

Installation & Maintenance Instructions

4-WAY SINGLE AND DUAL SOLENOID PILOTED VALVES
AND 4-WAY AIR PILOTED VALVES
SUB-BASE AND MANIFOLD MOUNTED
1/8" AND 1/4" NPT — AIR SERVICE ONLY

SERIES
8401
8402

Form No. V6586R5 — Sec. 1
(Section 1 of 2)

NOTICE: See Form No. V6586 — Section 2 of 2 for exploded views.

DESCRIPTION

Series 8401 and 8402 valves are 4-way directional control slide valves designed for air service. The sub-bases and main bodies are die cast aluminum; the pilot bodies are made of molded nylon. Internal valve parts are designed for low friction, high strength, and long life. Series 8401 solenoid piloted valves have a single or dual open-frame solenoid. A built-in manual operator allows manual operation when desired or during an electrical power outage. Series 8402 air piloted valves utilize a remotely located solenoid pilot valve for their operation.

The valves have a unique *Break Before Make* slide design that prevents *Cross-Talk* and ensures positive shifting with only main line pressure. This design generates a fast high-driven force in the shifting direction which prevents the slide from stopping in the mid position between ports.

Two valve constructions are available:

Sub-Base Construction — The upper valve body contains all working parts and is connected to the sub-base with screws. The sub-base contains the pressure, cylinder, and exhaust connections. This design permits removal of the upper valve for servicing without disturbing the pipe connections in the sub-base.

Manifold Mounted Construction — The valves are designed to be individually or manifold mounted (maximum of six valves per manifold). Valves are provided as *Do-It-Yourself* manifold assemblies for the field. The valve sub-bases are bolted together by means of manifold screws with lockwashers and nuts. The screws pass through holes in the sub-base and end plates. These valves require **End Plate Kits** consisting of two end plates containing 1/8" or 1/4" NPT connections for manifold piping. Three manifold port gaskets are supplied with each kit and are used to seal between sub-bases and end plates. Lubricate manifold port gaskets with DOW CORNING® 200 Fluid lubricant or an equivalent high-grade silicone fluid. Four additional socket head cap screws, lockwashers and nuts are included. Common pressure and exhaust connections may be made at either end of the manifold into the end plates.

End Plate Kit Ordering Information

NPT Size	Kit Number
1/8"	K238701-3
1/4"	K238701-4

Optional Electrical Connectors (Solenoid Piloted Valves)

DIN Plug Connector Kit No. K226061: The open-frame solenoid with spade terminal connections may be used with the plug connector kit providing a 2-pole with grounding contact 3 x DIN 46244 (Pg 9P), Industrial Type (11 mm) construction (see Figure 3).

Conduit Connector Kit No. K224735: The open-frame solenoid with lead wires may be provided with a gasket threaded conduit hub for watertight construction (see Figure 4).

OPERATION

Series 8401 (Solenoid Piloted Valves)

NOTE: A loss of main line pressure will not cause the valve to shift in either the energized or de-energized solenoid mode for both single and dual solenoid constructions.

Single Solenoid: This type of operation is used where automatic return of the valve on electrical power failure is required.

Solenoid De-energized: Flow is from Pressure 1 to Cylinder 2 and from Cylinder 4 to Exhaust 5. Exhaust 3 is closed.

Solenoid Energized: Flow is from Pressure 1 to Cylinder 4 and from Cylinder 2 to Exhaust 3. Exhaust 5 is closed.

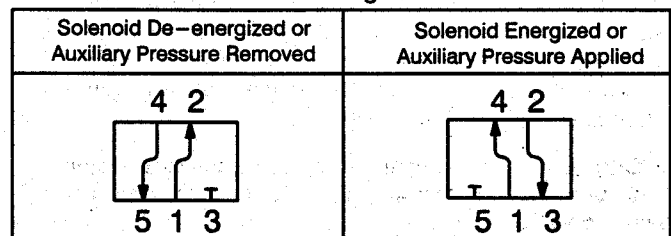
Series 8402 (Air Piloted Valves)

Air Pilot: This type of operation is used where automatic return of the valve is required when auxiliary pressure is lost or disconnected, or when remote location of the solenoid is required.

Auxiliary Pressure Removed: Flow is from Pressure 1 to Cylinder 2 and from Cylinder 4 to Exhaust 5. Exhaust 3 is closed.

Auxiliary Pressure Applied: Flow is from Pressure 1 to Cylinder 4 and from Cylinder 2 to Exhaust 3. Exhaust 5 is closed.

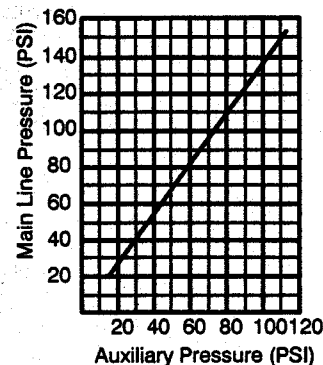
Flow Diagram



NOTE: If main line pressure is lost, auxiliary air piloted valves will not change position as long as pilot pressure is present. If pilot pressure is lost while main pressure is present, valve will change position.

IMPORTANT: For air piloted valves refer to graph to determine the minimum auxiliary air pressure required for a given main line pressure.

Air Actuated Valves
Auxiliary Pilot Air Pressure VS Main Line Pressure



Series 8401 (Solenoid Piloted Valves)

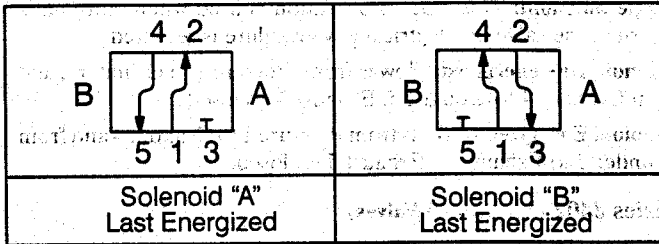
Dual Solenoids: Solenoid may be energized momentarily or continuously depending upon application. Dual solenoid valves are used where equipment must not change position when electrical power fails. Valve operates when one solenoid is energized and returns when the other solenoid is energized.

CAUTION: Do not energize solenoids A and B simultaneously, as this will cause valve to malfunction.

Solenoid A Last Energized: Flow is from Pressure 1 to Cylinder 2 and from Cylinder 4 to Exhaust 5. Exhaust 3 is closed.

Solenoid B Last Energized: Flow is from Pressure 1 to Cylinder 4 and from Cylinder 2 to Exhaust 3. Exhaust 5 is closed.

Flow Diagram

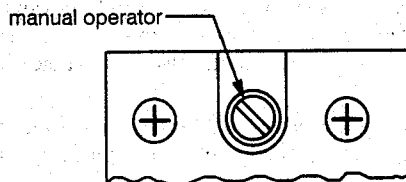


IMPORTANT: No minimum operating pressure differential is required; however, the main inlet pressure must be a minimum of 20 psig.

Manual Operation (Series 8401 only)

Manual operator provides manual operation when desired or during an electrical power outage. To operate valve manually, insert a screwdriver into stem slot and push downward, then release. This action will operate the valve momentarily. To maintain this position push down stem and rotate it clockwise 180°; stem will remain in the down position. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, rotate operator stem counterclockwise 180°; stem will return upward.

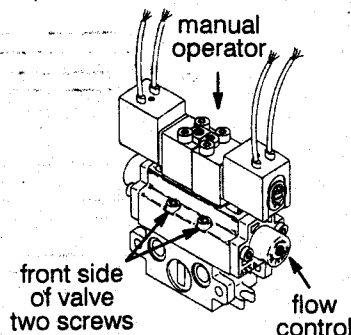
CAUTION: To prevent malfunction be sure to turn stem(s) to the up position (disengaging manual operator) before operating valve electrically.



Partial view of pilot valve (top) to show location of manual operator.

Flow Controls (Metering)

Orientation for Adjustment: Face the side of the valve body that has two sub-base socket head cap screws. These screws hold the valve body (with all moving parts) to the sub-base containing all pipe connections.



Adjustment

When the valve leaves the factory, the metering stem is backed out counterclockwise (toward plus +) as far as possible giving full unrestricted flow. Before starting, check this adjustment to verify that the metering stem is backed out fully counterclockwise.



CAUTION: Metering stem will turn easily and should not be forced once it stops.

- **Metering Stem Adjustment Left Side** when facing valve: With solenoid de-energized, solenoid A last energized (dual solenoid construction) or auxiliary pressure removed: Turn metering stem clockwise (toward minus -) to meter flow from Port 4 to Port 5 and from Port 1 to Port 2.
- **Metering Stem Adjustment Right Side** when facing valve: With solenoid energized, solenoid B last energized (dual solenoid construction) or auxiliary pressure applied: Turn metering stem clockwise (toward minus -) to meter flow from Port 1 to Port 4 and from Port 2 to Port 3.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

Positioning

Valve may be mounted in any position.

Ambient Temperature Limitations

- AC Construction: 0°F to 135°F
- DC Construction: 0°F to 77°F

Mounting

Refer to Figure 1 and 2 (below) for sub-base mounting dimensions.

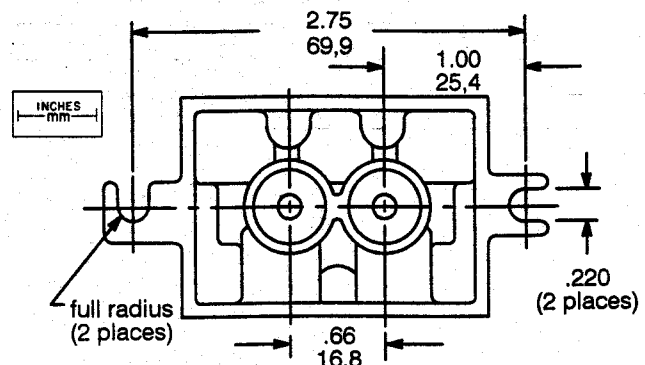


Figure 1. Stand alone construction

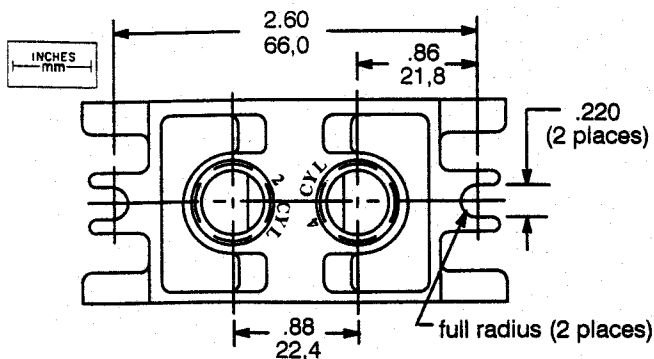


Figure 2. Manifold construction

Piping

Connect piping to valve according to markings on valve body. On air piloted valves, auxiliary pilot connection is 1/8" NPT. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

CAUTION: To avoid damage to the valve body, DO NOT OVERTIGHTEN PIPE CONNECTIONS. If TEFLON* tape, paste, spray or similar lubricant is used, use extra care when tightening due to reduced friction.

NOTE: The exhaust and/or cylinder lines may be restricted to control cylinder speed.

CAUTION: To protect the solenoid valve, install a strainer or filter, suitable for the service involved, in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601 and 8602 for strainers.

Installation of Complete Valve to Sub-base

The sub-base may be installed (piped and mounted) into the line of application before the complete valve is installed on the sub-base.

1. Position sub-base gasket and orient complete valve to make connection to sub-base.
2. With complete valve positioned on sub-base, install sub-base screws (3).

Wiring

Wiring must comply with local codes and the National Electrical Code. Open-frame solenoid may be rotated in 90° increments by removing retaining clip or cap and coil. Then reposition coil and reinstall retaining clip or cap. Torque retaining cap to 10–12 in-lb [1.1–1.3 Nm] with a 21/32" socket.

NOTE: Valves can be converted from alternating current (AC) to direct current (DC), or vice-versa, by changing the coil.

Installation of Conduit Connector Kit No. K224735

(Refer to Figure 3)

1. Thread coil lead wires through connector gasket and conduit connector.
2. Position gasket and conduit connector against coil and install center screw. torque center screw to 5 ± 1 in lbs [0.6 ± 0.1 Nm].

*Registered Trademark of DuPont.

Installation of DIN Plug Connector Kit No. K226061

(Refer to Figure 4)

1. Remove center screw from plug connector. Using a small screw driver, pry terminal block from connector housing.
2. Use #12–18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
3. Thread wire through gland nut, gland gasket, washer and connector housing.

NOTE: Connector housing may be rotated 180° from position shown in Figure 4 for alternate positioning of cable entry.

4. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block. Snap terminal block into connector housing and replace center screw.
5. Position gasket on coil and install plug connector. Torque center screw to 5 ± 1 in-lbs [0.6 ± 0.1 Nm].

Solenoid Temperature (Series 8401)

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid coil becomes hot and can be touched with the hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

NOTE: It is not necessary to remove the valve from the pipeline for repairs. For sub-base and manifold mounted valve constructions, the upper portion (with all working parts and solenoid) may be removed for inspecting, cleaning, and rebuilding.

WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power, depressurize valve (main and auxiliary lines), and vent fluid to a safe area before servicing the valve.

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to shift. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the valve as free from dirt and foreign material as possible.
- While in service, the valve should be operated at least once a month to ensure proper opening and closing.

Causes of Improper Operation

- **Faulty Control Circuits:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded coil, broken lead wires or splice connections.
- **Burned-Out Coil:** Check for open-circuited coil. Replace coil as necessary. Check supply voltage; it must be the same as specified on nameplate

- **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
- **Incorrect Pressure:** Check valve/pressure. Pressure to valve must be within range specified on nameplate. For air piloted valve, check auxiliary pilot pressure to valve. Refer to graph in *Operation* section for pressure requirements.
- **Excessive Leakage:** Disassemble valve and install a complete ASCO Rebuild Kit.

Coil Replacement

1. Disconnect coil lead wires.
2. Remove retaining clip or cap and slip coil off plugnut/core tube sub-assembly.

▲ CAUTION: When metal retaining clip disengages, it will spring outward.

3. Install new coil and replace retaining clip or cap. Torque retaining cap to 10–12 in-lb [1,1–1,3 Nm] with a 21/32" socket.
4. Make electrical hookup and restore electrical power supply.

Pilot Valve Replacement (Series 8401)

1. Disconnect coil lead wire and rigid conduit if present.

NOTE: For dual solenoid valves, replace pilot valves one at a time to avoid realignment of flow plate and gasket.

2. Remove two pilot valve screws.
3. Remove pilot valve and gaskets (2).
4. Install new gaskets (2), pilot valve and pilot valve screws.

Valve Disassembly

Service Note: Valves with design change letter **A** or **B** in the catalog number (example Cat. No. U8401**A**100 or **B**100) are built with metric hardware. Refer to torque chart on page 6 for proper tool sizes and torque values.

1. Disassemble valve in an orderly fashion. Use exploded views for identification and placement of parts.

NOTE: For dual solenoid valves, solenoids *A* and *B* and the pilot valve assemblies are identical in construction and follow the same procedure of disassembly.

2. For solenoid piloted valves, disconnect coil lead wires and rigid conduit if present. For air piloted valves, remove auxiliary pressure connection from 1/8" NPT connection on valve body.
3. Remove sub-base screws (3) from valve body.
4. Remove valve body assembly (containing all moving parts) and sub-base gasket for bench inspecting, cleaning, and rebuilding.

NOTE: Hold body assembly together to prevent parts from disengaging before reaching the bench.

5. For solenoid piloted valves remove pilot valve screws. Then remove pilot valve and port gaskets from valve body. For dual solenoid constructions, remove flow plate and flow gasket.
6. For air piloted valves, remove adapter screws, adapter, and adapter gasket from valve body.
7. Turn valve body upside down and remove the following parts.

- Plate retaining clips (2)
- Plate
- Upper Gasket
- Slide
- Spring

8. From either end of valve body, remove end cap screws, end caps, and one end cap gasket.
9. Remove spool with large and small u-cups from valve body by pushing inward from small diameter end.
10. Remove large and small u-cups from spool.
11. All parts are now accessible for replacement. Clean valve and install a complete ASCO Rebuild Kit.

Valve Reassembly

1. Reassemble valve using exploded views for identification and placement of parts.

IMPORTANT: Install all parts supplied in ASCO Rebuild Kit. Do not mix parts from Rebuild Kit with old parts from valve.

2. Lubricate the large and small gaskets, u-cups and bore of valve body (where spool seats) with Key Lube manufactured by Key Industries Inc.
3. Install large and small u-cups on spool. Be sure mouth or open end of u-cup faces inward, toward the center of the spool.
4. Install spool (small diameter end first) into large bore of valve body. Be sure flat cut (notch) on bottom of spool is facing valve body opening for the slide.
5. Lubricate the lapped surface of the slide with a light, uniform coat of DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease.
6. Carefully install spring and slide into notch in spool. Be sure the lapped and lubricated side of the slide is facing outward.

▲ CAUTION: Do not force slide in place.

7. Install upper gasket and plate in valve body.

NOTE: Hold this assembly together and push spool back and forth. Spool should slide easily.

8. Install plate retaining clips, one on either side of the plate. The spring portion of the plate retaining clip is insert into a cavity in the valve body next to the plate. The tab on the plate returning clip fits into a recess in the plate and acts as retainer.
9. Lubricate end cap gasket with DOW CORNING® 111 Compound lubricant. Install end cap gasket (one only at large diameter end), end cap, and end cap screws at either end of the valve body.
10. For dual solenoid valves, install flow gasket and flow plate on valve body.
11. Replace pilot valve port gaskets, pilot valve, and pilot valve mounting screws (2).
12. For air pilot valves, replace adapter gasket, adapter, and adapter screws (2).
13. Install sub-base gasket, valve body assembly, and sub-base screws (3) on sub-base.
14. Make electrical hookup to solenoid or auxiliary pressure connection to 1/8" NPT connection.

▲ WARNING: To prevent the possibility of personal injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

15. Restore electrical power supply, main and auxiliary pressure on air piloted valves.
16. After maintenance is completed, operate the valve a few times to be sure of proper operation.

ORDERING INFORMATION FOR ASCO REBUILD KITS AND COILS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. When Ordering Coils for ASCO valves, order the number stamped on your coil. If the number of the Rebuild Kit or the coil is not visible, order them and specify your valve's Catalog Number, Serial Number, Voltage and Frequency.

Installation & Maintenance Instructions

4-WAY SINGLE AND DUAL SOLENOID PILOTED VALVES
AND 4-WAY AIR PILOTED VALVES
SUB-BASE AND MANIFOLD MOUNTED
1/8" AND 1/4" NPT — AIR SERVICE ONLY

SERIES

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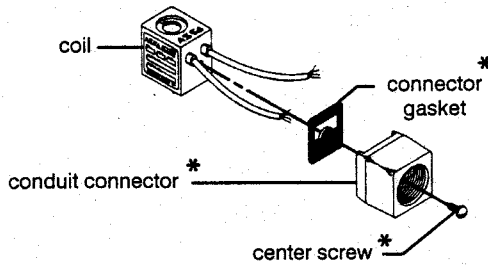
Form No. V6586 — Sec. 2
(Section 2 of 2)

NOTICE: See Form No. V6586 — Section 1 of 2
for instructions.

Torque Chart

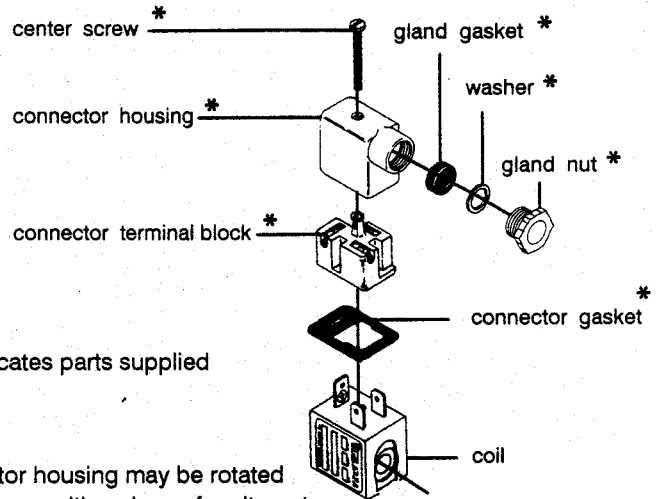
Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
Center screws	5 ± 1	0,6 ± 0,1
Retaining cap	10-12	1,1-1,3

* Indicates parts supplied



Note: The conduit hub is not included under the Underwriters Laboratories, Inc. Component Recognition of Series 8401 valves.

Figure 3. Conduit Connector Kit No. K224735

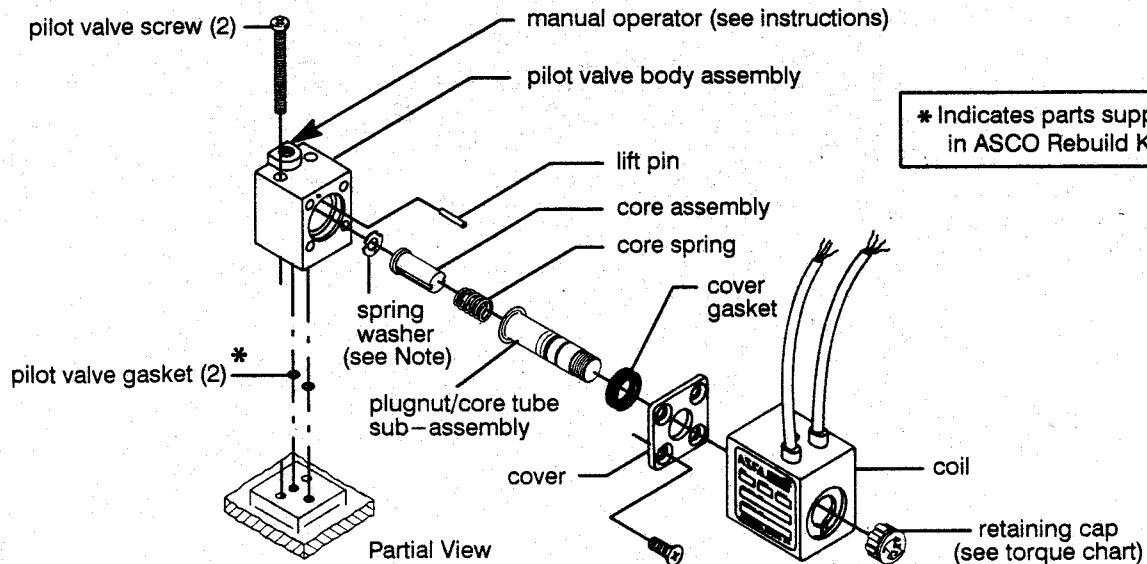


* Indicates parts supplied

Note: Connector housing may be rotated 180° from position shown for alternate positioning of cable entry.

Note: The DIN connector is not included under the Underwriters Laboratories, Inc. Component Recognition of Series 8401 valves.

Figure 4. Plug Connector Kit No. K226061



* Indicates parts supplied in ASCO Rebuild Kit

Note: Tabs on spring washer to face outward.

Figure 5. Alternate pilot valve construction.

Torque Chart

Part Name	Wrench Size or Tool	Torque Value Inch-Pounds	Torque Value Newton-Meters
Pilot Valve Screws	7/64" Hex key or Phillips head screwdriver	12 ± 2	1,4 ± 0,2
Cover Screws	Screwdriver	5 to 7	0,6 to 0,8
Sub-base Screws End Cap Screws (with standard end cap)	9/64" Hex key or †3mm Hex key	30 ± 2	3,4 ± 0,2
End Cap Screws (with metering end cap)	9/64" Hex key or †3mm Hex key	14 ± 2	1,6 ± 0,2
Manifold Screws	5/32" Hex key or †4mm Hex key	22 ± 2	2,5 ± 0,2

† Metric hardware is supplied on valves with design change letter **A** or **B** in the catalog number. For example, Catalog No. U8401**A**100 or **B**100.

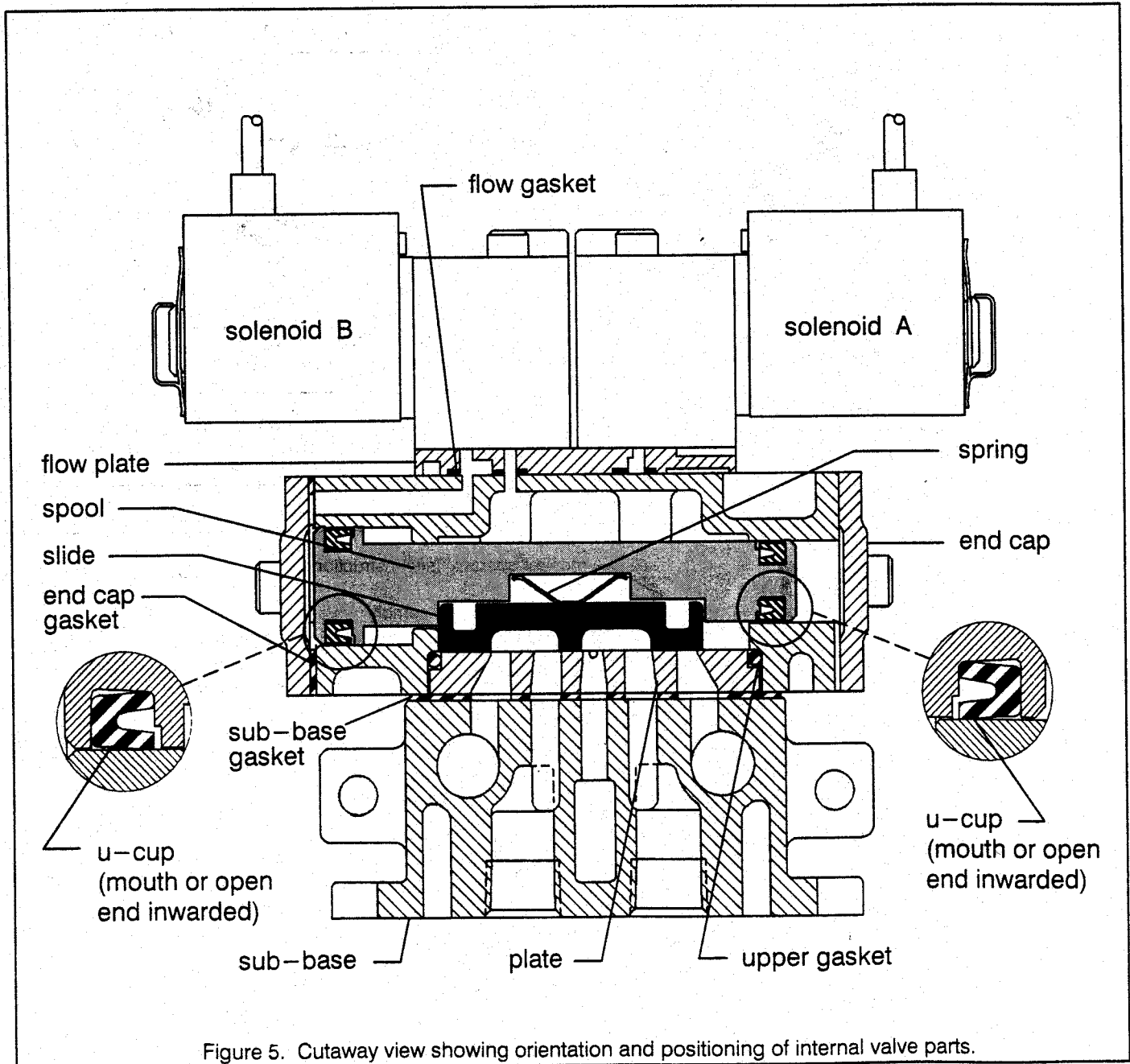


Figure 5. Cutaway view showing orientation and positioning of internal valve parts.

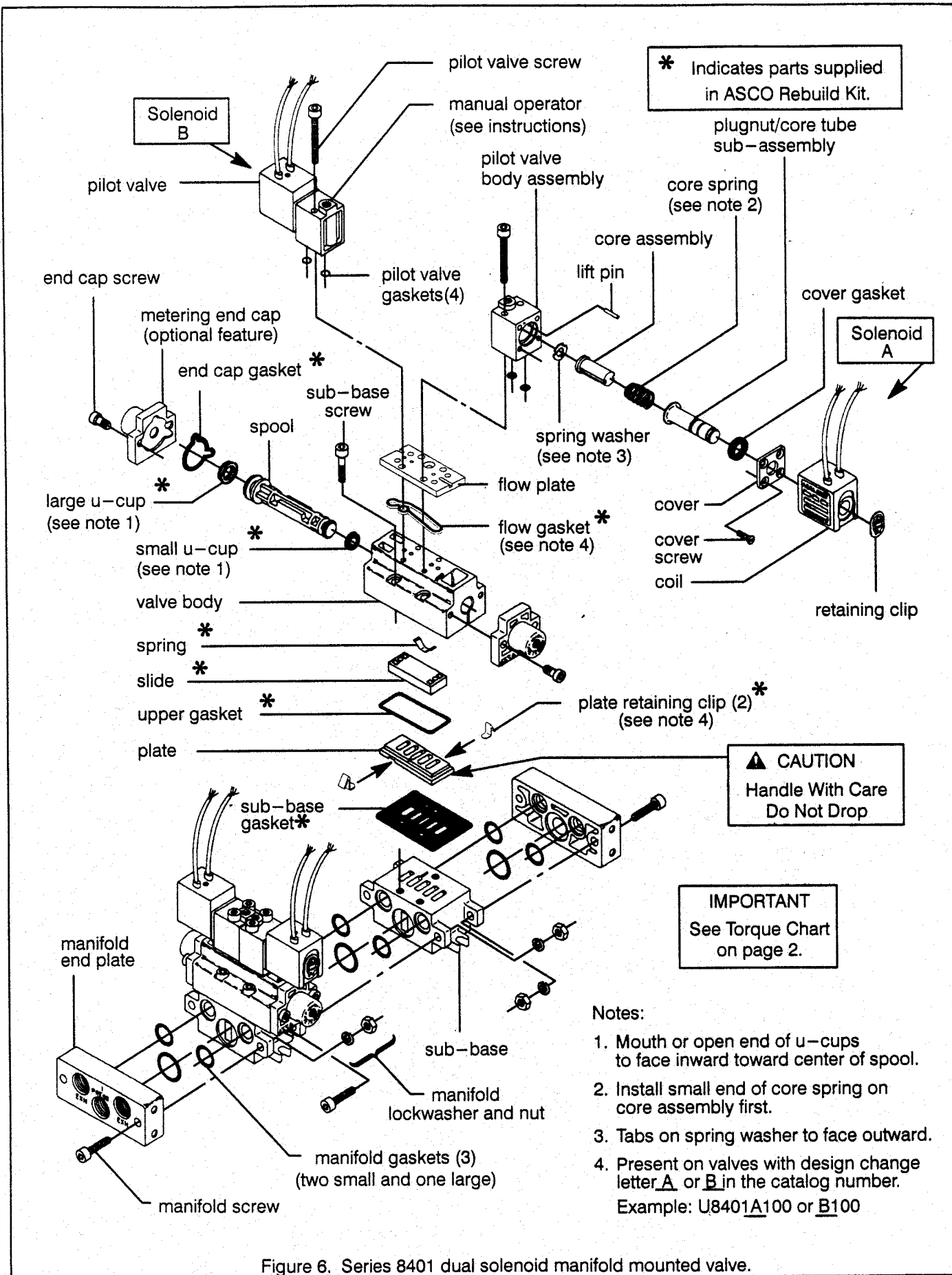


Figure 6. Series 8401 dual solenoid manifold mounted valve.

Torque Chart

Part Name	Wrench Size or Tool	Torque Value Inch-Pounds	Torque Value Newton-Meters
Pilot valve Screws Adapter Screws	7/64" Hex Key or Phillips head screwdriver	12 ± 2	1,4 ± 0,2
End Cap Screws Sub-base Screws	9/64" Hex Key or †3mm Hex key	30 ± 2	3,4 ± 0,2

† Metric hardware is supplied on valves with design change letter **A** or **B** in the catalog number. For example, Catalog No. U8401**A**100 or **B**100.

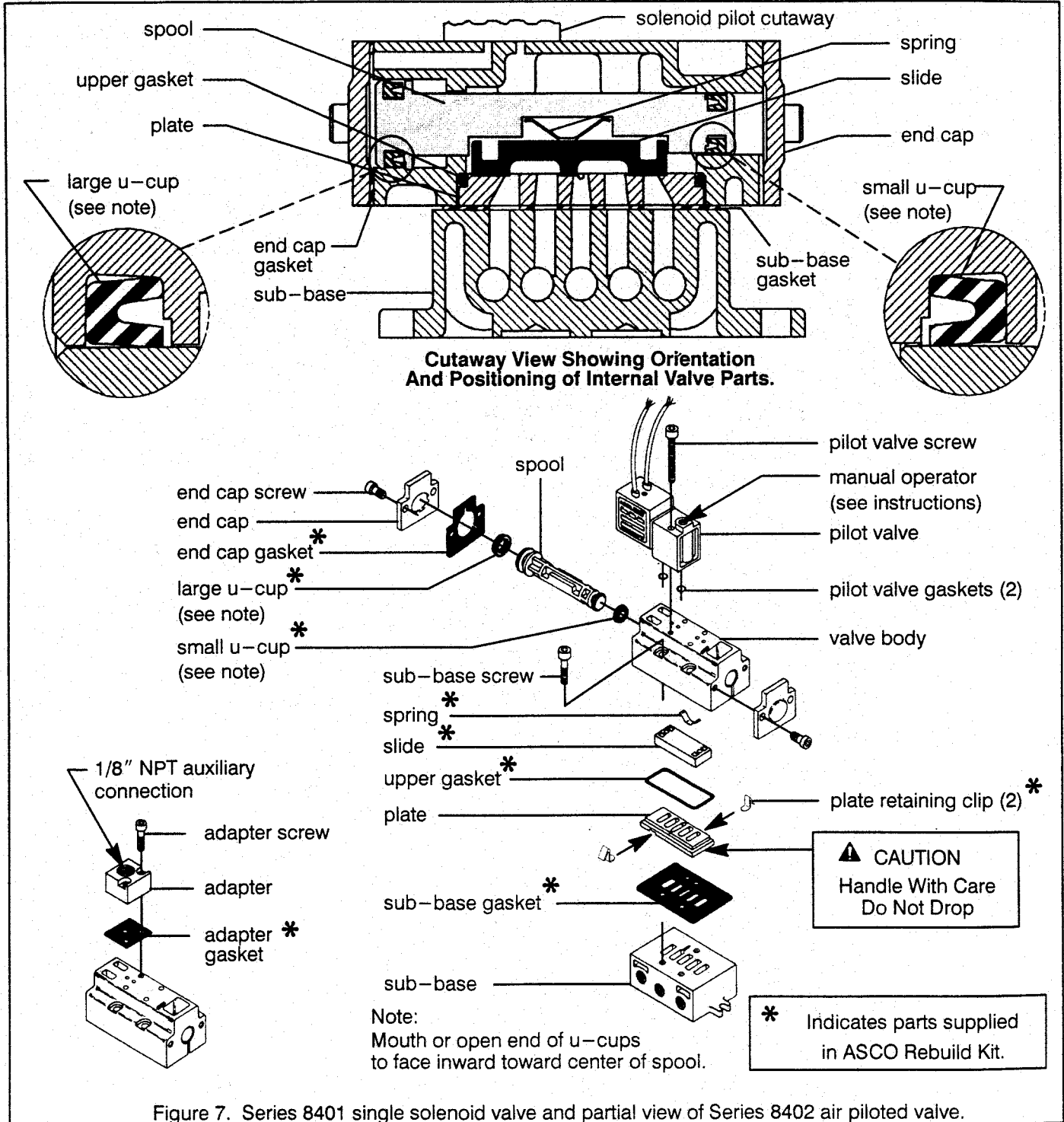


Figure 7. Series 8401 single solenoid valve and partial view of Series 8402 air piloted valve.