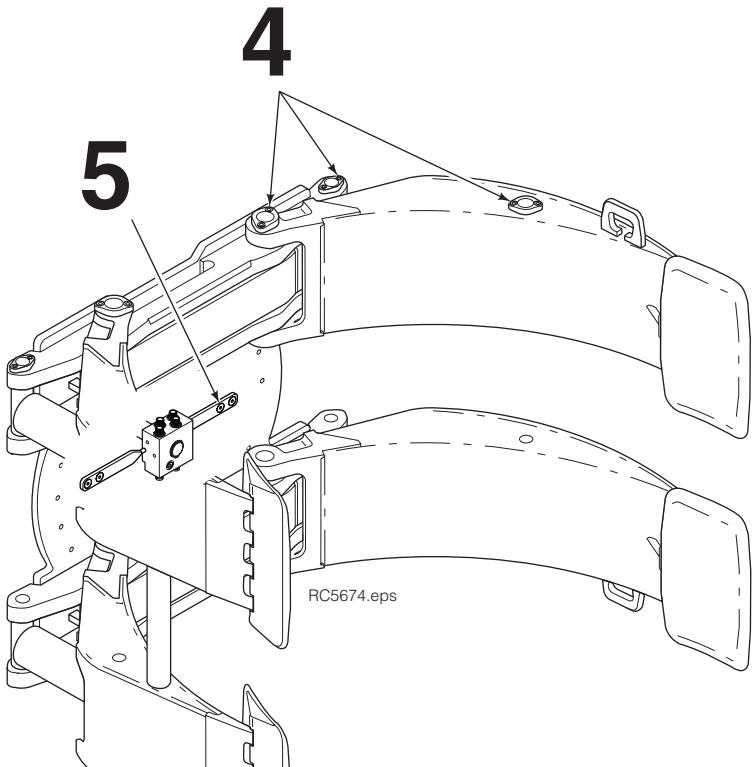
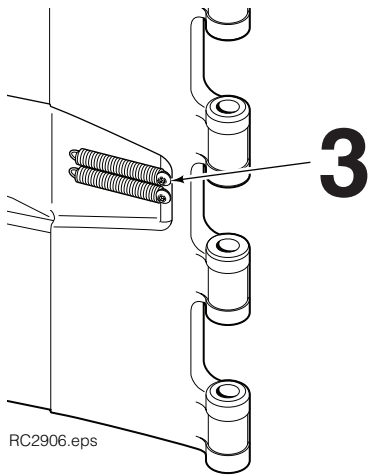
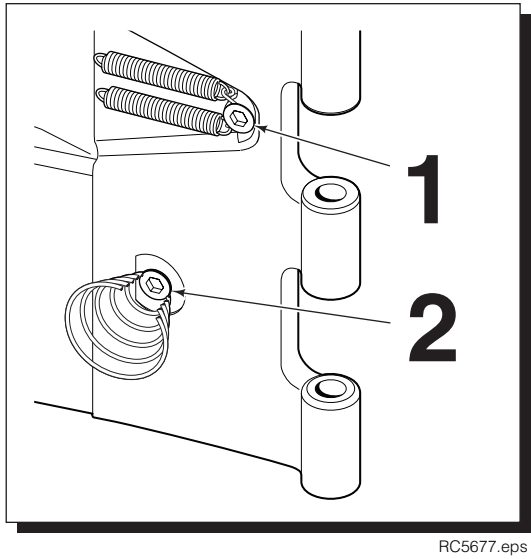
**NOTE:** All fasteners have a torque value range of ±10% of stated value.

### 5.4-1 All Attachments

#### All Attachments

Ref.	Fastener Location	Size	Ft.-lbs.	Nm
1	Arm Spring Capscrew	M6	5	7
2	Pad Spring Capscrew	M6	5	7
3	Arm Spring Button Head Capscrew ●	M4	3	4
4	Arm Retainer Hex Socket Capscrew	M10	28	38
5	Revolving Connection Support Bracket Capscrew	M10	32	42

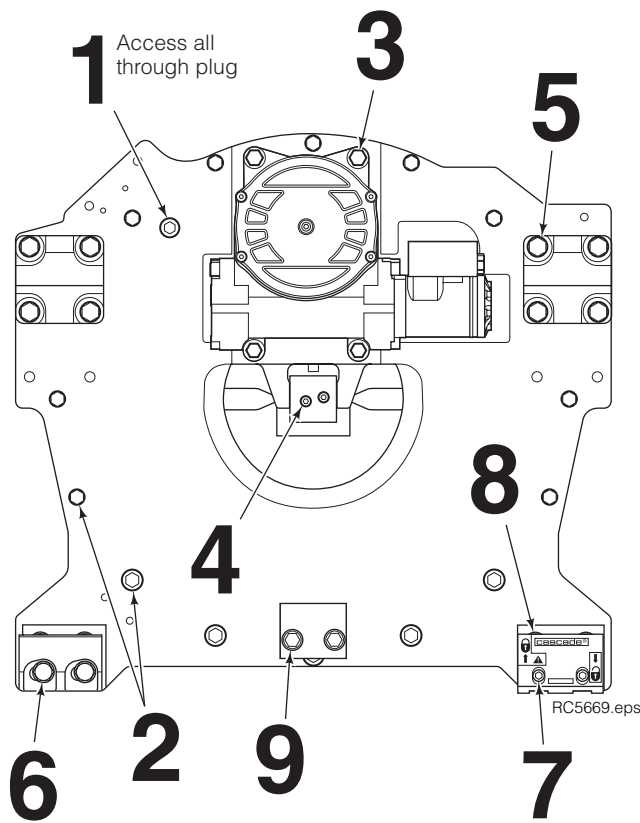
● Use Loctite 242 (Blue)



5.4-2 20H, 22H, 24H Attachments

Ref.	Fastener Location	Size	Ft. -lbs.	Nm
1	Bearing Capscrew ▲, 20H ●, 22H,24H ■	M12	80	110
2	Baseplate Capscrew ▲, 20H ●, 22H,24H ■	M12	66	90
3	Rotator Drive Capscrew	M12	48	66
4	End Block Capscrew	M8	31	42
5	Upper Hook Capscrew, Class II/III ●	M16	121	165
6	Lower Hook Capscrew, Class II/III ●	M16	121	165
7	Quick Disconnect Guide Capscrew ●	M16	121	165
8	Lower Spacer Capscrews ●	M16	121	165
9	Lower Center Spacer Capscrews ●	M12	48	65

- ▲ Double-Torque (tighten, loosen 1/2 turn, retighten)  
● Use Loctite 242 (Blue)  
■ Use Loctite 262 (Purple)



20H, 22H, 24H  
Back (Driver's) View

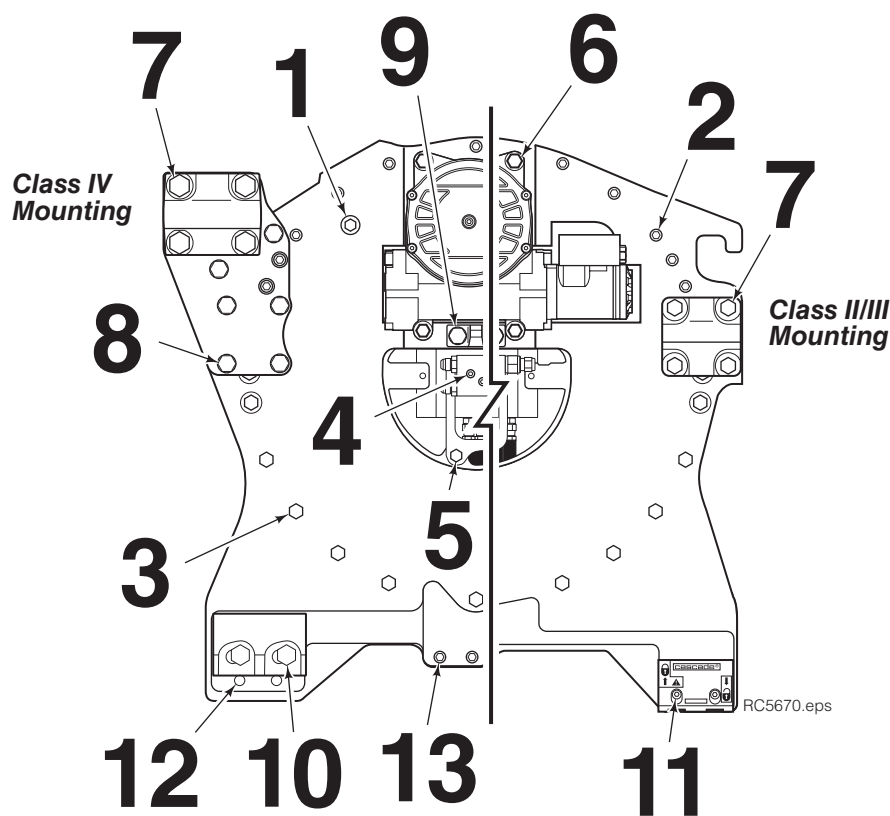
# SPECIFICATIONS

## 5.4-3 25H, 30H, 33H Attachments

Ref.	Fastener Location		Size	Ft.-lbs.	Nm
1	Bearing Capscrews ▲ ■		M12	80	110
2	Baseplate Capscrews, Socket Head ▲ ■		M12	80	110
3	Baseplate Capscrews, Hex Head ▲ ■		M12	66	90
4	End Block Capscrews		M8	31	42
5	Yoke Capscrew		M10	31	42
6	Rotator Drive Capscrew		M12	66	90
7	Upper Hook Capscrews	Class II/III	M16	121	165
		Class IV	M20	236	320
8	Upper Hook Spacer Capscrews		M16	121	165
9	Center Key Capscrews, Class III		M16	121	165
10	Lower Hook Capscrews	Class II/III	M16	121	165
		Class IV	M20	236	320
11	Quick Disconnect Guide	Class II/III	M16	121	165
		Class IV	M20	236	320
12	Lower Spacer Bar Capscrews		M12	77	105
13	Lower Center Spacer Capscrews		M12	77	105

■ Use Loctite 262 (Purple)

▲ Double-Torque (tighten, loosen 1/2 turn, retighten)



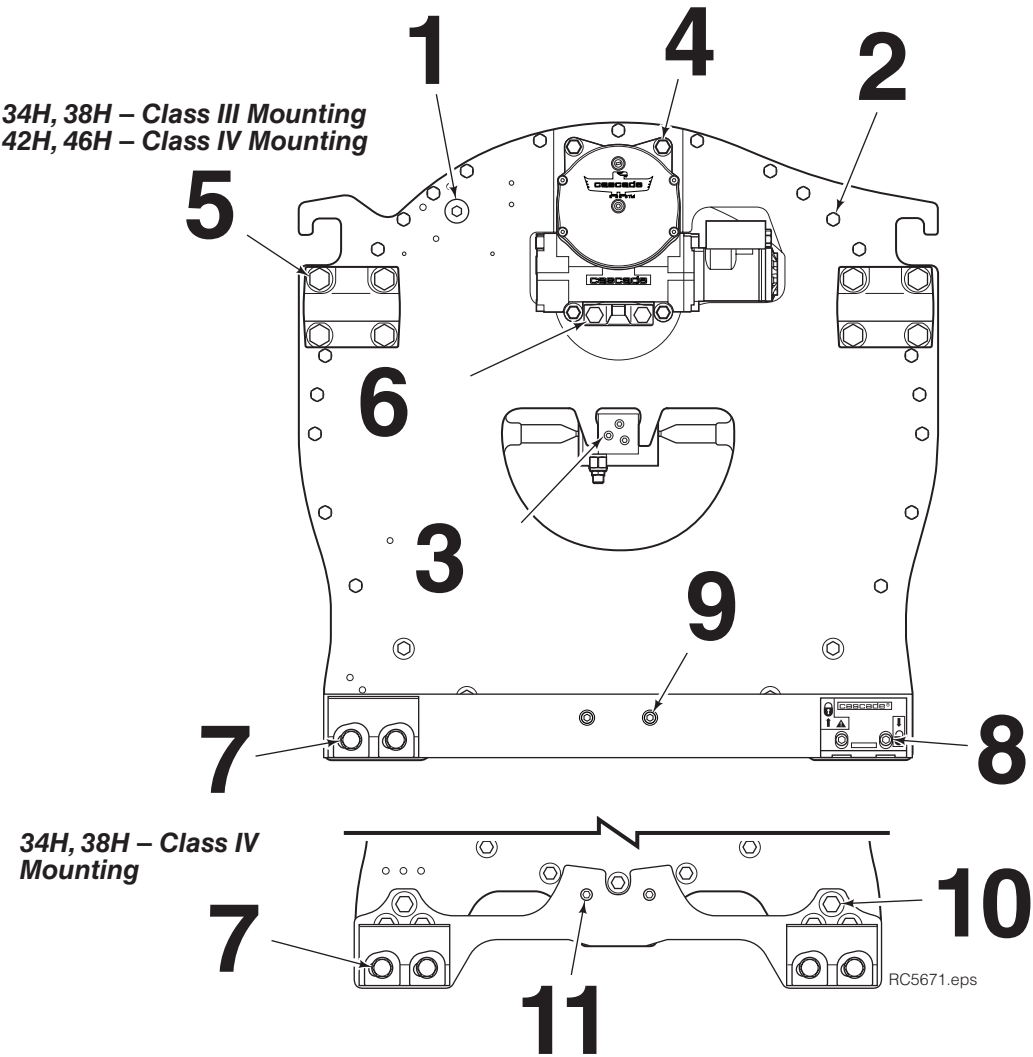
25H, 30H, 33H  
Back (Driver's) View

SPECIFICATIONS

5.4-4 34H, 38H, 42H, 46H Attachments

Ref.	Fastener Location	Size	Ft.-lbs.	Nm
1	Bearing Capscrews ▲ ■	M12	80	110
2	Baseplate Capscrews ▲ ■	M12	66	90
3	End Block Capscrews	M8	31	42
4	Rotator Drive Capscrew	M12	66	90
5	Upper Hook Capscrews	M20	200	270
6	Center Key Capscrews, Class III	M16	121	165
7	Lower Hook Capscrews	Class III M16	121	165
		Class IV M20	236	320
8	Quick Disconnect Guide	Class III M16	121	165
		Class IV M20	236	320
9	Lower Spacer Bar Capscrews	M12	77	105
10	Lower Spacer Bar Outer Capscrews	M16	122	165
11	Lower Spacer Bar Center Capscrews	M12	77	105

- Use Loctite 262 (Purple)
- ▲ Double-Torque (tighten, loosen 1/2 turn, retighten)





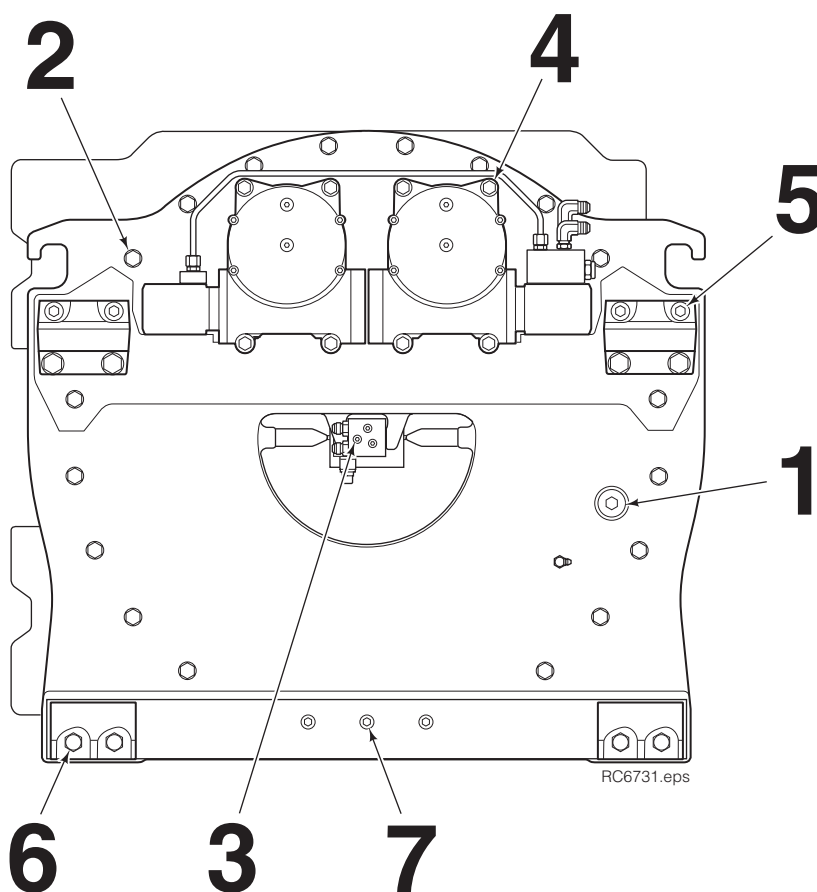
# SPECIFICATIONS

## 5.4-5 55H Attachments

Ref.	Fastener Location	Size	Ft.-lbs.	Nm
<b>1</b>	Bearing Capscrews ▲ ■	M16	202	274
<b>2</b>	Baseplate Capscrews ▲ ■	M16	166	225
<b>3</b>	End Block Capscrews	M8	31	42
<b>4</b>	Rotator Drive Capscrew	M12	66	90
<b>5</b>	Upper Hook Capscrews	M20	236	320
<b>6</b>	Lower Hook Capscrews	M20	236	320
<b>7</b>	Lower Spacer Bar Capscrews	M12	50	65

■ Use Loctite 262 (Purple)

▲ Double-Torque (tighten, loosen 1/2 turn, retighten)

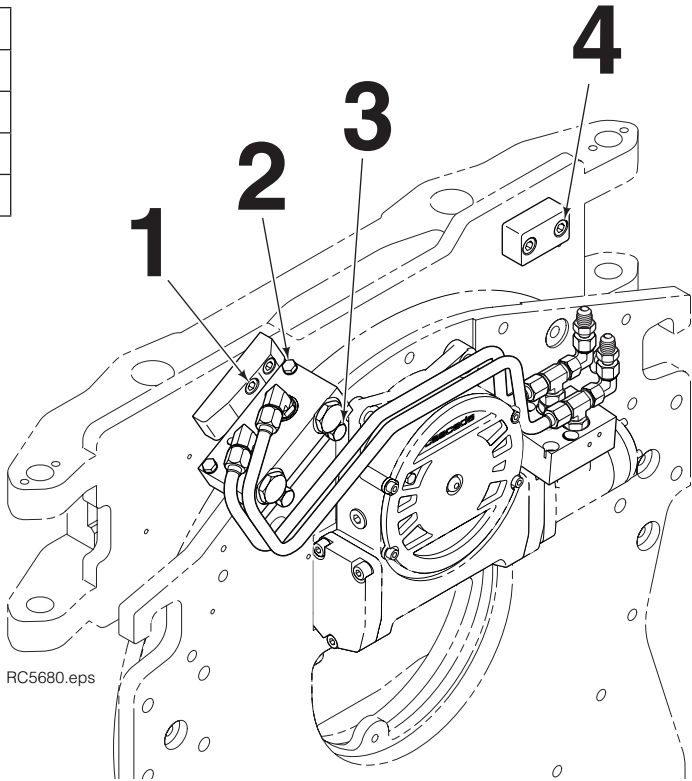


# SPECIFICATIONS

## 5.4-6 All Attachments With Hydraulic Rotational Control

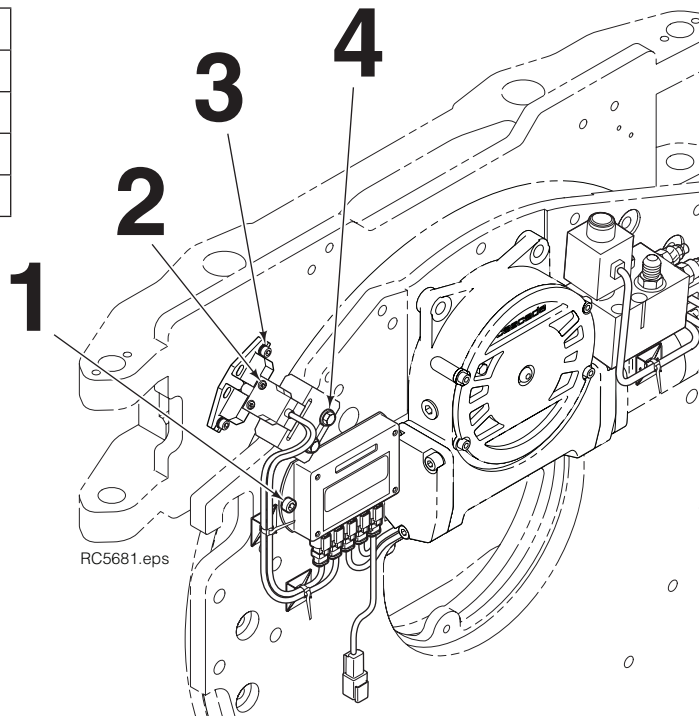
Ref.	Fastener Location	Size	Ft.-lbs.	Nm
1	Cam Capscrew ■	M12	77	105
2	Stop Valve Capscrew	M8	15	20
3	Mounting Bracket Capscrew ■	M12	77	105
4	Stop Block Capscrew ■	M12	80	110

■ Use Loctite 262 (Purple)



## 5.4-7 All Attachments With Electronic Rotational Control (ERC)

Ref.	Fastener Location	Size	Ft.-lbs.	Nm
1	Relay Capscrews	M6	3	4
2	Switch Capscrews	M5	3.5	4.5
3	Ramp Capscrews	M6	3	4
4	Mounting Bracket Capscrews	M8	15	20



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Call your nearest Cascade Service Department.

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