

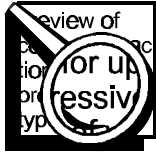
AC-02a

MAINTENANCE MECHANIC TRAINING

SKILL DEVELOPMENT GUIDE

Duty AC: Rotary Actuators
AC-02a: Rebuild Rotary Actuator

Issued 01/01/99



Task Preview

Rebuild Rotary Actuator

A Maintenance Mechanic rebuilds a rotary actuator when an Operator reports that the actuator has a lack of pressure for turning.

The rotary actuator is usually rebuilt in the shop or in an area near the pump location.

The procedure for rebuilding the rotary actuator is divided into three parts: disassembly, cleaning and inspection, and reassembly. During disassembly you will separate the three major components. You will remove the internal components, clean and inspect these components for serviceability, replace as necessary. These parts are reassembled in reverse order.

During the rebuild steps you will be required to handle cleaning solvents. Heavy industrial gloves and a respirator are the recommended protective equipment when cleaning pump components. Cleaning solutions must be disposed of per HAZMAT procedures.

How your skills will be checked

The Skill Check will require you to rebuild a rotary actuator. All tools, materials, and resources will be available. The Evaluator will verify that your demonstration meets the skill objective by observing or measuring each task standard. You must demonstrate safe work practices during the Skill Check. Contact your Evaluator when you are ready for the Skill Check.



Skill Objective

Given a repair ticket, rebuild a rotary actuator.

Task Standards

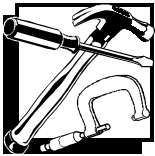
1. The rotary actuator must be rebuilt using the specified rebuild kit.
2. All endcap screws must have Loctite 242 applied.
3. All hex nuts must be torqued to 4550 inch-pounds.
4. The Teflon abutment seal must be cut diagonally on a 45-degree angle.
5. The bushing in both ends must be machined to match the wingshaft diameter, with a clearance of 0.001 to 0.003 inch.
6. All safe practices must be demonstrated.

What You Will Need

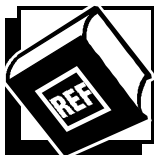
This section contains the safety information, tools, and resources you will need before rebuilding a rotary actuator.



- Follow all Caterpillar facility safety standards when performing this task.
- Wear heavy industrial gloves for protection against the hazards associated with the cleaning solvents.
- An explosion hazard exists with cleaning solvents. Smoking is not permitted in the cleaning area.
- Know the location of the MSDS for the cleaning solutions.
- Solvents must be disposed of according to the HAZMAT regulations.



- hammer and punch
- torque wrench (4550 inch-pounds)
- Maintenance Mechanic hand tools
- Loctite 242



- Hyd-ro-ac Overhaul Instructions & Parts List for Standard Models



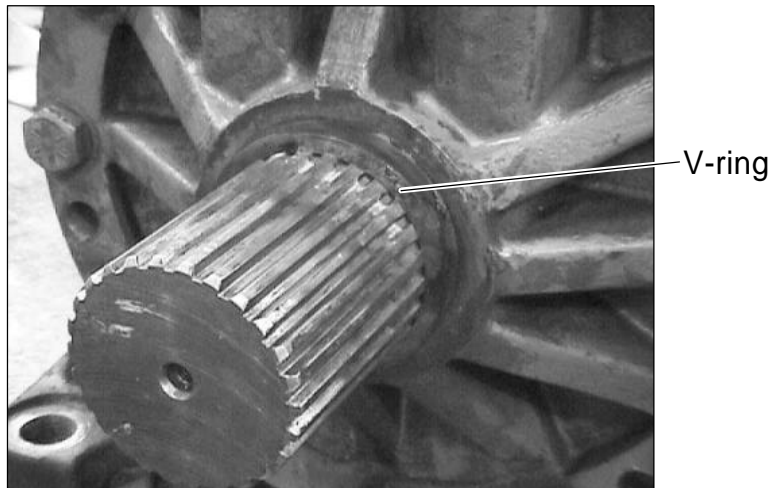
Task Steps

Rebuild Rotary Actuator

Note: The proper nomenclature for the end is End & Bushing Assembly. Throughout this task, any reference to the End & Bushing Assembly will mean end.

Disassemble the Rotary Actuator

1. Remove the V-ring from the shaft. See the figure below.

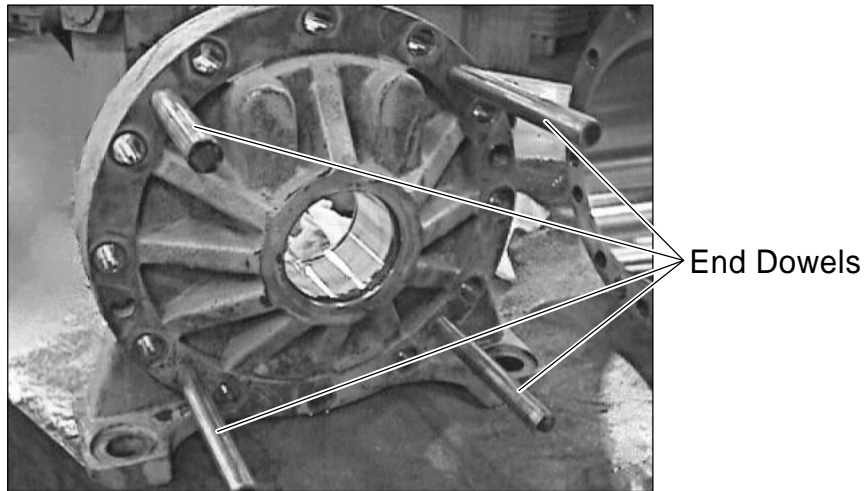


Note: Before disassembling the rotary actuator, remove the plug and drain the oil.

2. Remove the 12 end cap screws.

Note: Lay the actuator on its side before driving out the dowel pins from one side. Drive them through the end cap into the body.

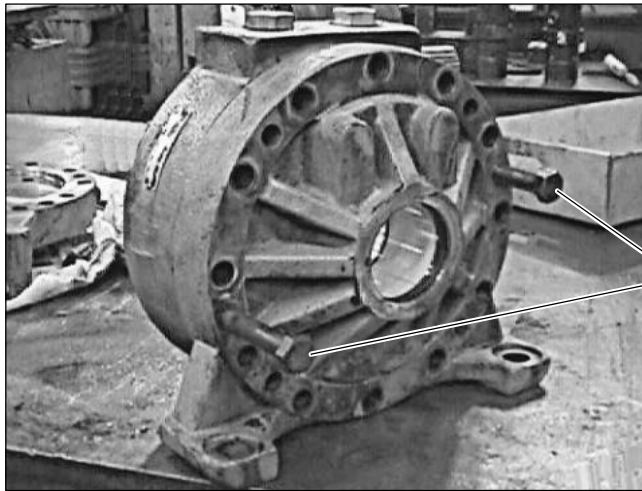
3. Remove the end dowels. See the figure below.



- Mark the end and body before disassembly to ensure that the dowel holes will align properly during assembly.
- Drive the four end dowels out from either end of the actuator.

4. Separate both ends from the body.

- Insert the spreader bolts into the threaded holes to separate one end from the body. See the figure below.



Spreader Bolts

- Remove the spreader bolts.
- Install an eyebolt to the end of the wingshaft. See the figure below.



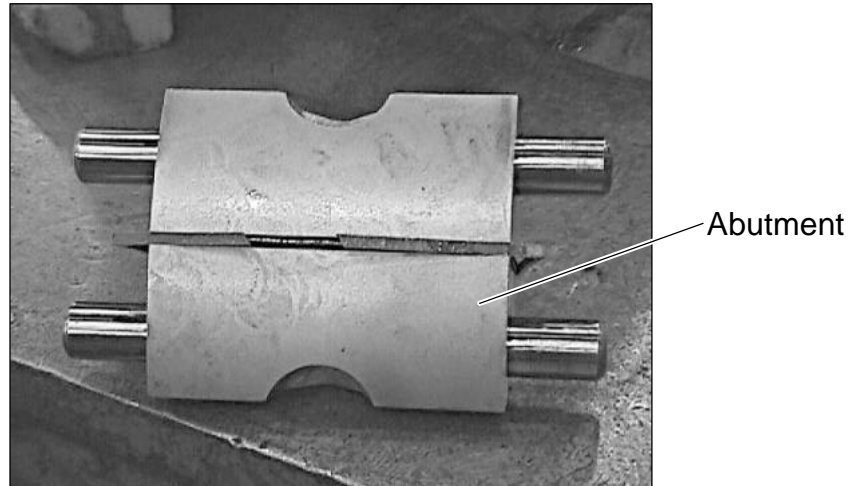
Single Vane
Wingshaft

Abutment

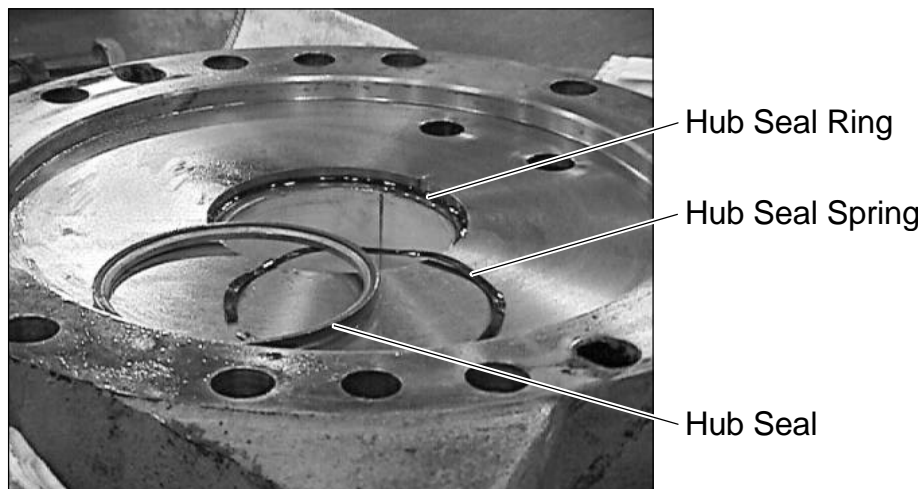
- Connect the hoist to the eyebolt and pull the wingshaft from the body with a straight, even pull.

Note: Do not allow the wingshaft to cock and break the sharp edges on the body causing internal leaking during operation.

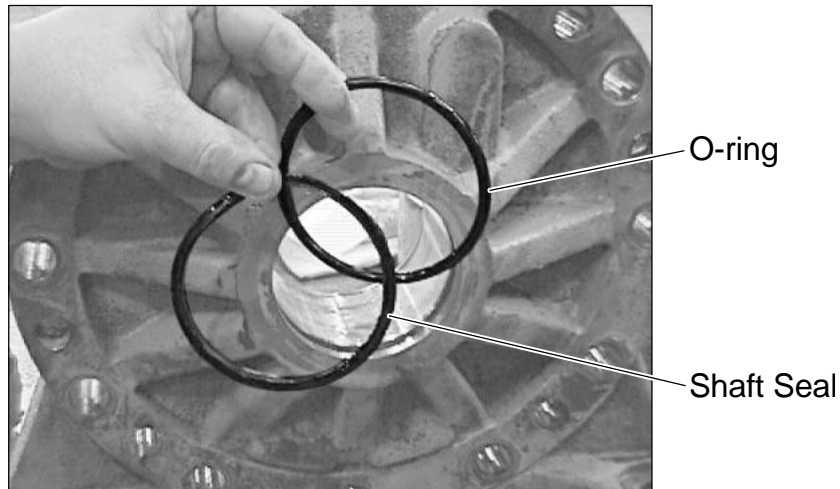
5. Remove the abutment. See the figure below.



- Turn the actuator over and drive the pins through the other end cap.
 - Insert the spreader bolts into the threaded holes to separate the other end from the body.
 - Remove the spreader bolts.
6. Remove the hub seal ring, hub seal spring, and the hub seal from inside both ends. See the figure below.



7. Remove the O-ring and shaft seal from the outside of both ends. See the figure below.



8. Remove the bushing from both ends. See the figure below.



- Use a die grinder with a rotary file to cut the bushing.

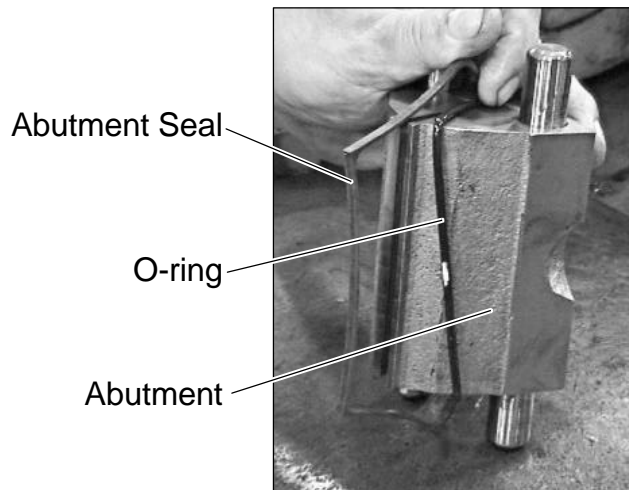
9. Remove the "C" type wingshaft vane seal and vane seal gasket from the wingshaft. See the figure below.



"C" type Wingshaft
Vane Seal

Vane Seal Gasket

10. Remove the abutment seal and O-ring packing from the abutment. See the figure below.



Abutment Seal

O-ring

Abutment

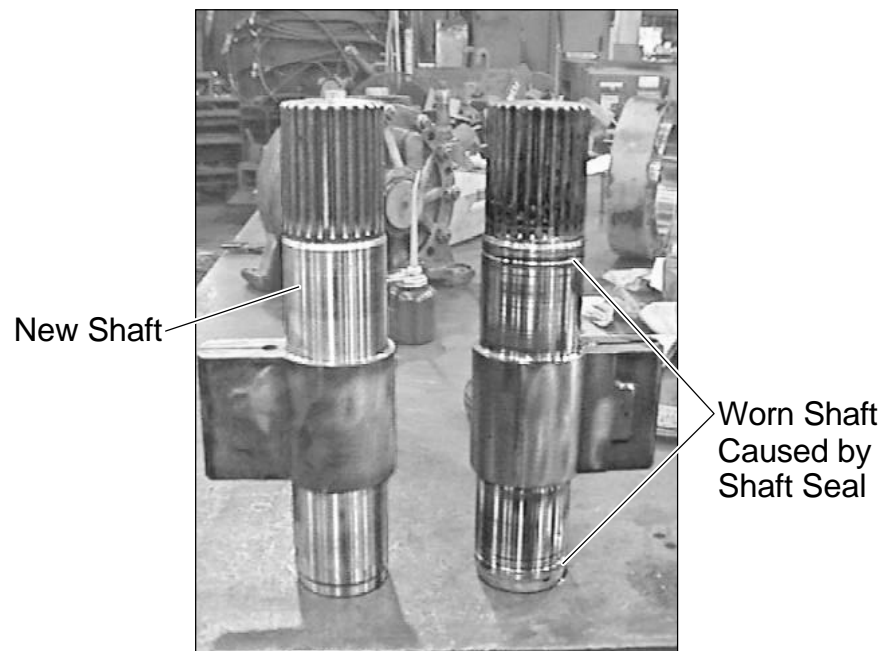
11. Remove the O-ring packing from both sides of the body. See the figure below.



12. Clean all parts.

Inspect the Parts

1. Inspect the polished surfaces of the wingshaft for cracks, nicks, scratches, and worn serration. See the figure below.

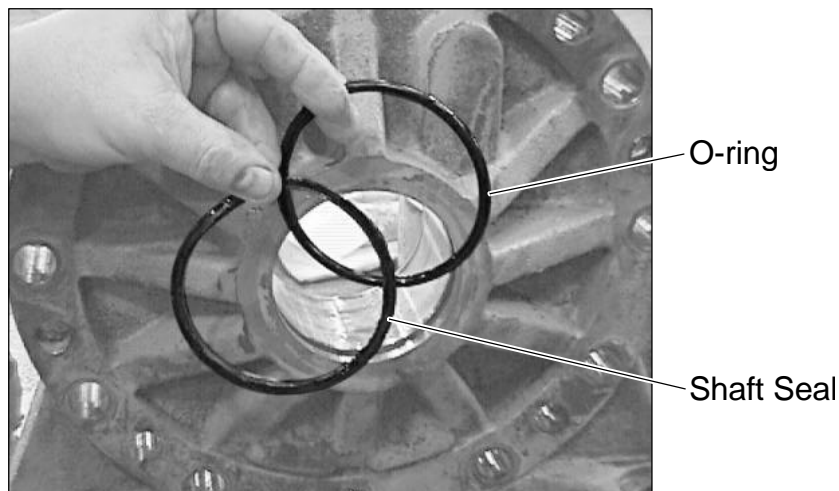


2. Inspect the polished surface of the end and bushing assemblies for cracks, nicks, and scratches.
3. Inspect the polished surface of the body for cracks, nicks, and scratches.
4. Inspect the abutment for cracks, nicks, and scratches.

Reassemble the Rotary Actuator

Note: Lubricate all O-rings sparingly with petroleum jelly or other suitable lubricant compatible with the O-ring material and hydraulic fluid being used.

1. Install the bushings into the ends.
 - Pack the bushings in dry ice to shrink them so they don't damage the machined surface.
 - Ask the Machinist to machine the bushing to match the wingshaft diameter, with a diametral clearance of 0.001 to 0.003 inches.
2. Install shaft seal and O-ring packing shaft seal in the outside of the both ends. See the figure below.

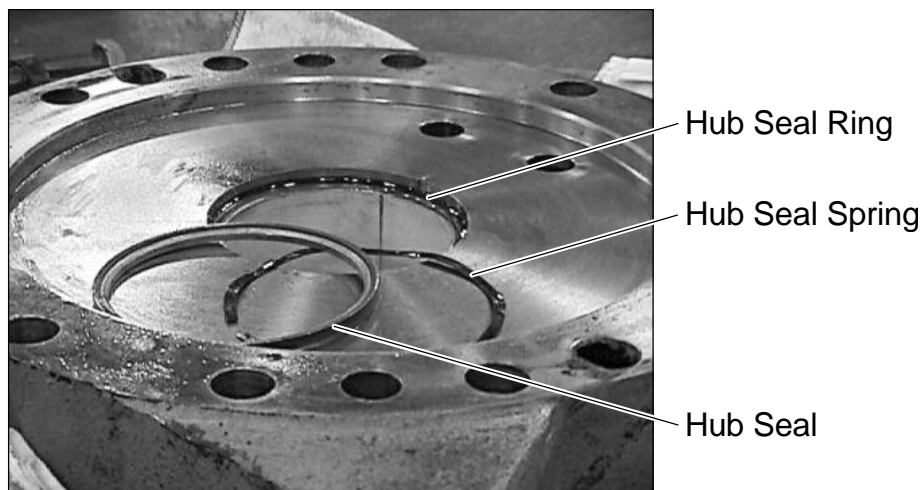


- Place the end on a flat surface with the polished surface down.
- Lubricate and install the seal and O-ring.
- Ensure that there are no ripples and wrinkles in the seal and O-ring.

3. Turn the end over so the polished surface faces up.
4. Lubricate and place the end O-ring packing to the outer lips of both sides of the body. See the figure below.



5. Lubricate and install the hub seal ring, hub seal spring, and hub seal in the inside of the end. See the figure below.

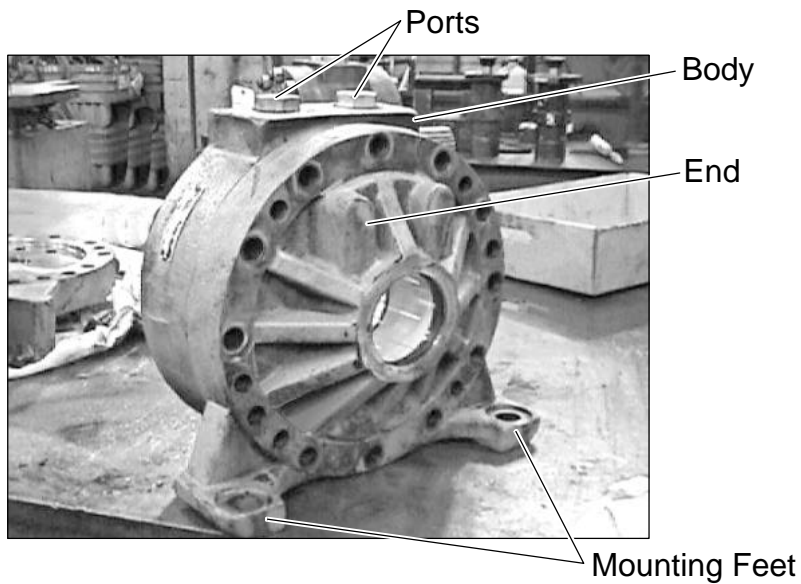


Ensure that there are no ripples and wrinkles hub seal ring and seal.

Note: The hub seal is free to move axially under pressure of the hub seal spring.

6. Align the body with the end.

- Ensure that the ported side of the body is pointing in the opposite direction of the mounting feet of the end. See the figure below.

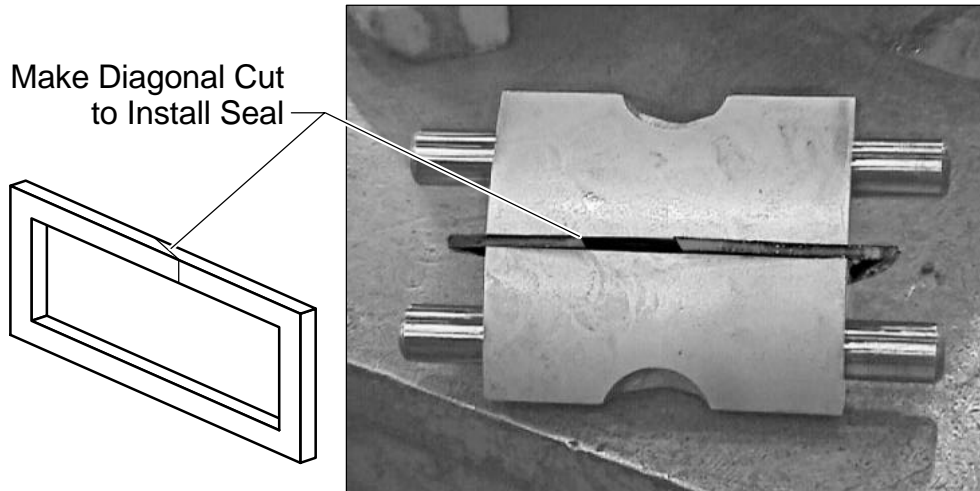


7. Lubricate the seals to hold them in position with petroleum jelly.

8. Install the abutment seal.

- Stretch the abutment seal O-ring packing around the abutment, and seat it in the abutment groove.

- Use a razor blade and make a centrally located diagonal cut (45 degrees) through the side of the Teflon abutment seal. See the figure below.

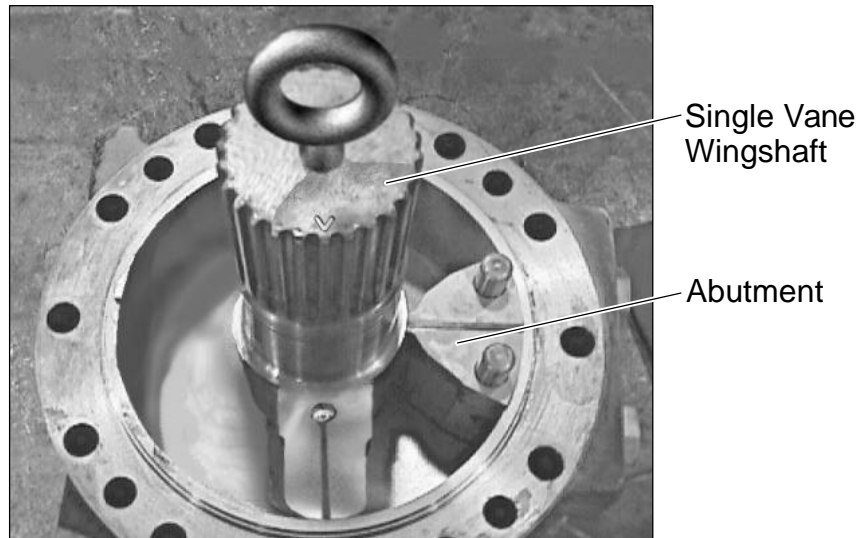


- Place the abutment seal in position.

Note: The diagonal cut must be on the side of the abutment, next to the body.

- Apply liberal amounts of lubricant to the abutment seal.
9. Install the wingshaft.
- Install the vane seal gasket and the “C” type wingshaft vane seal on the wingshaft.
 - Insert the wingshaft with the spline end up.

- Ensure that the V indicator is pointing 90 degrees away from the abutment. See the figure below.



Warning: Do not allow the vane seal gasket to be scratched, cut, or shaved when installing the wingshaft to prevent internal leakage during operation.

10. Install the abutment.

- Install the abutment dowels, if removed, in the abutment.
- Ensure that the abutment seal is not cut, shaved, or scratched, because this will cause internal leakage.

11. Install the other end.

- Turn the end over with the polished surface facing up.
- Lubricate and install the hub seal spring, hub seal ring, and hub seal in the inside of the end.
- Ensure that there are no ripples and wrinkles.

Note: The hub seal is free to move axially under pressure of the hub seal spring.

- Apply liberal amounts of lubricant to the hub.
- Align the end with body.

12. Turn the actuator upright as you position the end over the body.

Note: Do not cut any seals when closing the ends and body together.

13. Install the dowels pins.
14. Install the screws.
 - Apply blue Loctite 242 to the screw threads.
 - Tighten all nuts lightly before torquing.
 - Torque the nuts to 4550 inch-pounds (379 ft. lbs.).
 - Use a star pattern when torquing the nuts.
15. Follow the test procedures as outlined in the Hyd-ro-ac Overhaul Instructions & Parts List for Standard Models manual.



Concept Check

Rebuild Rotary Actuator

Answer the following questions to check your understanding of rebuilding a rotary actuator. Circle the correct answer in each question. Then compare your responses with the answers at the bottom of this page. Some of the questions may have more than one correct answer. If you have difficulty answering a question, review the Skill Development Guide or ask your Trainer for assistance.

1. What is the torque value for the hex nuts which holds the rotary actuator together?
 - a. 4000 inch-pounds
 - b. 4500 inch-pounds
 - c. 4550 inch-pounds
 - d. 5000 inch-pounds

2. Use a razor blade and make a centrally located cut (_____ degrees) through the side of the Teflon abutment seal.
 - a. 22.5
 - b. 45
 - c. 90

3. When installing the wing shaft, the 'V' indicator is _____ in relationship to the abutment.
 - a. 180 degrees
 - b. 135 degrees
 - c. 90 degrees
 - d. 45 degrees

Answers: (1. c 2. b 3. c)

Next Step

If you are ready to demonstrate the task now, ask your Evaluator or Trainer to schedule the Skill Check. However, if you need to practice some of the steps first, continue to the next section.



Practice

The following practice will help prepare you for the Skill Check. Ask your Trainer to set up the practice for you. After you complete a practice, ask your Trainer to check your work.

Practice 1

Your Trainer will designate a rotary actuator for the rebuilding activity. You will be asked to select the required repair kit. During this practice you will:

- disassemble the rotary actuator
- clean and inspect the actuator components
- reassemble the rotary actuator

Your Trainer will observe as you reassemble the rotary actuator to ensure that the rotary actuator is assembled properly. You are required to follow all the recommended safe practices associated with handling cleaning solvents. All cleaning solutions must be disposed of per HAZMAT regulations.

Practice Objective 1

The rotary actuator must be rebuilt using the specified rebuild kit. All endcap screws must have Loctite 242 applied. All hex nuts must be torqued to 4550 inch-pounds. The Teflon abutment seal must be cut diagonally on a 45-degree angle. The bushing in both ends must be machined to match the wingshaft diameter, with a clearance of 0.001 to 0.003 inch. All safe practices must be demonstrated.

Next Step

Continue to practice until you are ready for the Skill Check. When you are ready to demonstrate the task, ask your Evaluator or Trainer to schedule the Skill Check.