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K-M-V -

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PART NO.: 6441-802

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2. Click on the CAD | Ordering Data | Parts tab.
3. Enter your part number into the configurator.
4. Click the Get Replacement Parts button.
# TROUBLESHOOTING

## SERIES 1000-8000 ROTARY ACTUATORS

The following troubleshooting chart is provided solely to serve as an aid for identifying the cause of an actuator malfunction that may occur. The chart is divided into three columns: The “SYMPTOM” column describes the problem/behavior of the actuator. The “PROBABLE CAUSE” column identifies possible sources of the problem. The “RECOMMENDED ACTION” column indicates the procedure/action to correct the problem.

**NOTE:** One of the most common problems causing poor actuator performance is internal contamination. This is usually caused by improperly filtered air or oil powering the actuator, or excessive use of thread sealant/thread tape when installing fittings into the actuator ports.

**CAUTION:** Take special care to prevent the sealant or tape from entering into the actuator ports.

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### SYMPTOM

**Air or oil leaking around ends of actuator tube.**
- Tierods not tightened to specifications.
- Cut or defective tube seals.
- Pressure spike in a hydraulic unit may have stretched tierods.
- Replace tierods and nut assemblies.

**Air or oil leaking around optional Port Control®, cushion adjustment needles, or ball check retainer.**
- Retaining nut not tightened to specifications.
- Cut or defective gasket or O-ring seal.
- Replace gasket or O-ring seal.

**Air or oil leaking around optional angle adjustment screw.**
- Cut or defective angle adjustment seal.
- Replace angle adjustment O-ring.

**Loss of power/continuous flow of air or oil evident at pinion bearings.**
- Piston seal blow-by caused by:
  - Scratched or worn cylinder tube
  - Cut or worn piston seals
- Replace cylinder tube and/or piston seals.

**Erratic jumping/binding of pinion shaft during cycling.**
- Internal lubrication dried out.
  (Usually due to extended use.)
- Ball check not seating properly; usually caused by internal contaminants. (Cylinders with optional Port Control® only.)
- Clean/rebuild ball check assembly.

**Optional cushions not functioning properly.**
- Cushion seal in cushion block is cut or worn.
- Cushion seal/disc cut or worn, spring broken or damaged on piston and rod assembly.
- Scored cushion nose on piston.
- Internal contamination in ball check or adjusting needle cavities.
- Replace cushion seal O-ring in cushion block.
- Replace piston and rod assembly. (Sold as assembly from factory.)
- Replace piston and rod assembly. (Sold as assembly from factory.)
- Clean/rebuild ball check or adjusting needle assembly.

**Optional Port Control® not functioning properly.**
- Internal contamination in adjusting needle cavity or in the ball check cavity which causes the ball check to seat improperly.
- Clean/rebuild adjusting needle or ball check cavities.

**Teeth breaking on rack or pinion gear.**
- Excessive end-of-rotation shock due to:
  - Lack of proper shock absorbers
  - High cycle speed
  - Large load
- Install cushions, external shock absorbers, or external stops.
- Resize actuator for the application.
DISASSEMBLY (Figure 1)

1. Remove retaining ring from adjustment screw (if applicable to your model).
2. Remove adjustment screw nut (if applicable to your model).
3. Remove (4) tierod nuts.
4. Remove tierods from body.
5. Remove end cap.
6. Remove adjustment screw from end cap (if applicable to your model).
7. Remove tube.
8. Remove piston from tube.
9. Repeat steps 1 through 8 for each tube.
10. Remove upper and lower racks by turning shaft counterclockwise until both racks are free of pinion.
11. **NOTE:** Bearings must be inspected for smoothness of rotation and excessive play or looseness **before removal**. Remove retaining ring holding rear side (non-shaft side) bearing in place.
12. Remove retaining ring holding front (shaft side) bearing in place.
14. **NOTE:** Inspection of parts **must be made** to determine need for replacement.
   • Tube (Inside Diameter) - Any scratching or scoring detected with finger is cause for replacement.
   • Piston (Outside Diameter) - Any scratching or scoring detected with finger is cause for replacement.
     Remove old seals and inspect seal grooves for damage.
   • Rack - Check gear teeth for any damage, and diameter for scoring or uneven wearing.
   • Pinion - Gear teeth should be checked for any damage.
   • Bearings - Inspect for smoothness of rotation and excessive play or looseness.
   • Body - Inspect rack bores for wear. Look for bare aluminum, indicating worn-away hardcoat where racks have made contact with the body.
BEARINGS AND PINION INSTALLATION (Figures 2-4)

NOTE: WHILE ALL PARTS MUST BE THOROUGHLY CLEANED AND INSPECTED BEFORE REBUILDING, THE BEARINGS ARE SEALED. BE CAREFUL NOT TO WASH THE GREASE OUT OF THE BEARINGS.

1. Press one bearing onto the pinion shaft until seated against the shoulder of the pinion shaft, using an arbor press. (Figure 3)
2. Press bearing/pinion assembly halfway into body, using an arbor press. (Figure 4)
3. Apply a bead of “680 Loctite” or other suitable bearing-retaining compound around circumference of bearing at body.
4. Press the bearing/pinion assembly the remaining distance into body until seated, using an arbor press.
5. Install retaining ring.
6. Place second bearing on the other side of the shaft. Using an arbor press, press the bearing halfway into the body.
7. Repeat steps 4 through 6 for other bearing. (Figure 4)
8. The pinion shaft should rotate freely on the bearings.

NOTE: Field rebuilding voids the PHD warranty. Only factory-rebuilds are covered by warranty.
RACK INSTALLATION (Figures 5-8)

1. Using “Mobil” gear grease or other comparable high-pressure gear lubricant, grease both racks, coating the entire rack and filling gear teeth gaps with grease.

2. Insert rack into bottom bore of body, engaging rack with pinion gear. Center rack in body. Keyway of pinion should be at mid-rotation (12 o’clock) position. If not, remove rack, re-position pinion, and re-insert rack. (Figures 5-6)

3. Then move bottom rack out all the way to one side of body, almost to disengagement with pinion gear. (Figure 7, Step 1)

4. Now insert top rack from opposite side of body. (Figure 7, Step 2)

5. Rotate shaft to ensure that shaft keyway is at mid-point of rotation (12 o’clock) when both racks are centered in body. (Figure 8)
PISTONS AND TUBES (Figures 9-11)

1. Remove old seals from piston with dull-bladed instrument, taking care to avoid scratching piston or seal grooves in the piston.
2. Using a dull-bladed instrument, install new piston seals, making sure they all face in same direction (Figure 10) - towards cap. Make sure not to damage new seals during installation.
3. Attach new teflon piston seal backup rings. (Figure 10)
4. If applicable to your model, examine cushion disk and spring for wear or damage. Replace if necessary. Consult Parts List for proper Cushion Kits. NOTE: Never use an air cushion on a hydraulic unit!
5. Lightly coat piston and seals completely with grease. (Air units use “Magnalube-G”, hydraulic units use a Rykon/STP* mixture.)
6. Check tube for shavings, scratches, etc. Make sure tube is clean.
7. Insert piston into tube, compressing backup rings and lips of piston seals while inserting (Figure 11). NOTE: Make note of the direction the piston is inserted in the tube, so that when the tube is attached to the body, the lips of the piston seals face towards the end cap.
8. Insert tube into body. (No seal required between the tube and body.)
9. Repeat steps 1 through 8 for each piston/tube assembly.

ANGLE ADJUSTMENT SCREW - OPTIONAL (Figure 12)

1. Remove old O-ring and teflon piston seal backup ring from angle adjustment screw.
2. Install new O-ring and teflon piston seal backup ring.
3. Lubricate both seals with Rykon/STP* mixture.
4. Screw angle adjustment screw assembly into end cap until it is firmly seated.
5. Thread on angle adjustment screw nut.
6. Install retainer ring.

*Rykon/STP = 50% Rykon 32 and 50% STP
END CAP ASSEMBLY WITH OPTIONAL PORT CONTROL® & CUSHION (Figure 13)

1. Remove port control ball retainer screw.
2. Remove port control ball retaining spring and examine. Replace if damaged.
3. Remove port control ball and examine. Replace if damaged.
4. Clean cavity with solvent to remove any contamination and blow clear with compressed air.
5. Drop (new, if needed) port control ball into cleaned cavity.
6. Put a drop of Rykon/STP* mixture on top of port control ball.
7. Using an appropriate flat punch, lightly peen the ball into the bottom of the port control cavity.
8. Replace port control ball retaining spring into cavity.
9. Re-insert port control ball retainer screw.
10. Put a drop of oil into hole marked “P” on end cap and install port control adjustment screw.
11. If unit is equipped with cushion option (-D1 or -D2), put a drop of oil into hole marked “D” on end cap and install cushion adjustment screw.

*Rykon/STP = 50% Rykon 32 and 50% STP

REASSEMBLY (Figures 14-18)

1. Place flat tube seal into groove on end cap.
2. Place end cap on tube, making sure ports face in proper direction. (Figure 15)
3. Insert four (4) tierods through end cap into body, and tighten snugly. (Figure 16)
4. Repeat steps 1 through 3 per end cap assembly.
5. To ensure squareness, flatten end cap sides using a soft hammer. (Figure 17)
6. Perform final torquing of tierods in proper sequence (Figure 18) to correct torque. (See Torque Chart on next page.)
7. Attach angle adjustment screw nut on screw (if applicable to your model, reference Figure 12, previous page).
8. Attach retainer ring on angle adjustment screw (if applicable to your model, reference Figure 12, previous page).
## TORQUE SPECIFICATIONS (in-lb)

### SERIES 1000-8000 ROTARY ACTUATORS

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