

# A-07b

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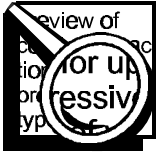
## MAINTENANCE MECHANIC TRAINING

### SKILL DEVELOPMENT GUIDE

**Duty A: Pumps (Not Hydraulic)**

**A-07b: Rebuild Pump (Graco Displacement)**

Issued 06/01/98



## Task Preview

### Rebuild Pump (Graco Displacement)

A Maintenance Mechanic rebuilds a Graco displacement pump when:

- the pump stalls during operation or
- when the pump leaks around the packing.

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

Several different rebuild kits are available for the Graco pump. The kit required for the rebuild task is based on the pump application. A pump used for a water application requires a rubber kit; a pump used for a paint application uses a neoprene kit. Selecting the correct pump kit is critical to pump operation.

During reassembly, it is important to properly install the ball valves. One of the two ball valves is a “vented” valve. Proper installation is critical to the operation of the pump. The pump will not vent properly if the vented ball seat is not installed in the port designated for the vented ball seat.

You will be required to handle cleaning solvents during the rebuild steps. Heavy industrial gloves and a respirator are the recommended protective clothing 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 Graco displacement pump. 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 defective Graco displacement pump, rebuild the pump.

### Task Standards

1. The pump must be reassembled using the specified parts.
2. The packing nut must be torqued to 51.66 ft-lb (70n/m).
3. The vented ball seat must be seated as designated by the warning tag on the pump.
4. All cleaning solutions must be disposed of per HAZMAT regulations.
5. 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 Graco displacement pump.

### **SAFETY FIRST**

**DON'T TAKE  
CHANCES**

- Follow all Caterpillar facility safety standards when performing this task.
- When working in the paint area, wear heavy industrial gloves and a respirator fitted with charcoal filter for protection against the hazards associated with the cleaning solvents.
- An explosive hazard exists with cleaning solvents. Smoking is not permitted in the paint or cleaning areas.
- Know the location of the MSDS for the cleaning solutions.
- Solvents must be disposed of according to the HAZMAT regulations.



- blue loctite
- tank of solvent and solvent tray for cleaning parts
- tray with putty knife
- wire brush
- 13mm wrench
- 13/16" wrench
- torque wrench
- channel locks
- soft mallet
- vise
- defective Graco 220-547 Displacement Pump

- rebuild kit
- Cabot Seal assembly lubricant



- Graco Parts Manual



## Task Steps

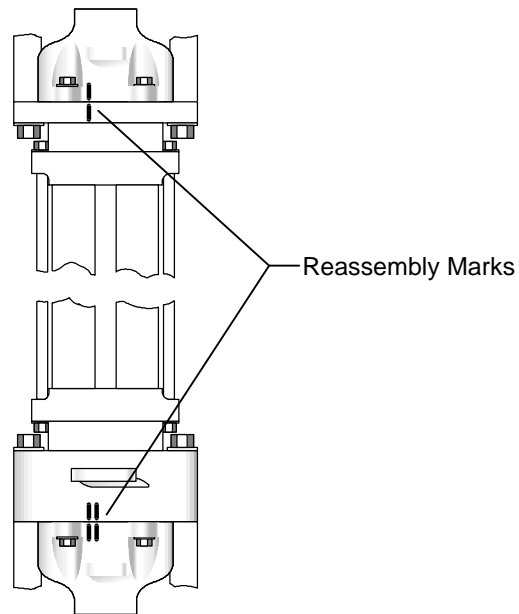
### Rebuild Pump (Graco Displacement)

**Warning:** A heavy grade of industrial rubber gloves must be worn to protect skin from harmful solvents. When working in a paint area, wear a respirator fitted with a charcoal filter.

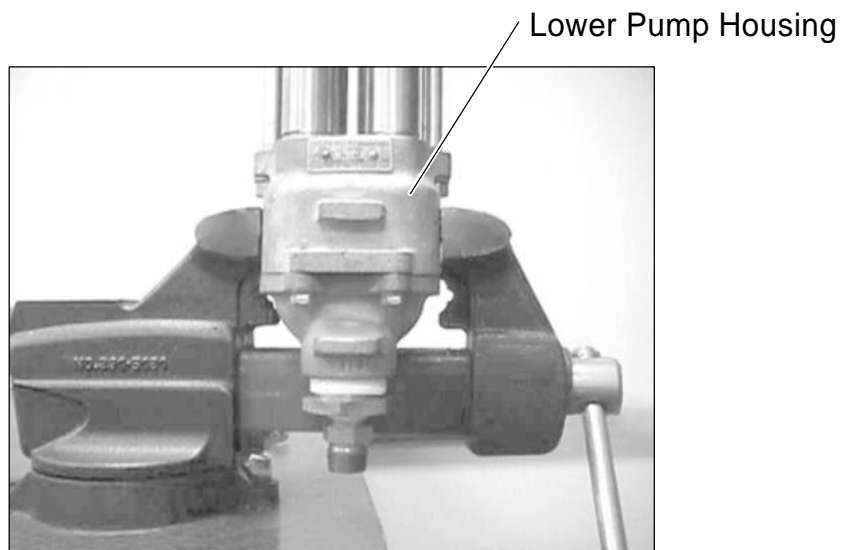
#### Disassembly

1. Obtain the specified repair kit.
  - Select a neoprene kit for a paint application; select a rubber kit for a non-paint application.
  - Refer to the Graco Parts Manual for the appropriate repair kit part.
2. Clean the pump.
  - Soak the pump in solvent. If possible, soak the pump in the cleaning tub for at least 24 hours. This soaking period helps dissolve the paint from the housing.
  - Use a wire brush, putty knife or other tools, as necessary, to remove remaining paint.
  - Clean all tools after use.

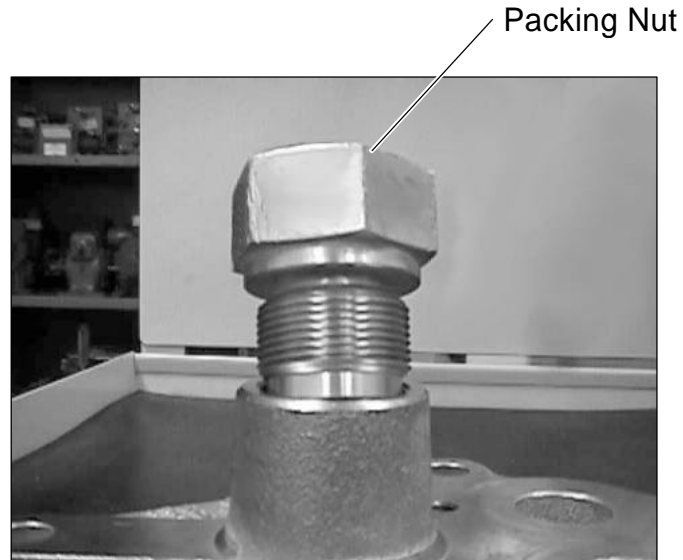
3. Mark the pump housing components to help ensure proper reassembly. See the figure below.



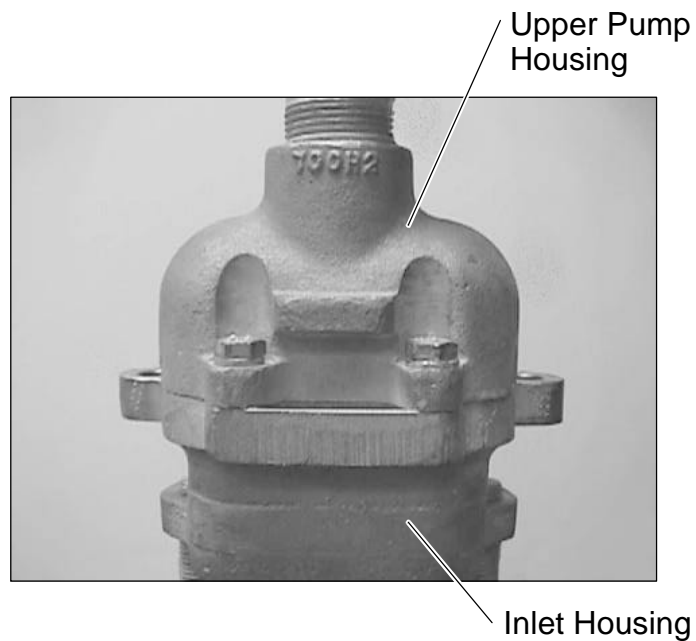
4. Mount the pump in the vise. Position the pump lower housing in the vise jaws, as shown below.



5. Remove the packing nut from the pump upper housing. See the figure below.

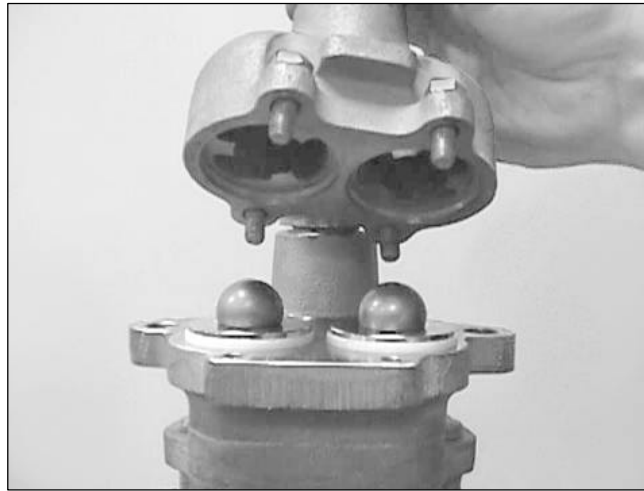


6. Using a 13mm wrench, remove the four M8 x 1.25 x 25 cap screws securing the inlet housing to the upper pump housing. See the figure below.

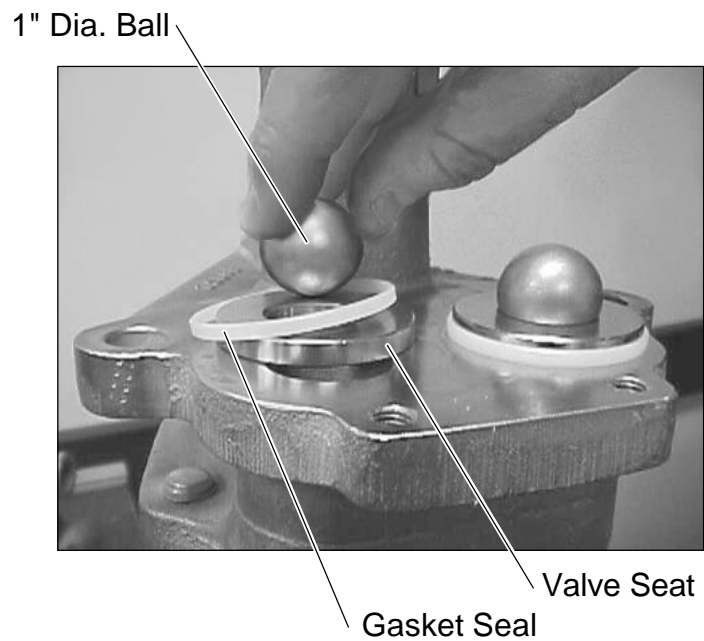




7. Remove the upper pump housing. Clean the housing, as necessary. See the figure below.

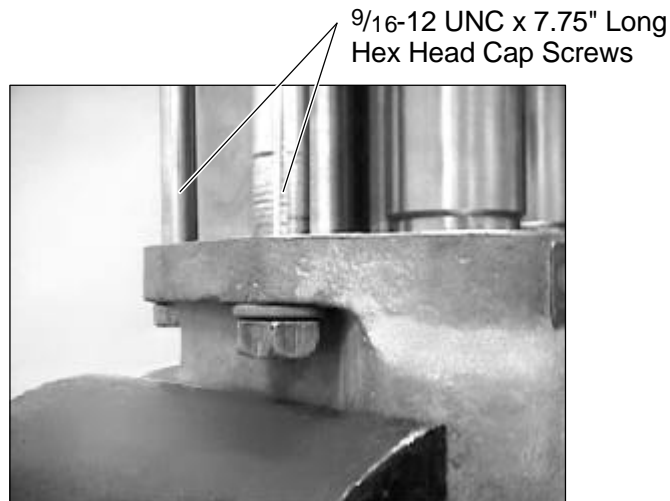


8. Remove the two 1" diameter metal balls, valve seats, and gasket seals. See the figure below.

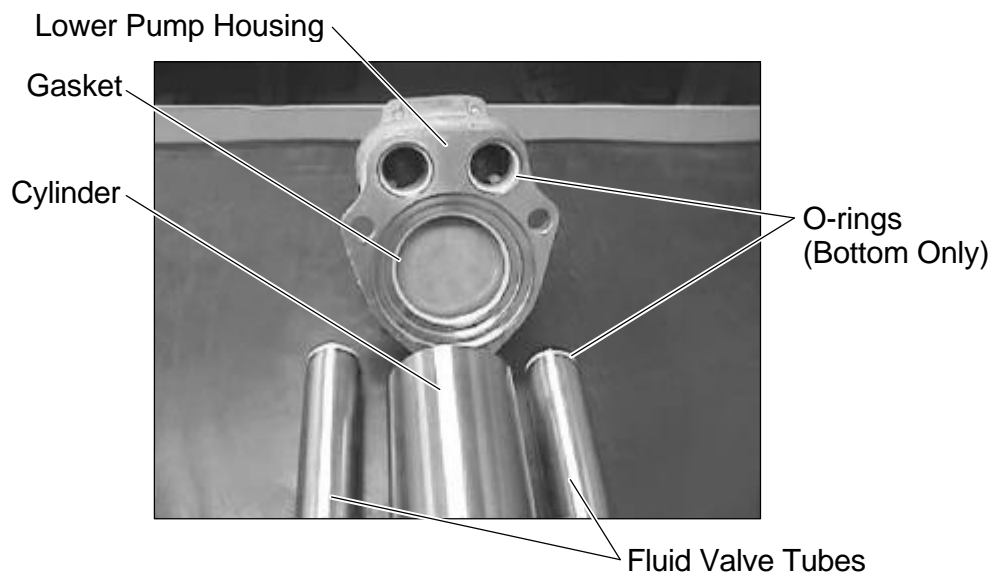


9. Disassemble the upper and lower pump housings.

- Using a 13/16" wrench, remove the three 9/16-12 UNC x 7.75" cap screws. Reposition the pump in the vice, as necessary, to provide clearance for cap screw removal. See the figure below.



- Using a soft mallet, tap the underside of the upper pump housing to break the upper housing loose from the lower housing. Paint around the cylinder and two fluid tubes may cause the upper and lower housing to stick together.
- Clean the parts and set aside. See the figure below.



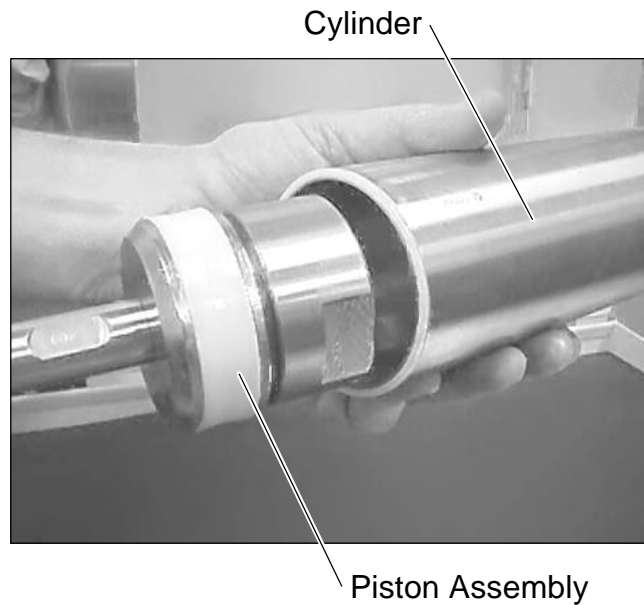
- ❑ Remove the o-rings from the fluid tube seats in the lower pump housing.
- ❑ Remove the o-rings from the fluid tubes and discard. See the figure below.



10. Remove the v-packing, female gland, and male gland. See the figure below.

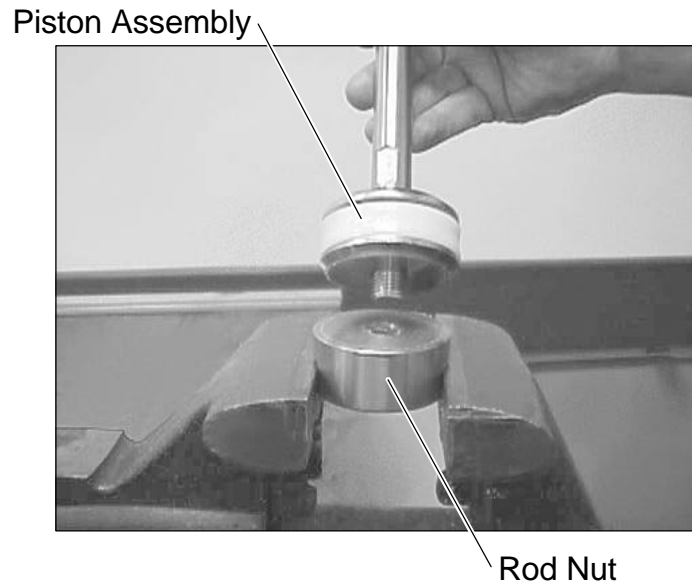


11. Remove the piston from the cylinder. See the figure below.

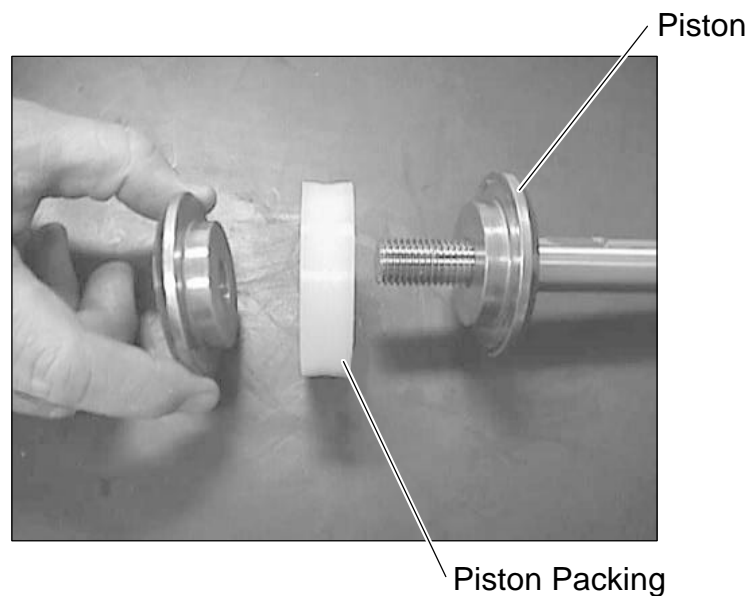


- Remove the gaskets from the top and bottom of the cylinder.
  - Check the cylinder for wear. If wear or grooves are visible, replace the cylinder.
12. Disassemble the piston rod from the rod nut.
- Secure the piston assembly in the vice. Clamp the vice jaws around the rod nut.

- Unscrew the piston rod from the rod nut. See the figure below.



13. Disassemble the piston rod from the piston packing. See the figure below.



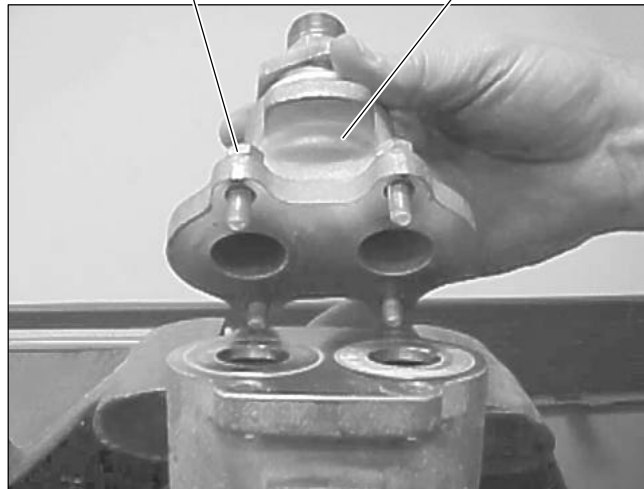
14. Remove the rod nut from the vise.

15. Remove the intake housing from the lower pump housing.

- Secure the lower pump housing in the vise.
- Using a 13mm wrench, remove the four cap screws. See the figure below.

M8 x 1.25 x 25 mm Long  
Hex Head Cap Screws

Intake Housing



- Refer to the Warning tag for vented seat replacement.



16. Remove the ball valve seats and seat gaskets.
- Note which ball valve seat is vented. The vented seat has a small vent hole. The vented valve must be placed over the same port during reassembly. See the figure below.



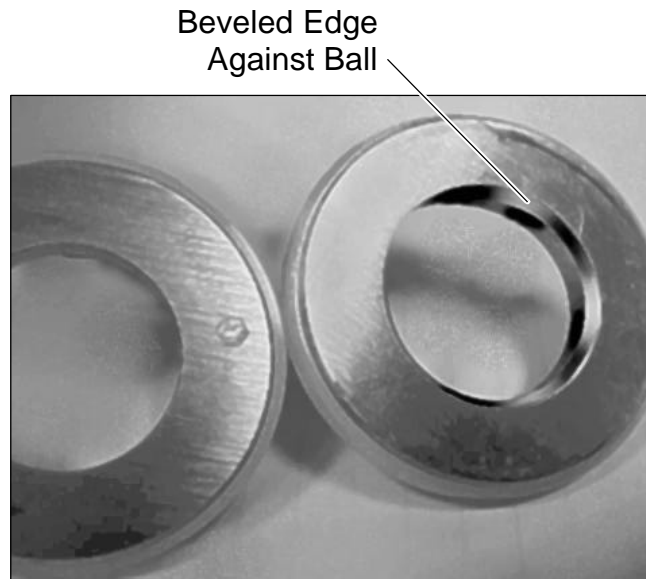
- Remove the two 1 1/4" metal balls.
  - Inspect all pump parts for residual paint, and clean as needed. All parts must be clean before starting reassembly.
  - Inspect all balls and ball seats for nicks or wear. Replace parts as necessary.
17. Dispose of all cleaning solutions per the Hazmat regulations.

### Reassembly

**Note:** If the reassembly steps require the use of a lubricant, apply as little as possible if the pump is used in a paint application. Excess lubricant can leak into the paint system causing contamination.

1. Place the 1 1/4" metal balls into the lower pump housing.
2. Install the valve seats and the new gaskets.

- Install the valve seat with the beveled edge towards the ball. See the figure below.



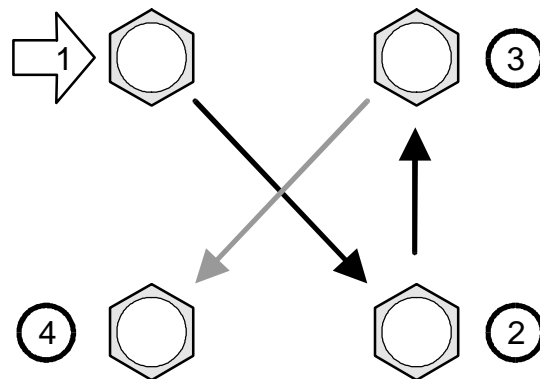
- Install the valve seats. To ensure proper pump operation, the vented valve seat must be installed in the port designated by the red arrow shown on the pump tag. See the figure below.





3. Mount the lower intake to the lower pump housing.

- Replace the cap screws and tighten wrench-tight. Tighten the cap screws in a criss-cross pattern. See the figure below.



- Remove the pump from the vise.

4. Reassemble the piston.

- Place new packing between the piston halves, then slide the piston halves onto the piston rod.
- Apply a drop of blue loctite to the inside surface of the piston nut. Secure the nut in the vise.
- Screw the piston rod assembly into the nut and tighten wrench-tight.

5. Mount the cylinder and two fluid tubes on the lower pump housing.

- Install the three 7 3/4" long cap screws into the housing.
- Clamp the lower pump housing in the vise.
- Slide the piston into the cylinder approximately half way into the cylinder.
- Apply a small amount of Cabot Seal assembly lubricant to the piston packing.
- Apply a small amount of Cabot Seal assembly lubricant to the new gaskets. Slip the gaskets onto the ends of the cylinder.
- Position the cylinder on the seat of the housing. Be careful when positioning the cylinder; the gaskets can easily be knocked out of position and create an improper fit.

- Apply assembly lubricant on the o-rings, and install the new o-rings in the end grooves of the two fluid tubes.
  - Check to ensure that the o-rings are seated in the fluid tube seats of the lower housing. Failure to install any of the o-rings will result in leakage and insufficient pressure during operation.
  - Install the fluid tubes in the lower housing.
6. Replace the top housing.
- Carefully lower the housing onto the cylinder and fluid tubes. As you lower the housing, ensure that the gasket on the top of the cylinder remains in place.
  - Start by hand, then tighten the three 7 3/4" long cap screws wrench-tight. Tighten in a uniform pattern.
7. Assemble the outlet housing and upper pump housing.
- Place the two 1" balls inside the outlet housing.
  - Install the valve seats. Check to ensure that the beveled side of the valve seat faces the ball. Install the valve seat gaskets.
  - Place the pump outlet housing on the upper pump housing.
  - Install the four M8 x 1.25 x 25 cap screws. Tighten the cap screws wrench-tight in uniform pattern.

8. Install the throat packing.

- Install the v-packing between the male and female glands.
- Slip the v-packing assembly into the stuffing box and over the piston rod with the v-shape facing down (male gland first). Slide the assembly all the way down the piston rod until it is seated in the throat-packing chamber. See the figure below.



Male Gland,  
V-packing, and  
Female Gland

Throat Packing Chamber

9. Replace the packing nut.

- Screw the packing nut onto to the upper pump housing stuffing box. Torque the packing nut to 51.66 ft-lb (70n/m).

10. Clean and store all tools.

11. Document the work history.



## Concept Check

### Rebuild Pump (Graco Displacement)

Answer the following questions to check your understanding of rebuilding a Graco displacement pump. 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. During reassembly blue loctite must be applied to the:
  - a. upper housing cap screw threads.
  - b. lower housing cap screw threads.
  - c. piston nut threads.
2. Which of the following fasteners has a torque specification?
  - a. packing nut
  - b. intake housing cap screws
  - c. lower pump housing cap screws
  - d. upper pump housing cap screws
3. Failure to seat the \_\_\_\_\_ on the fluid tubes in the lower housing will result in leakage and insufficient pressure during operation.
  - a. o-rings
  - b. gaskets
  - c. seals
  - d. ball valves
4. During reassembly it is important that the \_\_\_\_\_ side of the valve seat faces the ball.
  - a. square
  - b. beveled

Answers: (1. c 2. a 3. a 4. b)

## 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

Your Trainer will designate a pump for the rebuilding activity. You will be asked to select the required repair kit based on the pump application. During this practice you will:

- disassemble the pump
- clean the pump components
- reassemble the pump

Your Trainer will observe as you reassemble the pump to ensure that the pump 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

Pump must be reassembled using the specified parts. Packing nut must be torqued to 51.66 ft-lb (70n/m). The vented ball seat must be seated as designated by the warning tag on the pump. Cleaning solutions must be disposed of per regulatory procedures. 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.