

Standard Gate Valve Installation & Maintenance Manual



**1100 Series
Pneumatic Actuator**

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U.S.A.



Read all instructions in this manual before attempting to service the valve.



Warning
For safety, remove air to actuator before disassembly.

Do not attempt to disassemble or service the valve unless the air-pneumatic supply has been removed. Severe injury could occur.

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Introduction

The 11000 Series Gate Valves feature a positive lock-overcenter mechanism or soft closure with pneumatic lock (optional). Valves maintain a closed status in the event of an air pressure loss. Linear actuation allows the use of a welded bellows to seal the actuator (*i.e.* no rotary seals). Shock and vibration are reduced to a minimum by a unique air cylinder design. This feature is extremely beneficial for semiconductor fabrication and other sensitive processing requiring operation which is relatively free of vibration.

The HVA stainless steel body offers one of the smallest interior surface areas in the vacuum valve industry. The body and all major internal components are vacuum furnace brazed at 1100°C, at 1×10^{-6} Torr, ensuring maximum joint integrity. This eliminates the possibility of virtual leaks or entrapment areas and minimizes body distortion found in conventionally welded valves. For maintenance purposes, the carriage assembly can be removed from the body without removing the valve from the system.

All dimensions in this manual are given in inches unless specified otherwise.

Standard Specifications

Materials

Valve body and mechanism	304 stainless steel
Welded bellows shaft seal	AM-350
Million Cycle drive shaft/pins	Hardened stainless steel
Bonnet / gate seals	
HV	Viton® elastomer
UHV	OFHC copper / Viton® elastomer

Vacuum

Pressure range	
HV	1×10^{-9} Torr
UHV	1×10^{-10} Torr
Leak rate	2×10^{-10} AtmCC/Sec
Differential pressure	760 Torr in either direction
Maximum Δ pressure before opening	20 Torr

Bakeout Temperature

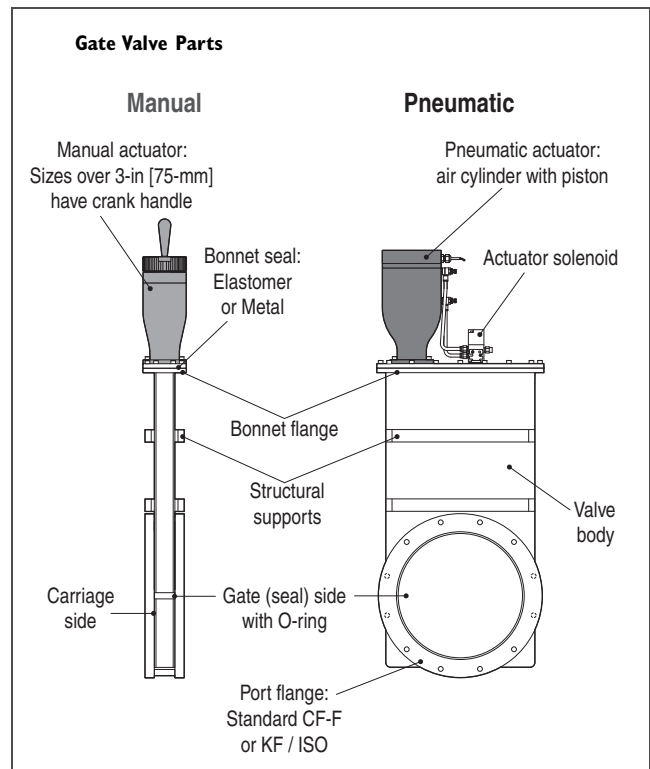
	without solenoid
Elastomer sealed bonnet	150°C
Metal sealed bonnet	
Valve open	200°C
Valve closed	150°C

Actuator

Manual	60°C
Pneumatic	60°C

Mechanism

Air service	80 psig
Solenoid	4.0 Watts
supplied voltage	120 VAC 50/60 Hz
optional voltages	24, 200, 240 VAC 50/60 Hz or 12, 24 VDC
Position indicator, max.	115 VAC or 28 VDC, 20 mA
Cycles until service, application dependent	100,000

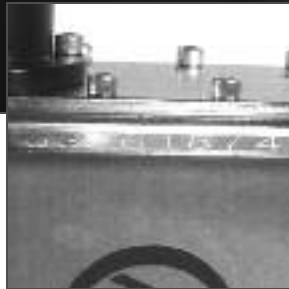


Notes

- Always wear powder-free latex gloves when performing maintenance or repairs of a gate valve. Oil from bare fingers may be missed during a wipe down of parts.
- *It is very important that gloves are worn for any grease application. Technical Data Sheets (TDS) and Material Safety Data Sheets (MSDS) are available through www.apiezon.com or www.magnalube.com.*
- Be careful not to scratch an O-ring groove. Use a plastic pick for O-ring removal. Small scratches parallel to the groove may not be harmful, but scratches across the groove cause leaks.
- Apply grease sparingly.
- Avoid twisting, stretching or deforming any O-ring.
- For safety, remove air to actuator before disassembly.



Model and Serial Numbers



Serial Number stamped on body flange

Model Number: _____

Serial Number: _____

Unpacking

Inspect shipping container before unpacking for damages sustained during transit. Any visible damage should be reported to the transportation company immediately.

Remove the valve and inspect the flange faces, making sure that they are free of nicks or scratches and that there is no obvious damage to the actuator assembly and body.

Record the model number and serial number for future reference. **Model numbers and serial numbers are required** when purchasing spare parts and when returning the valve for maintenance.

Pre-Installation

WARNING: NEVER PUT HANDS OR ANY OTHER OBJECT IN THE GATE VALVE – SERIOUS INJURIES WILL OCCUR AND VALVE WILL BE DAMAGED.



Determine that the valve and adjacent plumbing in the vacuum system will be adequately supported when installed. To minimize straining of valve body, make sure the mating flanges are in line, flat, parallel and the correct distance apart.

Remove the flange cover and wipe the flange and gaskets with a lint-free, dry wipe. If installing an O-ring seal flange, apply a light film of vacuum grease (*Apiezon-L* grease or an equivalent is recommended) to the O-ring and install in the flange groove.

Bench Test

Before installing the valve into a system, run a bench test to verify that gate functions are operational. A capacitance manometer is not necessary for test purposes. If possible, test the unit when it is under vacuum.

Connect air lines by pressing on the air fitting ring and inserting the air line. Release the air fitting ring to grip and secure the air line. Smaller valves have the solenoid remotely mounted. The fitting closest to the bonnet will open the valve, and the other fitting will close the valve. In all cases, air is exhausted through the solenoid.

Confirm that the valve actuates properly by carefully checking the operation of the valve using the minimum air pressure required to achieve full closure. First, make sure the gate is actuated into the open position. Next, slowly close the valve using the minimum amount of air required until you visually see the gate O-ring make contact. Increase pressure by five (5) pound increments, as necessary to achieve a seal (see operating tag on valve).

For continued trouble-free operation, it is recommended that an air filter/lubricator be used in the air line system. *Refer to the solenoid nameplate for the correct voltage when connecting to the electric service.* Visually check the valve opening for any obstruction, but do not put hands or any other object in the valve.

- **Air Operated:** Connect the compressed air supply to the valve using Teflon® tape or an equivalent on the threads to ensure leak-proof joints. Carefully check the operation of the valve using 20 PSIG air pressure (required to achieve full closure). The valve is now set and ready for operation.

- **Position Indicators:** Position indicator switches are preset and indicate when the valve is fully opened or fully closed. Wires are marked for **OPEN/CLOSE** indicators.

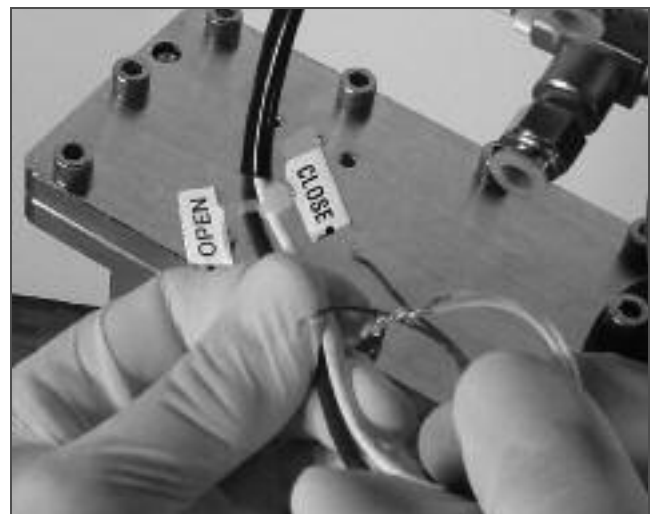
Installation

It is preferable to install the valve with vacuum on the backside of the gate so the valve body remains under vacuum at all times and the pumpdown of the valve body is eliminated.

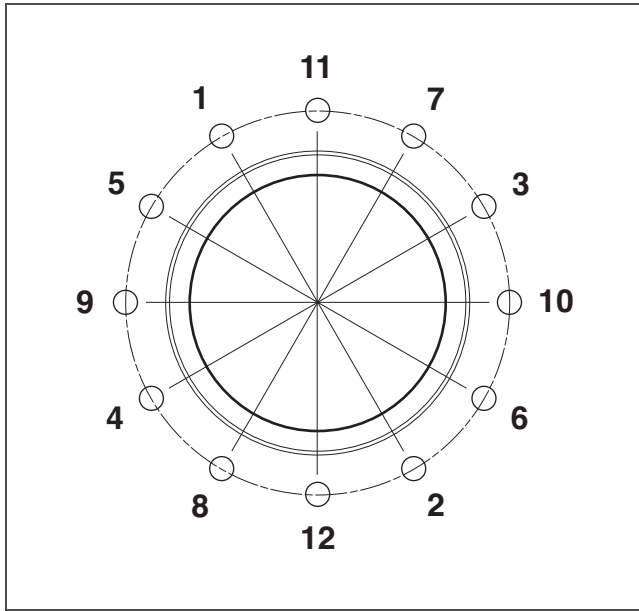
Valve orientation: for sizes 5/8" [16 mm] – 6" [160 mm], any orientation; for sizes 8" [200 mm] – 50" [1270mm] and greater, contact factory. HVA valves are adjusted at the factory for horizontal actuation. Valves that are mounted with vertical actuation may require a different speed control adjustment to compensate for the weight of the gate-carriage assembly.



Air line installation



Position Indicator wiring



Example Torque Sequence

Proper Torque Sequence:

180° bolt sequence

Always follow the proper bolt sequence for each of the following steps of tightening.

1. Finger tighten bolts first.
2. Tighten snugly with wrench.
3. Tighten to recommended torque range.

Example Torque Sequence for illustration purposes only. Number of bolt holes will vary depending on flange type and size.



Set up a clean, well-lit workbench for any maintenance.

Making sure that no foreign particles enter the valve, proceed with installation. When installing a valve, it is imperative that proper length bolts be used. **Bolts longer than the thickness of both mating flanges will damage the body panels and destroy the seal surface area for the gate O-ring. For best results, always use bolts that are at least 1/4-inch (6.4 mm) shorter than the thickness of both mating flanges.**

Lightly grease the flange bolts with high temperature, non-galling type grease such as Loctite® *Heavy Duty Anti-Seize* or equivalent.

Carefully tighten the bolts around the flange using the proper torque sequence until flanges are metal to metal and bolts are at proper torque. See chart below for proper torque on bolts.

COPPER GASKETS

For CF-F flanges

Valve size		Torque	
inch	mm	ft-lbs	N•m
5/8"	16	8 - 10	10.9 - 13.6
1½"	38	15 - 18	20.4 - 24.5
2" - 21"	51 - 533	25 - 30	34 - 40.8

VITON® O-RINGS

For KF, ISO, ANSI, JIS, others

Valve size		Torque	
inch	mm	ft-lbs	N•m
5/8"	16	5 - 8	6.8 - 10.9
1½"	38	8 - 10	10.9 - 13.6
2" - 21"	51 - 533	15 - 20	20.4 - 27.2

Operation

For continued trouble-free operation, keep the valve clean and free of contaminants. Valves are designed to run at 80 PSIG maximum. Do not operate pneumatic valves above 80 PSIG. Higher PSIG will shorten the life span of the valve. For higher actuator pressure requirements, contact the factory.

Replacement Parts

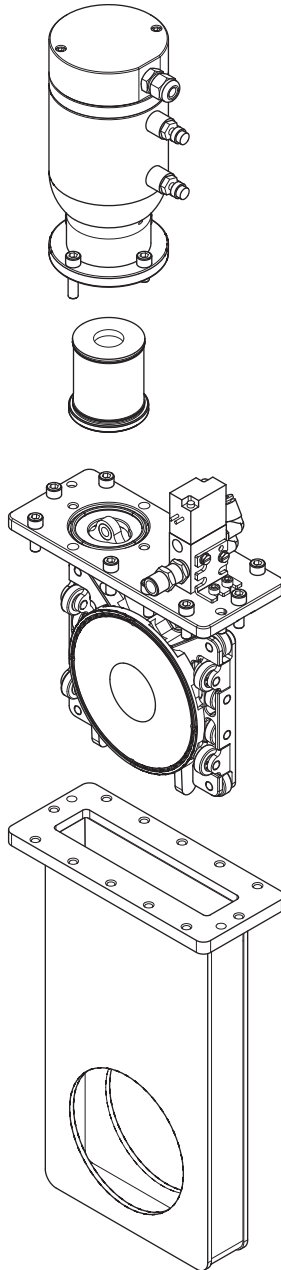
To order replacement parts or repair kits, call 775-359-4442 or 800-551-4422 toll free. **HVA requires a Model Number and a Serial Number when ordering replacement parts.**

Serviceable Parts

• Bulleted items under each heading are user-serviceable.
 Not all parts in the valve are user-serviceable. The drawing indicates which parts may be accessed for on-site service.
 Contact the factory for repair of non-user-serviceable parts.

Gate/Strongback Assembly

- Gate O-ring
- Bonnet O-ring
- Pins
- Bearings
- Washers
- Retaining rings
- Set screws
- Gate spring



Gate Actuator

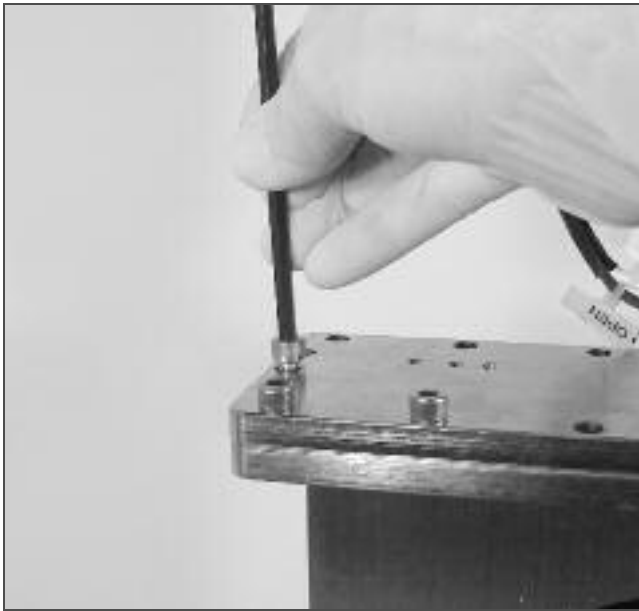
- Drive shaft O-ring
- Piston O-ring
- Piston wear rings
- Bellows
- Bellows O-ring

Solenoid

No user-serviceable parts

Valve Body

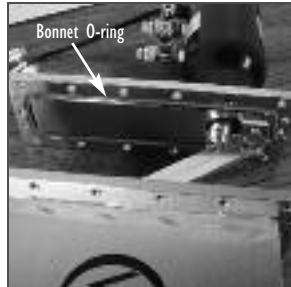
No user-serviceable parts



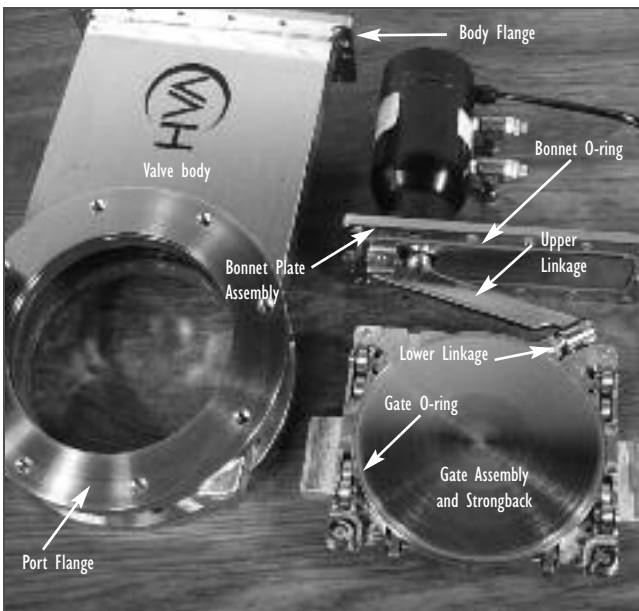
Remove bonnet bolts



Remove only two actuator bolts



Separate bonnet flanges



Bonnet Actuator Carriage Assembly, separated from valve body

Bonnet Actuator Carriage Assembly

All servicing of O-rings, bellows, pins and bearings requires removal of the Bonnet Actuator Carriage Assembly from the valve body.

This page details the steps to be followed in all of the listed service procedures:

Gate and Bonnet Sealspage 9
 Bellows, Piston & Shaft Sealspage 10
 Actuator O-ringpage 16
 Pins and Bearingspage 18
 Valve Adjustmentpage 26

Tools and Materials Required

- Allen wrench set
- 1/2" box wrench
- 1/4" 12 pt. wrench
- 5/16" 12 pt. wrench
- Powder-free latex gloves
- Appropriate replacement O-rings or metal gasket.

• ALWAYS WEAR POWDER-FREE LATEX GLOVES WHEN SERVICING THE VALVE.

Procedure

1. Both the station and the pump corresponding to the gate valve should be vented to atmosphere.
2. Actuate valve to **GATE OPEN** position.
3. For safety, remove air to actuator.
4. Remove bolts that hold Bonnet Actuator Carriage Assembly to body.
5. Pull out the Bonnet Actuator Carriage Assembly, taking care not to move adjustment of linkage.

Support the carriage with a wooden block to minimize stress on linkage.

Gate and Bonnet Seals

Standard and Metal Seal Bonnet (MSB)

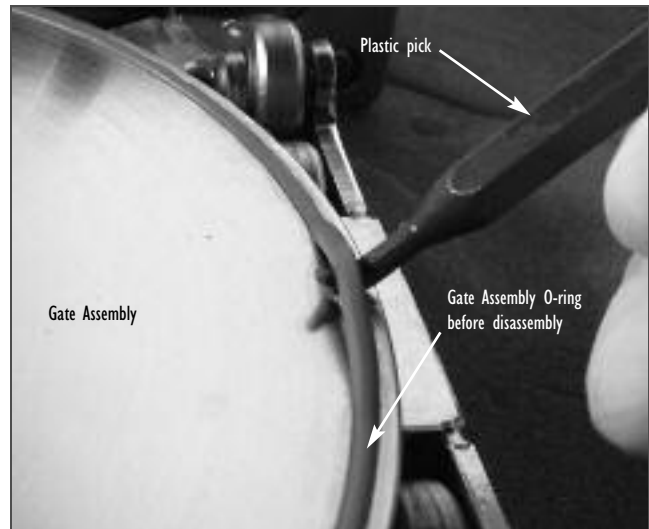
Tools and Materials Required

- Allen wrench set
- 1/2" box wrench
- O-ring pick, plastic
- Powder-free latex gloves
- Grease for O-rings: *Apiezon L*
- Isopropyl alcohol (IPA)
- Appropriate replacement O-rings or metal gasket.

- ALWAYS WEAR POWDER-FREE LATEX GLOVES WHEN SERVICING THE VALVE.
- BE CAREFUL NOT TO SCRATCH O-RING GROOVE.
- APPLY ONLY THIN LAYER OF GREASE.
- AVOID TWISTING, STRETCHING OR DEFORMING THE O-RING.

Procedure

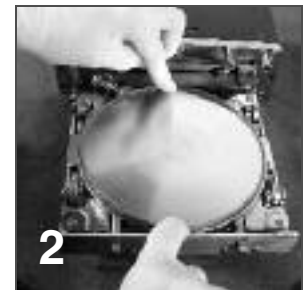
- Remove **Bonnet Actuator Carriage Assembly** per instructions on page 8.
1. Remove Bonnet O-ring or metal gasket and discard. Use a plastic O-ring pick to avoid scratching or marring the O-ring groove.
 2. Remove Gate O-ring with the plastic pick, taking care not to scratch the O-ring groove; discard the O-ring.
 3. Clean O-ring groove with IPA and dry out with Nitrogen or CDA.
 4. Apply a light coat of *Apiezon-L* grease to the new Gate O-ring.
 5. Install new O-ring on gate, taking care to avoid twisting or deforming the O-ring.
Follow the steps pictured at the right for installing the Gate O-ring. Larger valves will require more 180°-apart presses than smaller valves. Continue pressing until the entire O-ring is in the groove, then finish smoothing out the O-ring all the way around the groove.
 6. Apply a light coat of *Apiezon-L* grease to the new bonnet assembly Viton® O-ring. Copper gasket install dry.
 7. Install new O-ring or gasket on Bonnet assembly, taking care to avoid twisting or deforming the O-ring.
 8. Replace **Bonnet Actuator Carriage Assembly** into body.
 9. Install bolts and tighten. (For MSB, Copper gasket type, tighten side to side 20–25 ft-lb)



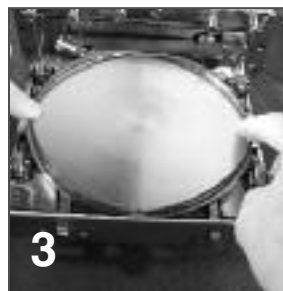
Use plastic O-ring pick to avoid scratching the O-ring groove



1 Set new O-ring on gate.



2 Press O-ring in at 6 and 12 o'clock.



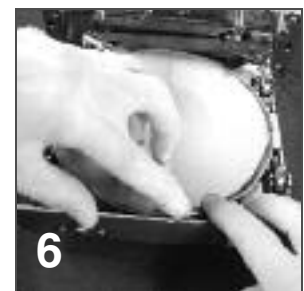
3 Then press at 3 and 9 o'clock.



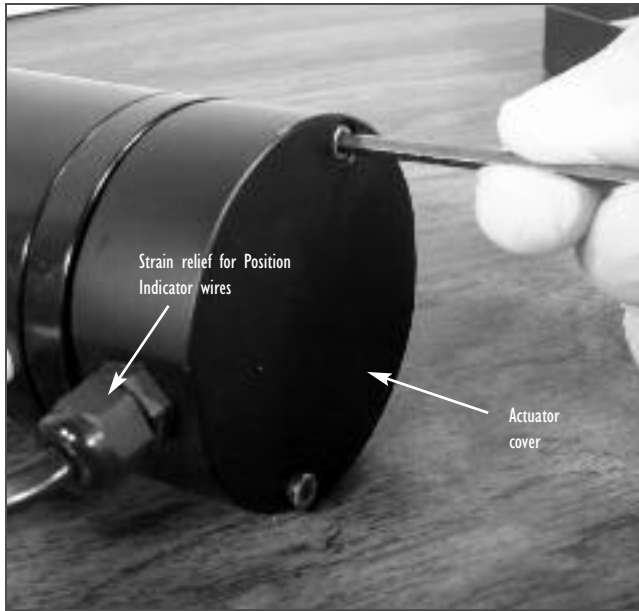
4 Continue pressing O-ring into groove at 180°-apart intervals.



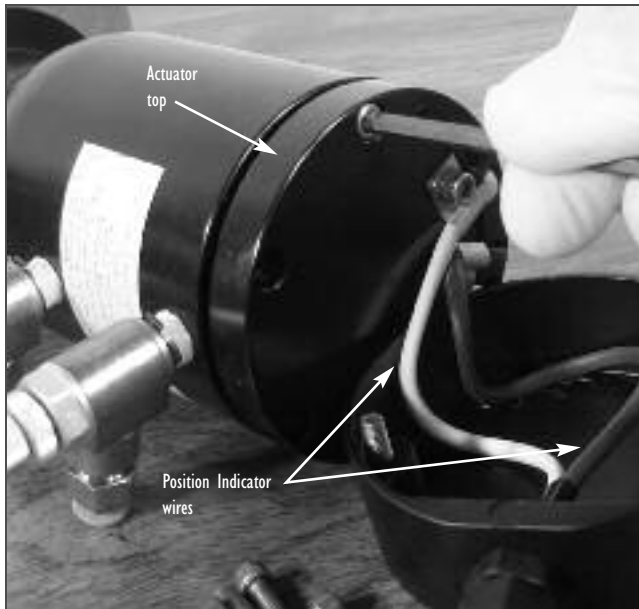
5 Press straight down without twisting the O-ring.



6 Smooth out the O-ring all the way around the groove.



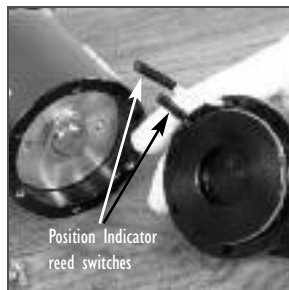
Remove actuator cover (2 screws)



Remove actuator top (6 screws)



Position Indicator partially out



Actuator top off

Bellows, Piston & Shaft Seals

Tools and Materials Required

- Special spanner wrench / custom piston removal tool
- Allen wrench set
- Calipers
- O-ring pick, plastic
- R-ring pick
- Needle-nose pliers
- Small standard screwdriver
- Powder-free latex gloves
- Actuator O-rings
- Grease for bellows O-ring: *Apiezon L*
- Vacuum grease
- IPA
- Heat gun
- *Lock-Tite*

- ALWAYS WEAR POWDER-FREE LATEX GLOVES WHEN SERVICING THE VALVE.
- GATE MUST BE IN THE OPEN POSITION TO ACCESS SPANNER WRENCH INDENTATIONS.
- HEAT GUN MAY BE REQUIRED TO MELT ANY *LOCK-TITE* ON JAM NUT THREADS.

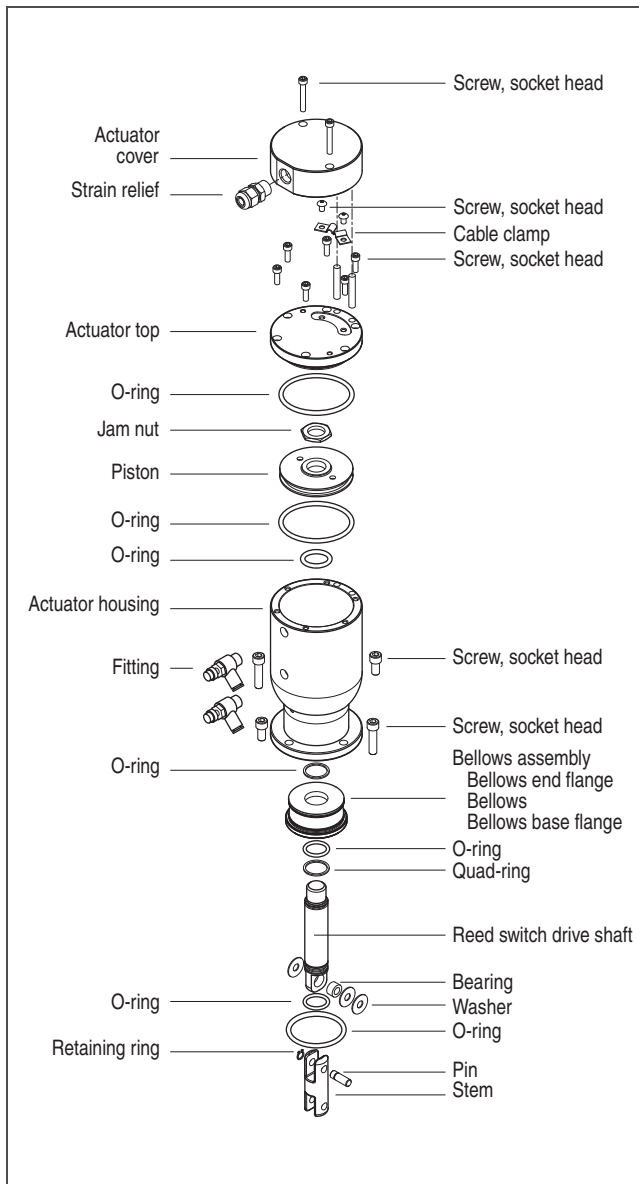
Procedure

- Remove **Bonnet Actuator Carriage Assembly** per instructions on page 8.
1. Remove **Actuator Cover** (2 screws).
 2. Remove **Actuator Top** (6 screws).
For 10" and 12" valves, 4 screws.

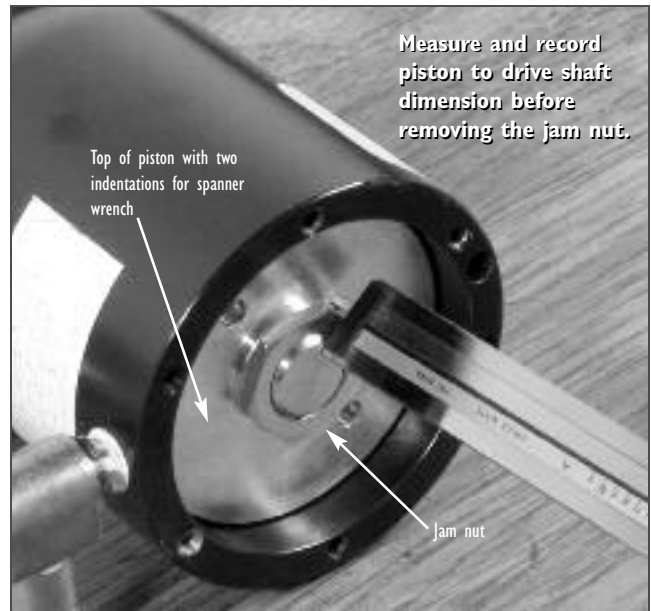
Bellows, Piston & Shaft Seals

Procedure (continued)

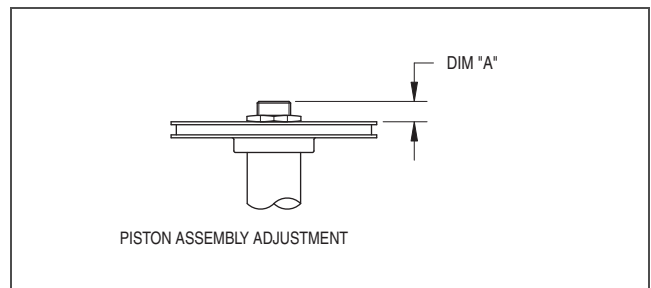
3. Measure the distance between the top of the piston and the top of the drive shaft: DIM "A" (This will be helpful later during reassembly and adjustment)
4. Remove the jam nut from the drive shaft. (Heat gun may be needed to melt the *Lock-Tite* on the thread)



Bellows and Actuator Assembly



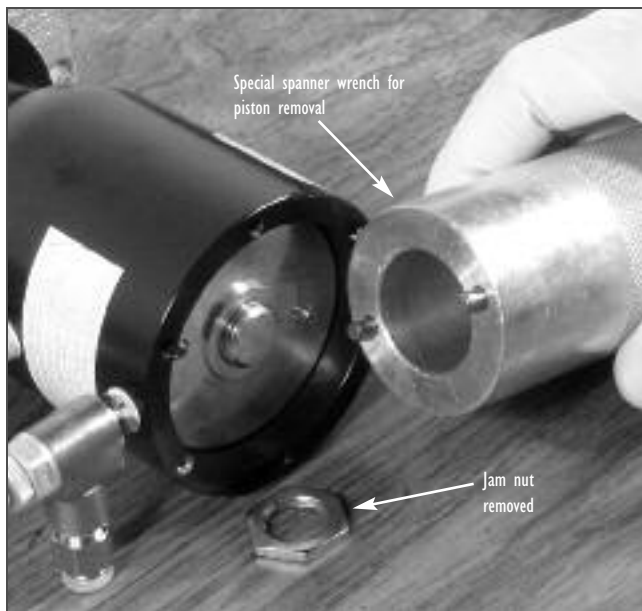
Measure and record piston to drive shaft dimension



Dimension A, reference page 27



Remove hex jam nut

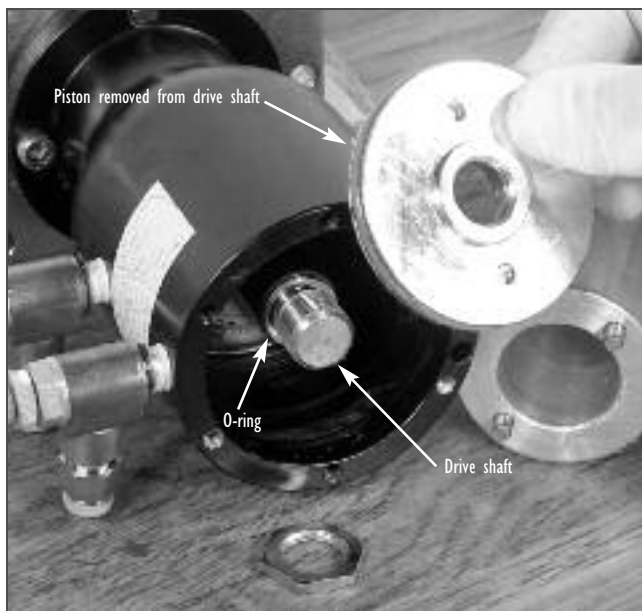


Custom piston removal tool required

Bellows, Piston & Shaft Seals

Procedure (continued)

5. Using a spanner wrench, mate the knobs on the wrench with the indentations on the piston.
6. Turn the piston counterclockwise to unscrew and remove piston from actuator housing.

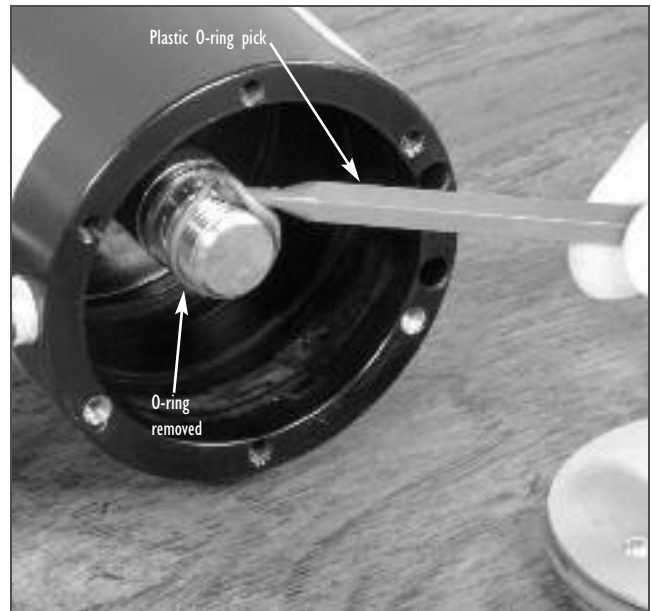


Turn piston counterclockwise to unscrew from drive shaft

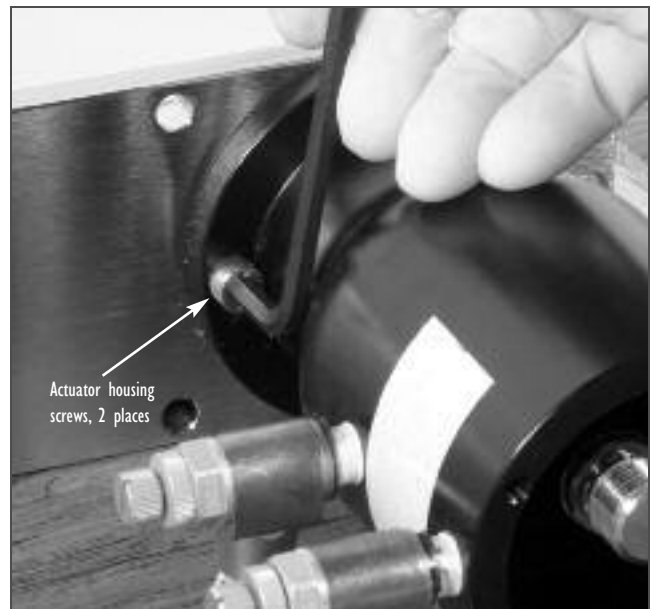
Bellows, Piston & Shaft Seals

Procedure *(continued)*

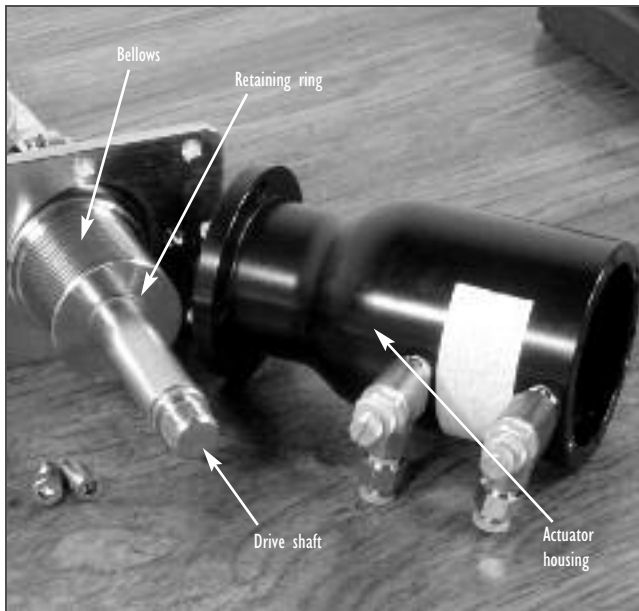
7. Remove O-ring from top of drive shaft.
This will allow the actuator housing to slide off the drive shaft.
8. Remove remaining screws holding the actuator housing to the bonnet plate (2 screws).



Drive shaft O-ring removal



Remove the two remaining actuator housing screws



Actuator housing removed — drive shaft and bellows exposed

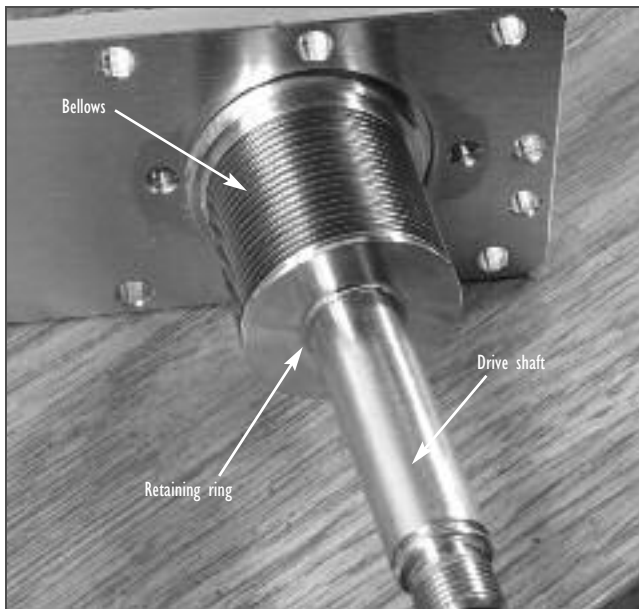
Bellows, Piston & Shaft Seals

Procedure (continued)

9. Remove the actuator housing.

Continue with Bellows Service as listed below;
-or-
Go to Actuator O-ring Service on page 16.

10. Remove R-ring from drive shaft, using a pick. If a replacement is NOT available, use care to preserve the R-ring. Otherwise, pull out using the needle nose pliers and discard.

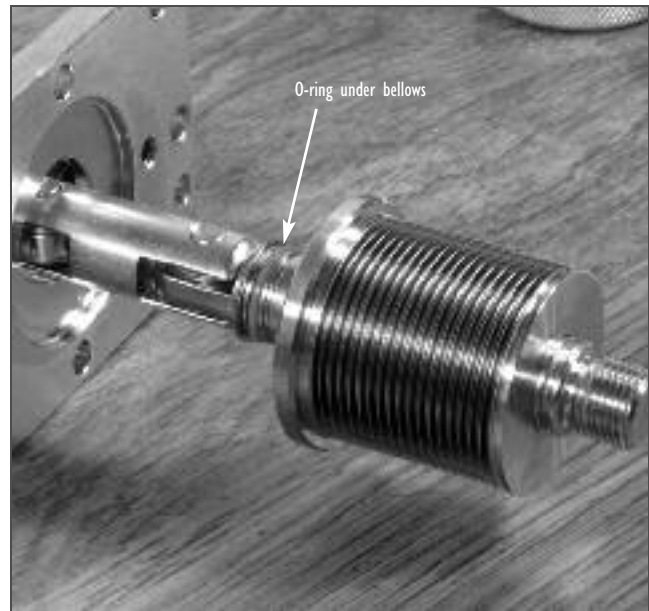


Remove and discard bellows retaining ring

Bellows, Piston & Shaft Seals

Procedure (continued)

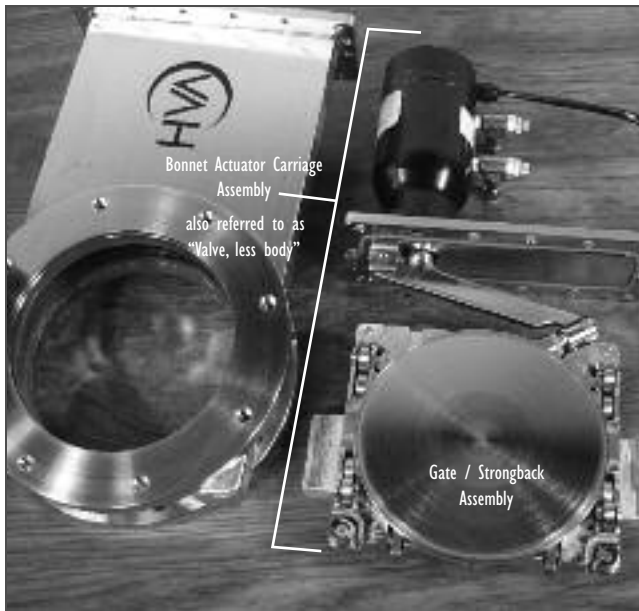
11. Remove bellows by pulling and twisting slightly. Discard.
12. Remove O-ring in the bellows drive shaft area and discard.
13. Clean drive shaft groove and bellows area with IPA.
14. Apply a thin coat of grease (*Apiezon L*) on the bellows area drive shaft O-ring.
15. Install O-ring.
16. Apply a thin coat of grease (*Apiezon L*) on the O-ring for the bellows base flange.
17. Install O-ring.
18. Replace bellows assembly on the drive shaft, pushing and twisting slightly to go over the O-ring.
19. Install R-ring on the drive shaft, using a screw driver and a pick. Make sure it clicks into the groove next to the top of the bellows.
20. Apply a thin coat of vacuum grease to the drive shaft.
21. Install actuator housing on the bonnet plate (2 screws).
22. Apply a thin coating of vacuum grease to the O-ring for the top of the drive shaft.
23. Install O-ring on the top of the drive shaft.
24. Apply a thin coating of vacuum grease to the piston area, if necessary.
25. Install piston on drive shaft; using a spanner wrench, turn clockwise until the measurement in step 3 is achieved.
It is helpful to visually locate the start of threads for both the drive shaft and the piston. Line them up so a first turn produces correct threading. Be careful to not cross-thread.
26. Install jam nut, using *Lock-Tite* and tighten.
27. Install actuator top with Position Indicator reed switches and tighten screws (6 screws).
For 10" and 12" valves, 4 screws.
28. Install actuator cover and tighten screws (2 screws).
29. Replace *Bonnet Actuator Carriage Assembly* into body.
30. Install bolts and tighten. (For MSB, Copper gasket type, tighten side to side 20–25 ft-lb)
31. Install air line and test operation of valve and actuator.



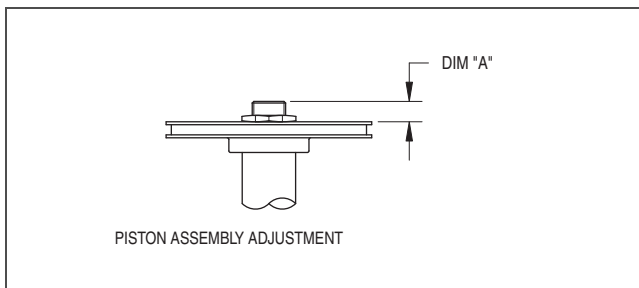
Twist the bellows slightly to pull free of the O-ring



Bellows removed and bellows base flange O-ring exposed



REMOVE & SEPARATE Bonnet Actuator Carriage Assembly



MEASURE & RECORD Dimension A, reference page 27



REMOVE & SEPARATE Actuator Housing

Actuator O-ring

Standard and Metal Seal Bonnet (MSB)

Tools and Materials Required

- Spanner wrench
- Allen wrench set
- O-ring pick, plastic
- Pick (for R-ring removal)
- Needle-nose pliers
- Small standard screwdriver
- Powder-free latex gloves
- Actuator O-ring replacements
- Grease for bellows O-ring: *Apiezon L*
- Vacuum grease
- IPA
- Heat gun
- *Lock-Tite*

- ALWAYS WEAR POWDER-FREE LATEX GLOVES WHEN SERVICING THE VALVE.
- GATE MUST BE IN THE OPEN POSITION TO ACCESS SPANNER WRENCH INDENTATIONS.
- HEAT GUN MAY BE REQUIRED TO MELT ANY LOCK-TITE ON JAM NUT THREADS.

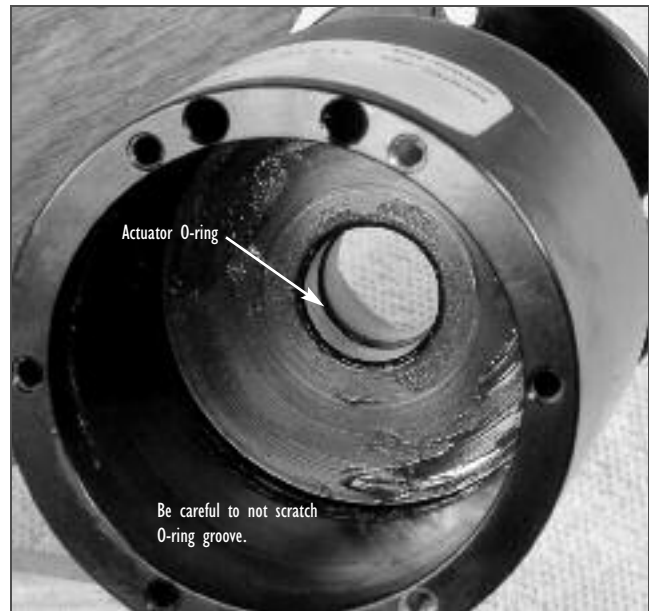
Procedure

- ☞ Note: It is not necessary to remove the *Bonnet Actuator Carriage Assembly* from the valve body if you are replacing the actuator O-ring only — skip to the second step: “Remove Actuator Cover...” Otherwise, follow all steps.
- Remove ***Bonnet Actuator Carriage Assembly*** per instructions on page 8.
- Remove ***Actuator Cover*** and ***Actuator Top*** per instructions on page 10.
- Measure and record piston to drive shaft dimension.
- Remove the ***Actuator Housing*** per instructions on pages 11–14.

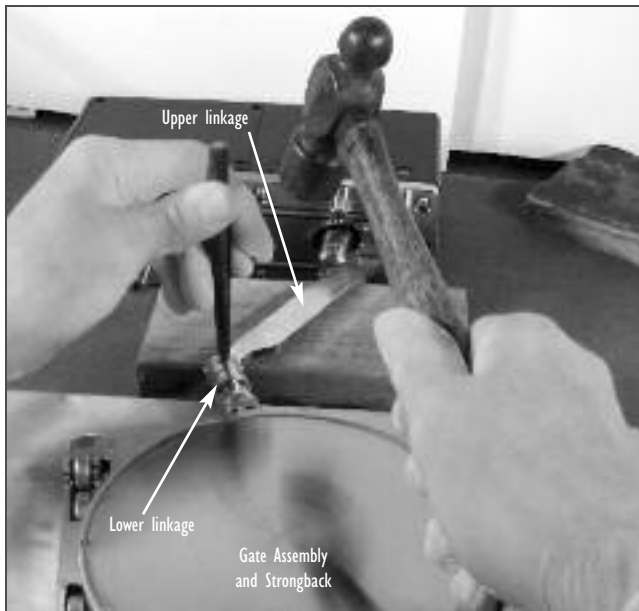
Actuator O-ring

Procedure (continued)

1. Remove O-ring in actuator housing, using a pick and using care to not scratch the groove surface.
2. Apply a thin coat of vacuum grease on the new O-ring.
3. Install O-ring.
4. Inspect the drive shaft; clean and lubricate as necessary.
5. Install actuator housing on the bonnet plate; tighten screws (2 screws).
6. Apply a thin coat of vacuum grease on the O-ring for the top of the drive shaft.
7. Install O-ring.
8. Inspect actuator housing; clean using isopropyl alcohol and lubricate as necessary .
9. Apply a thin coat of vacuum grease on the O-ring for the piston.
10. Install O-ring on the piston.
11. Install piston on drive shaft, using a spanner wrench and turning clockwise until the measurement Dimension A is achieved.
12. Install jam nut, using *Lock-Tite (Def Pro #51574 for high temperature applications or Lock-Tite 242-31 for standard applications recommended)* and tighten.
13. Apply a thin coat of vacuum grease to the O-ring for the actuator top.
14. Install O-ring on the actuator top.
15. Install actuator top with Position Indicator reed switches and tighten screws (6 screws).
For 10" and 12" valves, 4 screws.
16. Install actuator cover and tighten screws (2 screws).
17. Replace *Bonnet Actuator Carriage Assembly* into body.
18. Install bolts and tighten. (For MSB, Copper gasket type, tighten side to side 20–25 ft-lb)
19. Install air line and test operation of valve and actuator.



Actuator O-ring viewed through piston cylinder



Linkage removal. Discard all used parts. Re-using worn or used parts will lead to operational failure and damage to the valve.

Seal Plate Assembly, Pins & Bearings


4" to 21" sizes only

Tools and Materials Required

- Allen wrench set
- Arbor press
- Punch
- Hammer
- Wrenches, box or open
- Retaining ring pliers
- Calipers
- Vacuum grease: Castrol *Microcote*[®] 296
- Isopropyl alcohol (IPA)
- Powder-free latex gloves
- Replacement pins, bearings, washers and retaining rings; optional gate spring.

- ALWAYS WEAR POWDER-FREE LATEX GLOVES WHEN SERVICING THE VALVE.
- IF THE PIN DOES NOT COME OUT EASILY, TURN THE ASSEMBLY OVER AND HIT WITH PUNCH ON THE OTHER SIDE.

Procedure

1. Both the station and the pump corresponding to the gate valve should be vented to atmosphere.
2. Actuate valve to **GATE OPEN** position. 
3. For safety, remove air to actuator.
4. Remove bolts that hold bonnet actuator assembly to body.
5. Pull out the bonnet actuator carriage assembly.
6. Using a punch and hammer, remove the pin that holds the upper linkage to the lower linkage-upper linkage of Strongback. Inspect the pin assembly and place the punch on the end with the retaining ring.

Note: If the pin does not move, turn the assembly over and try from the other side.

Seal Plate Assembly, Pins & Bearings

Procedure *(continued)*

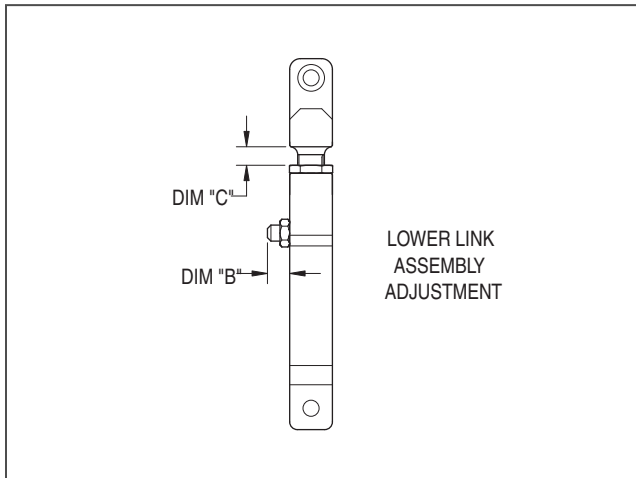
Discard all pins, washers and retaining rings and replace with all new parts. There should be three washers and a retaining ring recovered along with the pin.



Caution: Be careful not to bend the upper linkage; the use of a wooden block for support is recommended.

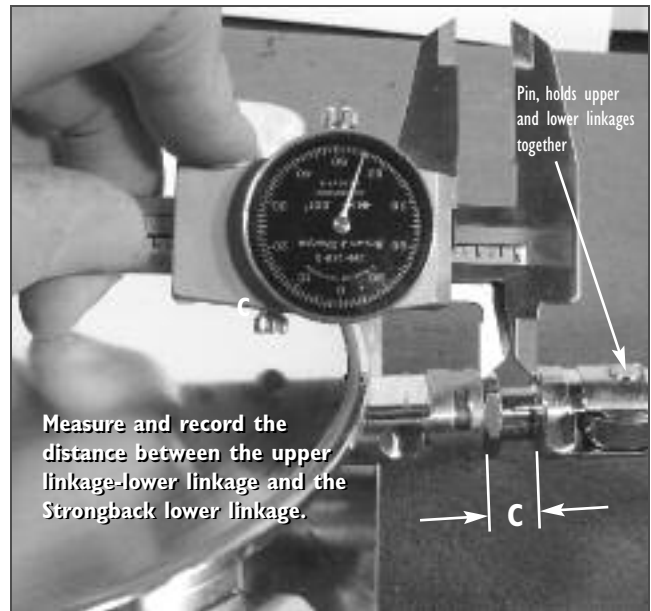
7. Separate the bonnet upper linkage assembly from the carriage assembly.
8. Measure the distance between the Strongback lower linkage and the upper linkage-lower linkage, Dimension C.
This will be helpful later during reassembly and valve adjustment.

Record this dimension.



Dimensions B and C, reference page 27

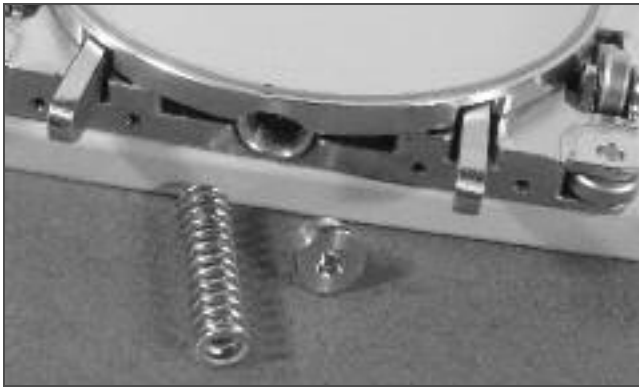
9. For the 6-inch and 8-inch valves, measure the Overcenter Adjustment, Dimension B.
Record this dimension.
10. Move Carriage assembly to a suitable work place for disassembly and the replacement of pins, bearings and R-rings.
11. Remove gate spring by removing one set screw with an Allen wrench.
Now the gate can be raised slightly from the Strongback assembly.



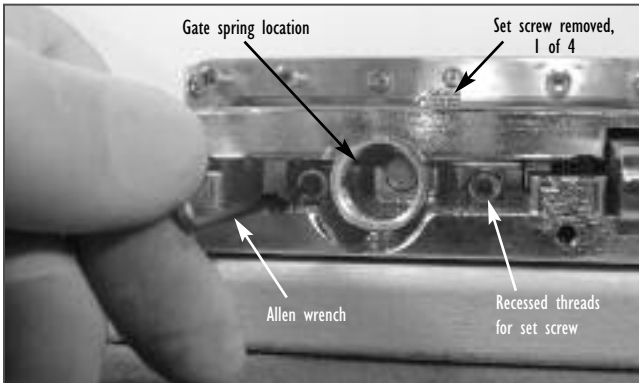
Pin and linkage close-up



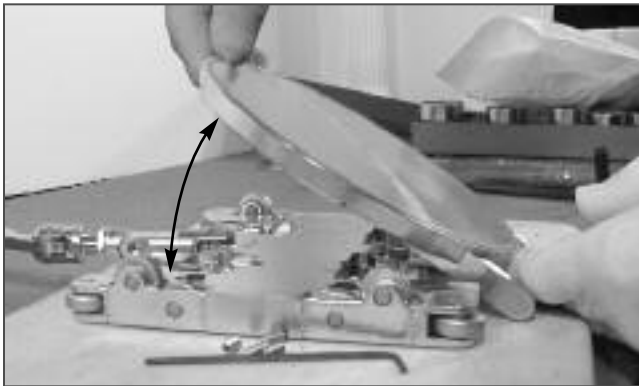
Remove set screw to access the gate spring



Gate spring and set screw



Remove set screws under the gate, two each end



Separate gate from Strongback like opening a book

Seal Plate Assembly, Pins & Bearings

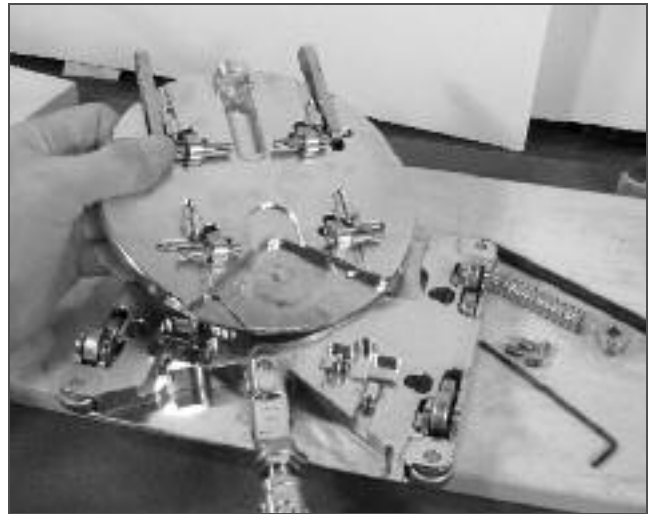
Procedure (continued)

12. Remove four Allen set screws that mount the gate to the Strongback. They are accessible under the gate, two each end, top and bottom.
13. Separate gate from Strongback. Peel off the gate from the Strongback as if opening a book with the bottom of the assembly as the spine of the book.

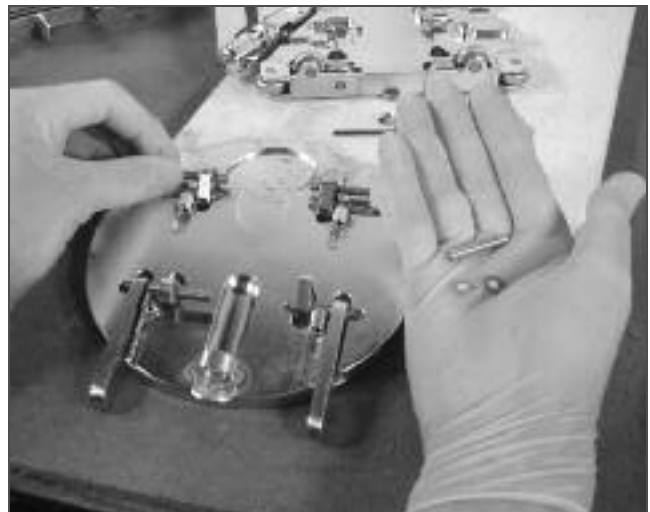
Seal Plate Assembly, Pins & Bearings

Procedure *(continued)*

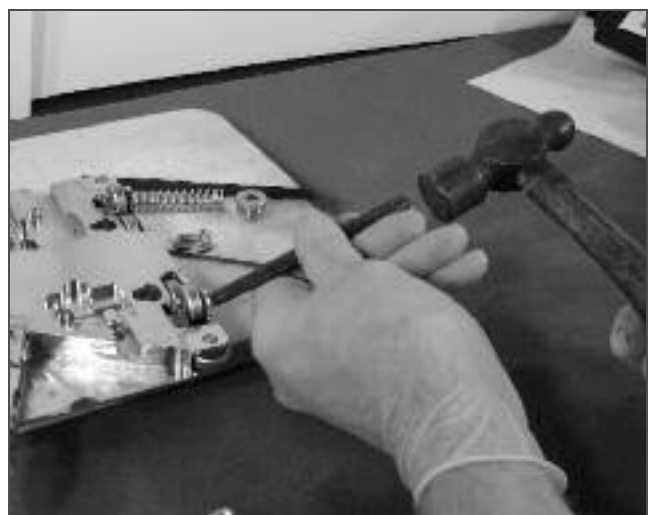
14. Remove set screws, links, washers, pins, and carriage bars. Discard all used parts, except the carriage bars. Re-using worn or used parts will lead to operational failure and damage to the valve.
15. Using a punch and hammer, remove pins from wheels. Before punching, inspect the pin assembly and place the punch on the end with the retaining ring.
Note: If the pin does not move, try from the other side.
16. Using an arbor press, remove the bearings from the links and wheels. Discard expendable parts.
17. Clean all reusable parts such as the gate, Strongback, links, carriage bars, and gate spring with IPA.
18. Press new bearings in using an arbor press. For Viton® bonnet sealing valves, ensure that the bearings are properly lubricated with the appropriate vacuum grease (Castrol *Microcote*® 296 recommended). For copper sealing bonnet valves run bearings dry.
19. Verify that all bearings spin freely.



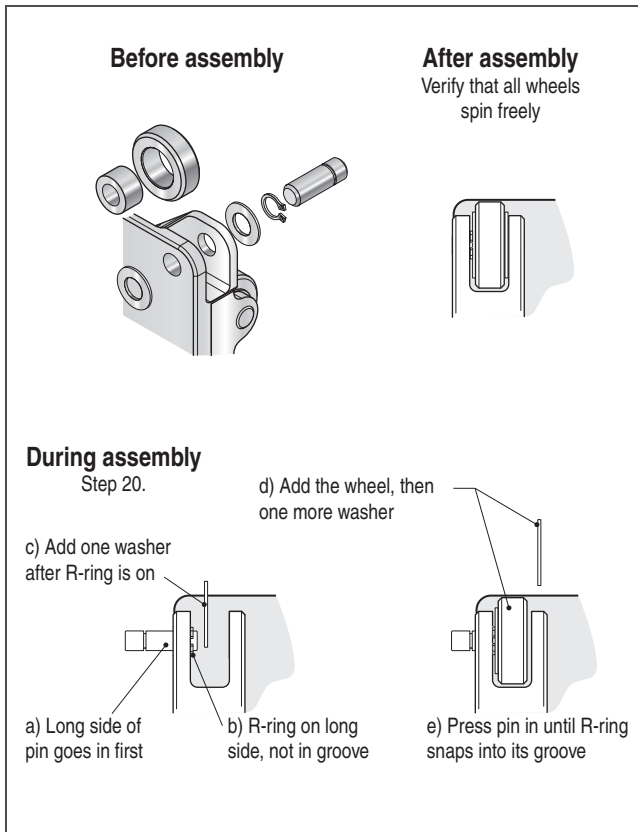
Gate separated from Strongback



Remove all set screws, links, washers, pins, and carriage bars



Use a punch and hammer to remove wheels from pins

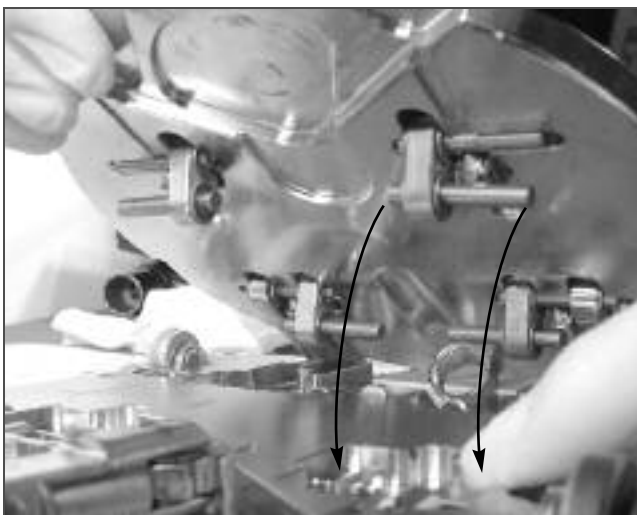


Pins, washers and R-ring reassembly drawing

Seal Plate Assembly, Pins & Bearings

Procedure (continued)

20. Install washers, pins and R-rings into Strongback.
The recommended technique is as follows:
 - a) Slide long side of pin through hole first (the side without the groove);
 - b) Install R-ring close to the end of the pin, not in the groove;
 - c) Add one washer;
 - d) Add the wheel, then one more washer;
 - e) Push pin in until the R-ring snaps into its groove.
21. Verify that all wheels spin freely.
22. Set Strongback aside for later assembly.
23. Install links, washers, and pins into gate slots.
Use a small amount of *Microcote® 296* on washers to make them stick to the links during assembly.
24. Adjust pins to correspond to Strongback pin pockets.
Align the pins so they will be in the center of each slot when the gate lies on the Strongback.
25. Install gate to Strongback and verify that all pins fit into Strongback pockets.
26. Install four new set screws under the gate which were removed in step 12. Watch to see that the gate does not rise up when the set screws are tightened.

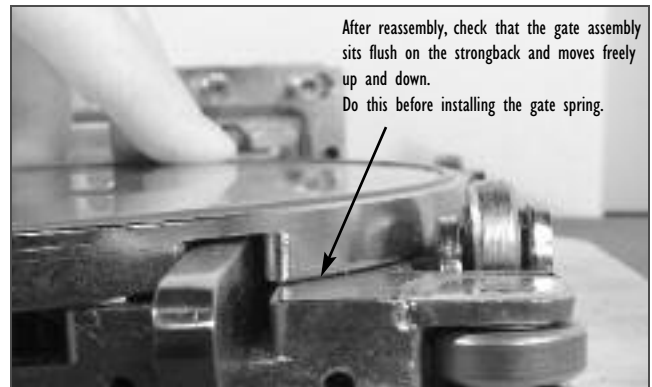


Visually position pins to match Strongback pin pockets

Seal Plate Assembly, Pins & Bearings

Procedure *(continued)*

27. Verify that the gate is flush with the Strongback in the down position and moves freely up and down.
28. Install gate spring. This may require pressure to compress the spring.
29. Install and tighten set screw removed in step 11.



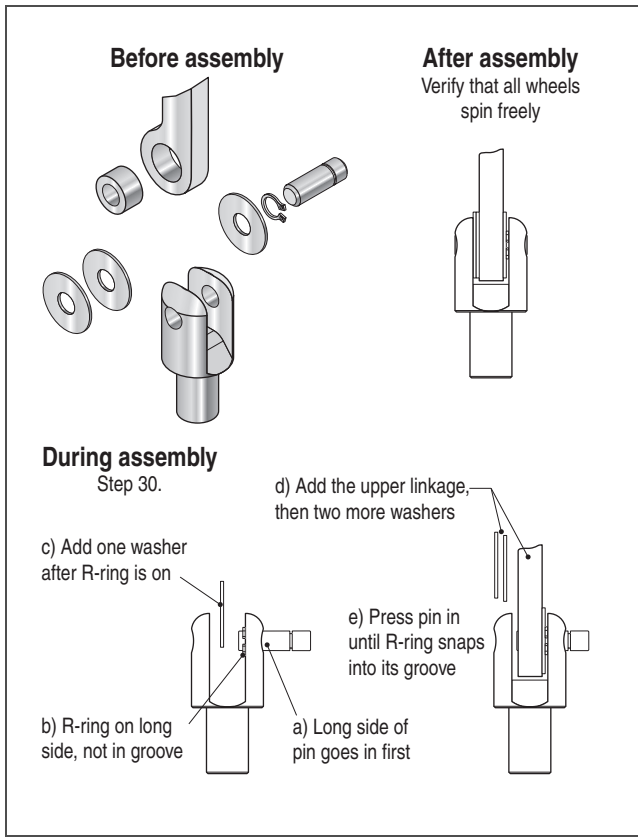
Gate and Strongback assemblies after reassembly



Verify free movement of gate



Install the gate spring



Pins, washers and R-ring reassembly drawing

Seal Plate Assembly, Pins & Bearings

Procedure (continued)

30. Reattach upper linkage to Strongback lower linkage-upper linkage.

The recommended technique is as follows:

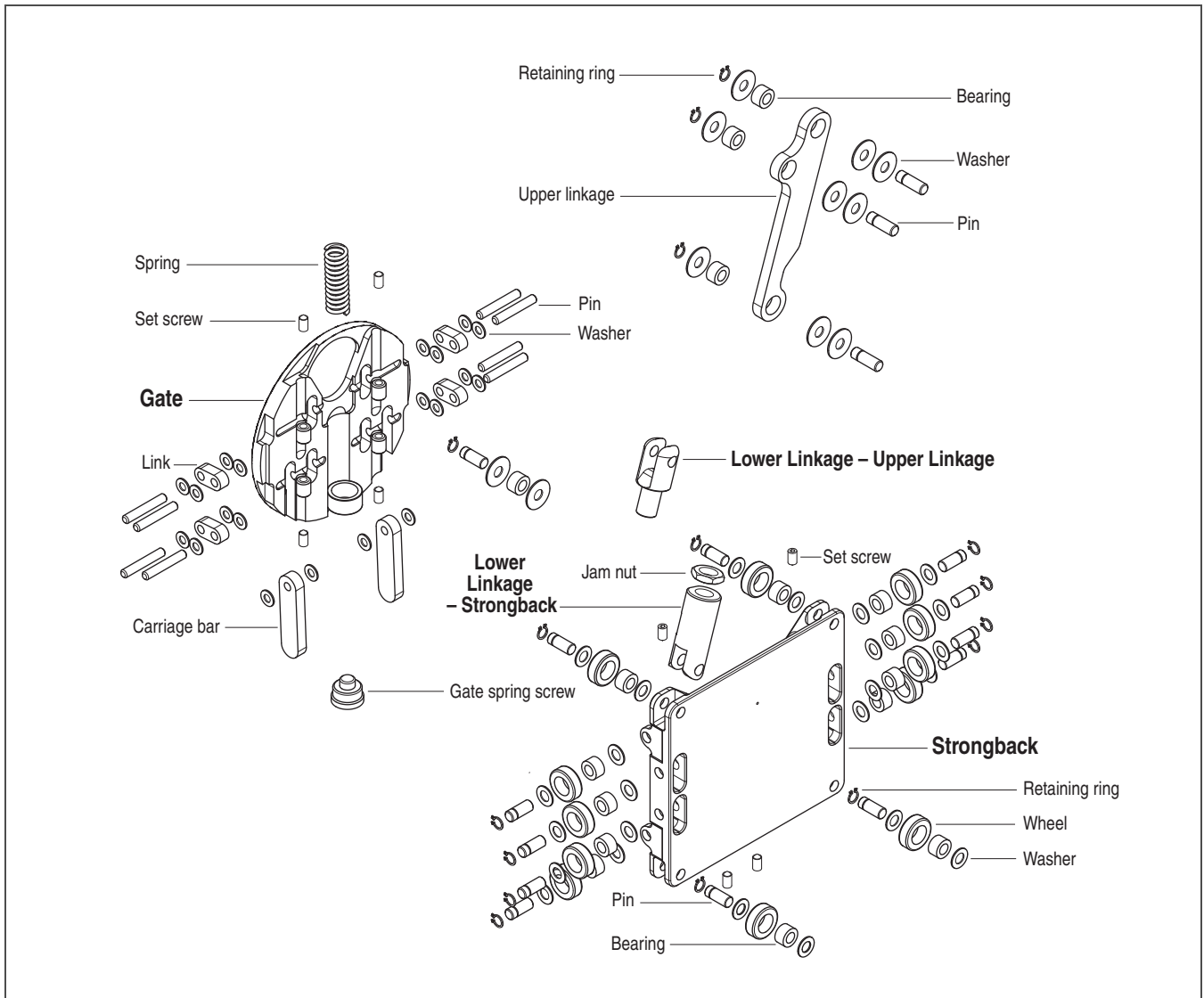
- a) Slide long side of pin through hole first (the side without the groove);
- b) Install R-ring close to the end of the pin, not in the groove;
- c) Add one washer;
- d) Add the upper link, then the other two washers;
- e) Push pin in until the R-ring snaps into its groove.

31. Verify that the link moves freely.

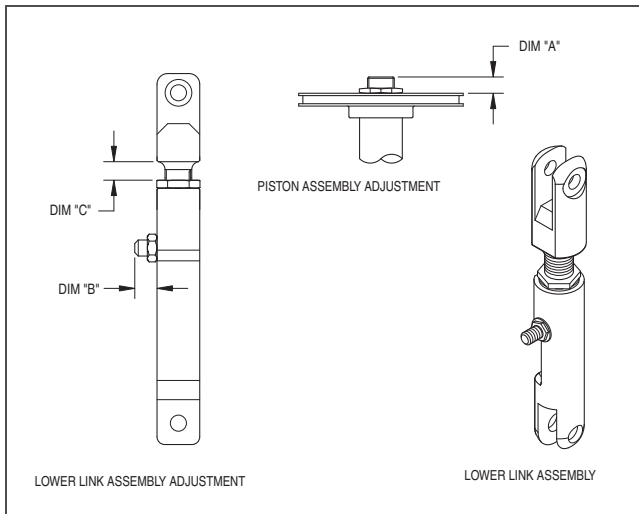
33. Verify the measurement in step 8, and adjust as necessary.

The Bonnet Actuator Carriage Assembly can now be reinstalled into the valve body

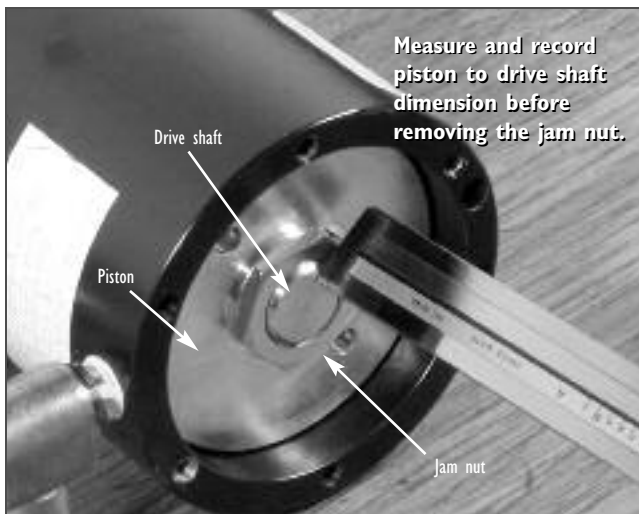
34. Replace complete assembly into valve body.
35. Tighten bolts.
36. Test valve operation.
37. If necessary, refer to the Valve Adjustment Procedure on page 26.



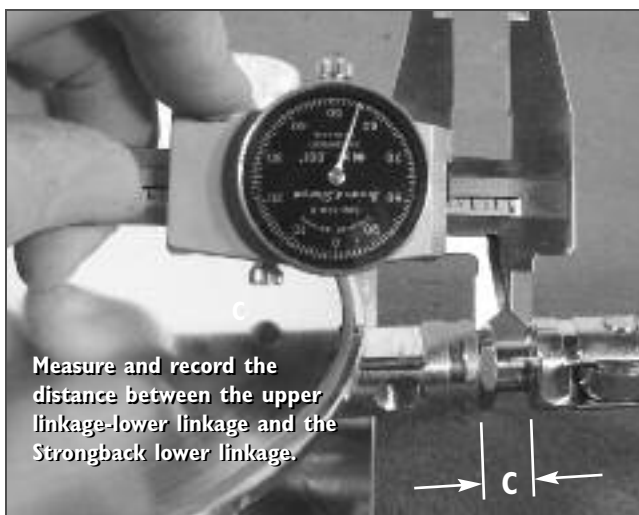
Gate and Strongback assembly



Dimensions A, B and C



Dimension A



Dimension C

Valve Adjustment

Compression and Over-Center

Tools and Materials Required

- Allen wrench set
- Wrench set, box or open
- Calipers
- Air regulator
- Heat gun
- Powder-free latex gloves

• ALWAYS WEAR POWDER-FREE LATEX GLOVES WHEN SERVICING THE VALVE.

Procedure

Steps 1–8 apply to 1.5" to 3" gate valves only.

1. Vent station and pump corresponding to gate valve to atmosphere.
2. Actuate valve to GATE OPEN position.
3. For safety, remove air to actuator.
4. Remove actuator cover (2 screws).
5. Remove actuator top (6 screws).
6. Loosen jam nut on drive shaft. This may require the use of the heat gun to melt the *Lock-Tite* (Def Pro #51574 for high temp applications or *Lock-Tite 242-31* for standard applications recommended) on the thread.
7. Check Dimension A on Chart for specific valve size. This is only the starting adjustment.
8. Adjust and tighten jam nut. Do not use *Lock-Tite* at this point, as adjustment may be needed later.
9. Install actuator top, using only 2-4 screws.
10. Remove bolts holding the bonnet actuator assembly to valve body; for Quick-Clamp Bonnet, undo the clamp.
11. Pull out actuator bonnet carriage assembly from valve body.
12. Check Dimension C on Chart for specific valve size.



Valve Adjustment Chart					
Valve Size	Dimension A Piston Adjust *	Dimension B Overcenter Adjust	Dimension B No Overcenter Adjust	Dimension C Compression Adjust	Recommended Locking Air Pressure
1.50	.110 **	N/A	N/A	.210	20–30 PSI
2.00	.120 **	N/A	N/A	.360	35–50 PSI
2.50	.125 **	N/A	N/A	.190	35–55 PSI
3.00	.125 **	N/A	N/A	.390	60–65 PSI
4.00	N/A	.278	.360	.420	20–35 PSI
6.00	N/A	.085	.160	.350	35–45 PSI
8.00	N/A	.365	.465	.260	55–70 PSI
10.00	N/A	—	.800	.720	25–35 PSI
10.75	N/A	.635	1.035	.550	30–40 PSI
12.00	N/A	.640	1.035	.550	30–40 PSI
14.00	N/A	—	—	—	45–55 PSI
16.00	N/A	.540	.760	.540	65–80 PSI
18.00	N/A	—	—	—	—
21.00	N/A	—	—	—	—

ALL DIMENSIONS IN INCHES
 * = Starting adjustment
 ** = Piston adjustment controls overcenter adjustment

Valve Adjustment

Procedure (continued)

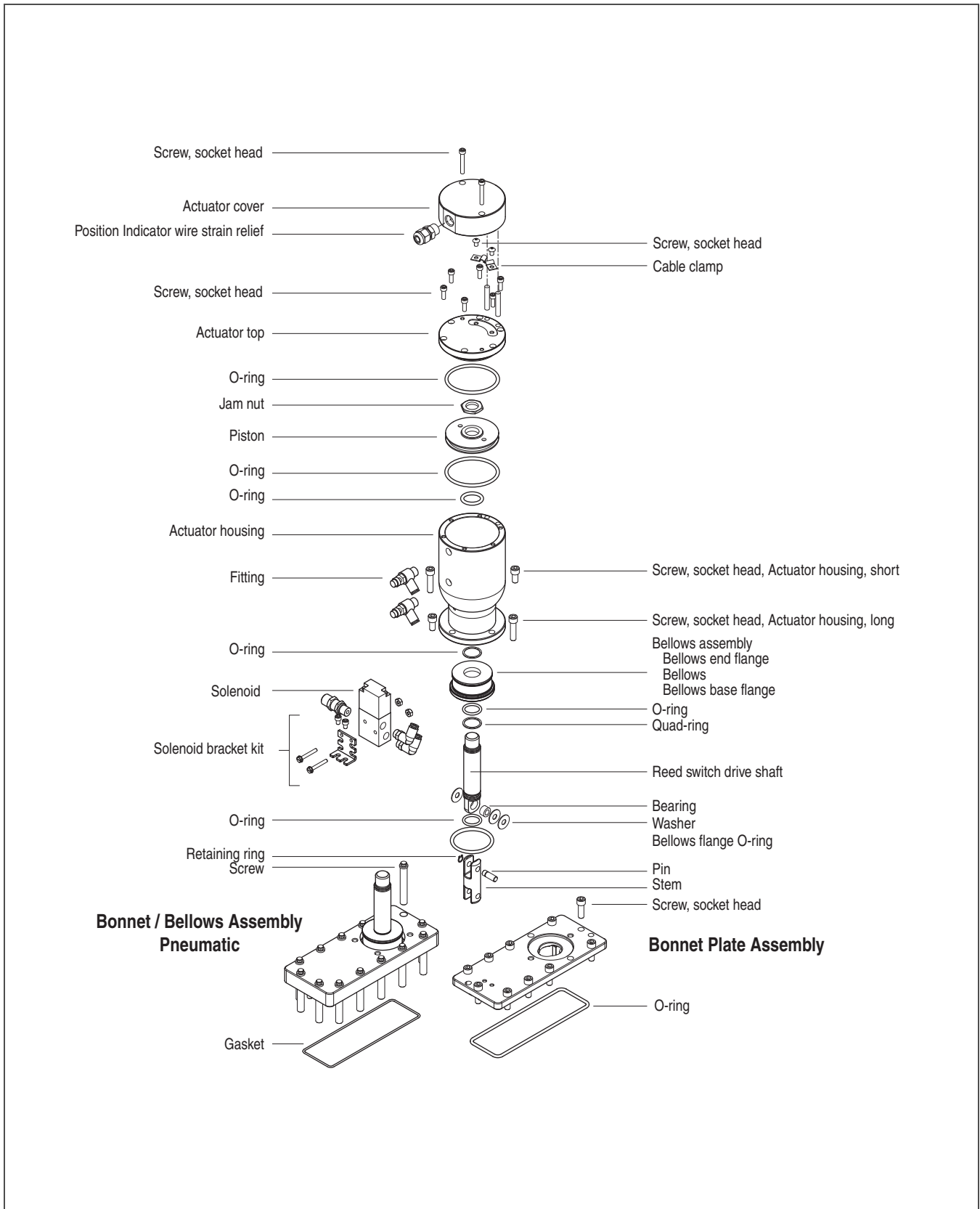
13. To adjust, loosen jam nut, then turn lower linkage-upper linkage counterclockwise to increase dimension for more compression; or turn clockwise to decrease the dimension for less compression. More compression means more air pressure to lock valve; less compression means less air pressure to lock valve.
14. After adjusting, tighten jam nut.
15. Reassemble bonnet carriage assembly on valve body.
16. Using an in-line air regulator, check the air pressure required to lock valve. Refer to Chart for recommended locking air pressure per size of gate valve.
17. Adjust Dimension C until the correct locking air pressure is achieved.

Steps 18–20 apply to 4" to 12" gate valves only.

18. Check Dimension B on Chart for specific valve size, depending on Overcenter or No Overcenter requirement. Note: Proper Overcenter means that the gate does not drop when air pressure is removed from the actuator.
19. If necessary, loosen nut and adjust Dimension B by turning screw counterclockwise to increase dimension for less Overcenter or turn clockwise to decrease dimension for more Overcenter. Less Overcenter means less travel for the Linkage; more Overcenter means more travel.
20. Check for Overcenter adjustment: If gate drops after removal of air pressure for valves that require Overcenter, go back to Step 18.

Steps 21–23 apply to all gate valves.

21. Tighten nut.
22. Install all bolts and tighten.
23. Test valve operation.



Pneumatic Actuator Assembly



Call the toll free number prior to returning the item.

CONTACT	Company _____	_____
	Address _____	<i>Return Material Authorization Number</i>
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	Country _____	Contact _____
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	Describe any problems _____	
DESCRIPTION	_____	

RETURN TO	Return a copy of this form along with the product to:	A Return Material Authorization number must be legibly marked on the outside of the shipping box.
	HVA RMA# _____ 12880 Moya Boulevard Reno NV 89506 U.S.A.	Telephone: 1-775-359-4442 Toll free: 1-800-551-4422 Facsimile: 1-775-359-1369 Email: sales@highvac.com



Glossary

AM-350	a grade of stainless steel used in welded bellows	No Overcenter	valve is not adjusted to mechanically lock over center
B.C.	bolt circle diameter	OAH	overall height
CDA	compressed dry air	O.D. or OD	outside diameter
CF-F	a standardized metal sealed flange, compatible with Conflat® flanges	OEM	original equipment manufacturer
CCW	counterclockwise	OFHC	oxygen-free high conductivity, a grade of copper that is non-contaminating, used in gaskets for metal seal flanges and valve bonnets
CW	clockwise	Overcenter	valve is adjusted to mechanically lock over center
Dia. or dia.	diameter	P.I.	Position indicator
Est. or est.	estimated	Pneu.	pneumatic
Flg	Flange	PSI	pounds per square inch, US system measurement of pressure
ft-lb	US system measurement of torque	psig	pounds per square inch, gauge, a measure of air pressure relative to atmosphere
HV	high vacuum	RMA	Return Material Authorization Note: Returned goods will not be accepted without an RMA number clearly visible on the outside of the shipping carton.
Hz	Hertz, a measure of frequency	R-R or R-ring	retaining ring
I.D. or ID	inside diameter	S/H	Socket head
IPA	Isopropyl alcohol	STD	standard, elastomer sealed bonnet
ISO	International Standards Organization	Strongback Assembly	the supporting transport mechanism behind the gate
JIS	Japanese Industrial Standard	SW	switch
KF	kleinflansch (German), the smaller of the ISO line of clamping flanges	TDS	Technical Data Sheet
mA	milliamp, a measure of electrical current	UHV	ultrahigh vacuum
Man.	manual, as in a manually operated valve	UNF	Unified National Fine, thread description
MSB	metal seal bonnet	VAC	alternating current voltage
MSDS	Material Safety Data Sheet	VDC	direct current voltage
N/A	Not Applicable	Viton®	elastomer O-rings used in standard valves
NW	nenn weite (German), nominal diameter		



Contact Information

Please call, email, or fax in your questions to HVA at:

Telephone (toll free): 1-800-551-4422

Local: 1-775-359-4442

Email: sales@highvac.com

Facsimile: 1-775-359-1369

Mailing address: 12880 Moya Boulevard
Reno NV 89506
U.S.A.

Product Warranty

Each product sold by HVA, LLC (HVA) is warranted to be free from manufacturing defects that adversely affect its normal functioning during the one-year immediately following delivery thereof by HVA (or in the case of products or components of any product purchased by HVA from another for any lesser period of time that such manufacturer warrants said product or component to HVA).

Notwithstanding the warranty provisions set forth above, all of HVA's obligations with respect to such warranties shall be contingent on licensee's use of the licensed programs in accordance with HVA's instructions as provided by HVA in the documentation or otherwise, and as may be amended, supplemented, or modified by HVA from time to time. HVA shall have no warranty obligations with respect to any product which has been:

- A. Operated by purchaser in a manner inconsistent with requirements set forth in the documentation or under the provisions of this agreement or that has been modified or repaired by any party other than HVA;
- B. Damaged in any manner and by any cause other than the act or omission of HVA; or,
- C. Operated or maintained in environmental conditions outside the parameters designated by HVA in the documentation or elsewhere.

HVA shall not be liable for any damage, loss or expense, whether consequential, special, incidental, direct or otherwise caused by, arising out of or connected with the manufacture, delivery (including any delay in, or failure to, deliver), packaging, storage or use of any product sold or delivered by HVA, whether or not resulting from negligence or from breach of contract except that in the event that any product so sold or delivered by HVA shall fail to conform to the foregoing warranty, the purchaser, as its exclusive remedy, shall upon prompt notice to HVA of any such defect or failure and upon the return of the product, part of component in question to HVA at its factory, with transportation charges prepaid, and upon HVA's inspection confirming the existence of any defect inconsistent with said warranty or any such failure, be entitled to have such defect or failure cured at HVA's factory and at no charge therefore, by replacement or repair of such product as HVA may elect.

The warranties stated are the sole and exclusive warranties offered by HVA. There are no other warranties respecting the products provided hereunder, either express or implied, including but not limited to any warranty of design, merchantability, or fitness for a particular purpose, even if HVA has been informed of such purpose. No agent of HVA is authorized to alter or exceed the warranty obligations of HVA as set forth herein.

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If a unit requires service, call HVA to discuss the problem. Prior to returning a unit, a Return Material Authorization number must be assigned by HVA. That RMA number must be legibly marked on the outside of the shipping box. Place the unit in a clean plastic bag to protect the unit from packing materials. Package the unit in its original box or an equivalent one. Cushion the unit securely to prevent damage during shipping. After obtaining an RMA number, complete the Service Report on page 29. Return a copy of the Service Report along with the unit.

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