

AJ-01

MAINTENANCE MECHANIC TRAINING

SKILL DEVELOPMENT GUIDE

Duty AJ: Air Motors

AJ-01: Rebuild Air Motor (Graco Bulldog)

Issued 06/01/98



Task Preview

Rebuild Air Motor (Graco Bulldog)

A Maintenance Mechanic rebuilds a Graco Bulldog air motor when an Operator reports that the valves are sticking or the gaskets are blown.

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

The steps for rebuilding the air motor are divided into two parts: disassembly and reassembly. During disassembly you will remove the air motor shield, detent housing, air manifolds, air motor cylinder, and piston. These parts are reassembled in reverse order.

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 Bulldog air motor. 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 request to rebuild a Graco Bulldog air motor, rebuild the air motor.

Task Standards

1. The air motor must be reassembled using the specified parts.
2. All fasteners must be secured wrench-tight.
3. The distance from the top face of the nut to the top of the trip rod must be .031 inch, when checked with a caliper.
4. The air motor shield inlet hole must be aligned with the unplugged air manifold port.
5. All cleaning solutions must be disposed of per HAZMAT regulations.
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 Graco Bulldog air motor.

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 explosion 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.



- Amogel assembly lubricant
- blue loctite
- tank of solvent and solvent tray for cleaning parts
- tray with putty knife
- wire brush
- 1 1/4" wrench or 1 1/4" deep well socket (1/2" drive)
- 1" socket (1/2" drive)
- 7/16" wrench
- 7/8" wrench
- 3/4" wrench
- 9/16" wrench

- 1/2" drive ratchet
- air impact wrench (1/2" drive)
- rebuild kit
- vice
- caliper
- hammer



- Graco Bulldog Air Motor Operator's Manual



Task Steps

Rebuild Air Motor (Graco Bulldog)

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.**
 - Refer to the Graco Bulldog Air Motor Operator's Manual for the appropriate repair kit part. The pump is shown below.



Graco Bulldog Air Motor

2. Remove the three pump mounting rods and the air motor pump coupling. See the figure below.



3. Using a 1 1/16" open end wrench, remove the 90° adapter union from the air supply. See the figure below.



90° Adapter Union

4. Remove the lift ring from the detent housing.

- Tap the ring with a hammer to start unthreading the ring from the detent housing. Remove the lift ring. See the figure below.



5. Remove the air motor shield.

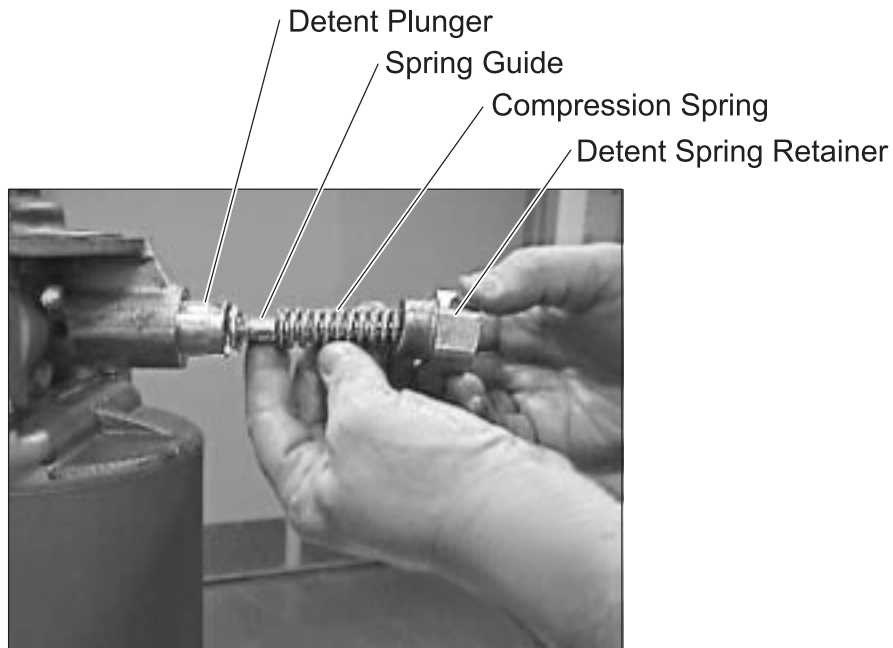
- Using a 7/16" wrench, remove the eight 1/4-20 x 1/2 cap screws. See the figure below.



- Lift the motor shield off the detent housing.

6. Remove the detent housing.

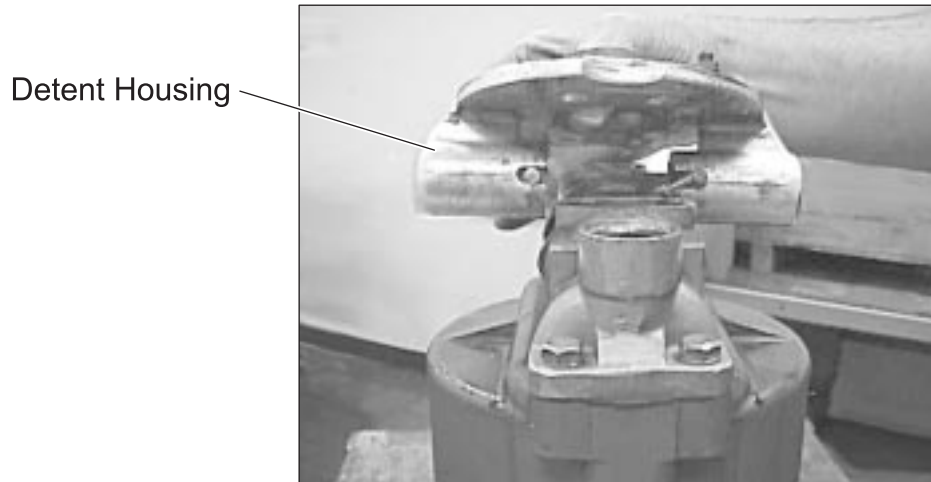
- Using an air impact wrench or a 1 1/4" wrench, remove the detent spring retainers. See the figure below.



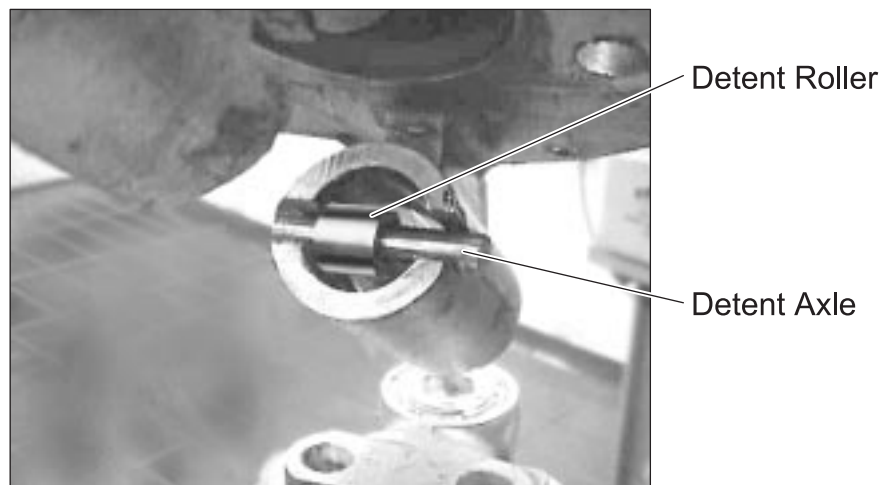
- Using an air impact wrench or a 5/8" wrench, remove the four 7/16-14 x 3 1/2 cap screws. See the figure below.



- Lift the detent housing off the air manifolds. See the figure below.



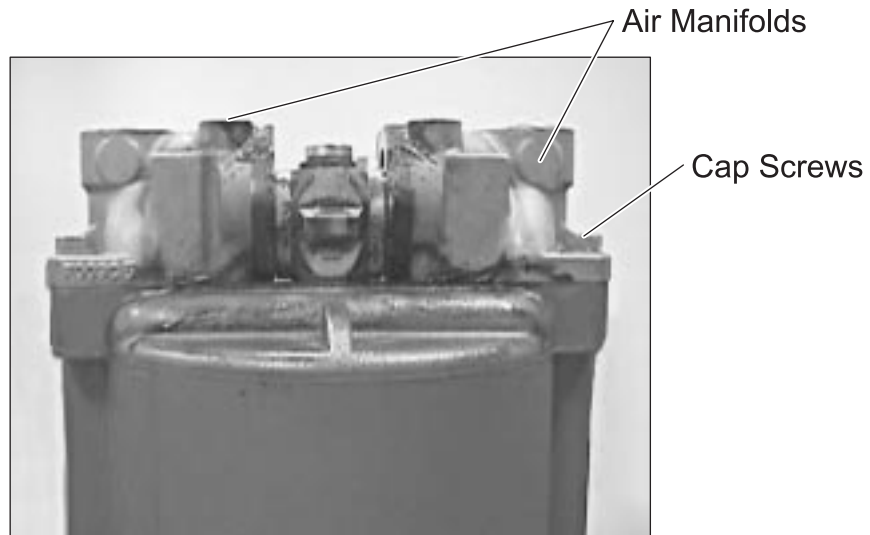
- Remove the two axle rollers and detent axles. See the figure below.



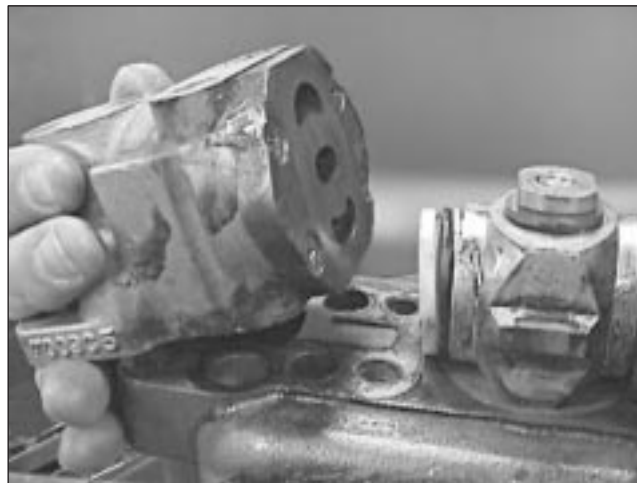
- Remove the flat washer and dampening pad.

7. Remove the air manifolds and valves.

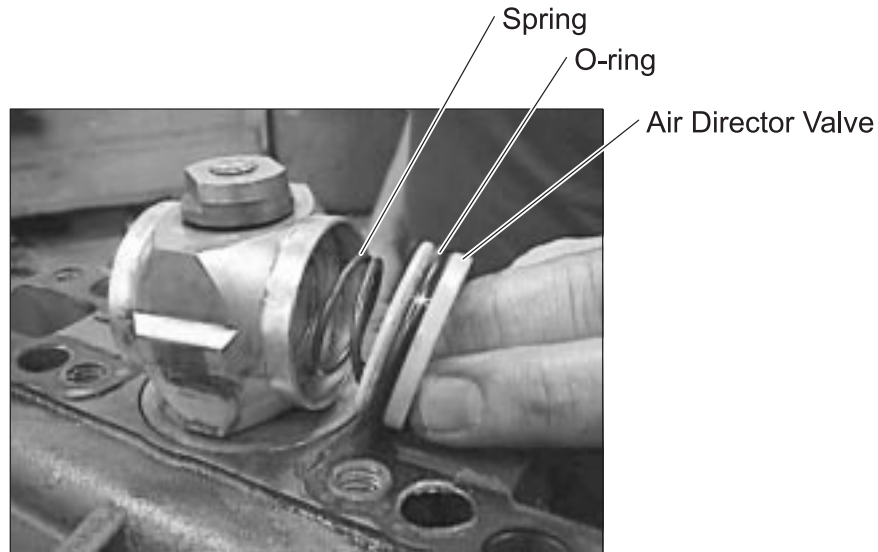
- Using a $9/16''$ wrench, remove the four $3/8-16 \times 1$ cap screws. Each manifold is secured with two cap screws. See the figure below.



- Lift both air manifolds off the air motor cylinder. See the figure below.



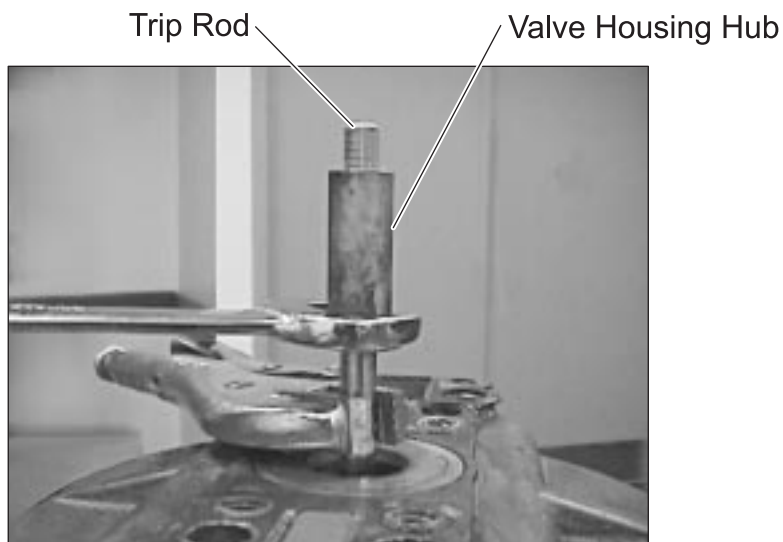
- Remove the air director valves and compression springs. See the figure below.



8. Remove the air valve housing.

- Using a 3/4" wrench, remove the 3/8-24 nut from the trip rod. Using a 7/8" wrench, hold the valve housing hub under the air valve housing.

9. Using a 7/8" wrench, remove the valve housing hub. See the figure below.



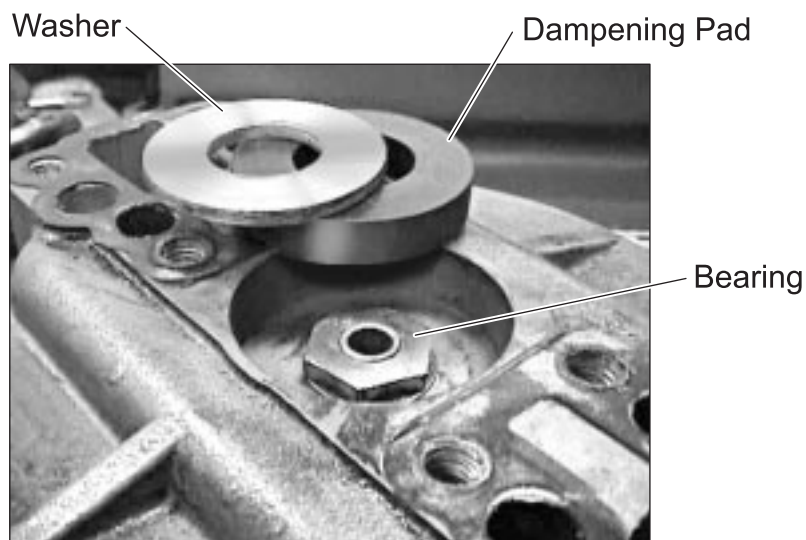
10. Remove the air motor cylinder.

- Using a 3/4" wrench, remove the eight 1/2 x 13 x 1 1/4 cap screws. See the figure below.



- Lift the air motor cylinder off the air motor base.

11. Remove the flat washer, dampening pad, and bearing from the top of the air motor cylinder. See the figure below.



- Using a small pick or screwdriver, remove the backup washer and the v-packing from the bottom of the bearing.

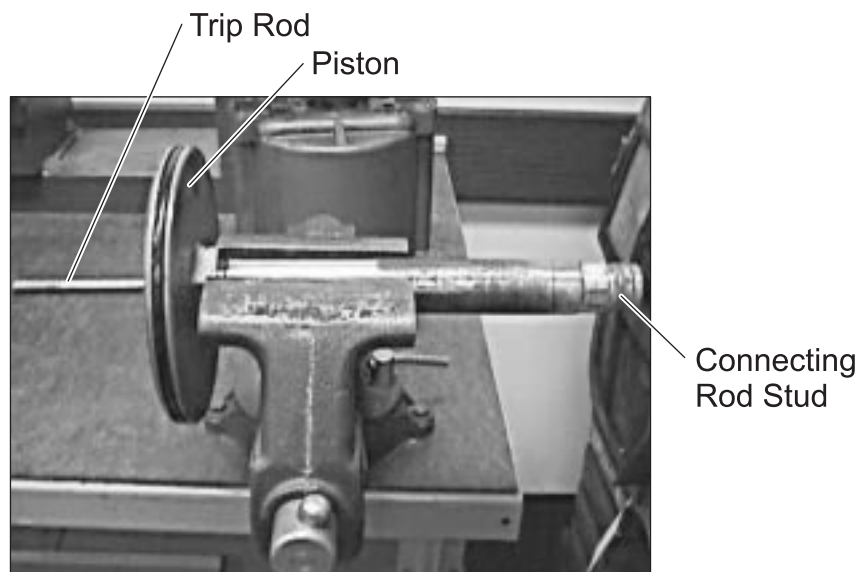
12. Remove the air piston and connecting tube. See the figure below.



- Pull the air piston assembly out of the air motor base.
- Inspect the connecting tube for wear grooves and corrosion.

13. Disassemble the piston.

- Clamp the piston in a vice.
- Remove the connecting rod stud.
- Slide the trip rod out of the connecting tube. See the figure below.



14. **Remove the v-packing and backup washer from the top of the air motor base and the felt wiper seal from the bottom of the air motor base.**
15. **Inspect the air motor components for debris and wear.**
 - Clean the air motor components, as needed. Note parts that require replacement.
 - Dispose of cleaning solvents per HAZMAT procedures.

Reassembly

1. **Obtain the specified rebuild kit for the air motor.**
 - Refer to the Graco Bulldog Air Motor Operator's Manual for rebuild kit part number.
2. **Reassemble the piston.**
 - With the piston mounted in the vice, install the trip rod. (Use a generous amount of Amogel assembly lubricant around the spring.)
 - Coat the connecting rod stud with blue loctite and install the connecting rod stud. Tighten wrench-tight (very securely).
 - Lubricate the packing o-ring and install the packing o-ring in the piston groove. See the figure below.



3. Install the backup washer and v-packing in the bearing.

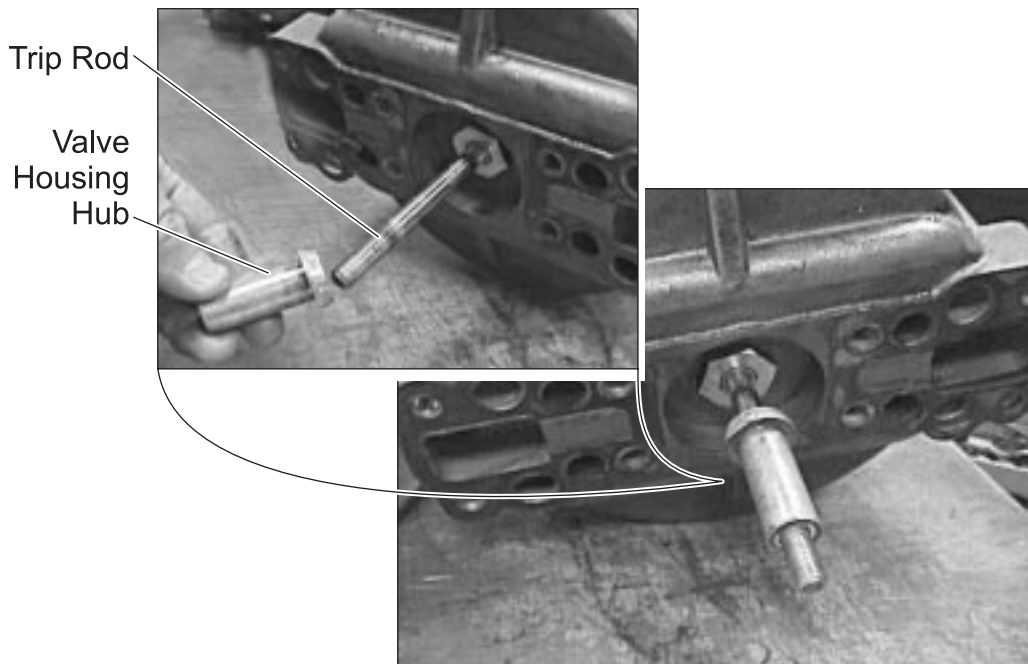
- The lips of the v-packing must face down when the bearing is installed.

4. Install the piston into the air motor cylinder.

- Coat the inside surface area of the air motor cylinder with assembly lubricant.
- Install the gasket and bearing on the top of the air motor cylinder and tighten wrench-tight.
- Insert the piston approximately halfway into the air motor cylinder.

Note: Check to ensure that the packing o-ring is seated in the groove of the air piston and connecting tube assembly.

- Install the hub valve housing on the trip rod. Screw it down to the bottom of the threads on the trip rod. See the figure below.



5. Install the v-packing and seal into the motor base top and the felt wiper seal in the bottom.

- Check to ensure that the lips of the v-packing face up.

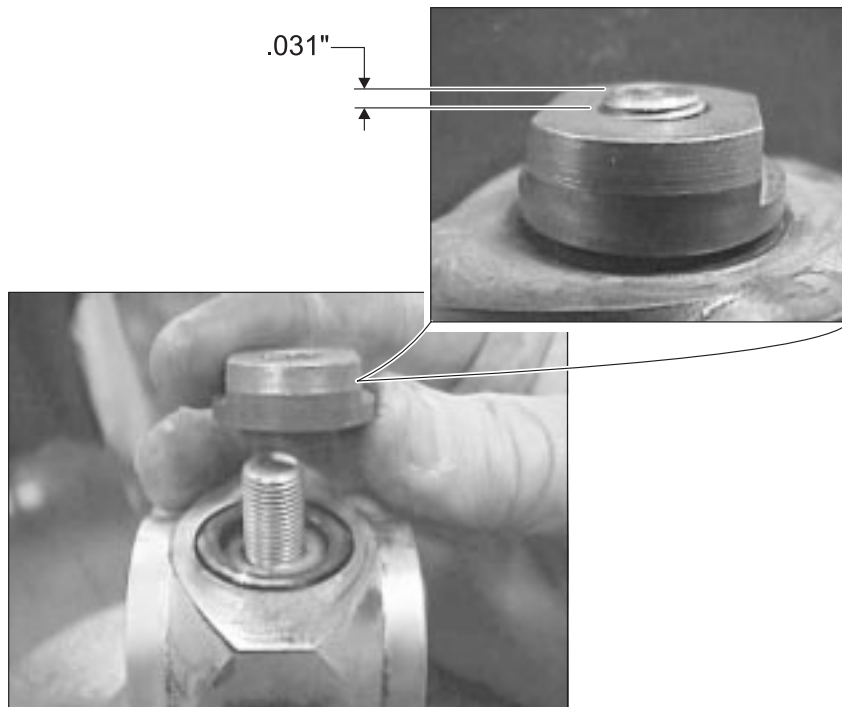
6. Install the piston onto the motor base.

- Check the gasket between the motor base and cylinder; if it is damaged, replace it.
- Set the motor cylinder on the motor base. Align bolt holes.
- Install the eight 1/2-13 x 1 1/4" cap screws. Tighten wrench-tight.
- Install the flat washer and dampening pad in the air motor cylinder.

7. Install the air valve housing.

- Place the air valve housing over the trip rod, onto the valve housing hub.
- Install the 3/8" lock washer.
- Install the 3/8-24 nut on the trip rod.

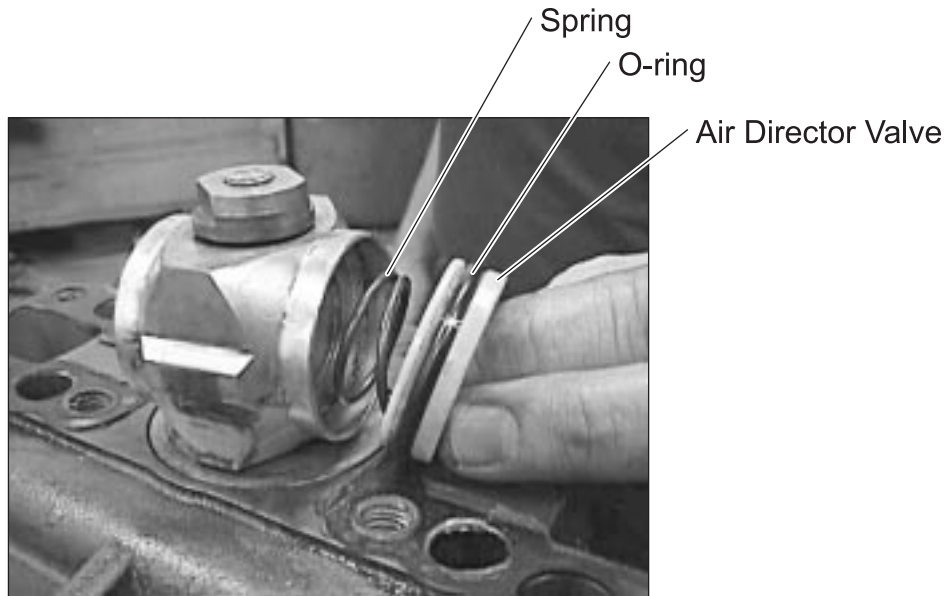
Note: The distance from the top face of the nut to the top of the trip rod must be .031" when measured with a caliper. See the figure below.



- Holding the valve housing hub, tighten the nut wrench-tight.
- Check to ensure that the .031" distance was not changed when the hub was tightened. Readjust, as necessary.

8. Assemble and install the air motor manifold.

- Install the o-ring coated with assembly lubricant on the air director valve.
- Seat the compression spring in the air director valve. See the figure below.



- Install the air director valve in the air valve housing.
- Place a new gasket under the manifold. Place the air manifold on the air cylinder.
- Apply blue loctite to the threads, then install the two 3/8-16 x 1 cap screws. Run the cap screws down by hand to allow movement of the manifolds.
- Repeat step 8 for the other air manifold.

9. Install the detent housing.

- Apply a generous amount of Amogel assembly lubricant on the flat washer and dampening pad.
- Install on the underside of the housing.
- Apply a generous amount of Amogel assembly lubricant on the detent roller and install on the detent axle.

- Position the axle in the slots of the detent housing. See the figure below.



- Turn the detent housing upside down and place on the air manifolds. Check to ensure that the detent axles, rollers, and washer remain in position.
- Apply blue loctite to the threads, then install the four 7/16-14 x 3 1/2 cap screws hand-tight.
- Visually check to ensure that the detent housing and air manifolds are aligned and adjust, as necessary.
- Tighten the detent housing cap screws and the four air manifold cap screws wrench-tight.
- Install the detent plunger.
- Check to ensure that the axle and axle rollers mate into the groove of the detent plunger.

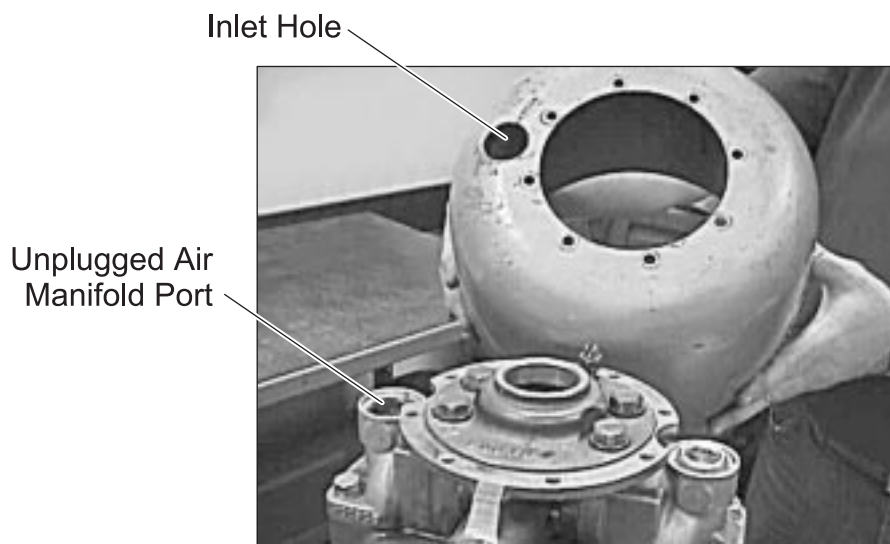
- Install the spring guide, compression spring, and detent spring retainer on one side of the housing. See the figure below.



- Screw the spring retainer in approximately two threads.
- Install the spring guide, compression spring, and detent spring retainer on the other side of the housing.
- Using a 1 1/4" wrench, secure both spring retainers wrench-tight.

10. Install the air motor shield.

- Align the air inlet hole to the unplugged air manifold port. See the figure below.



- Using a 7/16" wrench, tighten the eight 1/4-20 x 1/2 cap screws wrench-tight.
- 11. Install the 90° adapter union. Leave the adapter union loosely attached.**
- 12. Install the ring lift and tighten wrench-tight.**
- 13. install the three pump mounting rods and the air motor pump housing.**
- 14. Test the pump.**
 - Obtain a fitting that will fit the 90° degree union and 3/4" ball valve on the other end.
 - Install a Hanson male plug for the opposite side of the ball valve.
 - With the ball valve in the off position, connect plant air.
 - Slightly crack open the ball valve until the motor starts to slowly cycle. Allow the air motor to slowly cycle three to four times, then shut off the valve.
- 15. If the pump will be stored in the shop, tag the pump.**
- 16. Clean up the work area.**
- 17. Document the work history.**



Concept Check

Rebuild Air Motor (Graco Bulldog)

Answer the following questions to check your understanding of rebuilding a Graco Bulldog air motor. 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. The distance between the top of the trip rod and the top face of the nut must be:
 - a. .025 inch.
 - b. .028 inch.
 - c. .031 inch.
 - d. .033 inch.

2. When the bearing is installed, the lips of the v-packing must face:
 - a. up.
 - b. down.

3. The air motor shield inlet hole must be aligned with the _____ air manifold port.
 - a. plugged
 - b. unplugged

Answers: (1. c 2. b 3. 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 an air motor for the rebuilding activity. You will be asked to select the required repair kit. During this practice you will:

- disassemble the air motor
- clean the air motor components
- reassemble the air motor

Your Trainer will observe as you reassemble the air motor to ensure that the air motor 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

The air motor must be reassembled using the specified parts. All fasteners must be secured wrench-tight. The distance from the top face of the nut to the top of the trip rod must be .031 inch when checked with a caliper. The air motor shield inlet hole must be aligned with the unplugged air manifold port. All cleaning solutions must be disposed of per HAZMAT regulations. 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.