



ATI BEARING SEAL FIELD REPAIR

Scope of Supplement

This supplement is intended to assist those who are involved with the installation, operation and maintenance of the primary Bearing and its seals for the piston rod of an ATI Linear Actuator. This supplement shall be used only in conjunction with a relevant ATI Installation, Operation & Maintenance Manual (IOM) and with any other applicable manuals and supplements that apply to a Product.

Applicable Product

This manual is intended as a guide for the Bearing and Bearing Seal Replacement. Failure to read and comply with installation, operation and maintenance instructions may result in bodily injury or equipment damage and void the manufacturer's warranty.

Company Contact

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Reference Documents

This IOM Supplement references or is referenced by the following publications, and it may be referenced in additional documents.

- IOM 1001 ATI Pneumatic Spring-Return Extend (SRE) Actuator
- IOM 1002 ATI Pneumatic Spring-Return Retract (SRR) Actuator
- IOM 1003 ATI Pneumatic Double-Acting (DA) Actuator
- IOMS004 Fastener Torque Guide
- IOMS005 HD Threaded Coupling Valve Stem Connection
- IOMS006 Split Coupling Valve Stem Connection

Safety Warnings

THIS SUPPLEMENT IS NOT A COMPLETE INSTALLATION, OPERATION AND MAINTENANCE MANUAL (IOM). USERS MUST FOLLOW INSTRUCTIONS AND GUIDELINES OF A COMPLETE IOM TO PREVENT PERSONAL INJURY, PROPERTY DAMAGE, AND DAMAGE TO THE PRODUCT.

DO NOT INSTALL, OPERATE, OR MAINTAIN AN ATI PRODUCT UNLESS TRAINED AND QUALIFIED IN PRODUCT AND ACCESSORY INSTALLATION, OPERATION AND MAINTENANCE.

Revision Record

Rev #	Issue Date	Description	Reviewed By & Date	Approved By & Date
A	5/19/2016	Initial Release based on MP1045 Rev B.	JP/DAR 5/19/2016	DPL 5/19/2016



General Description

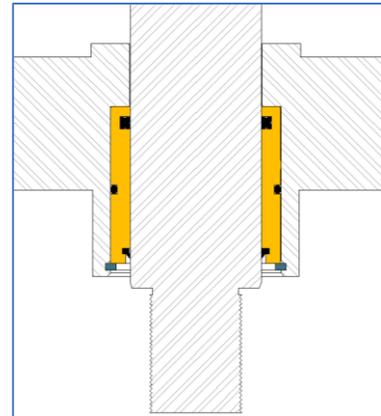
The Bearing fits within the lower head of an ATI actuator. It reduces friction from side loads, and it ensures that the piston rod remains centered within performance limits of dynamic bearing seals.

This procedure describes how to remove the Bearing and replace Bearing Seals in a typical L-series or HDL-series actuator. This maintenance may be performed in the field, without disassembling the actuator cylinder and piston seals.

Product Operation

The Bearing supports side loads on the Piston Rod. Side loads increase friction between the piston rod and the bearing, and in applications with high cycles and side loads, components will wear to the point that seals in the bearing can no longer hold pressure for normal operation.

Typical bearing cross section



Bearings are manufactured from a material that is softer than the actuator piston rod. Typically the bearing is bronze, but other materials may be used in engineered applications. The bearing is secured in the lower head by a retaining ring. The bearing includes one or more static seals around its outside diameter to seal pressure against the lower head, and the bearing includes one or more dynamic seals around its inside diameter to seal pressure against the piston rod.

1 Preparation for Maintenance

1.1 Tools Required

1. Crane, suitable for lifting the required load
2. Air pressure regulators, quantity of 2 recommended
3. Instrument ball valves, NPT plugs or tube plugs to block instrument supply lines, as needed
4. Wrenches for bolting, including Allen keys for socket head screws
5. Snap ring pliers
6. Degreaser solvent and clean shop rags
7. Grease that is compatible with Seal Kit
8. Leak detection fluid (e.g. Snoop or Leak-tec)

1.2 Actuator Orientation

Instructions that follow assume the L-series actuator has been removed from the valve and placed on a stable, flat work surface. Refer to Appendix B for guidelines for field maintenance on a valve.

1.2.1 Double Acting and Spring Extend Actuators (DA, SRE)

For item references that follow, refer to Appendix A, Figure 1.

1. Orient the actuator to the vertical position.
2. Remove the snap ring (*Item H*) from the lower head (*Item 4*).
3. If not already, install stem coupling to piston rod, and wrap cloth near the connection between split coupling block (*Item 14*) and piston rod (*Item 8*), as shown in the photo at right. This cloth will serve as a cushioned stop for the bearing when ejected from the lower head.
4. Pressurize the top chamber of the actuator to at least 40 psig. If not already extended, the piston rod will move to its full extended position. Maintain this pressure on the top chamber throughout the bearing replacement. If you have only 1 pressure regulator, fill this chamber through a valve, then close the valve to trap pressure in the top chamber.
5. With a cloth and degreaser solvent, remove foreign particles, dust, and grease from the exposed piston rod surface (*Item 8*).





1.2.2 Spring Retract Actuators (SRR)

For item references that follow, refer to Appendix A, Figure 2.

1. Orient the actuator to the vertical position.
2. Remove the snap ring (*Item H*) from the base of the spring cartridge (*Item 6*).
3. If not already, install stem coupling to piston rod, and wrap cloth near the connection between split coupling block (*Item 7*) and piston rod (*Item 5*), as shown in the photo Section 1.2.1. This cloth will serve as a cushioned stop for the bearing when ejected from the lower head.
4. Pressurize the top chamber of the actuator to 40-100 psig, or up to its pressure rating, as required to compress the spring and fully extend the piston rod. Fill this chamber through a valve and close this valve to trap pressure in the top chamber to prevent sudden release of pressure. This pressure should be maintained in the upper chamber until the bearing and its seals are replaced (*at the completion of Section 3.1*).
5. With a cloth and degreaser solvent, remove foreign particles, dust, and grease from the exposed piston rod surface (*Item 5*).

2 Disassembly

2.1 Bearing Removal

1. Ensure that ports to the upper chamber are blocked (*Step 4 in sections 1.2.* above*).
2. **Take special precaution during this step, as the bearing will be ejected, creating a pinch point.** Apply low pressure to the lower chamber of the actuator cylinder. Start from 0 psig; increase pressure at a rate of about 1 psig per 5 seconds until the bearing moves; **do not exceed 30 psig**. From the moment that the bearing starts to move, friction will drop and the bearing will be suddenly ejected from the lower head and projected against the cushioned stop (the cloth described in Step 4 in sections 1.2.*). **Do not attempt to catch or handle the bearing until it is clear of the head and pressure in the lower chamber is relieved.**
3. Disconnect supply pressure at the lower chamber. Maintain pressure (blocked ports) at the upper chamber.

2.2 Actuator Disassembly

In most cases, when the actuator is fully extended, there is not enough clearance under the piston rod to remove the bearing. In this case, follow these steps.

For item references that follow, refer to Appendix A.

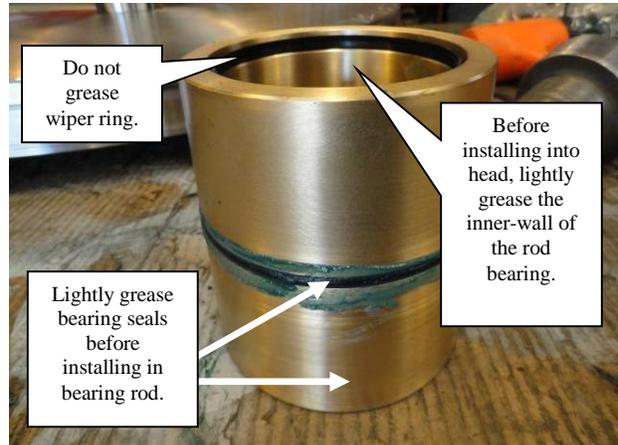
1. Remove stem coupling (*Fig. 1 Item 14, Fig. 2 Item 17*) from piston rod. This will allow the bearing to be removed from the actuator.
2. Remove hex head cap screws (*Fig. 1 Item 13, Fig. 2 Item 15*) from actuator's lower head.
3. Refer to the IOM for the actuator for details on lifting points on the upper head (*Item 1*); lifting points are different for Spring Return and Double Acting actuators. Using a crane that is appropriately rated for the weight of the actuator, lift the actuator a few inches and remove the loose bearing from the piston rod.

3 Repair & Test

3.1 Seal Replacement & Bearing Installation

For item references that follow, refer to Appendix A.

1. Remove all seals and wiper ring (*Items C, D, E, and H*) from the bearing. Using a degreaser solvent and rag, clean the bearing. Ensure that all grease and particles have been removed from the seal grooves.
2. For installation of the new seals: Lightly grease the bearing seals (*Items D and E*) and install on rod bearing. Install wiper ring (*Item C*) on the rod bearing without grease (*Item Detail 2*).
3. Before installing the piston rod bearing: clean the surface of the piston rod and the bore hole in the lower head to remove particles, dust, dirt, and foreign materials.



4. To install piston rod bearing: Slide the bearing over the piston rod and back into the bearing housing.
5. Using the snap ring pliers, install bearing retaining ring (*Item H*) into groove on the bearing tube of the lower head or spring cartridge.
6. With the bearing now fully installed, the upper chamber of the actuator may be depressurized. For SRR actuators, this will cause the piston rod to fully retract.

3.2 Test

1. Apply pressure to the lower cavity of the actuator.
2. Spray a leak detecting solution where the piston rod and bearing meet.
3. Evaluate to ensure that no bubble formation exists. Bubble formation indicates a leak.
4. It is recommended that the actuator be cycled at least ten times, with bubble testing at maximum and minimum supply pressure.

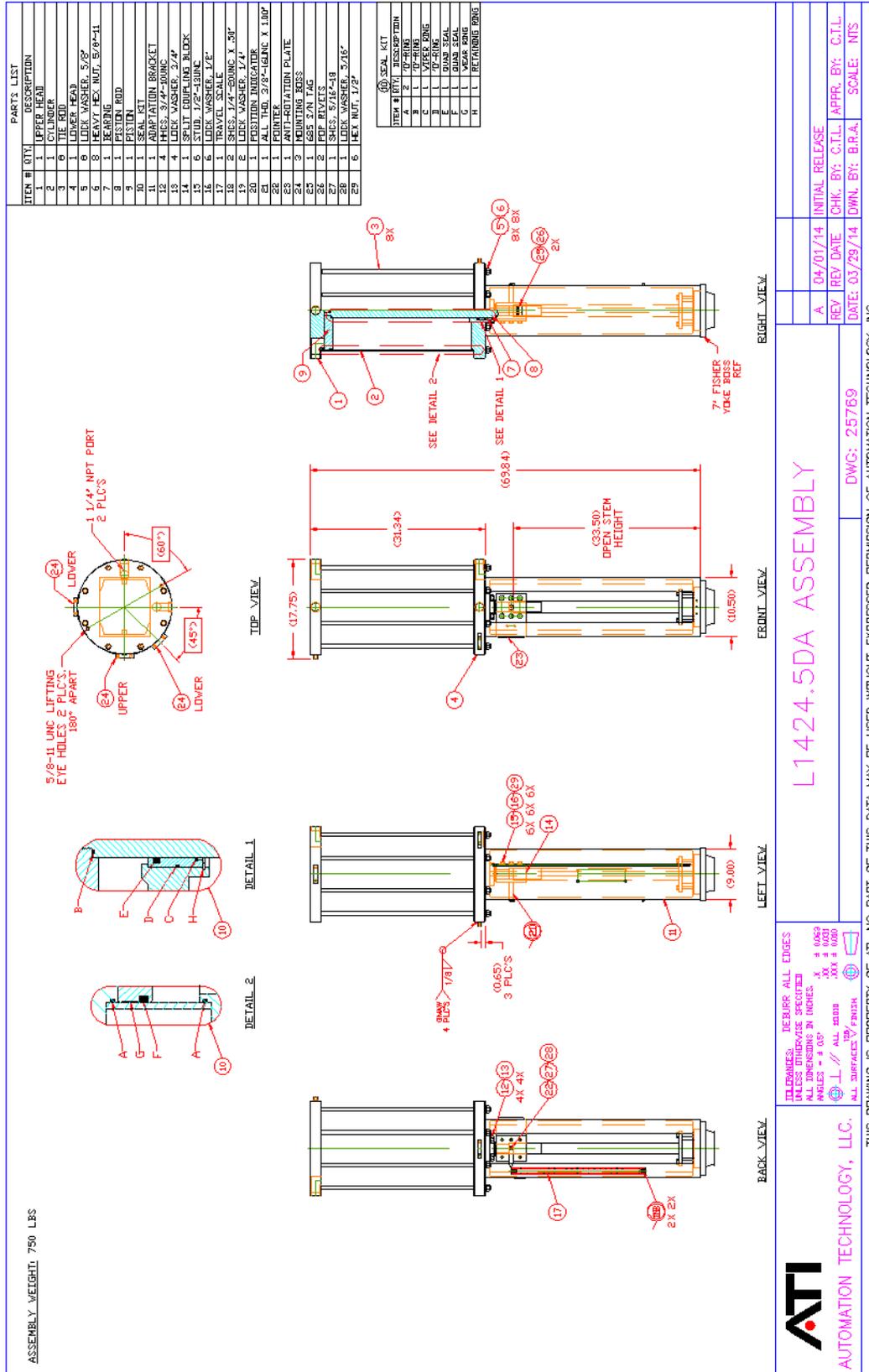
4 Reassembly & Completion

1. If there are no air leaks around the piston rod and bearing connection, proceed with re-installing the actuator to its adaption bracket.
2. Reassemble actuator to the valve following relevant manufacturers' instructions.



APPENDIX A – TYPICAL ACTUATOR ASSEMBLIES

Figure 1, L-DA Actuator (adapted from Drawing 25769)





APPENDIX B – FIELD REPAIR OF INSTALLED ACTUATOR

In the special case that a user prefers to replace the Bearing or the Bearing seals on an actuator while it is installed on a valve, the following guideline can be used to avoid removing the cylinder from the adaption bracket and to avoid removing the stem coupling and its stops from the valve stem.

SAFETY WARNING: During this procedure, the actuator will be disconnected from the valve stem, and the user must ensure that all pressure on the valve is safely controlled and the stem locked in place during this maintenance operation.

1. Close the valve and ensure that the valve remains in the closed position while work is performed on the actuator. **Safety check that pipe line pressure cannot open valve.**
2. De-couple piston rod from valve coupling. When doing so, depressurize all ports to actuator; this is particularly necessary for threaded stem couplings with external stops; the stops can cause small side loads on the stem coupling that will bind threads, increasing torque required for re-connection. Refer to the appropriate IOM for the stem coupling for the actuator under repair (e.g. IOMS005 or IOMS006).
3. Apply supply pressure to the lower cylinder and retract the piston rod. Block the rod in the retracted position and remove pressure from the lower cylinder. Plug or block all ports to the upper head.
4. Remove the bearing retainer from the lower head bearing assembly. For standard design using a snap ring, this may require use of small, flathead screwdrivers to work the snap ring out of the groove. This step requires patience, and it may require two technicians. If the piston rod is not fully retracted (which will happen if rod is not blocked per Step 3), take extra precautions to protect the piston rods from scratches during this step.
5. If possible, adjust the block under the rod (step 3, above) to allow for a 6-8" gap under bottom of bearing tube. This 6-8" of rod will control the bearing when it is ejected from the actuator. The block used for this must be wood, or something soft to cushion the bearing from impact during the next step.
6. **Take special precaution during this step, as the bearing will be ejected, creating a pinch point.** Apply low pressure to the lower chamber of the actuator cylinder. Start from 0 psig; increase pressure at a rate of about 1 psig per 5 seconds until the bearing moves; **do not exceed 30 psig.** From the moment that the bearing starts to move, friction will drop and the bearing will be suddenly ejected from the lower head and projected against the cushioned stop (as described in Step 5). **Do not attempt to catch or handle the bearing until it is clear of the head and pressure in the lower chamber is relieved.**
7. Remove bearing **and re-block the piston rod** to keep it near its retracted position. If not blocked, the piston may drift to an extended position due to gravity, and once extended, the rod cannot be retracted with supply pressure until the bearing is replaced in Step 9.
8. Clean the bearing, the piston rod and the bore hole in the lower head. Inspect the bearing and the piston rod for damage. Replace seals in the bearing, apply an appropriate grease to all seals, but do not grease the wiper rod. For more detail, refer to Section 3.1, Seal Replacement & Bearing Installation.
9. Install bearing in the lower head. Use a block of wood to tap the bearing flush with the lower head. Using a narrow punch or small screwdriver, and being careful not to touch (scratch) piston rod, gently push or tap the bearing into its final position (approximately 1/4" past the inside of the bearing tube), and install the bearing retaining ring.
10. Check bearing seal for leaks while cycling piston rod through an extend/retract cycle.
11. Retract piston rod and remove blocks and any loose tools from inside of adaption bracket. If piston extends under its own weight, apply pressure to the lower head to hold it in its retracted position.
12. Re-install stem coupling to piston rod. Stroke actuator as necessary to reconnect piston rod to valve coupling. Refer to Stem Coupling installation instructions as necessary, and follow all relevant installation instructions for valve operation. *During this step, avoid applying full pressure to the actuator in the extend position, as this can result in small side loads on the coupling connection. This side loading is normal, but it can increase the effort required to complete assembly of threaded connections.*
13. Cycle the actuator and valve. Check bearing seal for leaks (final check).
14. Remove any maintenance plugs or block valves from the actuator and re-connect all control connections that were loosened during testing. Check all fittings and connections for leaks.