

Operating Instructions

Models 5701, 5703, & 5704

Pneumatic Actuators

1.0 DESCRIPTION

Rheodyne Pneumatic Actuators permit automatic operation of Rheodyne high and low pressure manual valves. Model 5701 actuates two-position valves, Model 5703 actuates six-position valves, and Model 5704 actuates both two-position and six-position valves. Model 5704 Tandem Actuator is a stepping actuator with two side-by-side drive shafts which operate two rotary valves simultaneously. Designed primarily to turn two Rheodyne six-position valves, Model 5704 can also drive two Rheodyne two-position valves without their 60° travel stops.

The actuator consists of two single-acting air cylinders connected back-to-back with the two pistons joined together by a toothed rack which drives a gear back and forth through a 60° angle. The actuator shaft is connected to the valve shaft through a coupling which allows removal of the valve for servicing. For Models 5703 and 5704, a ratchet and pawl are connected to the gear to convert back-and-forth rotation of the gear to 60° steps of the shaft in either clockwise (CW) or counterclockwise (CCW) rotation.

Figure 1 is a schematic of Model 5701. Pressurizing the clockwise (CW) port rotates the valve CW (facing valve shaft end). Pressurizing the counterclockwise (CCW) port rotates the valve CCW. Figures 2 and 3 are schematics of Models 5703 and 5704 respectively. For each Model, pressurizing one port rotates the valve. Venting that port and pressurizing the other port will cock the ratchet for the next step. A ratchet reversing spring is accessible inside the actuator cover and can be set for either CW or CCW rotation. It is set at the factory for CW rotation.

Suggested control connections are shown in Figures 4 and 5. The actuator can be operated with either a 3-way or 4-way solenoid valve.

2.0 SUPPLIED WITH THE ACTUATOR

- Hex Key(s)
- 1/4-5/16" Open End Wrench
- Mounting Screw(s)
- Dowel Pin(s)
- Type 50 Mounting Hardware if actuator purchased separately.

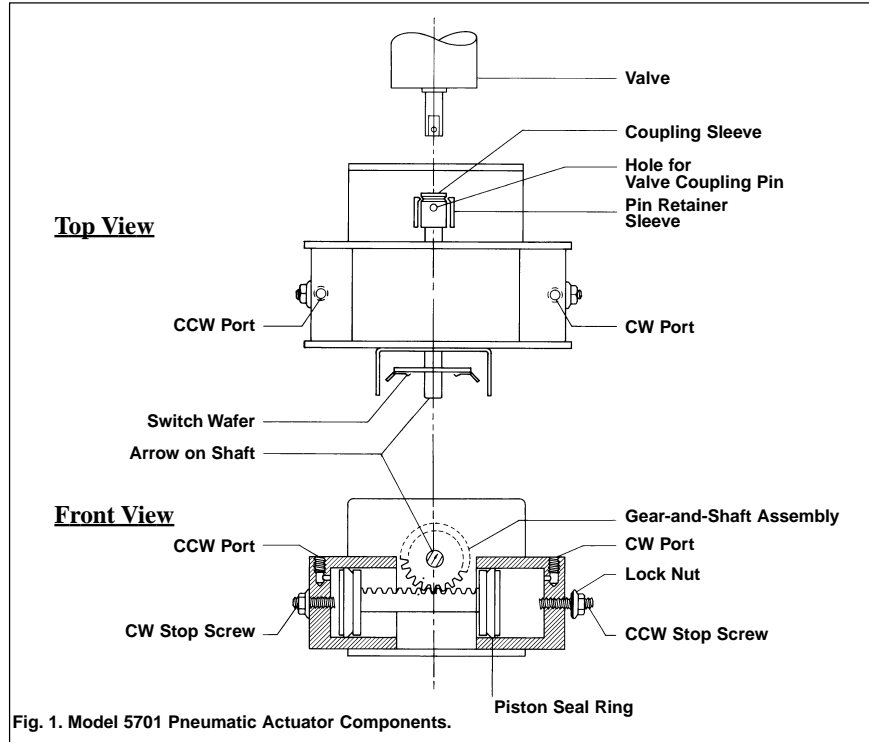


Fig. 1. Model 5701 Pneumatic Actuator Components.

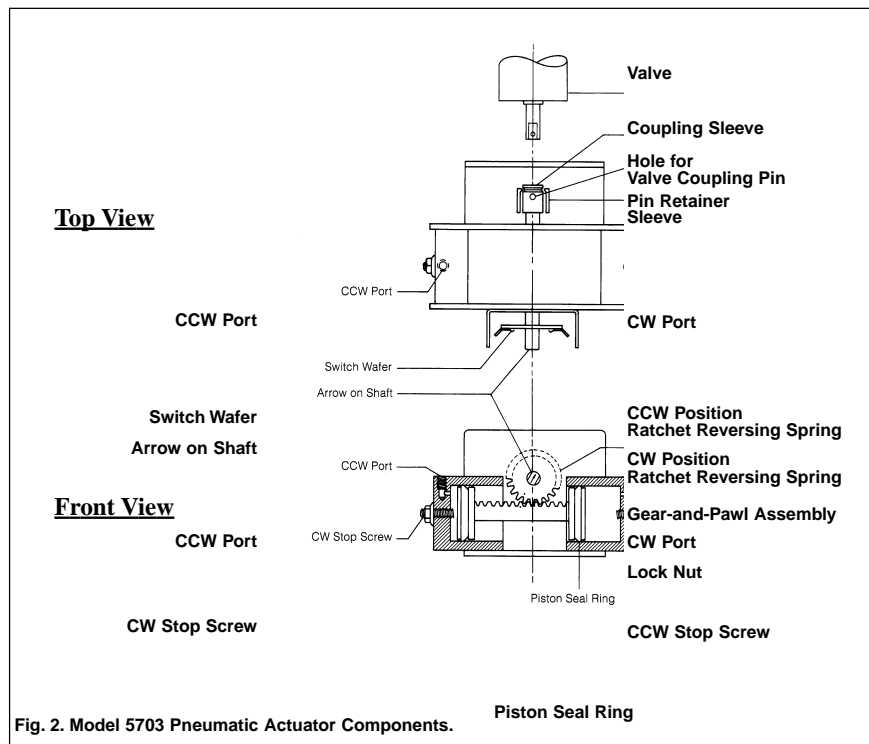


Fig. 2. Model 5703 Pneumatic Actuator Components.

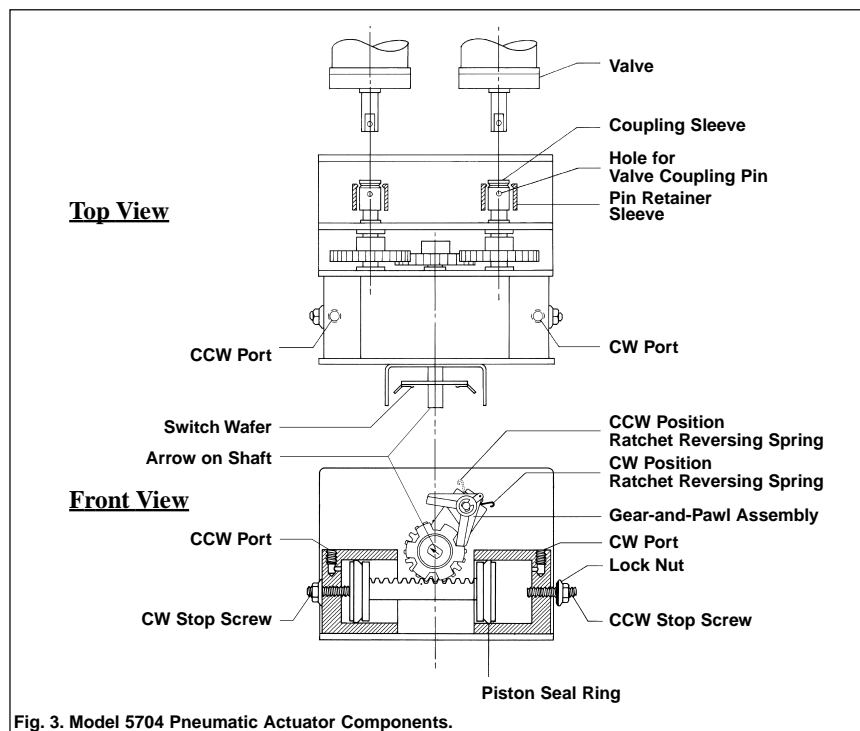


Fig. 3. Model 5704 Pneumatic Actuator Components.

3.0 SPECIFICATIONS

- Gas supply of 0.42 to 0.70 MPa (4.14 to 6.90 bar, 60 to 100 psi) required for **Models 5701 and 5703**; 0.70 MPa (6.90 bar, 100psi) required for **Model 5704**.
- Pneumatic connections are 10-32 ports.
- Built-in position sensing switch.
- Maximum temperature 50°C.

4.0 INSTALLATION

Refer to section 5.0 for instructions on mounting the valve to the actuator. If the valve is factory-assembled with the actuator, it is ready for operation. Mount the assembly in any orientation, but avoid having the valve facing up (90° to bench top) because this will allow liquids to spill onto the actuator.

Make pneumatic connections according to Figure 4. The limiting pneumatic orifice in the actuator is 2.4 mm (0.093") in diameter. Rapid motion is possible when the connecting tubing is of sufficient internal diameter. Select an operating pneumatic pressure which results in reliable operation. 60 psi (100 psi for Model 5704) is the recommended minimum pressure for use with high pressure valves. The only precaution to observe in use of the valve and actuator is that the frequency of operation (repetitive cycle rate) should be limited to avoid overheating the valve rotor seal. The energy dissipated at the interface between stator and rotor seal can be as high as 1.8 watt-seconds per stroke. The flowing liquid will help to dissipate this energy. If there is no liquid flowing through the valve, it is recommended that the cycling frequency be kept below 5 or 6 cycles per minute. This will limit the average power dissipation to 0.4 watt. Keep this limitation in mind when testing the actuator.

5.0 MOUNTING THE VALVE

Note that the Model 5701 is for 2-position valves. The coupling pin supplied with the actuator is to be used to pin the valve shaft to the coupling sleeve. This pin slips easily through the hole in the valve shaft. If it does not the hole might be deformed. To clear the hole, use a 3/32" drill or reamer. To mount the valve refer to Figures 1, 2, or 3, and proceed as outlined in Sections 5.1 and 5.2.

5.1 MOUNTING HIGH PRESSURE VALVES

Before mounting a six position valve onto Model 5703 or Model 5704, the detent mechanism on the valve must be disabled. Follow the valve's Operating Instructions to disable the detent. Be sure to leave the disabled detent on the valve before proceeding.

a) Push the pin retainer sleeve back toward actuator wall to expose the front hole for the pin.

b) Orient the actuator shaft so that its arrow (end opposite the coupling sleeve) points to position A or position 1.

c) Move the valve to the CCW position, remove the handle.

d) Insert the valve shaft into the coupling sleeve and push the valve coupling pin through the holes in coupling sleeve and valve shaft. The pin must go all the way in and be flush with both sides of the coupling sleeve.

e) Slide the pin retainer sleeve forward until it snaps into place and covers the coupling sleeve. Be sure that this retainer sleeve remains in this position so that the coupling pins cannot fall out.

f) Fasten the valve to the actuator plate using the two (four for 5704) screws supplied with the actuator.

g) If mounting onto a 5704, repeat the above procedure with the second valve.

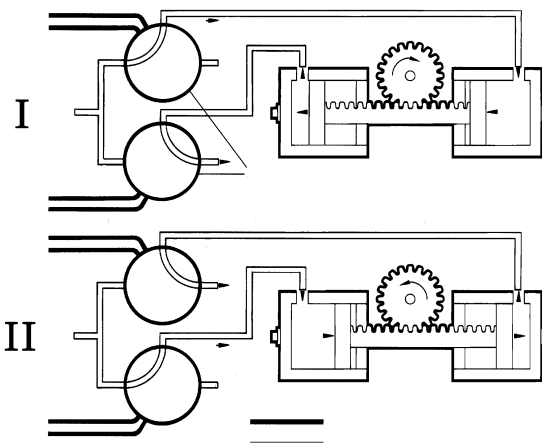


Fig. 4. Double three-way solenoid valve operating a two-position valve via a pneumatic actuator. In (I) the two-position valve rotates to 'A' position. In (II) the two-position valve rotates to 'B' position.

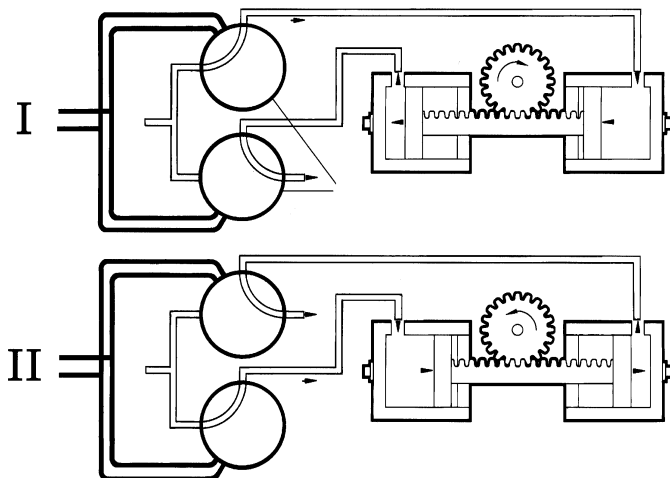


Fig. 5. Single four-way solenoid valve operating a two-position valve in a pneumatic actuator. Power On (I), two-position valve rotates to 'A' position. Power Off (II), two-position valve rotates back to 'B' position.

5.2 MOUNTING LOW PRESSURE VALVES

The Type 50 Valve Mounting Kit is supplied if the actuator was purchased separately. To mount the valve refer to Figures 1, 2, or 3 and proceed as follows:

- Remove the knob from the shaft.
- Remove entire detent assembly (6 position valves) by removing the two flat head screws, the plastic stop plate, and the stop pin.
- Replace the three valve cap screws with three 29 mm (1.125") long screws supplied.
- Add three hex nuts (supplied) to the three ends of the cap screws. Tighten these in place with a wrench so that they act as locknuts.
- Following steps (a) through (e) under Mounting High Pressure Valves to couple the valve shaft to the actuator.
- Fasten the valve to the actuator plate using the two spacers and the two 19 mm (0.75 inch) long screws and hex nuts. The projections on the spacers fit into the oblong holes in the actuator plate.
- If mounting onto a 5704, repeat the above procedure with the second valve.

6.0 POSITION SENSING SWITCH

The position sensing switch is a wafer switch (Figure 6) attached underneath the numbered panel indicating the valve's position. The switch is rated for 1/2 amp at 110/VDC or 1 amp at 24/VDC. There are 12 stationary clips and a central wiper contact. The wiper contact rotates with the valve shaft. One electrical lead (wire from your instrument) is always connected to this central wiper contact.

A choice of two types of communication is possible with the position sensing wafer: continuous and momentary closure communication. The electrical connection between the event relay of your instrument to the C clip on the wafer gives a continuous

closure as the wiper stops at the clip. The electrical connection between the event relay of your instrument to the M clip gives a momentary closure as the wiper passes at the clip.

To connect your instrument to the valve actuator:

- Remove hex nuts with the supplied $\frac{1}{4}$ - $\frac{3}{16}$ " open end wrench from the position indicator cover on the actuator. Remove the position indicator cover and the white spacers.
- Remove the position sensing wafer.
- Orient the wafer as illustrated in Figure 6. The central wiper orientation is not important.
- Solder the wire connected to the ground event relay on your instrument to the Common Tab of the wafer.
- Two clips correspond to each of the positions of the valve. See Figure 6. One clip is used for continuous closure communication and the other clip is used for momentary closure communication (communication option depends on your instrument).

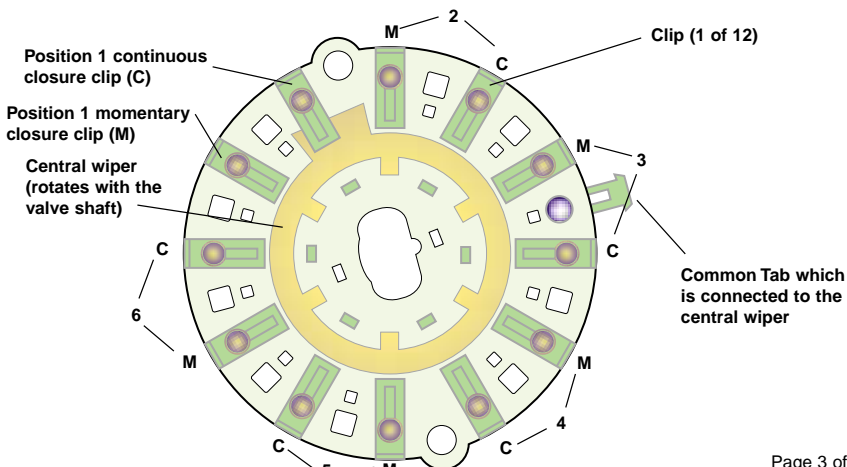


Fig. 6. Detailed view of position sensing wafer.

f) Locate the desired clips (C or M clip) of the positions to be monitored.

g) Solder wire to the clip of the positions to be monitored. All the wires attached to the clips of the actuator are connected together and connected as one to the event relay of your instrument.

h) To replace the wafer onto the actuator, rotate the central wiper to fit over the position indicator (arrow) on the actuator. Replace the wafer onto the actuator by lining up the two screws and the position indicator on the actuator with the corresponding holes in the wafer.

i) Replace the position indicator cover on the actuator and replace and tighten the hex nuts.

7.0 SETTING TRAVEL STOPS

Models 5701, 5703, and 5704 are shipped from the factory adjusted for correct 60° rotation. The travel stop adjusting screws are hex socket screws with locking nuts located on the end of each cylinder block. Do not adjust these screws unless you suspect misadjustment. The locking nuts are also sealing nuts and when properly tightened, the nuts seal the adjusting screws airtight.

To adjust the travel stop(s) refer to Figures 1, 2, or 3 and proceed as follows:

- Pressurize CW port to rotate valve CW.
- Loosen the CW locking nut and turn the CW stop screw outward two turns.
- Turn the CW screw slowly until you feel the screw touch the piston. Turn inward 45° beyond this point and tighten the lock nut securely. This position of the stop screw will limit the actuator piston travel stop.
- Follow step (a) through (c) above with the opposite rotation (CW becomes CCW).

Note that the actuator shaft will spring back slightly when pressure is removed from the just pressurized port. This is normal and results from the compliance of the mechanism. The valve shaft does not spring back.

8.0 MAINTENANCE

Models 5701, 5703, and 5704 Pneumatic Actuators are designed to give many thousands of cycles without trouble. The valve will undoubtedly require servicing before the actuator does. After one or two years of operation the following maintenance procedures should be performed:

- a) Oil the two actuator shaft bearings.
- b) Remove the rear actuator plate and add grease to the rack and gear.
- c) Add o-ring grease to the cylinder walls to lubricate the piston seal rings.

If for any reason the actuator has been disassembled, the following points should be observed during reassembly:

- 1) Note the center-punch marks on the rack and gear. When the rack and gear are properly meshed, the marks will be opposite one another.
- 2) Be careful in inserting the pistons into the cylinders that the lip of the piston seal ring enters the cylinder without folding back.

9.0 WARRANTY

All Rheodyne products are warranted against defects in materials and workmanship for a period of one-year following the date of shipment by Rheodyne. Rheodyne will repair or replace any Rheodyne product that fails during the warranty period due to a defect in materials or workmanship at no charge to the customer.

The product must be returned to Rheodyne's factory in original packaging or equivalent, transportation prepaid. Damage occurring in transit is not covered by the warranty.

This limited warranty is Rheodyne's sole warranty of its products, and all other warranties of merchantability or fitness for any particular purpose are hereby disclaimed. Under no circumstances will Rheodyne be liable for any consequential or incidental damages attributable to a claimed failure of a Rheodyne product, even if Rheodyne has been placed on notice of possibility of such damages.