



MODEL 9540L

P/P - PNEUMATIC POSITIONER FOR LINEAR VALVES

SECTION I

I. DESCRIPTION AND SCOPE

Model 9540L is a single acting, compact, force balance, pneumatic positioner used on linear travel (sliding stem) control valves. This positioner is utilized to linearize the relationship between valve stem position and the system's control signal. This design is only suitable for nominal 3-15 psig input signals, or split range variations thereof.

Each unit comes complete with a set of built-in gages within the internals; the cover includes a clear see-thru panel to monitor gages. Gages monitor input "SIG" and output "LOAD".

The Model 9540L P/P positioner may be utilized with the following current Cashco product models:

987	964	520 TFE	SCV-30
988	2266 (2" size)	521 TFE	
989	2296	SCV-S	

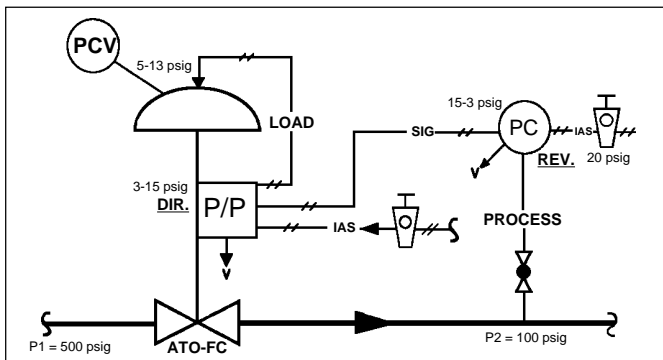


Figure 1: Typical Pressure Reducing Pneumatic Control Loop - PCV with P/P Positioner

- IAS - Instrument Air Supply
- PC - Pressure Controller
- PCV - Pressure Control Valve
- ATO-FC - Air-to-Open, Fail Close
- ATC-FO - Air-to-Close, Fail Open
- P/P - Pneumatic Input/Pneumatic Output
- DIR - Direct Acting
- REV - Reverse Acting
- SIG - Controller Output Signal
- V - Vent
- CW - Clockwise rotation
- CCW - Counter-clockwise rotation

SECTION II

II. METHOD OF OPERATION (See Figure 2)

The positioner operates with the force balance principle: the input signal "SIG" (3-15 psig) acts on the input diaphragm (50). The stroke of the input diaphragm is transferred to the flapper lever (38). The resulting movement of the flapper varies the dynamic pressure at the nozzle (51). This pressure acts on the

amplifier (53) and the change in output pressure causes a movement of the actuator/valve stem.

This movement is back fed from the actuator/valve stem (55) by the feedback lever (13) of the positioner, and transferred to the stroke factor lever (19). The stroke factor lever (19) is connected to the flapper lever (38) by means of a range spring (41).

A force balance is created on the flapper lever (38) when the force generated by the input diaphragm (50) balances with the counter-force produced on the range spring (41). This ensures that the actuator/valve stem position is always proportional to the input signal.

Dynamic matching of the actuator (sensitivity, stability) is factory set by means of the throttle screw (42) and the damping throttles (44). The stroke range and zero are set by means of the stroke factor thumbscrew (40) and the zero thumbscrew (39). The changeover plate (15) is used to set either an increasing or decreasing output pressure for an increasing input signal, i.e. direct or reverse acting.

The normal factory set position of the bypass switch (3) is "EIN" (ON) (pointer at 6 o'clock), and the positioner will be operational. If the positioner bypass switch (3) is set to the "AUS" (OFF) position (pointer at 9 o'clock), the input signal SIG is supplied direct to the actuator; i.e. the positioner has no effect. Operation in the "AUS" (OFF) position is only practical for control valves where the positioner action is "Direct" and the actuator bench range is approximately equal to the 3-15 psig "SIG".

Use of bench ranges with upper limits greater than 15 psig will cause the control valve to not be able to fully stroke when bypassed.

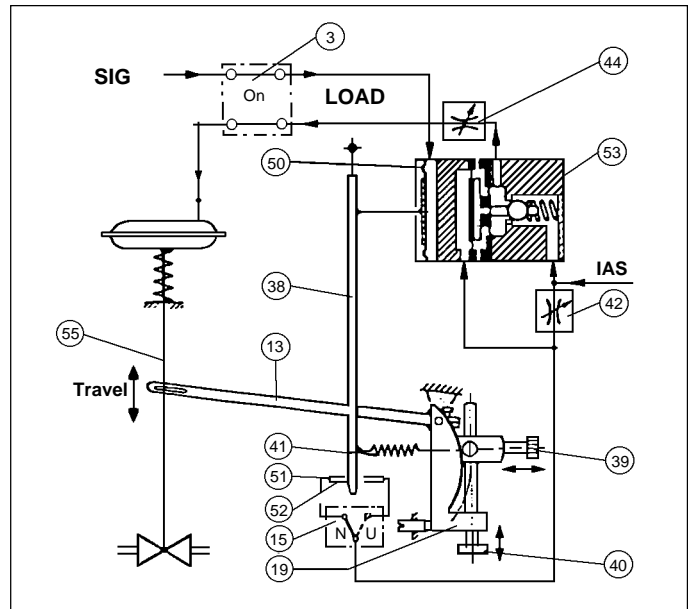


Figure 2: Single-acting positioner functional diagram.

SECTION III

III. MOUNTING TO SPRING DIAPHRAGM ACTUATORS

A. The following text applies to field mounting of a positioner.

B. Determining Mounting Side:

1. The action/failure position on the control valve unit must be known "Air-to-Open, Fail Closed" (ATO-FC); or "Air-to-Close, Fail Open" (ATC-FO). The mounting side is selected from Table 1 considering:

- a.) Valve action/failure position
- b.) Stem travel direction with increasing "SIG"
- c.) Positioner action - Direct or Reverse

(Choose either steps 2a. -to- 3a.; or choose steps 2b. -to- 3b.)

2a. On actuator yokes with a cast-on rib located on one of the legs that support the lower diaphragm housing, see representative cross-section Figure 3A. Rotate the actuator until the rib with its mounting taps is located on the side (right or left) as indicated in Table 1. (Includes 987's, 964's and 2" 2266's, 520 &

521 TFE's with Models 55D, 55R, 115D and 115R actuators).

2b. The actuator yokes without a cast-on rib will have four mounting holes on one of the yoke's legs. (See representative cross-section Figure 3B.) Rotate the actuator until the leg with the four holes is on the side (right or left) as indicated Table 1. (Includes 520 & 521 TFE's with Model 30 actuator.)

3a. On yokes with a rib, attach the positioner's mounting bracket (12) in accordance with the dimensions of Figure 4 to the actuator yoke. Use the center hole of the mounting bracket (12) for attachment using the rib mounting bracket (12) will give the proper dimensions. (Figure 4 is shown as right-hand; if left-hand is required, then dimensions are mirror-imaged.)

3b. On yokes without a rib, attach the positioner's mounting bracket (12) in accordance with the dimensions of Figure 4 to the actuator yoke. Use two yoke mounting screws and nuts (10B) and the two holes closest to the frontal position when properly rotated. (Figure 4 is shown as right-hand; if left-hand is required, then dimensions are mirror imaged.)

TABLE 1

CASHCO PRODUCT	CONTROL VALVE ACTION/FAIL POSITION	POSITIONER			STEM TRAVEL DIRECTION	PLUG ACTION WITH SIGNAL INCREASING
		MOUNTING LOCATION	ACTION	CHANGEOVER PLATE SETTING		
2"- 2266 & 964 (Non-Reversible Actuator, Reversible Trim)	ATO-FC	Right	Direct		Downwards to Open	Opens
	ATC-FO	Left	Direct		Downwards to Close	Closes
	ATC-FO	Right	Reverse		Downwards to Close	Opens
	ATO-FC	Left	Reverse		Downwards to Open	Closes
987, 988, 988MB, 989, 520, 521, SCV-S, SCV-30 (Non-Reversible Trim, Reversible OR Non-Reversible Actuator)	ATO-FC	Left	Direct		Upwards to Open	Opens
	ATC-FO	Right	Direct		Upwards to Open	Closes
	ATC-FO	Left	Reverse		Upwards to Open	Opens
	ATO-FC	Right	Reverse		Upwards to Open	Closes

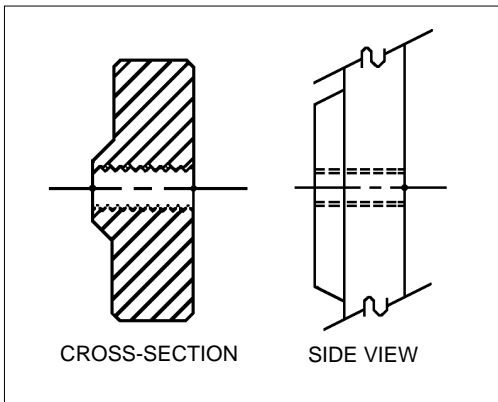


Figure 3A

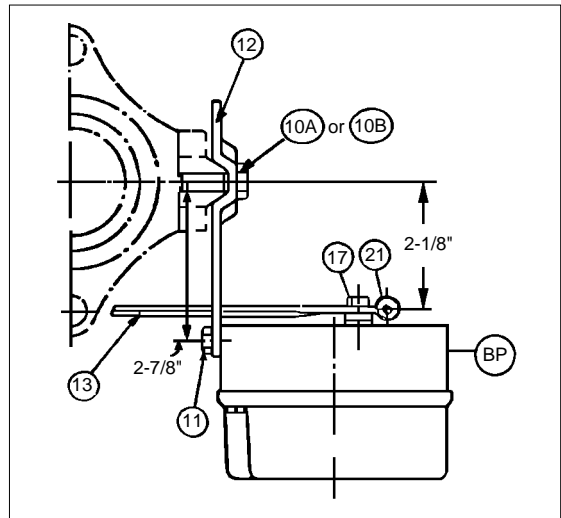


Figure 4

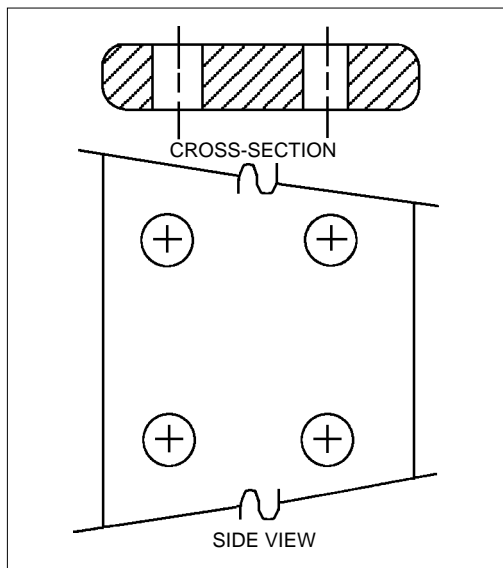


Figure 3B



Figure 5A (Model 987)

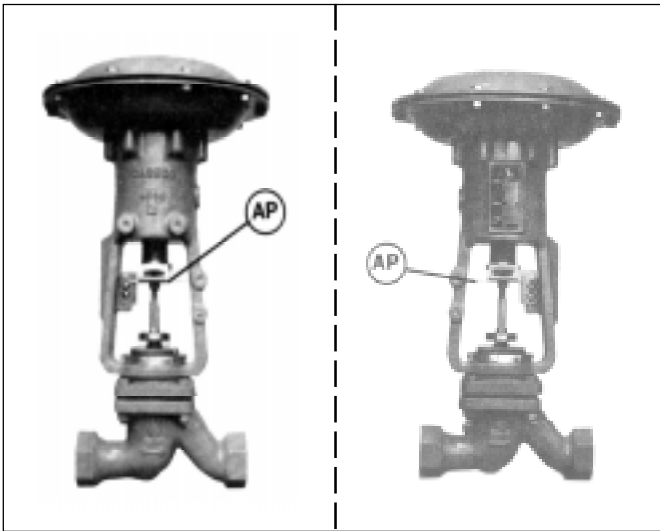


Figure 5B: (Model 964 w/left and right mounting positions)

4. If the control valve does not have an accessory plate (AP) installed, the actuator stem must be decoupled from the valve stem. (Refer to the valve/actuator instructions for de-coupling procedure.) Place accessory plate (AP) as indicated in Figures 5A, 5B or 5C.
5. If it is necessary to re-orient an existing accessory plate (AP) that is secured to the valve's stem by a jam nut, loosen the jam nut so that the accessory plate (AP) is loosened enough that it can be tipped and rotated to the proper frontal position. Re-tighten the accessory plate (AP) jam nut. Attach the stem feedback carrier bolt (14) to the accessory plate (AP) using the Tinnerman nut.

(Note: Above is true for the 987 and 2296 actuators. For Models 30, 55D, 55R, 115D and 115R actuators, separate accessory plates are required for "left" or "right" mounting positions.)

6. Remove the positioner cover (WC). Orient the unit so that the DAMPING & GAIN labels are top/center, and the gauges (1A & 1B) are right side up.
7. Fasten the positioner baseplate (BP) to the mounting bracket (12) using the two mounting screws (11) (See Figure 4).
8. With the actuator at zero stroke ("LOAD" = 0 psig; i.e. no air to actuator diaphragm), attach the feedback lever (13) on the main shaft (17) (Figure 4) of the positioner with the feedback carrier bolt (14) located in the feedback lever's (13) slot. The compensating spring (18) must be located above the feedback carrier bolt (14) when the unit mounting is on the right (See Figure 6A), and below the feedback carrier bolt (14) when the mounting is on the left. (See Figure 6B). Hand tighten socket cap screw (21) (Figure 4); **DO NOT WRENCH TIGHTEN!**

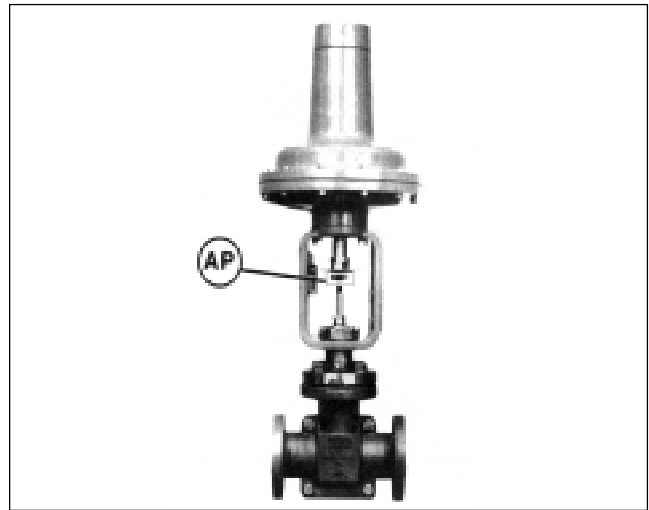


Figure 5C: (Model 521 w/Model 30 actuator)

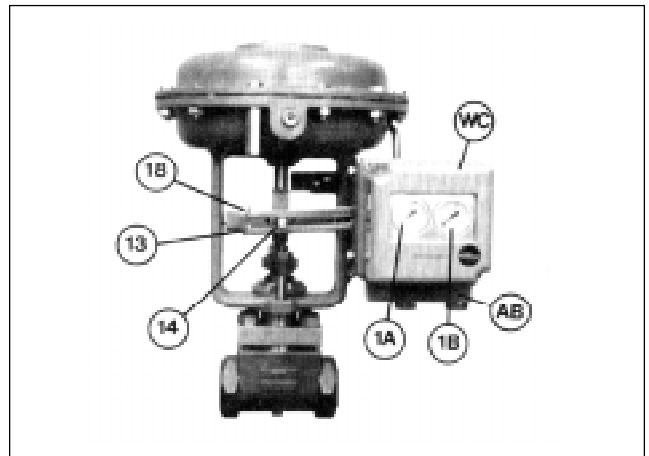


Figure 6A



Figure 6B

9. Press the stroke factor lever (19) (See Figure 7) of the positioner's internals against the travel stop pin (20) and hold firmly in place. Place the #5 Allen wrench into the head of the socket cap screw (21), and tighten while still holding stroke factor lever (19). Tighten firmly. (A 5 mm, #5 metric Allen wrench should be provided with the unit.)
10. Install tubing fittings with acceptable thread sealant and tubing from the unit's 1/4" NPT (female) "OUTPUT 1" port of the adapter block(AB) up to

the connection port of the actuator casing. **NOTE-Thread Sealants:** *If TFE tape is used, make sure that small pieces of tape will not be “pinched off” and enter the pneumatic internals. (Liquid thread sealants are not recommended.)*

- Place temporary fittings and tubing so that the positioner is able to be supplied with a 20-35 psig air supply to the “SUPPLY AIR” port of the adapter block (AB). Supply pressure depends upon actuator bench range; see Table 2. Using a manual loader, connect a 3-15 psig air source to the “INPUT (3-15 psig) W” port of the adapter block (AB).

TABLE 2

Actuator Bench Setting (psig)	Supply Pressure (psig)	Max Supply Pressure (psig)
3-15, 4-15	20	25
5-15, 3-10		
8-15, 3-13		
6-26, 6-27, 6-30	35	40
6-20, 7-28, 9-30		
10-30, 16-30		

- Stroke the valve through its full travel by varying the input signal “SIG” span of 3-15 psig. Observe the feedback linkage to assure that the linkage does not bind and does not experience overtravel. At a 9 psig signal input, the feedback lever should be approximately horizontal.

IMPORTANT NOTE: *If the feedback lever (13) is turned forcibly against the travel stop pin (20), the stroke factor lever (19) will be released from rigid connection (unscrews) to the positioner main shaft (17). If this occurs, the feedback lever (13) must be loosened, the main shaft (17) must be retightened to the stroke factor lever (19) by holding the stroke factor lever (19) firmly against the travel stop pin (20), while turning the main shaft (17) CW (viewed from shaft end) using a screwdriver on the main shaft’s (17) end. Steps 8 thru 11 must be repeated.*

- Leave temporary air sources as installed for final calibration, Section V, but turn off the air supply so that no pressures are induced to the internals.

SECTION IV

IV. BASIC ADJUSTMENTS/SETTINGS

A. Required Tools:

The following tools are required for the basic adjustment:

- Screwdriver
- Open-end wrench - 6 mm
- Feeler gauge 0.6 mm (.024 in)
- (2) test gauges - 30 psig (for 20 psig max bench range); (1) test gauge - 30 psig and (1) test gauge - 60 psig (for 30 psig max bench range)
- Manual loader/airset
- Open-end wrench - 10 mm
- Needle-nose pliers; small
- #5 Allen wrench (5 mm) (provided)

B. Manual Bypass Setting: (See Figure 7)

- There are two positions for the pneumatic bypass switch (3) to be in:

“EIN”-Positioner is active (ON); this is the factor set position.

“AUS” - Positioner is inactive (OFF), and the input “SIG” is passed directly to the actuator, bypassing the positioner internals.

- “EIN” or “AUS” are labels cast into the baseplate (BP). To bypass, loosen the bypass screw (2) CCW to release the bypass switch (3) rotor; two full revolutions of the bypass screw (2) will be required. Rotate the bypass switch (3) CW 90° to move to bypass (AUS); rotate CCW to activate the positioner (EIN). The bypass switch (3) has a rib on its outer edge that indicates the position of the bypass switch (3). When adjustments are completed, retighten bypass screw (2). **DO NOT LEAVE AT AN INTERMEDIATE POSITION; PLACE AT “EIN” OR “AUS” ONLY.**

NOTE: *For picture clarity, all photographs hereafter have the two internal gages removed.*

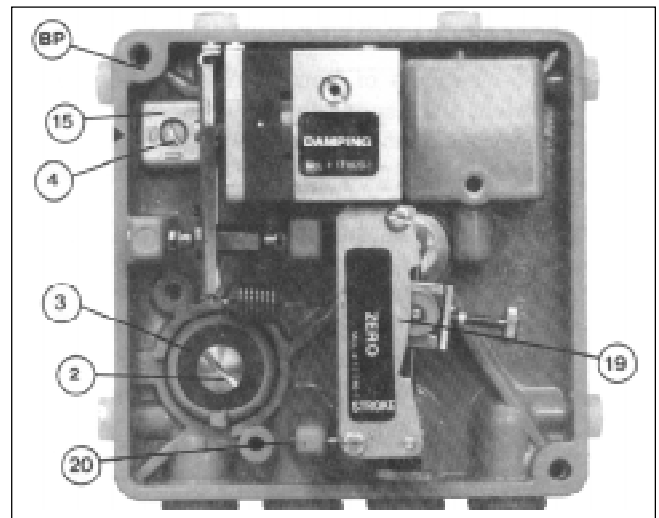


Figure 7

TABLE 3

Valve Stroke	Applicable Range Spring (41)				Product Size - Model
	Input Signal: 3-15 psig		Split Range Input Signals: 3-9, 9-15, 3-7, 7-11 and 11-15 psig		
	P/N*	Color Code	P/N*	Color Code	
7/16"	-08000-	light yellow	-08000-	light yellow	1/2"-520 & 521 TFE's
1/2"	-08000-	"	-08000-	light yellow	All sizes 987
9/16"	-08000-	"	-08001-	olive green	1" & 1-1/2" 964's
5/8"	-08000-	"	-08001-	"	1" 520 & 521 TFE's
3/4"	-08000-	"	-08001-	"	2" 2266
7/8"	-08000-	"	-08001-	"	2" 520 & 521 TFE's
1-1/8"	-08001-	olive green	-08002-	light gray	2" & 3" 964's

*Complete Part Number (P/N) is shown in Figure 8. Table 3 indicates the missing nos. of the complete P/N. General P/N = 830-69-5-_____-00.




PART NO.	COLOR	COILS
 830-69-5-08002-00	light gray	7 -1/4
 830-69-5-08001-00	olive green	6 -3/4
 830-69-5-08000-00	light yellow	5 -3/4

Figure 8

C. Action Setting:

1. Refer to Table 1 to see the graphical indicated position of the changeover plate (15). The indicator arrow is located on the edge of the baseplate (BP). There are two positions for this pneumatic switch to be in:

 "N" - Direct action
 "U" - Reverse action
2. The "N" and "U" are labels cast into the surface of the changeover plate (15). If necessary, to change action loosen CP screw (4) to removal. Lift the changeover plate (15) and its CP gasket (16) and replace them to align the label with the arrow as desired. Replace and retighten changeover plate screw (4).

D. Range Spring Selection:

1. Each positioner unit is supplied with a color-coded range spring (41). Figure 8 shows the springs; identification is by the number of coils. The range spring (41) to be utilized is indicated above in Table 3.
2. To remove/change the range spring (41) see Figure 9; hold stroke factor lever (19) against the travel stop pin (20) and simultaneously hold the zero thumbscrew (39). Using needle nose pliers, remove the end of the range spring (41) hooked to the flapper; then remove the opposite end from the zero mechanism. Reverse the procedure with the new/different range spring (41). Always make sure that the range spring's (41) coils are closest to the flapper lever (38).
3. After removal/change of the range spring (41), recalibration is required. See Section V.

SECTION V

V. CALIBRATION/ADJUSTMENTS

A. ZERO AND STROKE Settings: (See Figure 9)

1. After settings of Section IV have been completed, place separate manual loaders to supply the positioner with air ("IAS") and develop a variable 3-15 psig signal ("SIG") as the input.
2. If the positioner has an input "SIG" of 3-15, 3-9 or 3-7 (i.e. full stroke is a 15 psig, 9 psig or 7 psig "SIG" respectively for REVERSE action), skip Step 3 following and go to Step 4.
3. If the positioner is split ranged for 9-15 or 11-15 psig "SIG" input (i.e. zero stroke is at a 9 psig or 11 psig "SIG" respectively for DIRECT action; full stroke is at a 9 psig or 11 psig

"SIG" respectively for REVERSE action), then follow this procedure:

- a. Shutoff supply air ("IAS", i.e. 0 psig).
- b. Release all tension on range spring (41) by turning zero thumbscrew (39) CCW.
- c. See Figure 4; loosen screw (21) securing the feedback lever (13) on the backside of the unit to the main shaft (17) using the #5 (5 mm) metric Allen wrench provided. Manually move the stroke factor lever (19) away from the tip of the stop pin (20) a distance of approximately 1/4" - 3/8" using some form of spacer; i.e. folded cardboard, etc. Retighten feedback lever (13) to main shaft (17). Remove the temporary 1/4" - 3/8" spacer.

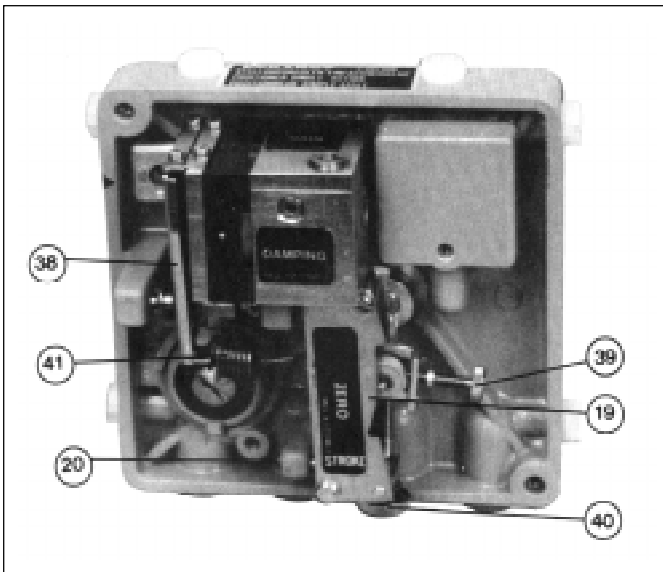


Figure 9

- d. Introduce an air supply (“IAS”) to the positioner as required by Table 2.
- e. Press the flapper lever (38) several times to the left and right until the flappers are correctly aligned.
- f. Set the minimum input “SIG” with the manual loader; i.e. 9 psig for 9-15 psig, 11 psig for 11-15 psig.
- g. Turn zero thumbscrew (39) CW, increasing tension of range spring (41), until the actuator begins to move away from its zero (shelf) position. (If adjustment does not cause valve response, turn off air supply (“IAS”) and return to 3.C. above; increase the temporary spacer thickness in increments of 1/8” and repeat steps until the valve does move). Care should be taken to assure that the stroke factor lever (19) does not overtravel from the starting point to the point where the stroke factor lever (19) will hit the housing cover (WC), before reaching its end position - approximately 39° rotation.
- h. Induce the maximum input “SIG” with the manual loader; i.e. 15 psig for 9-15 psig or 11-15 psig.
- i. Turn the stroke factor thumbscrew (40) CW; this shortens the valve stroke with respect to the “SIG” change; i.e. less air pressure required to reach valve’s maximum stroke position. Once valve stem moves with each CW adjustment of the stroke factor thumbscrew (40), reverse to CCW rotation of stroke factor thumbscrew (40) and precisely adjust up to the maximum stroke position of the control valve.

- j. Repeat Steps e. and h. a minimum of three times, as under this adjustment of Steps b. and c. above, the STROKE and ZERO adjustments are mutually dependent; i.e. interacting.
 - k. If procedures of Step 3 above have been completed, skip Step 4 following, and go to next paragraph V.B.
4. Press the flapper lever (38) several times to the left and right until the flappers are correctly aligned.
- a. Induce the minimum value of the input signal (“SIG”) using a manual loader. (This corresponds to the start of the valve’s stroke.)
 - b. Turn the zero thumbscrew (39) either CW or CCW until the actuator begins to cause valve stem travel. Precisely adjust to the point where travel just begins.
 - c. Induce the maximum value of the input “SIG”. (This corresponds to the end of the valve’s stroke.)
 - d. Turn the stroke factor thumbscrew (40) first CCW until observing the shortening of the valve’s stroke. Turn the stroke factor thumbscrew (40) CW until the valve travel is precisely at its full stroke.
 - e. Recheck the ZERO and STROKE settings. They should be repeatable. Under this procedure for adjustment, the ZERO and STROKE calibrations are mutually independent (i.e. non-interacting, when the feedback lever (13) and travel stop pin (20) are properly installed and positioned).

B. Setting GAIN: (See Figure 10)

- 1. Increasing GAIN increases the sensitivity of the positioner to a change in the input “SIG”. GAIN is normally factory set when mounted by the factory, and should not require field adjustment.
- 2. The open loop gain varies with the supply “IAS” pressure, and the values represent linear amplification. Table 4 is a guide to the gain available for each range spring (41) utilized:

TABLE 4

Supply Pressure (psig)	Adjustable Range
20	150:1
35	125:1

3. A change in GAIN is normally indicated when instability sluggishness shows up at steady state operating conditions. If the positioner output "LOAD" seems to rapidly oscillate (psst-psst-psst-...) too much gain is present and GAIN setting should be reduced until stability is reached. If the positioner output "LOAD" does not react to small changes in the "SIG", insufficient GAIN may be present; increase GAIN until instability (psst-psst-psst-...) is present, then reduce as described previously. This procedure allows the gain of the control loop to match the dynamic requirements of the control system.

4. Determine whether GAIN should increase or decrease based on above text. To increase GAIN, rotate throttle screw (42) CW; to decrease GAIN, rotate throttle screw (42) CCW. To prevent overadjustment the throttle screw (42) is located within the limiting screw (43). This allows the throttle screw (42) to only be adjustable a total of approximately one revolution from maximum to minimum. Thus, GAIN should be adjusted slowly in very small increments.

5. If GAIN is adjusted, ZERO resetting may be required. Check and use Procedure V.A.

C. Setting DAMPING: (See Figure 10)

1. Increasing DAMPING introduces extra time constant to the output "LOAD" of the positioner. DAMPING should be increased/decreased

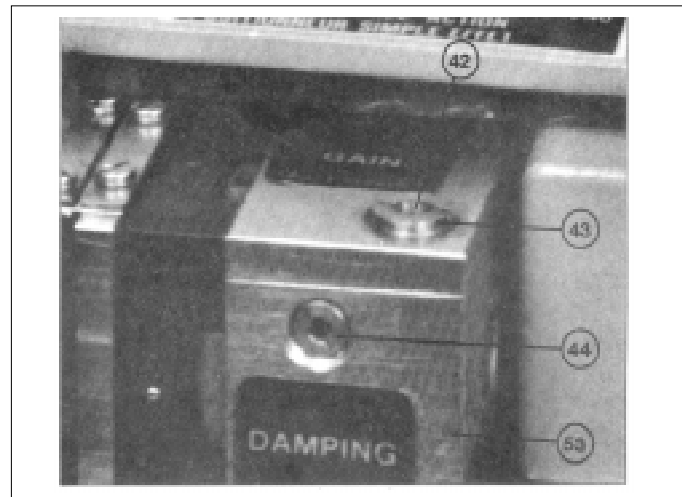


Figure 10

depending on the time observed for the positioner to respond to a large change in input "SIG" during a non-steady state operating condition.

2. DAMPING is factory set, and normally requires minimal/no adjustment. However, if determined as required, DAMPING is adjustable from a minimum - to - maximum ratio of 1:2.5. In its normal factory set position, the damping screw (44) is set approximately flush with the amplifier housing (53); this position is minimum DAMPING. As the damping screw (44) is screwed CW inwards, DAMPING increases. DAMPING may be increased by up to approximately three full revolutions of the damping screw (44), which will represent maximum DAMPING.

SECTION VI

VI. MAINTENANCE

A. Adjustment of the Positioner: (See Figure 11)

1. Component adjustment is only required when the positioner has been disassembled or sub-assemblies have been exchanged. All settings performed in order to match the positioner to the actuator are described in Sections IV. and V.

2. See Section IV.A. for a list of required tools.

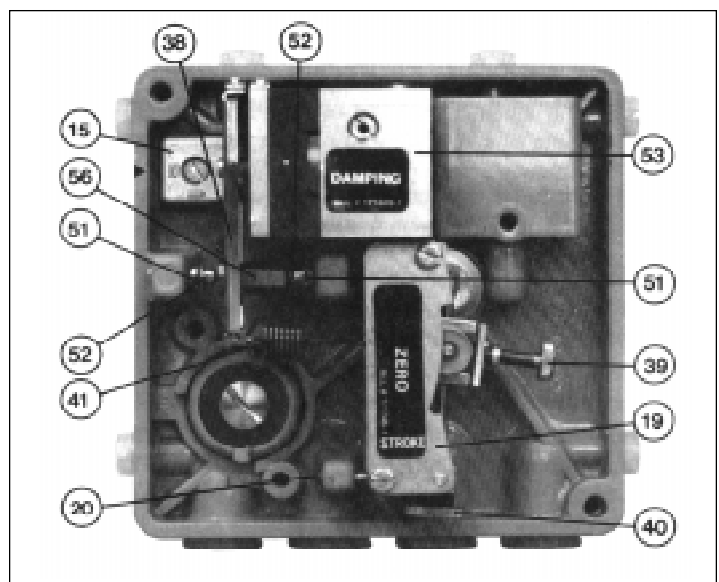


Figure 11

3. If adjustments are made with the positioner mounted on the control valve, the feedback lever (13) on the main shaft (17) of the positioner must be loosened. (See Section III:8-9).
 - a. Set the changeover plate (15) to "N".
 - b. Turn the throttling screw (42) CW to its stops (maximum GAIN).
 - c. Unhook the range spring (41) from the flapper lever (38).
 - d. Check that the flappers (52) are aligned concentrically with the nozzles (51). If necessary loosen the AMPLIFIER mounting screws on the rear of the positioner and align the amplifier (53) sub-assembly accordingly.
 - e. Press the flapper lever (38) several times alternately to the left and right, so that the ball-and-socket mounted flappers (52) are aligned parallel to the nozzles (51).
 - f. Press the flapper lever (38) to the left. Set the clearance between the right-hand nozzle (51) and the right-hand flapper (52) to 0.6 mm (0.024 in.) with the aid of feeler gauge by turning the hexagonal adjuster (56) with a 6 mm wrench. Then secure the nut against further turning using sealing paint.
 - g. Connect the positioner as shown in the test circuit in Figure 12. Provide an "IAS" of 60 psig.
 - h. Press the flapper lever (38) to the left. If the output does not rise to the level of the supply air pressure, either leaks are present or the flapper (52) is not correctly aligned (repeat e.).
 - i. Hook the range spring (41) onto the flapper lever (38), and provide a 9 psig input "SIG" to port "Input (3-15) W" using a manual loader.
4. The following procedure must be observed in order to achieve a no-feedback adjustment of the zero and stroke settings:
 - a. Press the stroke factor lever (19) against the travel stop pin (20).
 - b. Set the stroke factor thumbscrew (40) to a high stroke factor (approx. 5/64" before the upper stop).
 - c. Turn the zero thumbscrew (39) until the output pressure is 9 psig and make a note of this value.
 - d. Set the stroke factor thumbscrew (40) to a low stroke factor (approx. 5/64 before the lower stop). The output pressure may not vary by more than ± 0.003 psig as compared with the setting described in c. above.
 - e. In case of excessive deviations the travel stop pin (20) should be adjusted. Whenever the travel stop pin (20) is adjusted, the settings described in b. -to- d. should be repeated until the deviation is less than ± 0.003 psig.
 - f. Seal the travel stop pin (20) with sealing paint.
5. For mounting see Section III.
6. Return the changeover plate (15) to its original position if it was "U". Re-tighten the feedback (13) lever onto the main shaft (17) of the positioner (See Section III.B.8 & 9.).

B. Cleaning The Throttle Screw: (See Figure 10)

1. Unscrew CCW the limiting screw (43). If you can't pull it out by hand, unscrew CCW the throttle screw (42) and remove both by hand.
2. Pull the throttle screw (42) out of the limiting screw (43).
3. Place the throttle screw (42) in a solvent (e.g. benzene) and blow through it carefully. It is best to clean in an ultrasonic solvent bath.
4. Turn the throttle screw (42) in again as far as it goes CW.
5. Turn the limiting screw (43) in as far as it goes CW; then back it out CCW about half a revolution.
6. Secure the limiting screw (43) with sealing paint.

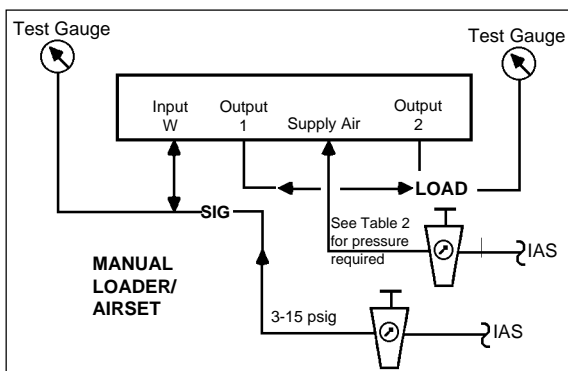


Figure 12

C. Replacing The Amplifier: (See Figure 13)

1. Unhook the range spring (41) from the flapper lever (38). (See Figure 11.)
2. Unscrew and remove the amplifier (53) sub-assembly; the two amplifier mounting screws are accessible from the rear of the positioner.
3. Install a new amplifier (53). Do not forget the O-rings between the amplifier and the baseplate (BP) (air baffle). Before tightening, carefully align the mounting screws, position the amplifier (53) in such a way that the flappers (52) are concentrically aligned with the nozzles (51).
4. Hook the range spring (41) onto the flapper lever (38).
5. Perform a maintenance basic adjustment and recalibrate per Sections IV, V and VI.

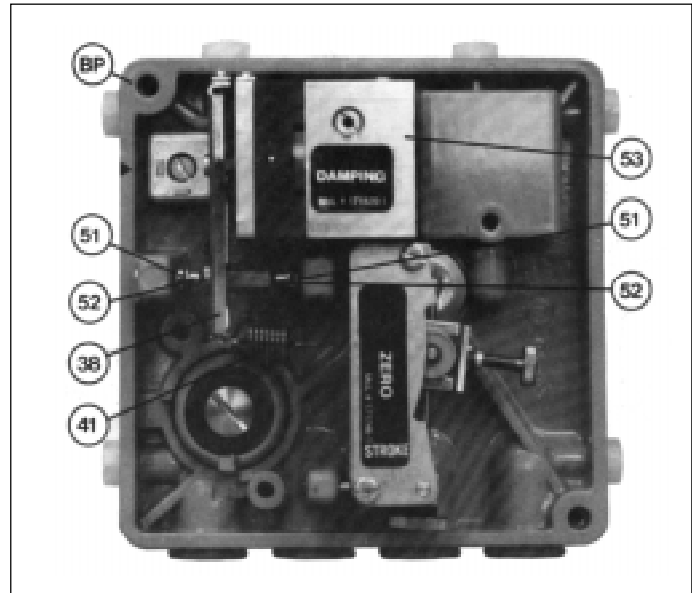


Figure 13

SECTION VII

VII. TROUBLE SHOOTING GUIDE

1. Actuator does not respond to applied input signal.

Possible Causes	Remedies
A. Amplifier defective	A1. Replace amplifier (See VI.C.).
B. Pneumatic connections reversed	B1. Check connections.
C. Feedback lever not tightened	C1. Screw feedback lever tight (See III.B.9.).
D. Stroke factor lever is loose on the shaft	D1. Tight shaft.
E. Positioner mounted on the wrong side	E1. Check mounting side in accordance with table in Section III.
F. Changeover plate in the wrong orientation	F1. Check setting accordance with table in Section III.

2. Output pressure does not reach its maximum.

Possible Causes	Remedies
A. Amplifier throttle dirty	A1. Remove and clean throttle (See VI.B.).
B. Supply air too low	B1. Check supply air pressure.
C. Flappers not parallel with nozzles	C1. Align flappers (See VI.A.d.-f.).
D. Supply air filter dirty	D1. Replace filter.

3. Actuator moves to end position.

Possible Causes	Remedies
A. Positioner mounted on wrong side	A1. Check mounting side in accordance with table in Section III.
B. Feedback lever not tightened	B1. Tighten feedback lever.
C. Stroke factor lever loose on shaft	C1. Tighten shaft (See Section III.B.).

4. Unstable behavior; non-steady state in control loop.

Possible Causes	Remedies
A. Amplification too high	A1. Reduce amplification.
B. Gland friction on the valve too high	B1. Loosen gland packing somewhat or replace.

5. Stroke range cannot be adjusted.

Possible Causes	Remedies
A. Wrong range spring	A1. Replace range spring (See Section IV.D.).
B. Positioner does not completely reduce pressure	B1. Check supply air pressure. B2. Check amplification. B3. Adjust clearance between nozzle and flapper.

6. Positioner makes "buzzing" noise

Possible Causes	Remedies
A. Wrong action setting	A1. Check position of the bypass switch and the action. Change as required.

REPAIR PARTS KITS

KIT A: Includes gaskets, O-rings and small parts. Order **P/N 295-08-5-07410-00**.

KIT B: Replacement pneumatic amplifier. Order **P/N 653-75-5-09542-00**.

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