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INTRODUCTION

CAUTION:
 The instructions provided herein should be completely reviewed and understood prior to installing, operating, or repairing this equipment. All **CAUTION:** and **WARNING:** notes (displayed in boxes such as this one) must be strictly observed to prevent serious injury or equipment malfunction.

SCOPE

This instruction manual includes installation, operation and maintenance information for 1.0" through 8.0" Norriseal Series 2700A Control Valves. Please refer to separate manuals for instructions covering controllers and positioners.

DESCRIPTION

The Series 2700A Valve is designed for general purpose use in liquid and gas control applications calling for either modulating or on/off service. The Series 2700A has a single-port body with two types of trim, Plug control and Cage control. Plug control trim may be balanced or unbalanced. Cage control is always balanced. The pneumatic Spring/Diaphragm Actuator has the Spring in the Yoke under the Diaphragm for both direct (fail open) and reverse (fail closed) acting modes.

Plug Control trim is used with the fluid flowing up under the characterized valve plug (flow-to-open). The fluid pressure drop occurs at the flow area between plug and seat. The contour on the plug characterizes flow as quick opening or modified percent.

Balanced Cage Control trim is used with the fluid flowing either down (for most applications) or up (in noise abatement or other specialized applications) through the characterized ports in the cage. The fluid pressure drop occurs at the flow area of the cage's port with the port's contour characterizing flow as linear or equal percent.

Norriseal valves are equipped standard with spring-diaphragm pneumatic actuators, either reverse acting (spring closing) or direct acting (spring opening) type. Both actuator types are available in a range of sizes and with a selection of springs to suit the operating conditions.

Series 2700A valves are available with either adjustable or non-adjustable packing. Non-adjustable packing is Chevron V-ring style with a spring below the packing to maintain a positive stem seal. Adjustable packing is square (cross section) compression packing, either Teflon/Kevlar or Grafoil. Both packing styles are retained with two studs holding a compressor bar on the packing retainer. The Series 2700A bonnets have an NPT thread for mounting an optional packing lubricator.

CAUTION:
 Before disassembly or maintenance, all pressures in this device must be relieved. Failure to relieve pressures may result in personal injury or device damage. The resulting uncontrolled venting or spilling of line fluids may cause personal injury, loss of process control or environmental contamination.

VALVE IDENTIFICATION

A nameplate is attached to the upper diaphragm housing of each valve assembly. The nameplate lists the serial number, series number and model number as well as other information applicable to the particular valve assembly, including trim size, trim and plug materials, and pressure and temperature limits.

Valve model numbers are 13 positions long; with a typical model number being RF-14TGS-12NX. Refer to the product brochure for specific information on the valve nomenclature.

When servicing valves, always use only Norriseal replacement parts. Please refer to the serial and model numbers on the nameplate when ordering replacement parts.

WARNING:

Maximum allowable pressures for the valve body and actuator and the maximum allowable pressure at the maximum temperature for the valve are shown on the nameplate mounted on the actuator. If pressure to the valve is capable of exceeding these limits, install relief valves or other over-pressure protection devices in the pressure lines.

CAUTION:

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and fluid conditions. Since some body/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting the Norriseal sales office or your sales representative.

1.0 VALVE INSTALLATION AND START-UP

1. Before installing the valve, inspect it for any shipment damage and for any foreign material that may have collected during crating and shipment. Remove flange protectors from body end connections.
2. Blow out all pipelines to remove pipe scale, chips, welding slag, and other foreign materials. Gasket surfaces should also be free of any foreign materials.
3. Install the valve so that flow is in the direction indicated by the flow direction arrow either cast on the body or on the tag pinned to the body.
4. Install valve using good piping practice. For flanged bodies, use a suitable gasket between the body and pipeline flanges. For threaded (NPT) bodies, use TFE tape or pipe thread sealant on external pipe threads.
5. The Bodies are rated ANSI 150, 300, 600, 900, 1500 or 2500 class. Do not install the valve in a system where the working pressures can exceed those marked on the nameplate.
6. Where piping is insulated, *DO NOT insulate the valve above the valve bonnet flange.*

7. Connect instrument air to actuator or positioner connection. Refer to the nameplate for the maximum instrument air pressure. Check for proper valve operation by cycling actuator several times and observing stem movement.

WARNING:

Do not exceed the maximum instrument air pressure specified on the warning tag or stamped on the valve nameplate. Under no circumstances should the actuator loading pressure ever exceed 35 psi.

8. Actuator springs are pre-set at the factory and may require adjustment to suit specific operating conditions. To adjust actuator spring setting, proceed as follows:

- a. **Reverse actuator:** Loosen the lock nut on the stem below the spring, and turn the adjusting nut above it clockwise to increase the spring's pre-load and plug seating force to achieve tighter shutoff. Turn the adjusting nut counterclockwise to reduce preload. Retighten the lock nut after adjustment.

NOTE: An increase in plug seating force will also require an increase in the diaphragm supply pressure required to fully open the valve.

NOTE: Excessive adjustment of the spring to increase seating force may shorten the valve stroke preventing the valve from opening fully.

- b. **Direct actuator:** Loosen the lock nut on the adjusting nut below the spring, and turn the adjusting nut clockwise to increase the spring's pre-load and turn it counterclockwise to reduce the pre-load. Retighten the lock nut after adjustment.

NOTE: In a direct actuator, any increase in supply pressure to diaphragm produces a corresponding increase in plug seating force when the valve is closed. *Do not exceed 35 psi supply pressure.*

Table 1

Stem travels for valves with full size trim are listed below. For valves with reduced or restricted trim, stem travel maybe less than the value shown.

BODY SIZE (in)	STEM TRAVEL (in)
1.00	0.75
1.50	1.00
2.00	1.25
3.00	1.50
4.00	2.00
6.00	2.75
8.00	4.00

2.0 VALVE MAINTENANCE

WARNING:

Before attempting any repairs, isolate the control valve from the system and make sure that all pressure is released from the valve body both upstream and downstream. Shut off and vent supply and signal air lines to the actuator.

1. Isolate the valve from the process.
2. Shut off all control and supply lines to the actuator.
3. Release the process pressure.
4. Vent the actuator loading pressure.

Valve parts are subject to normal wear and must be inspected and replaced as necessary, with the frequency of inspection and maintenance depending upon the severity of service conditions. The following sections describe the procedures for disassembling and re-assembling the valve for normal maintenance and troubleshooting. All maintenance operations may be performed while the valve body remains in line *as long as the line is not in service and/or is isolated from active process by block valves.* Table 2 lists the maintenance schedule for the valve assembly. Table 5 presents a chart for assistance in troubleshooting valve operation.

Table 2
Maintenance Schedule*

Item	Inspection Schedule
Valve Trim (Seat, Plug, Cage & Guide)	Inspect every 6 months, under normal service conditions (low pressure drop and no sand or abrasives in fluid). Or inspect every 2 months, under service conditions, such as high pressure drop, corrosion, or fluid with sand.
Stem Packing	Inspect Packing at least once a year.
Actuator	Inspect Diaphragm, Spring, and Stem once a year.
Body	The body should last many years under normal conditions. However, under severe conditions of corrosion or erosion from sand in the flowing fluid, high pressure drops, or high fluid velocity, body life may be greatly reduced. Inspect the body each time the bonnet is removed.
Bonnet	Inspect Bonnet once a year or whenever trim inspection is done.
Seals	Replace Gaskets and inspect O-Rings each time valve is disassembled.

* Under certain operating conditions, this suggested maintenance schedule will not be adequate and a shorter time schedule may be required.

A parts list drawing showing the valve configuration with a list of all parts is available. Please contact Norriseal or your local Norriseal representative.

2.1 ACTUATOR DISASSEMBLY

For all spring-diaphragm actuators:

1. Remove instrument air from the actuator.
2. Loosen the lock nut on the stem (reverse acting actuators) or the adjusting nut (direct actuators), and turn the adjusting nut above it counterclockwise until the spring's preload is completely removed (de-energized).
3. Unscrew the two cap screws on the stem connector and remove the stem connector.
4. Unscrew the yoke lock nut using a metal punch or narrow flat metal bar and hammer. Remove the actuator yoke from the valve bonnet.
5. Unscrew the cap screws around the diaphragm housing and remove the upper housing.
6. Remove the lock nut and adjusting nut from the actuator stem (reverse actuators) or the actuator body (direct actuators). On reverse actuators, the spring retainer and actuator spring will be held to the adjusting nut by gravity and will be removed when the adjusting nut is removed. The actuator may be inverted or laid on its side for this step.
7. Remove the diaphragm plate/diaphragm/stem assembly from the yoke.
8. Unscrew the jam nut on top of the actuator stem and disassemble the lock washer, diaphragm plate, diaphragm, and actuator stem.
9. On direct actuators, remove the actuator spring and lower spring retainer from the yoke.

2.2 ACTUATOR REASSEMBLY

A. For reverse actuators:

Reverse Steps 1 through 8 of the Actuator Disassembly instructions.

B. For direct actuators:

Reverse Steps 1 through 9 of the Actuator Disassembly instructions.

2.3 VALVE DISASSEMBLY

A. (Balanced Plug Control Trim)

CAUTION:

Use care to avoid damaging gasket sealing surfaces. The surface finish of the valve stem is critical for making a good packing seal. The inside surface of the cage assembly or cage retainer is critical for smooth operation of the valve plug and for making a seal with the piston ring. The seating surfaces of the valve plug and seat ring are critical for tight shutoff. Assume all of these parts are in good condition when disassembling the valve and protect them accordingly.

1. Loosen the lock nut on the actuator stem and turn the adjusting nut above it counter clockwise to completely remove the spring's pre-load. This will leave the actuator attached to the valve bonnet. (Alternately, completely remove the actuator by following steps 1-4 in Section 2.1 Actuator Disassembly instructions above.)
2. Remove the nuts from the bonnet flange studs.
3. Lift the bonnet off the body along with guide, cage, plug, and stem being careful to lift straight up to avoid scoring or damaging the valve internals.
4. Separate the plug from the stem by driving out the plug pin with a punch and turning the plug, cage, and guide counter clockwise. The plug pin is exposed and visible just above guide. If the valve plug needs replacing, always replace the entire plug, plug pin, and stem assembly.
5. If the actuator/valve stem connector has been removed, the stem and trim assembly can be removed from the bonnet. *Always replace the packing if the stem is removed from the valve bonnet.* Loosen the packing retainer and remove the stem from the bonnet.
6. Slide the plug out of the cage and guide.
7. Lift the seat ring and gasket out of the body.

2.3 VALVE DISASSEMBLY

B. (Unbalanced Plug Control Trim)

CAUTION:

Use care to avoid damaging gasket sealing surfaces. The surface finish of the valve stem is critical for making a good packing seal. The inside surface of the cage assembly or cage retainer is critical for smooth operation of the valve plug and for making a seal with the piston ring. The seating surfaces of the valve plug and seat ring are critical for tight shutoff. Assume all of these parts are in good condition when disassembling the valve and protect them accordingly.

NOTE: This section applies to unbalanced plug control trim of 0.25" through 1.0" size when used in 2.0", 3.0", and 4.0" valve bodies. For 1.0" valve bodies, follow the procedures for Balanced Plug Control Trim in Paragraph 2.3 A above. The

"stem adapter" referred to below is a special part that connects the valve plug to the valve stem.

NOTE: For these trim sizes, the valve seat is integral with the valve cage and is referred to as the "seat/cage". The seat/cage is positioned within the valve body by means of a seat adapter.

1. Remove the valve bonnet from body, using Steps 1, 2, and 3 in paragraph 2.3A above. When bonnet is removed from body, it will bring with it the valve plug and body/cage adapter.
2. If the actuator/valve stem connector has been removed, the stem and trim assembly can be removed from the bonnet. *Always replace the packing if the stem is removed from the valve bonnet.* Loosen the packing retainer and remove the stem from the bonnet.
3. Separate the valve stem, stem adapter, and plug assembly from the body/cage adapter.
4. Remove the plug from the stem adapter by first driving out the roll pin securing the plug to the stem adapter. Unscrew the plug by turning counterclockwise.
5. Lift the seat/cage and seat adapter out of the body. Separate the adapter from the seat/cage by pulling downward to overcome the o-ring friction.
6. If necessary, the stem adapter may be removed from the valve stem by first driving out the roll pin and unscrewing the adapter from the stem.
7. FOR 3.0" AND 4.0" VALVE BODIES ONLY : The seat adapter is positioned within a second adapter, which in turn, is positioned in the valve body. This is referred to as the body adapter. Complete the trim removal by lifting the body adapter with its o-ring and gasket out of body.

2.3 VALVE DISASSEMBLY

C. (Balanced Cage Control Trim)

CAUTION:

Use care to avoid damaging gasket sealing surfaces. The surface finish of the valve stem is critical for making a good packing seal. The inside surface of the cage assembly or cage retainer is critical for smooth operation of the valve plug and for making a seal with the piston ring. The seating surfaces of the valve plug and seat ring are critical for tight shutoff. Assume all of these parts are in good condition when disassembling the valve and protect them accordingly.

1. Loosen the lock nut on the actuator stem and turn the adjusting nut above it counter clockwise to completely remove the spring's pre-load. This will leave the actuator attached to the valve bonnet. (Alternately, completely remove the actuator by following steps 1-4 in Section 2.1 Actuator Disassembly instructions above.)

2. Remove the nuts from the bonnet flange studs.
3. Lift the bonnet off the body along with the plug, and stem.
4. Separate the plug from the stem by driving out the plug pin with a punch.
5. Remove the plug by turning the plug counter clockwise.
6. If the actuator/valve stem connector has been removed, the stem and plug assembly can be removed from the bonnet. *Always replace the packing if the stem is removed from the valve bonnet.* Loosen the packing retainer and remove the stem from the bonnet.
7. Lift the cage out of the body.
8. Lift the seat ring and gasket out of the body.
9. If the valve has reduced trim, complete the trim removal by removing the seat adapter and its gasket from body.

2.4 TRIM INSPECTION

1. Visually inspect the valve plug and seat for signs of erosion, pitting, scratches and damage from corrosion. A magnifying glass can be helpful in determining the type and severity of any damage that may be present.
2. Fit the plug and the seat together. While looking into the bottom of the seat, hold the trim set against a bright light. If any light can be seen between the plug and seat contact surfaces, this is an indication of poor seat condition.
3. Determine the magnitude of any wear or corrosion damage. Many times the plug and seat contact surfaces can be fully restored by relapping. Replace any parts that cannot be fully restored by relapping.
4. If the stem has been removed, examine the stem for pitting, scratches, or other damage in the packing box area. If any damage cannot be removed by polishing the stem, replace the stem.

Table 3
Lapping Compounds

TRIM MATERIAL	LAPPING* MATERIAL
300 Series SST	Clover
17-4PH SST	Boron-Carbide
440C SST	Grade 2A
Tungsten Carbide	9U Heavy Diamond

* Equivalent products from other manufacturers may be used.

2.5 TRIM RESTORATION

CAUTION:

Overlapping will widen the lap band and can reduce seat tightness.

Lap the plug to the seat. *NOTE: This process does not apply to plugs with soft seat inserts.*

1. Clean plug and seat in solvent and wipe dry.
2. Select the appropriate lapping compound as shown in Table 3.
3. Using a stir stick or similar device, apply lapping compound sparingly at 3 or 4 places approximately equidistant along the seat surface on the plug. *NOTE: The use of excess compound runs the risk of uneven lapping of the surfaces.*
4. With lapping compound applied to plug, fit seat against plug and begin lapping trim with firm hand pressure applied by rotating seat back and forth against stationary plug. Occasionally change hand gripping points on seat to redistribute applied pressure during lapping process. (Keep seat as concentric to plug as possible during lapping).
5. Under an adequate light source, visually inspect the lapped contact surfaces of seat and plug.
6. Seat shall have a circular uninterrupted lap band approximately 1/32" to 1/16" in width at the base of seating chamfer.
7. Plug will have a definite continuous lap band approximately 1/32" to 3/32.0" in width without being grooved.
8. The finished lap areas of seat and plug shall have a continuous smooth, close grained, dull appearance with no skips or tears.
9. Wash plug and seat in solvent to remove all lapping compound and wipe the parts dry.

2.6 REPLACEMENT OF TEFLON V-RING PACKING (Non-Adjustable)

1. Remove the two nuts retaining the packing compressor bar and lift the compressor bar and packing retainer from the bonnet. Pull out the old packing with a hook or packing removal tool. *NOTE: be careful to avoid scratching the packing box wall or stem.* If the stem has been removed, the packing may be pushed out using a rod inserted through the hole in the bottom of the bonnet. It is also possible to pull up and push down on the stem until the packing pops loose since the packing is spring loaded.
2. Clean the packing box and all metal parts.

3. Install the new packing and associated parts in the following sequence (be careful not to damage the packing during installation):
 - a. Packing spring
 - b. Lower packing retainer
 - c. Male "V" packing ring
 - d. The "V" rings with the "V" downward toward the body
 - e. Upper packing retainer with female "V" toward the packing
 - f. Compressor Bar
 - g. Two 3/8" nuts
4. Replace the valve plug/stem assembly and install the bonnet on the body using new gaskets.
5. Tighten the compressor bar nuts until retainer shoulder meets bonnet surface.

2.6 REPLACEMENT OF VALVE COMPRESSION PACKING (Adjustable)

1. Remove the two nuts retaining the packing compressor bar and lift the compressor bar and packing retainer from the bonnet. Pull out the old packing with a hook or packing removal tool. *NOTE: be careful to avoid scratching the packing box wall or the stem.* If the stem has been removed, the packing may also be pushed out using a rod inserted through the hole the bottom of the bonnet.
2. Clean the packing box and all metal parts.
3. Install the new packing and associated parts in the following sequence:
 - a. Lower packing washer
 - b. Three packing rings
 - c. Lantern ring
 - d. Six packing rings
 - e. Packing retainer
 - f. Packing compression bar
 - g. Two 3/8" nuts
4. Replace the valve plug/stem assembly and install the bonnet on the body using new gaskets.
5. Compress the packing by tightening the two 3/8" nuts. If the compressor bar bottoms out on the bonnet when the nuts are tightened, remove the two nuts and lift the compressor bar and retainer and add one or two additional rings of packing. This allows future adjustment of the compressor bar.
6. If equipped with a lubricator, lubricate packing following the instructions in Paragraph 2.7.

2.7 PACKING LUBRICATION

A lubricator/isolating valve is provided as an option with adjustable packing valves.

To operate the lubricator, first open the lubricator/isolating valve and then turn the cap screw clockwise to force the lubricant into the packing box. Close the isolating valve again after lubrication has been completed.

To recharge the lubricator, first make sure the isolating valve is closed, remove the cap screw from the lubricator, and inject the lubricant into the assembly. Reinstall the cap screw.

Norriseal recommends the use of Dow-Corning #111 Silicon, Norriseal part number 416744.

2.8 VALVE REASSEMBLY

A. (Balanced Plug Control Trim)

CAUTION:

If the packing is to be re-used and was not removed from the bonnet, use care when re-installing the bonnet to avoid damaging the packing with the valve stem threads.

NOTE: Use all new gaskets and seals for re-assembly.

1. Clean all gasket surfaces, including the body, bonnet, and guide.
2. A light coat of lubricant, such as light oil, may be used on the soft seals to aid ease of assembly.
3. Push the stem through the bonnet packing, taking care not to damage the packing.
4. Assembly of the plug with insert: (For assembly of solid metal plug without insert, go to step 5.)
 - a. Place O-ring into cavity of plug butt.
 - b. Install the insert into the butt and recess.
 - c. Install plug retainer, pushing the locating boss through the insert and o-ring.
 - d. Install the socket head cap screw and torque 1/2" screws to 60 ft.lbs. and 3/4" screws to 125 ft.lbs.
5. Re-assemble guide, cage, and plug assembly:
 - a. Place upper plug guide upside down on a flat surface (i.e., the deep recess will be turned upward). Place the seal rings into the guide recess.
 - b. Place the cage into upper plug guide recess with extended lip down.
 - c. Insert the valve plug with the stem thread down into the cage/guide. Press the plug downward into the lower cage through the seals. A block of wood may be necessary to drive the plug downward until the large portion of the

valve plug (shoulder) bottoms on the internal recess of the cage.

6. Place the guide gasket over the valve stem to make the seal between the bonnet and upper guide.
7. Install the plug/cage/guide and gasket assembly on the stem by screwing the plug onto the valve stem clockwise until the hole in the plug top aligns with the hole in the valve stem.
8. Insert the roll pin until it is flush with the outside diameter of the plug.
9. Install the new seat gasket into the seat cavity in the body's bridgewall.
10. Install the seat ring into the body's seat cavity.
11. Install the new bonnet gasket into the top valve body flange recess.
12. Mount the bonnet and trim assembly onto the body.
13. Tighten the bonnet-to-body bolts to the recommended torques given in Table 4a or 4b that identifies valve size and recommended torque values in foot-pounds. Tighten the nuts in across pattern in 25, 50, 75 and 100% increments of the final torque values.
14. Mount the actuator on the bonnet and connect the actuator stem to the valve stem.

Table 4a
Final Bolt Torques for Carbon Steel Bodies.
(All Values are in Foot Pounds.)

Valve Size	ANSI Pressure Class					
	150	300	600	900	1500	2500
1.00" Stud Size Torque	0.75 110	0.75 110	0.75 110	0.75 120	0.75 120	0.88 250
1.50" Stud Size Torque	0.62 85	0.62 85	0.62 85	0.62 85	0.62 85	0.75 250
2.00" Stud Size Torque	0.75 75	0.75 80	0.75 80	0.75 175	0.75 175	1.00 375
3.00" Stud Size Torque	0.75 90	0.75 90	0.75 90	0.75 140	1.00 275	1.38 875
4.00" Stud Size Torque	0.88 145	0.88 145	0.88 145	0.88 225	1.00 288	1.50 1400
6.00" Stud Size Torque	0.88 280	0.88 280	0.88 280	1.25 375	1.25 680	
8.00" Stud Size Torque	1.12 425	1.12 425	1.12 425	1.25 465	1.38 1200	

2.8 VALVE REASSEMBLY

B. (Reduced Unbalanced Plug Control Trim)

CAUTION:

If the packing is to be reused and was not removed from the bonnet, use care when installing the stem in the bonnet to avoid damaging the packing with the valve stem threads.

NOTE: The following procedure applies only to valve body sizes of 2.0", 3.0", and 4.0".

1. Begin by performing Steps 1 and 2 above for balanced trim.
2. Replace stem adapter on valve stem. Screw adapter onto stem until pin hole in adapter is aligned with hole through stem. Insert 3/16" diameter roll pin, and drive into place until end of pin is flush with outer surface of stem adapter.

CAUTION:

The ends of the roll pin must not protrude beyond the outer surface of the stem adapter.

3. Replace valve plug on stem adapter. Screw plug onto adapter until pin holes are aligned. Insert 1/8" diameter roll pin, to secure plug to stem adapter.

Table 4b
Final Bolt Torques for Stainless Steel Bodies.
(All Values are in Foot Pounds.)

Valve Size	ANSI Pressure Class					
	150	300	600	900	1500	2500
1.00" Stud Size Torque	0.75 110	0.75 110	0.75 110	0.75 120	0.75 120	0.88 250
1.50" Stud Size Torque	0.62 85	0.62 85	0.62 85	0.62 85	0.62 85	0.75 250
2.00" Stud Size Torque	0.75 75	0.75 80	0.75 80	0.75 175	0.75 175	1.00 375
3.00" Stud Size Torque	0.75 90	0.75 90	0.75 90	0.75 140	1.00 275	1.38 875
4.00" Stud Size Torque	0.88 145	0.88 145	0.88 145	0.88 225	1.00 288	1.50 1400
6.00" Stud Size Torque	0.88 280	0.88 280	0.88 280	1.25 375	1.25 680	
8.00" Stud Size Torque	1.12 425	1.12 425	1.12 425	1.25 465	1.38 1150	

4. Install new gasket into seat pocket in body bridge.
5. For valve body size of 2.0", proceed to Step 6. For 3.0" and 4.0" bodies, re-install body adapter in proper position on top of gasket in body seat pocket. Install a new o-ring in body adapter groove.
6. Install a new o-ring in groove near bottom of seat/cage. Re-install seat/cage into seat adapter. Light hand pressure will be required to overcome o-ring friction.
7. Re-install seat/cage with seat adapter into valve body.
8. Install valve stem, with stem adapter and plug, upward through bottom of body/cage adapter. Plug will stop against counterbore surface in body/cage adapter.
9. Carefully insert stem upward through bottom of bonnet so that end of stem slides through packing and out through packing retainer at top of bonnet.
10. Re-install stem connector to connect valve stem to actuator stem.
11. Complete the re-assembly process by performing Steps 11, 12 and 13 above.
8. Install the new seat gasket into the seat cavity in the body's bridgewall.
9. Install the seat ring into the body's seat cavity.
10. If the valve has a soft seat, install the seat insert in the groove on top of the seat ring.
11. Install the cage on top of the seat ring.
12. Install the new bonnet gasket into the top valve body flange recess.
13. Install the new cage gasket in the groove on top of the cage.
14. Lower the bonnet/stem/plug assembly on to the body guiding the plug into the cage ensuring the chamfer on top of the cage properly compresses the plug's o-ring and piston bearing ring.
15. Tighten the bonnet-to-body bolts to the recommended torques given in Table 4a or 4b. that identifies valve size, number of studs, stud size in inches, and recommended torque values in foot-pounds. Tighten the nuts in across pattern in 25, 50, 75 and 100% increments of the final torque values.
16. Mount the actuator on the bonnet and connect the actuator stem to the valve stem.

2.8 VALVE REASSEMBLY

C. (Balanced Cage Control Trim)

CAUTION:

If the packing is to be reused and was not removed from the bonnet, use care when installing the stem in the bonnet to avoid damaging the packing with the valve stem threads.

Note: Use all new gaskets and seals for re-assembly.

1. Clean all gasketed surfaces, including the body, bonnet, and guide.
2. A light coat of lubricant, such as light oil, may be used on the soft seals to aid ease of assembly.
3. Install the plug and seal assembly on the stem by screwing the plug onto the valve stem until the hole in the plug top aligns with the hole in the valve stem.
4. Insert the roll pin through the plug and into the stem until it is flush with the outside diameter of the plug.
5. Install the plug o-ring with a backup ring on each side of the o-ring in the plug's seal groove.
6. Install the piston bearing ring in the plug's top groove.
7. Push the stem through the bonnet packing taking care not to damage the packing. Tighten the packing gland.

2.8 VALVE REASSEMBLY

D. (Reduced Balanced Cage Control Trim)

NOTE: The reassembly procedure for reduced cage control trim is the same as for full size trim, except for the following additional steps required to re-install the seat adapter in the valve body.

1. Begin by performing Steps 1 through 7 above, for full size trim.
2. Next, install a new gasket in seat pocket of body bridge.
3. Re-install seat adapter on top of gasket in body seat pocket.
4. Install a new gasket in recess at top of seat adapter.
5. Re-install valve seat on top of gasket in seat adapter recess.
6. Complete the re-assembly by performing Steps 10 through 16 above for full size trim.

3.0 REPAIR KITS

Norriseal provides four repair kits for use in valve maintenance: a valve repair kit, a valve seal kit, a trim repair kit, and an actuator repair kit.

Table 5
Trouble Diagnosis

TROUBLE	SYMPTOM POSSIBLE CAUSE	CORRECTIVE ACTION
Valve will not cycle when instrument air is applied to the actuator.	<ol style="list-style-type: none"> 1. Broken valve stem. 2. Diaphragm ruptured or torn. 3. Diaphragm plate connection at top may be loose. 4. Actuator vent plugged 	<ol style="list-style-type: none"> 1. Replace Stem. 2. Remove upper diaphragm housing. Inspect the diaphragm and replace if necessary. 3. Remove upper diaphragm housing. Inspect the plate-to-stem connection and tighten if loose. 4. Clean out vent fitting
Excessive trim leakage with valve closed	<ol style="list-style-type: none"> 1. Insufficient shut-off force from actuator 2. Foreign object interfering with plug-to-seat contact. 3. Plug and seat contact surfaces may be worn or damaged. 	<ol style="list-style-type: none"> 1. For reverse actuator - increase spring load. For direct actuator - increase supply pressure to diaphragm. DO NOT exceed 35 psi supply pressure. 2. Remove actuator and bonnet from body. Inspect trim and remove foreign objects if present. 3. Inspect critical surfaces of plug and seat. For minor wear or damage, lap seating surfaces. If severely worn or damaged, replace plug and seat.
Fluid leakage from top of bonnet.	<ol style="list-style-type: none"> 1. Stem packing is worn or loose. 	<ol style="list-style-type: none"> 1. For non-adjustable spring loaded packing: remove and replace packing. 2. For adjusting packing: tighten adjusting nut(s) or add extra packing rings.
Fluid leakage from body/bonnet joint.	<ol style="list-style-type: none"> 1. Some or all bonnet studs may be loose. 2. Body/bonnet gasket may be worn or damaged. 	<ol style="list-style-type: none"> 1. Check studs and nuts, tighten if necessary. 2. Inspect gasket, replace if necessary.
Instrument air leaks from outer edge of diaphragm housings.	<ol style="list-style-type: none"> 1 Cap screws securing upper and lower housings may be loose. 	<ol style="list-style-type: none"> 1. Inspect cap screws, tighten as necessary.
Instrument air leaks from actuator vent connection located in upper housing of reverse actuator or lower housing of direct actuator.	<ol style="list-style-type: none"> 1. Diaphragm may be torn or ruptured, allowing air to leak through. 	<ol style="list-style-type: none"> 1. Disassemble upper and lower housing and inspect diaphragm. Replace if damaged.
Valve stem movement is sticky or jerky.	<ol style="list-style-type: none"> 1. Valve stem or actuator stem may be bent or misaligned. 	<ol style="list-style-type: none"> 1. Disassemble valve and/or actuator to inspect stem. Replace if bent or otherwise damaged.

Headquarters, Manufacturing Plant and Sales:

P.O. Box 40525 * Houston, TX 77240-0525
11122 West Little York * Houston, TX 77041-5016
Phone: 713-466-3552 * Fax: 713-896- 7386

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