

# OPERATING AND MAINTENANCE MANUAL

## Series 2700A Control Valve



Series 2700A



**Engineered  
Performance**

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### INTRODUCTION

#### CAUTION!

You will see warning boxes like this throughout the manual. Please read and strictly observe these warnings to prevent personal injury or equipment damage. Before you begin the installation, operation or repair of equipment, make sure to completely review and understand the instructions in this manual.

#### Scope

This instruction manual includes installation, operation and maintenance information for 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 applications for modulating or on/off service in liquid or gas control. The Series 2700A has a single-port body with two types of trim—plug control and cage control. Plug control can either be balanced or unbalanced. Cage control must always be balanced. The Spring/Diaphragm Actuator has a spring under the diaphragm for both direct (fail open) and reverse (fail closed) settings.

The plug control trim, which can either be balanced or unbalanced, is used when fluid is flowing up under the valve plug. The fluid pressure drop will occur between the plug and the seat. The curve on the plug will signify the flow as quick opening or modified percent.

The cage control trim, which must always be balanced, can be used when fluid is moving either up or down. The fluid pressure drop will occur at the cage's port. The curve on the cage will signify the flow as linear or equal percent.

Norriseal valves come standard with spring diaphragm pneumatic actuators. These actuators are available in spring closing or spring opening types and are both available in a range of sizes to suit your 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 compression packing, either Teflon/Kevlar or Grafoil material. Both packing types are held together with two studs that hold a compressor bar to the packing retainer. The Series 2700A bonnets have a NPT thread, if you wish to add 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

The nameplate of the valve is attached to the upper diaphragm housing of each valve. 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 characters long (an example of a model number would be: RF-14TGS-12NX). For more information on the model numbers, refer to the individual product brochure.

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 temperature for the valve are shown on the nameplate. If pressure to the valve is capable of exceeding these limits, install relief valves and other protection devices.*

#### CAUTION!

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

### 1.0 Valve Installation and Start-Up

1. Before installing the valve, inspect it for any shipment damage or any debris that may have collected during crating and shipment. Remove the flange protectors from the body end connections.
2. Blow out all pipelines to remove pipe scale, chips, welding slag and other debris. Gasket surfaces should also be free of any debris.
3. Install the valve so that flow is in the direction indicated by the flow direction arrow, which will either be on the body of the valve or on a tag pinned to the valve.
4. Install the valve using good piping practice. For bodies which contain flanges, use a suitable gasket between the body and

pipeline. For threaded (NPT) bodies, use pipe thread sealant.

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 exceed the limitations noted on the nameplate.
6. Where piping is insulated **do not insulate the valve above the valve bonnet.**
7. Connect the instrument air to the actuator or positioner connection. Refer to the nameplate for maximum instrument air pressure. Check for proper valve operation by cycling the actuator several times and observing the stem movement.

### WARNING!

*Do not exceed the maximum instrument air pressure stamped on the valve nameplate. Under no circumstances should the actuator loading pressure exceed 55 psi.*

8. Actuator springs are pre-set at a factory and may require adjustments to suit your specific operating conditions. To adjust the spring setting, complete the following:
  - a. **Reverse (fail close):** 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. This will achieve a more secure shut-off. Turn the adjusting nut counterclockwise to reduce preload. Retighten the 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 (fail open):** Loosen the lock nut on the adjusting nut below the spring. Turn the adjusting nut clockwise to increase the spring's preload and turn it counterclockwise to reduce the preload. Retighten the nut after adjustment.

*NOTE: In a direct setting, any increase in pressure may produce an increase in plug seating force when the valve is closed. Do not exceed 55 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 may be 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
10.00	4.00
12.00	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 up 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 depending upon the severity of the repair needed. The following sections describe the procedures for disassembling and reassembling 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 provides assistance in troubleshooting valve operation.

<b>TABLE 2 MAINTENANCE SCHEDULE*</b>	
<b>ITEM</b>	<b>INSPECTION SCHEDULE</b>
<b>Valve Trim (Seat, Plug, Cage &amp; Guide)</b>	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.
<b>Stem Packing</b>	Inspect packing at least once a year.
<b>Actuator</b>	Inspect diaphragm, spring and stem once a year.
<b>Body</b>	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.
<b>Bonnet</b>	Inspect bonnet once a year or whenever trim inspection is done.
<b>Seals</b>	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 is available. Please contact your Norriseal sales representative for this information.

### 2.1 Actuator Disassembly

#### For all spring-diaphragm actuators

1. Remove instrument air from the actuator.
2. Loosen the lock nut on the stem and turn the adjusting nut counterclockwise until the spring's preload is completely removed and is 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 diaphragm stem and disassemble the lock washer, diaphragm plate, diaphragm and stem.
9. On direct actuators, remove the spring and lower 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 plug seal 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 nut above it counterclockwise to completely remove the spring's preload. This will leave the diaphragm attached to the valve bonnet. (Alternately, completely remove the actuator by following steps 1-4 in Section 2.1 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 counterclockwise. The plug pin is exposed and visible

just above the 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 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 2.3 A 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.
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 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 the 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 important for making a good packing seal. The inside surface of the cage assembly or cage retainer is important for smooth operation of the valve plug and for making a seal with the plug seal ring. The seating surfaces of the valve plug and seat ring are important 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 diaphragm stem and turn the nut above it counterclockwise to remove the spring's preload. To remove the actuator, follow steps 1-4 in Section 2.1 above.
2. Remove the nuts from the bonnet flange.
3. Lift the bonnet off the body along with the plug and stem.
4. Separate the plug from the stem by punching out the plug pin.
5. Remove the plug by turning it counterclockwise.
6. If the 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 other damages. A magnifying glass may be helpful here.
2. Fit the plug and seat together. While looking into the bottom of the seat, hold the trim against a bright light. If any light can be seen between the plug and seat contact surfaces, you may have poor seat condition.
3. Determine the severity of the damage. Many times the plug and seat contact surfaces can be fully restored by relapping. Replace any products that cannot be restored.
4. If the stem has been removed, examine the stem for pitting, scratches or any other damage. If any damage cannot be removed by polishing the stem, replace the stem.

### 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 the plug and seat in solvent and wipe dry.
2. Select the appropriate lapping compound as shown in Table 3.
3. Using a stir stick, apply lapping compound sparingly at 3 or 4 places along the seat surface on the plug. Note: the use of excess compound runs the risk of uneven

lapping of the surfaces.

4. With the compound applied to the plug, fit the seat against the plug and begin lapping trim with firm hand pressure applied by rotating the seat back and forth against the stationary plug. Occasionally change hand gripping points on seat to redistribute applied pressure during lapping process. Keep the seat in the same place as much as possible during this time.
5. Under the adequate light source, 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 chamber.
7. The plug will have a definite continuous lap band approximately 1/32" to 3/32" in width without being grooved.
8. The finished lap areas of seat and plug will have a smooth, close grained, dull appearance with no skips or tears.
9. Wash the 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 bar and retainer from the bonnet. Pull out the old packing with a hook. 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 at 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 parts in the following sequence:
  - a. Packing spring
  - b. Lower packing retainer
  - c. Male "V" packing ring
  - d. The "V" rings with the "V" pointed downward toward the body
  - e. Upper packing retainer with the 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 the retainer shoulder meets the bonnet surface.

**TABLE 3**

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

\* Equivalent products from other manufacturers may be used.

### 2.6 Replacement of Valve Compression Packing (Adjustable)

1. Remove two nuts retaining the packing compressor bar and lift the compressor bar and retainer from the bonnet. Pull the old packing with a hook. Note: Be careful to avoid scratching the packing box tool or stem. If the stem has been removed, the packing may also be pushed out using a rod inserted into the hole at the bottom of the bonnet.
2. Clean the packing box and all metal parts.
3. Install the new packing and 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 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. 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 bar.
6. Lubricate the packing, if possible, by following the instructions in Paragraph 2.7.

### 2.7 Packing Lubrication

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

To operate the lubricator, first open the isolation valve and then turn the cap screw clockwise to force the lubricant into the packing box. Close the isolation valve again after lubrication is complete.

To recharge the lubricator, make sure the isolation valve is closed, remove the cap screw 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 (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 reassembly.

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 the solid plug without the insert, go directly 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 lbs.

5. Reassemble guide, cage and plug assembly:

- a. Place upper plug guide upside down on a flat surface. Place the seal rings into the guide recess.
- b. Place the cage into the upper plug guide recess with the 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 into 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 overhand 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, which identifies valve size and recommended torque valves in foot pounds. Tighten the nuts in across pattern in 25, 50, 75 and 100% increments of the final torque values.
14. Mount the diaphragm on the bonnet and connect the diaphragm stem to the valve stem.

### 2.8 Valve Reassembly (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," 3" and 4."*

1. Begin by performing Steps 1 and 2 in 2.8A for balanced trim.
2. Replace the stem adapter on the

valve stem. Screw the adapter onto the stem until the pin hole in the adapter is aligned with the hole through the stem. Insert a 3/16" diameter pin and drive it into place until the pin is flush with the stem adapter.

#### CAUTION!

*The ends of the pin must not stick out beyond the outer surface of the stem adapter.*

3. Replace valve plug on the stem adapter. Screw the plug onto the diaphragm until the pin holes are aligned. Insert 1/8" diameter roll pin to secure the plug.
4. Install the new gasket into the seat pocket in the body.
5. For a valve body size of 2," skip to step 6. For a body size of 3" and 4," reinstall the body adapter in the proper position on top of the gasket in the pocket.
6. Install a new O-ring in the body adapter groove.

Install a new O-ring in the groove near the bottom of the seat/cage. Reinstall the seat/cage into the seat adapter. Light hand pressure will be required for this.

7. Re-install the seat/cage with the seat adapter into the valve body.
8. Install the valve stem, with stem adapter and plug, upward through the bottom of the adapter. The plug will stop against the surface in the adapter.
9. Carefully insert the stem upward through the bottom of the bonnet so that the end of the stem slides through packing and out through the retainer at the top of the bonnet.

10. Reinstall the stem connector to connect the valve stem to the diaphragm stem.
11. Complete the reassembly process by performing Steps 11, 12 and 13 above.

### 2.8 Valve Reassembly (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 reassembly.*

1. Clean all gasketed surfaces, including the body, bonnet and guide.
2. A light coat of lubricant may be used on 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 plug.
5. Install the plug O-ring with a backup ring on each side of the O-ring in the plug's 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.

8. Install the new seat gasket into the cavity in the body's bridge-wall.
9. Install the seat ring into the body's cavity.
10. If the valve has a soft seat, install the seat insert in the groove on the top of the ring.
11. Install the cage on top of the 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 onto the body, guiding the plug into the cage, ensuring the chamber 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 and 4B. Tighten the nuts in across patterns in 25, 50, 75 and 100% increments of the final torque valves.

16. Mount the diaphragm on the bonnet and connect the diaphragm stem to the valve stem.

### 2.8 Valve Reassembly (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 the

seat pocket of the body bridge.

3. Reinstall the seat adapter on top of the gasket in the body seat pocket.
4. Install a new gasket in recess at top of the seat adapter.
5. Reinstall valve seat on top of gasket in seat adapter recess.
6. Complete the reassembly 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 a diaphragm kit.

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## Series 2700A Control Valve

**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	0.75	0.75	0.75	0.75	0.75	0.88
Torque	110	110	110	120	120	250
1.50" Stud Size	0.62	0.62	0.62	0.62	0.62	0.75
Torque	85	85	85	85	85	250
2.00" Stud Size	0.75	0.75	0.75	0.75	0.75	1.00
Torque	75	80	80	175	175	375
3.00" Stud Size	0.75	0.75	0.75	0.75	1.00	1.38
Torque	90	90	90	140	275	875
4.00" Stud Size	0.88	0.88	0.88	0.88	1.00	1.50
Torque	145	145	145	225	288	1400
6.00" Stud Size	0.88	0.88	0.88	1.25	1.25	
Torque	280	280	280	375	680	
8.00" Stud Size	1.12	1.12	1.12	1.25	1.38	
Torque	425	425	425	465	1200	
10.00" Stud Size	1.12	1.12	1.12			
Torque	435	435	435			
12.00" Stud Size	1.12	1.12	1.12			
Torque	435	435	435			

**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	0.75	0.75	0.75	0.75	0.75	0.88
Torque	110	110	110	120	120	250
1.50" Stud Size	0.62	0.62	0.62	0.62	0.62	0.75
Torque	85	85	85	85	85	250
2.00" Stud Size	0.75	0.75	0.75	0.75	0.75	1.00
Torque	75	80	80	175	175	375
3.00" Stud Size	0.75	0.75	0.75	0.75	1.00	1.38
Torque	90	90	90	140	275	875
4.00" Stud Size	0.88	0.88	0.88	0.88	1.00	1.50
Torque	145	145	145	225	288	1400
6.00" Stud Size	0.88	0.88	0.88	1.25		
Torque	280	280	280	375		
8.00" Stud Size	1.12	1.12	1.12	1.25		
Torque	425	425	425	465		
10.00" Stud Size	1.12	1.12	1.12			
Torque	435	435	435			
12.00" Stud Size	1.12	1.12	1.12			
Torque	435	435	435			

**Table 5 Trouble Diagnosis**

<b>Symptom</b>	<b>Probable Cause(s)</b>	<b>Corrective Action(s)</b>
1. Valve will not cycle when instrument air is applied to the actuator.	<ul style="list-style-type: none"> <li>• Broken valve stem.</li> <li>• Diaphragm ruptured or torn.</li> <li>• Diaphragm plate connection at top may be loose.</li> <li>• Actuator vent plugged.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace stem.</li> <li>• Remove upper diaphragm housing. Inspect the diaphragm and replace if necessary.</li> <li>• Remove upper diaphragm housing. Inspect the plate-to-stem connection and tighten if loose.</li> <li>• Clean out vent fitting.</li> </ul>
2. Excessive trim leakage with valve closed.	<ul style="list-style-type: none"> <li>• Insufficient shut-off force from actuator.</li> <li>• Foreign object interfering with plug-to-seat contact.</li> <li>• Plug and seat contact surfaces may be worn or damaged.</li> </ul>	<ul style="list-style-type: none"> <li>• For reverse actuator - increase spring load.</li> <li>• For direct actuator - increase supply pressure to diaphragm. <b>DO NOT exceed 55 psi supply pressure.</b></li> <li>• Remove actuator and bonnet from body. Inspect trim and remove foreign objects if present.</li> <li>• Inspect critical surfaces of plug and seat. For minor wear or damage, lap seating surfaces. If severely worn or damaged, replace plug and seat.</li> </ul>
3. Fluid leakage from top of bonnet.	<ul style="list-style-type: none"> <li>• Stem packing is worn or loose.</li> </ul>	<ul style="list-style-type: none"> <li>• For non-adjustable spring loaded packing: remove and replace packing.</li> <li>• For adjustable packing: tighten adjusting nut(s) or add extra packing rings.</li> </ul>
4. Fluid leakage from body/bonnet joint.	<ul style="list-style-type: none"> <li>• Some or all bonnet studs may be loose.</li> <li>• Body/bonnet gasket may be worn or damaged.</li> </ul>	<ul style="list-style-type: none"> <li>• Check studs and nuts, tighten if necessary.</li> <li>• Inspect gasket, replace if necessary.</li> </ul>
5. Instrument air leaks from outer edge of diaphragm housings.	<ul style="list-style-type: none"> <li>• Cap screws securing upper and lower housings may be loose.</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect cap screws, tighten as necessary.</li> </ul>
6. Instrument air leaks from actuator vent connection located in upper housing of reverse actuator or lower housing of direct actuator.	<ul style="list-style-type: none"> <li>• Diaphragm may be torn or ruptured, allowing air to leak through.</li> </ul>	<ul style="list-style-type: none"> <li>• Disassemble upper and lower housing and inspect diaphragm. Replace if damaged.</li> </ul>
7. Valve stem movement is sticky or jerky.	<ul style="list-style-type: none"> <li>• Valve stem or actuator stem may be bent or misaligned.</li> </ul>	<ul style="list-style-type: none"> <li>• Disassemble valve and/or actuator to inspect stem. Replace if bent or otherwise damaged.</li> </ul>



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# OPERATING AND MAINTENANCE MANUAL

## Series 2700A Control Valve

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