POSITIONER PT. NO. 5311450-□
APPLIED TO DIAPHRAGM-ACTUATED VALVES

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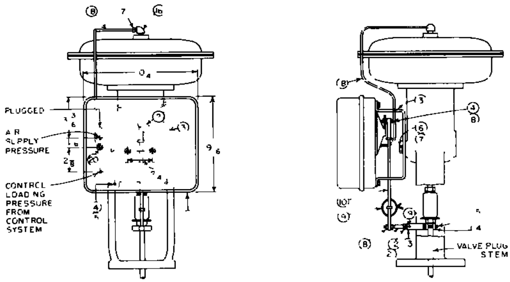
Bailey Positioner Part Number 5311450-□ is a pneumatic relay device which is applied to a Control Valve to accurately position an inner valve in response to the control demand signal

CROSS REFERENCES

Instrument or Equipment	Instruction Section
Positioner Installation on Diaphragm-Actuated Valves	P92 32
Connecting Tubing	G18 2

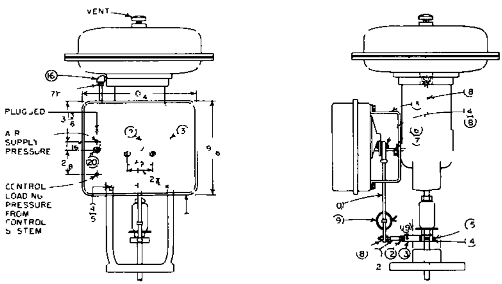
Bailey Babcock & Wilcox



TOP CONNECTED VALVE ACTUATOR

TYPE V$^{B}_{C}$□ 2□

TABLE A		
NAME	PART NO	FOR
POS TIONER	53 450 2	5 25 PS G OR 3 27 PS G
	53 450 5	3 5 PS G
POS T ON NG CAMS	53 2226 A 2 53 799 B ½ 53 798 C ½	¾ 4 B ½ STROKE
	53 449 A 53 448 B 53 34 C	½ 2 2½ 3 8 3½ STROKE
POSIT ONER DR VE ARM	53 686	FOR ALL CAM STROKES SHOWN ABOVE
CLAMP	53 687 2	½ TO ¾ D A VALVE STEM
	53 2483	D A VALVE STEM
CLAMP PLATE	53 69	⅜ TO ¾ D A VALVE STEM
	53 247	¾ TO " D A VALVE STEM
CONNECT NG L NK	53 2449 2	S ZE 40 ACTUATOR ½ D A STEM ¾ STROKE
	53 2449 7	S ZE 50 ACTUATOR D A STEM ¾ STROKE
	53 2449 6	S ZE 50 ACTUATOR ¾ D A STEM ¾ B STROKE
		S ZE 60 ACTUATOR ¾ B D A STEM ¾ B STROKE



BOTTOM CONNECTED VALVE ACTUATOR

TYPE V$^{B}_{C}$□2½□

	POS T ONER AND POS T ON NG AMS	SEE TABLE A
2	POS T ONER DR VE ARM	SEE TABLE A
3	BRACKET	53 69
4	NO 0 3 x ⅞ LG RD HD STL SCREW	
5	NO 2 0 00 SHAKEPROOF LOCKWASHER	
6	5 6 8 x ⅝ LG HEX HD ST L SCREW	
	NO 2 8-00 SHAKEPROOF LOCKWASHER	
8	ELAST C STOP NUT	97 20 5
9	DIA 6 T PE 34 ST STL W RE	
0	CONNECT NG L NK	SEE TABLE A
	ADJ DR VE ARM	53 690
2	⅜ 24 HEX ST L NUT	
3	CLAMP	SEE TABLE A
4	CLAMP PLA E	SEE TABLE A
5	⅜ 6 x 2 LG HEX SOC HD CAP SCREW	
6	ELBOW CONNECTOR	95 59 3
7	CONNECTOR NUT	95 58 2
8	4 O D COPPER TUB NG	
9	/8 x ⅝" LG GROOV P N TYPE	
20	MALE CONNECTOR	95 67 2
2	NO 220 00 SHAKEPROOF LOCKWASHER	

FIGURE 1 - Positioner Mounted on Diaphragm Type Actuator

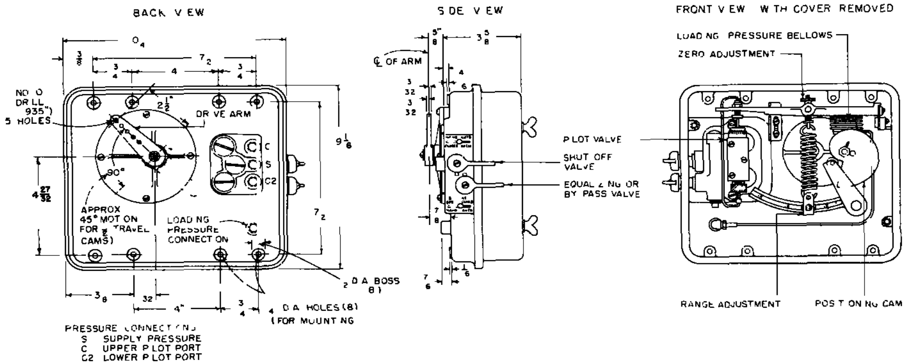


FIGURE 2 - Bailey Positioner

INSTALLATION

If the Positioner is included with a Control Valve furnished by Bailey Meter Company, it is mounted on the valve yoke and piped to the diaphragm casing as shown in Figure 1. (Pressure gages are not included unless specified)

If the Positioner is furnished separately for mounting on a valve, refer to Instruction Section P92-32 for installation procedures

When making connections to the Positioner, refer to Instruction Section G18-2 for tubing methods and precautions, and note the following (see Figure 2)

1 Positioner connection C1 applied to a Diaphragm Actuated Valve is always plugged

2 Positioner connection C2 is always connected to Diaphragm Actuator casing

3 Bypass valve and pilot valve block inner passages are arranged so that control pressure is always delivered thru connection C2

DESCRIPTION OF OPERATION

The Positioner (Figure 3) consists essentially of two opposing forces balanced against each other When the Positioner is at balance, the force exerted upward on the balance beam by the loading bellows is equal to the downward force exerted by the positioning spring

The force exerted by the bellows depends upon the control loading pressure established by the system in relation to the demand for the controlled medium The force exerted by the positioning spring depends upon the position of the Valve stem (or position of the inner valve) and the shape of the positioning cam

The Valve stem is tied back to the Positioner drive arm thru the Positioner drive rod. Therefore, for every position of the Valve stem, the drive arm assumes a corresponding position. The drive arm is geared to the positioning cam which is shaped to give a desired characteristic of inner valve position vs control loading pressure.

Automatic Positioning

Refer to Sketch A in Figure 4 When the control system indicates that the Control Valve should be opened, the force exerted on the balance beam by the loading bellows increases as a result of the increase in control loading pressure Movement of the beam raises the pilot Valve stem, opening the upper valve port to full supply pressure, increasing the control air pressure applied to the diaphragm, and causing the actuator stem to move into the valve

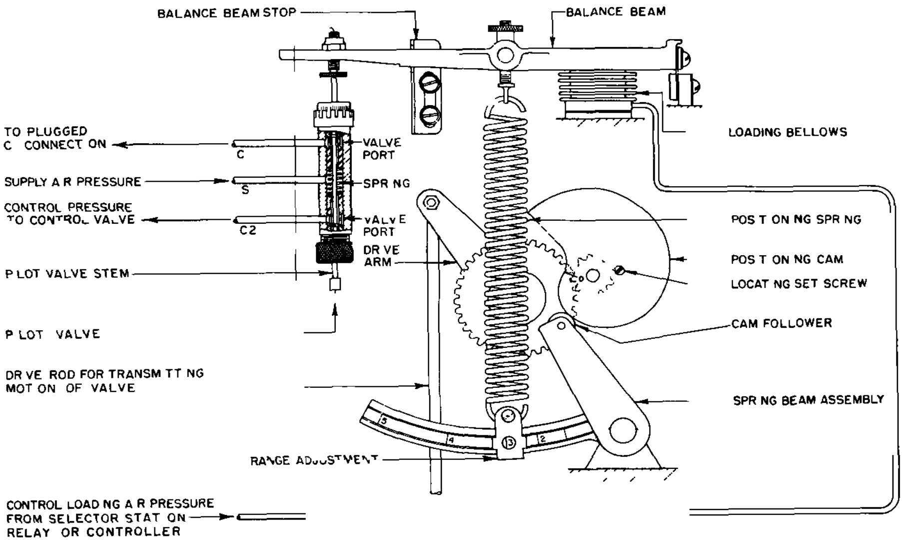


FIGURE 3 - Positioner Shown Schematically

body Downward motion of the drive rod positions the Positioner drive arm and thus produces a proportional, clockwise rotation of the cam which moves the spring beam down and increases tension on the positioning spring until· (1) the forces exerted by the bellows and spring are again at balance, (2) the pilot valve stem returns to its balance position, interrupting the flow of control pressure to the diaphragm, and (3) the actuator stem is held in its new position. The reverse action occurs for a decrease in loading pressure from the control system.

Functions

The main functions of the Positioner are.

1. TO PROVIDE CHARACTERIZED CONTROL The positioning cam may be shaped to cause control demand vs rate of flow thru the Valve to match similar characteristics of other power devices operating in parallel with the Control Valve

2 TO PROVIDE ACCURATE INNER VALVE POSITIONING The inner valve is accurately positioned throughout the entire control range since it is balanced against the control demand.

3 TO PROVIDE RELAY ACTION. For a 0 065 psi change in control loading pressure to the loading bellows, the Positioner may apply to the Diaphragm Actuator any pressure change up to full supply pressure or down to zero psi, depending on the direction of change. This action provides more power to overcome friction and faster Diaphragm action than would be possible with only a 0.065 psi change to the Diaphragm Actuator

4 TO PROVIDE VARIABLE OPERATING RANGES. The Positioner includes suppression and range adjustments which afford almost any desired combination of Valve stem stroke and loading pressure range.

Control Loading Arrangements

Depending on the application, the Positioner may be adjusted for either direct or reverse loading operation as described below When

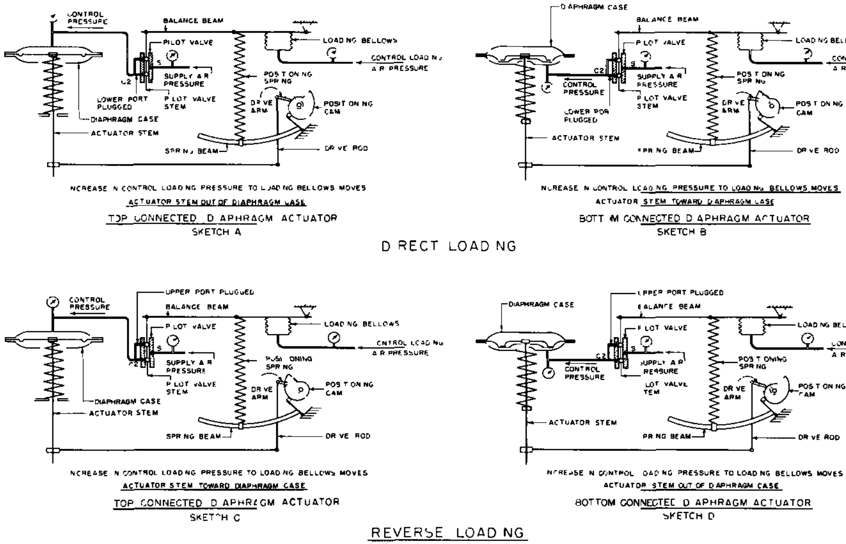


FIGURE 4 - Application of Positioner to Diaphragm Actuators

applied for direct loading, an increase in control loading pressure to the loading bellows causes an increase in control pressure to the Diaphragm Actuator When applied for reverse loading, an increase in control loading pressure to the loading bellows causes a decrease in control pressure to the Diaphragm Actuator.

Direct Loading

1. TOP CONNECTED DIAPHRAGM ACTUATOR (Figure 4, Sketch A). An increase in control loading pressure to the loading bellows raises the pilot stem, increases control pressure to the Diaphragm Actuator, moves the actuator stem into the Valve body, lowers the Positioner drive arm, and turns the positioning cam clockwise to increase tension on the positioning spring until the forces exerted by the bellows and spring are at balance

2 BOTTOM CONNECTED DIAPHRAGM ACTUATOR (Figure 4, Sketch B) An increase in control loading pressure to the loading bellows raises the pilot stem increases control pressure to the Diaphragm Actuator, moves the actuator stem out of the Valve body, raises the Positioner drive arm, and turns the positioning cam counterclockwise to increase the tension of the positioning spring until the forces exerted by the bellows and spring are at balance.

Reverse Loading

1. TOP CONNECTED DIAPHRAGM ACTUATOR (Figure 4, Sketch C). An increase in control loading pressure to the loading bellows raises the pilot stem, decreases control pressure to the Diaphragm Actuator, moves the Actuator stem out of the Valve body, raises the Positioner drive arm, and turns the positioning cam counterclockwise to increase the tension of the positioning spring until the forces exerted by the bellows and spring are at balance.

2. BOTTOM CONNECTED DIAPHRAGM ACTUATOR (Figure 4, Sketch D). An increase in control loading pressure to the loading bellows raises the pilot stem, decreases control pressure to the Diaphragm Actuator, moves the Actuator stem into the Valve body, lowers the Positioner drive arm, and turns the positioning spring until the forces exerted by the bellows and spring are at balance.

OPERATION

After adjusting the Positioner for service as outlined on page 9, and with supply and control pressure applied, the Control Valve may be operated either manually or automatically as outlined below (see Figure 5)

Direct Loading

To change from Remote Control to Local Manual Control:

1 Turn bypass valve to "Open Hand"

2. Turn supply valve to "Closed Auto".

To change from Local Manual Control to Remote Control:

1. Turn supply valve to "Auto-Open"

2 Turn bypass valve to "Closed Auto"

Manipulate valves in this sequence to avoid a momentary pressure loss to the Diaphragm Actuator

When the valves are set for manual operation, control loading pressure goes to the loading bellows and also thru the bypass valve to the Diaphragm Actuator (Figure 5, Sketch B) Thus, the Actuator is supplied with control loading pressure directly from the control system

The Control Valve may be positioned either by loading pressure from the control system or, preferably, by manual operation of the Selector Station (if used) connected by the control loading pressure line to the Positioner (see control or piping diagram of the specific control system of which the Control Valve is a part)

Note that the Positioner normally cannot be transferred from automatic to manual operation without disturbing the control system since the Positioner is usually calibrated to deliver control pressure to the Diaphragm Actuator which differs from the control loading pressure received from the control system (see "Calibration Adjustments", page 9) To maintain stable control while on manual operation, the Control Valve should be positioned by manual operation of the Selector Station to duplicate the characteristic provided by the Positioner on automatic operation When the Control Valve is positioned by the handjack so that Positioner balance beam (Figure 6) is mid way between upper and lower stops, automatic Positioner operation is duplicated

To manually operate Control Valve by handjack:

1 Pick up Valve position with handjack

2 Turn supply valve to "Hand-Closed"

3 Turn bypass valve to "Closed Auto'

Reverse Loading

To change from Remote Control to Local Manual Control

1 Pick up Valve position with handjack.

2 Turn supply valve to 'Hand-Closed"

3 Use handjack to position Control Valve

To change from Local Manual Control to Remote Control

1 Adjust remote control signal to agree with valve position in local manual control (Positioner balance beam will be midway between stops)

2 Turn supply valve to Auto-Open"

NOTE: When arranged for reverse loading, the upper pilot valve port and the connection between the control loading pressure line and the Positioner bypass valve are plugged (see Figure 5) In addition, the bypass valve position is fixed and the valve handle is removed Serious trouble might result if the bypass valve position were altered and control loading pressure were introduced directly to the Diaphragm Actuator, since for reverse loading, the control pressure to the Diaphragm Actuator during automatic operation is the opposite of control loading pressure from the control system to the Positioner bellows, i.e., for an increase in control loading pressure, the control pressure to the Diaphragm decreases Thus, to effect a bypass arrangement, it is necessary to reverse the control loading pressure during manual operation of the Positioner This move is not practical for the small amount of time that the Positioner would be on HAND during normal operation

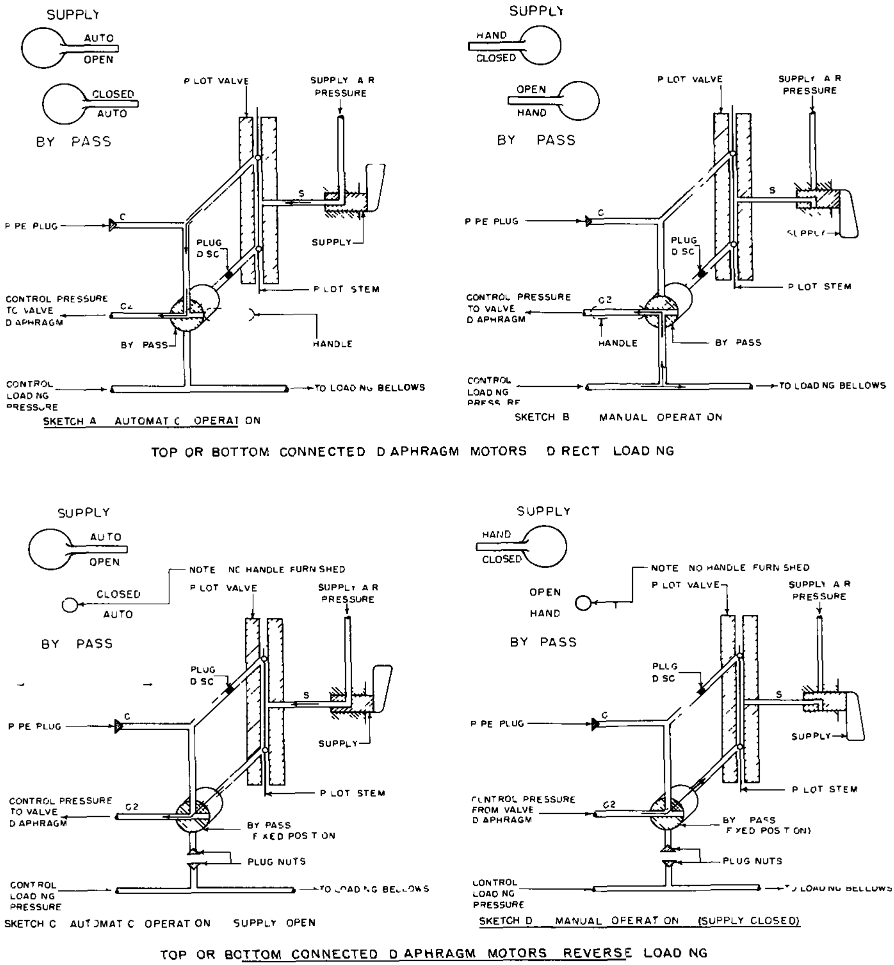


FIGURE 5 Supply and Bypass Valve Arrangements

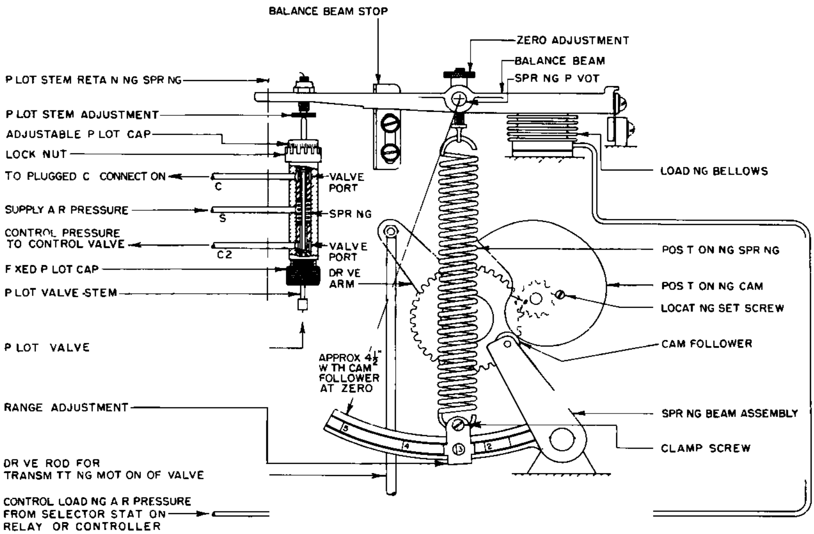


FIGURE 6 - Positioner Adjustments

ADJUSTMENT AND CALIBRATION

Make the following adjustment checks to insure correct operation of the Control Valve and Positioner before attempting any adjustments to adapt the Valve to its particular application described under "Calibration Adjustments" page 9

Adjustment Checks

The adjustments below are based on a direct loading, top connected Diaphragm Actuator and inner valve which opens as the Valve stem moves into the Valve body as shown in Figure 4, Sketch A

Normally, the Control Valve used in the direct loading arrangement will be in CLOSED position when the valve stem has traveled out of the Valve body to its fullest extent and OPEN when the stem has traveled into the Valve body to its fullest extent Therefore, the words OPEN and CLOSED used below refer to the position in terms of each specific Control Valve Refer to Figure 6

1 Use B or B 1/2 positioning cam which is shipped in place in the Positioner assembly (see "Characteristic Adjustment"), page 9

2 Make supply air (40 psig) connection at back of Positioner case (Figure 1)

3. Make certain that fixed pilot cap and adjustable pilot caps are tightened securely

4 Turn supply valve to "AUTO-OPEN" and bypass valve to "CLOSED AUTO". Set control loading pressure at zero psig.

5. If cam follower is not at zero mark on positioning cam with Valve in CLOSED position, adjust turnbuckle on drive rod until Positioner drive arm assumes the position which places follower on zero mark

6 Set loading pressure at minimum range value (3 psig). Control Valve should remain in CLOSED position and Positioner balance beam should be horizontal and between upper and lower stops. If beam is not horizontal, turn zero adjustment nut clockwise (in half turn increments) to lower beam to horizontal position or counterclockwise to raise beam to horizontal position.

7. Turn on air supply. Adjust pilot stem adjustment so valve is just closed.

8. Increase loading pressure to 3.5 psig. If Valve does not begin to leave CLOSED position as soon as pressure is increased, turn pilot stem adjustment nut until such movement is obtained.

9. Set loading pressure at maximum range value (15 or 27 psig). If Control Valve does not move to OPEN position, loosen range adjustment clamp screw and slide range adjustment along spring beam until Valve reaches OPEN position Tighten clamp screw to insure that adjustment will remain locked.

10. Decrease loading pressure 0.5 psig below maximum range value (15 or 27 psig). If Valve does not begin to move from OPEN position as soon as pressure is decreased, readjust range adjustment until such movement is obtained.

11. Return control loading pressure to 3 psig. Valve should just go to CLOSED position and cam follower should be at zero mark. If not, repeat steps 6 thru 11 until desired valve travel is obtained.

Calibration Adjustments

The Positioner adjustments described below may be used to improve the operation of the Control Valve either by itself or in relation to other systems or parts of a multiple system.

1 Zero or Suppression Adjustment - By means of the zero adjustment (Figure 6), an initial tension may be imposed upon the positioning spring so that the Valve will not start to move from its minimum position until the control loading pressure has increased from minimum range value (3 psig) to any value up to 40% of full loading pressure range (i e , 3 to 15 psig for a 3-27 range or 3 to 8 psig for 3-15 range) or has decreased from maximum range value (15 or 27 psig) to any value down to 40% of full range, i.e , 27 to 13 psig (3-27 range) or 15 to 8 psig (3-15 range). This adjustment is of value when two or more Valves are to be operated in sequence or where the Valve is equipped with a minimum stop and its flow characteristic must be matched with that of another power device

NOTE: Suppression values above pertain to zero adjustment settings only when using full control loading pressure range and a full rise (uncut) positioning cam. Greater suppression may be obtained from the "Range Adjustment" and "Characteristic Adjustment" below.

2. Range Adjustment - The range adjustment (Figure 6) affords a variation of Valve motion for a given range of control loading pressure. The variation extends, roughly, from full Valve travel for a 3 to 15 psig change in control loading pressure to one-half Valve travel for a 3 to 27 psig control loading pressure change In combination with the zero adjustment described above, full Valve travel may be obtained for as small a loading pressure change as 10 psig (e.g , 10 to 20 psig range). Range adjustments available with each Positioner cam are shown in Figures 7, 8, and 9. This adjustment is of value when the Valve is oversized since it allows operation of the Valve thru its useful motion for the desired full change in control loading pressure. It is also useful in matching the loading vs position characteristic of the Valve with those of related power devices in the same control system.

3 Speed Adjustment - When the system involves a single Valve, a high Valve positioning speed is usually an advantage. In a complex control system it is generally desirable to operate all power devices at the same speed in order to avoid interaction between units or undesirable process conditions during load changes The speed of operation of the Valve may be decreased as described on page 12 under "Speed Control".

4. Characteristic Adjustment - This adjustment involves selecting or shaping the proper positioning cam in order to obtain that characteristic of inner valve position to control loading pressure which will afford the desired characteristic of flow (or pressure drop, etc.) vs control loading pressure.

Three cams are furnished with each Positioner. Cams A, B, and C are furnished for Control Valves which have a stroke of 1-1/2 inches, 2-inches, or 2-1/2 inches and cams A-1/2, B-1/2, or C-1/2 are furnished for Valves with 3/4-inch stroke. The characteristics for which the cams are shaped are listed in Table 1 and are shown in Figures 7, 8, and 9 The Figures show a family of curves for each cam, each curve of the family representing a range adjustment when used with that specific cam. Table 2 shows pressure values of the various control loading ranges equivalent to the control loading per cent values shown in Figures 7, 8, and 9.

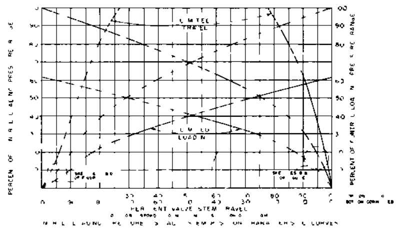


FIGURE 7 Cam A or A 1/2, Square Root Relation

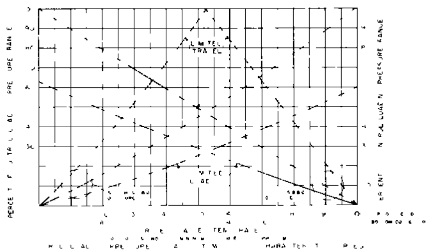


FIGURE 8 - Cam B or B-1/2, Straight Line Relation

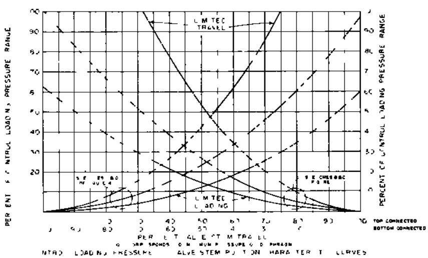


FIGURE 9 Cam C or C 1/2, Square Relation

Positioning Cam, Any Stroke	Inner Valve Position (P) vs. Control Loading (L)	Fig No
A or A 1/2 B or B-1/2 C or C-1 2	Square Root (L $\sqrt{P}$) Straight Line (L P) Square (L P^2)	7 8 9

TABLE 1 Positioning Cam Characteristic

When a control system involves a single Valve, the B or B 1/2 straight line cam will probably be satisfactory However, one of the other cams may provide a more uniform flow vs control loading characteristic and thus provide stable control over a wide range of operation. For a Valve which is an integral part of a complex control system, the cams provide a selection of characteristics which, together with the range adjustment, afford close paralleling of the position vs loading characteristics of the Valve with that of other power devices in the system. Refer to "Characterized Cams", below for a Valve which is to be part of a complex control system

CONTROL LOADING PRESSURE		
PER CENT VALUE	PRESSURE VALUE (PSIG)	
	Control System Ranges	
	3 27	3 15
0	3 0	3 0
10	5 4	4 2
20	7.8	5 4
30	10 2	6.6
40	12.6	7 8
50	15 0	9 0
60	17 4	10.2
70	19.8	11 4
80	22.2	12.6
90	24.6	13.8
100	27 0	15 0

TABLE 2 Conversion Table for Control System Ranges

Characterized Cams

In order to match the inherent characteristic of a specific inner valve to that of another inner valve of a different type, a damper, or a variable speed control etc , it is usually most practical to reduce the flow vs valve position characteristic of each device in the system to a straight line relationship with regard to control loading pressure This straight line relationship is established by calibrating the Positioner with respect to the correct positioning cam by the following method

NOTE: In this procedure (and "Cam Shaping Method' page 11) substitute control air pressure for valve stem travel, substitute per cent rating or load (for boilers) for per cent flow Note this substitution in the graphs of Figures 7 thru 13

1 Use the straight line cam B or B-1/2 to determine the actual flow vs valve position characteristic (see Figure 10). (The per cent of control loading range with the B or B-1/2 cam is equivalent to the per cent of Valve position)

2. Decide upon the exact flow vs control loading pressure characteristic desired (see Figure 11).

3 Take values for per cent valve stem travel from step 1 (Figure 10) and for per cent control loading pressure from step 2 (Figure 11) and plot a curve as shown in Figure 12.

4 Compare the curve made in step 3 with those shown in Figures 7, 8, and 9 and select positioning cam whose characteristic most closely matches the characteristic plotted in step 3

5 If necessary, set range and zero adjustments to match loading vs Valve position characteristic more accurately.

6. If the required characteristics cannot be matched by the above procedure or if a more exact characteristic is required, alter cam shape as described under "Cam Shaping Method"

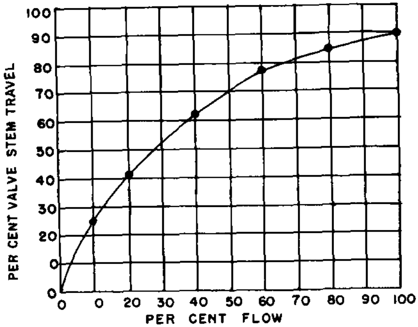


FIGURE 10 - Valve Characteristic

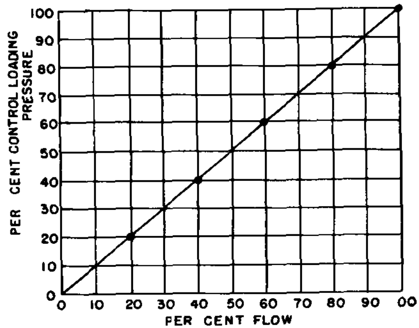


FIGURE 11 Desired Control

Cam Shaping Method

To assist in the alteration process, cams are marked with radial lines (index of per cent travel) and concentric lines (index of per cent loading pressure) The ten concentric lines on the cam correspond to actual control loading pressure shown in Table 2 for the specific control system range being used.

NOTE· Before cutting any cam, make certain that cutting will involve removal of cam material rather than building it up. Thus, if the characteristic plotted lies between the A and B cam (Figures 7 and 8), the A cam should be cut, etc Alter cam shape as follows·

1 On cam selected in step 4 under "Characterized Cams", for each increment of control loading pressure (concentric lines), locate that Valve position (radial lines) which corresponds to flow required for specific loading pressure determined in step 3 above. Refer to Figure 13 for method of locating these points on cam

2 A curve drawn thru points located on cam in step 1 is desired cam shape Either alter cam or cut a new cam to this shape

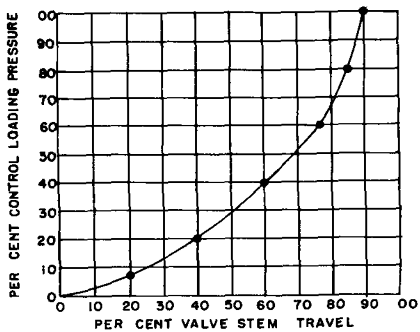


FIGURE 12 Cam Characteristic

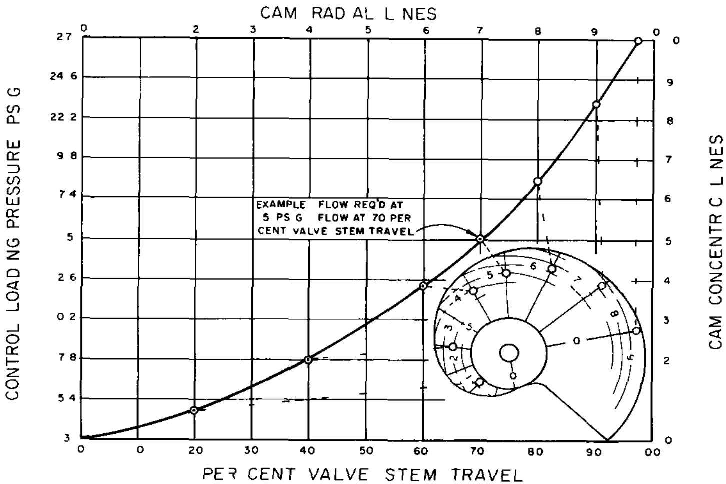


FIGURE 13 Locatıng Poınts for Shapıng Posıtıoner Cam

<u>Speed Control</u>

If ıt ıs necessary to reduce the speed of Control Valve operatıon, a speed control orıfıce ıs avaılable for ınsertıon ın the control lıne from *the pılot valve to the Dıaphragm Actuator. Note* the tıme requıred for full travel (3/4, 1-1/2, or 2 ınch valve stroke) If thıs tıme were 10 seconds, the orıfıce (No 60 drıll, 040 ınch dıameter) would reduce the speed of operatıon to 24 *seconds. The speed may be ıncreased up to the* normal ın proportıon to the dıameter of the orıfıce hole To ınsert a speed control orıfıce, follow the steps below

1 *Remove pılot stem by sprıngıng open* stem retaınıng sprıng and allowıng stem to drop out (Do not scratch stem lands durıng removal.)

2 *Remove pılot valve by removıng attach*ıng screws (see Fıgure 14).

3 Remove O rıng gasket from upper or lower hole ın pılot valve block that does not contaın a plug dısc

4. Insert speed control orıfıce ın valve block hole from whıch O rıng gasket was removed.

5 Replace O-rıng gasket

6. Reassemble pılot valve to valve block

7 Reassemble pılot stem ın pılot valve and replace stem retaınıng sprıng

MAINTENANCE

General

1. Keep air connections tight to prevent leakage which may indicate improper functioning of unit. Check all connections for leakage while under pressure with a soapsuds solution.

2. Maintain a clean air supply (free of dirt, oil, or mositure) for satisfactory operation of Positioner and Diaphragm Actuator.

Routine Maintenance

1. Whenever Control Valve is out of service (or when required) remove pilot valve stem and inner liners and clean with a common solvent. Never use files, reamers, or abrasives on valve stem lands or valve liners. If liners stick in valve body upon removal, push them free with a wooden stick or pencil, never use a metal rod for this purpose

2. Once each year or whenever Positioner supply or bypass valves begin to show signs of sticking, remove valve and lubricate with Bailey Petcock Lubricant (Part No. 19987-1). To remove valve, leave handle in present position and turn valve nut (Figure 12) out of pilot valve body.

NOTE: Valves are not interchangeable with each other or with valves in other Positioners. Valve and valve bodies are marked "1" and "2" for identification in reassembly.

3 Apply a few drops of light machine oil to spring beam assembly bearing at three or four-month intervals.

4 Once each year check filters in pilot valve body (Figure 14) and replace if dirty (note that filters are included as added protection and are not a substitute for the required clean air supply).

5 Once every two or three years change grease in Positioner gear case. Fill gear case about half full with aluminum stearate base grease with a 1-2 consistency (such as Vulcan Lube, Grade No. 1, from C H. Clark Oil Co Cleveland, Ohio). Rotate gears to work grease into teeth.

6 Once each year check calibration of Positioner

REPLACEMENT PARTS

Spare Parts Kit

The Spare Parts Kit shown in Figure 14 should be carried in stock Specify the Spare Parts Kit part number to order a complete kit

Ordering Individual Parts

Figure 14 is a Parts Drawing of the Positioner, Pt No 5311450-□ Normally this Drawing will apply to the unit furnished However, there may be individual differences in specific units because of·

a. Design changes made since the printing of this Instruction Section

b. Special design of the Positioner to make it suitable for a special application

Therefore, when ordering parts assure the receipt of correct replacements by specifying on the order

1. The complete nomenclature (stamped on instrument nameplate) of the Positioner for which parts are desired.

2 The Parts Drawing on which each part is illustrated. (The Parts Drawing Number is given in the title for the Figure)

ITEM	PART NO	NAME
1	CCLE LABEL	GIVE NO ON LABEL WHEN ORDERING PTS
2	95171 4	TEE SEE TABLE
3	5311853 1	SPRING SUPPORT
4	53 2082 1	SLEEVE
5	6 32 1 2	FIL HD STN STL SCR
6	5311754	TUB ASSY SEE TABLE
7	0 32x3 8	EXT STN STL SEMS 11 REQD
8	197227 1	SPECIAL HEX HD SCR
10	5311686	POS TIONER DR ARM
11	5311816 1	SPEED CONTROL WASH
12	531 747	PILOT VALVE GASKET
3	3 1304 1	SEAL NC S RIP
14	5311407 1	COVER ASSY INCL
14A	5311408	C VER
4B	5311409 1	COVER SCR 2 REQ
14C	198173 16	RET RING 2 REQ
15	8 32x5 16	RD HD STN STL SCREW ? REQD
16	NO 8	PLA N STN STL WASH 2 REQD
7	531163 1	HANDLE 2 REQ
9	5311418 1	PILOT BEAM ASSY
20	531 456	P LOT STEM SPRING
2	4 20x3 8	RD HD STN STL SCREW ? REQD
22	53 1451 1	PILOT STEM ADJ SCR
24	53123 6	SEAL NG TUBE
25	53 1433 1	GEAR & SHAFT ASSY
26	SEE TABLE	PILOT STEM*
27	53 1423 1	SPG BEAM ASSY INCL
27A	5311424 1	COMPO BRG ? REQ
27B	531 425	CAM ROLLER
27C	197164 15	RET RING 2 REQ
27D	5311446 1	CAM ROLLER PIN
28	53114?7	P LOT BEAM STOP
?9	NO 1610 00	SHK LK WASH STN STL

ITEM	PART NO	NAME
30	5311443 1	ADJUSTING NUT
31	5311436 1	EYE BOLT
32	531 442	ADJUSTING PIVOT
33	SEE TABLE	SPRING
35	SEE TABLE	STRA GHT LINE CAM B
36	5311432 1	CAM HUB
37	5311429 1	CAM SHAFT & PINION
38	531 415 1	SPRING RETAINER
39	5311414 1	P LOT BEAM SPRING
40	5311875 1	SPRING RETA NER
4	5 16 18	HEX JAM STN STL NUT
42	197165 1	SET SCREW
43	97 64 37	RETA NING RING
44	53 1452 1	BELLOWS & TUBE ASSY
45	SEE TABLE	SQUARE CAM C
46	SEE TABLE	SQUARE ROOT CAM A
4	5312314 1	REAR BRG COVER NCL
47A	53123 3 1	C L SEAL
47B	5311421 2	NEEDLE BEARING
5	SEE TABLE	NAMEPLATE
52	NC 0x1 8	RD HD STN STL THD FORMING SCR TYPE U 4 REQD
53	NO 1 4 20	EXT KEPS LK WASH STN STL
54	10 32x7 8	EXT RD HD SEMS STN STL
55	53 6343 1	SP CAM MTG BRKT
56	0 3?	HEX STN STL NUT
58	53 070 1	TORSION SPRING
59	5315164 1	SPRING
60	5312161 2	LATCH
61	4804 09 0 410?	SHK LK WASH STN STL 2 REQE
62	195 87 1	ELBOW
63	SEE TABLE	PILOT V & BLK ASSY INCL ITEMS 64 THRU 73
64	SEE TABLE	P LOT V BLK ASSY INCL
64A	5311401 1	VALVE NUT 2 REQ
64B	53 40?	SPRING 2 REQ

ITEM	PART NO	NAME
65	SEE TABLE	PILOT VALVE ASSY INCL
65A	581028	CAP FOR 1 8 PILOT VALVE ***
65A	5311939 1	CAP FOR 3 16 PILOT VALVE
65B	58877 2	VALVE SEAT 2 REQ FOR 1 8 PILOT V ***
65B	5311825 1	VALVE SEAT 2 REQ FOR 3 16 PILOT V
65C	58878 1	SLEEVE 2 REQ FOR 1 8 PILOT V ONLY***
65D	5311426 1	P LOT VALVE SPG
65E	5311406 1	VALVE BODY
65F	536486	CAP LOCK NUT
65G	536487 1	ADJ CAP
66	10 32x 8	EXT RD HD STN STL SEMS 3 REQD
67	53 1419 1	F LTER CAP 3 REQ
68	5311428 1	O RING GASKET 3 REQ
69	53 802 ?	CONN PLUG SEE TABLE
70	53 1478 2	O RING GASKET 2 REQ
71	5321889	FIL WASH & D SC ASSY 3 REQ
72	5313000 1	F LTER CUP 3 REQ
73	5311427 1	FILTER SPG 3 REQ
74	1/8 27 NPT	SQ HD STD BRASS PIPE PLUG
75	9987	BAILEY PETCOCK LUBRICANT
76	SEE TABLE	BACKPLATE ASSY

TABLE OF VARIABLE PARTS

P si ner Par No	USUAL USE	P LOT SIZE	CAM STROKE	RANGE PSG	ITEMS ? 6 & 69	ITEM 76	TEM 26*	ITEM 33	ITEM 35	TEM 45	ITEM 46	TEM 51	ITEM 63	TEM 64	TEM 65
53 450 1	DRIVE	1 8	FULL	3 27 r 5 25	OMIT	53 4 2 1	5311439	53 444 1	5311448 1	531 341	5311449 1	196600 1	53 1397 1	5316050	53148 9 1
5311450 2	VALVE	1 8	HALF	3 27 or 5 25	1 REQ	53 4 2	5311439 1	53 444 1	5311799 1	531 798 1	5312226 1	196600 ?	53 1397 2	5316050 2	53148 9 1
53 1450 3	DRIVE	3 6	FULL	3 27 r 5 25	OM T	5311412 1	53 827	5311444 1	531 448	5311341 1	5311449	96600 3	531139 3	53160 ?	5314880
53 145 4	DRIVE	1 8	FULL	3 5	OM T	5311412 1	531 439 1	53 6767 1	531 448	5311341 1	5311449 1	196600 4	531 39	5316050 1	5314879
53 450 ?	VALVE	1 8	HALF	3 5	1 REQ	531 412	5311439	53 678	531 799	53 98 1	5312276 1	96600 5	5311397 2	53 6050 2	5314879 1
531 450 6	DRIVE	3 6	FULL	3 5	OM T	5311412	53 877 1	5316767	53 448	531 341 1	53 449	96600 6	53 397 3	316050	5314880
531145?	DRIVE	1 8	FULL	3 ? or 25	OMIT	53 4 ? 1	531474 1	53 444	53 1448 1	531 341	53 1449 1	96600 29	531 39	531605?	5314879 1
53 450 8	DRIVE	1 8	FULL	3 15	OMIT	53 41? 1	531474	531676	5311448 1	53 34 1	5311449 1	196600 3?	5311397	53 605?	53 4879
531 450 9	VALVE	3 16	BLANK	3 2 or 2	1 REQ	5311412	53 1877 1	5311444 1	5320078 1	53?0078 1	53200 8 1	196600 8	53 397 4	5316050 2	53 4880
53 450 0	VALVE	3 16	HALF	3 5	1 REQ	53 4 ? 1	5311827 1	53 6767 1	531 798 1	53 798	5312226 1	196600 9	5311397 4	53 6050 2	5314880 1
5311450 11	**	8	HALF	3 ? or 5 ?	OM T	5311412	53 1439 1	5311444 1	53 799 1	53 1798 1	53 2276	196600 0	53 397 1	5316050	53 4879 1
53 450 1?	VALVE	1 8	FULL	3 27 r 5 25	1 REQ	53 14 2 1	5311439	53 444 1	5311448 1	53 34	531 449 1	96600 7	5311397 2	53 6350 2	5314879
531 450 13	VALVE	8	FULL	3 5	REQ	53 14 2 1	53 439	316 67 1	53 448	53 134 1	5311449 1	96600 18	53 1397 2	5316050 2	53 4879 1
531 450 14	DRIVE	8	FULL	3 5	OM T	53 198?	5314747 1	5316767	53 448 1	5311341 1	53 449 1	96600 31	53 1397 1	53 6050	53 4879 1
5311450 5	DRIVE	1 8	FULL	3 2? or 5 25	OM T	532198 1	5314 47 1	53 444 1	53 448 1	53 34	5311449 1	196600 32	531139 1	53 6050 1	5314879

SPARE PARTS KITS

KIT NO 2 ?0	
FOR POS TIONER PART NOS 5311450 1 ? 4 5 11 12 3 (8 PILOT S ZE	
QUANTITY	ITEM NO SEE NOTE
EACH	?0 26 2 B ?7D 39 44 58 59 65D 75
2 EACH	?7C 65B 65
2	33 SEE NOTE ?
3 EACH	68 70 71 ?3

K T NO ?56001 2	
FOR POS T ONER PART NOS 531 450 3 6 9 0 3 16 P LOT S ZE	
QUANTITY	TEM NO SEE NOTE 1
EACH	20 ?6 2 B ?7? 39 44 58 59 65? 5
2 EACH	2 C 65B
?	33 SEE NOTE 2
3 EACH	68 ?? 71 73

KIT NO ?5600 3	
FOR POS T ONER PART NOS 53 450 7 8 4 15 1 8 PILOT SIZE	
QUANTITY	ITEM NO SEE NOTE
1 EACH	20 26 27B ? D 39 44 58 59 65D 75
2 EA H	2 C 65B 65C
2	33 SEE NOTE ?
3 EACH	68 ?0 71 3

NOTES

WHERE THE ITEM SPEC F ED S A VAR ABLE PART THE PART APPLICABLE TO THE POS T ONER L STED IS INCLUDED N KIT

2 KIT INCLUDES RANGE SPRING 531 444 1 FOR 5 25 r 3 2 PSG AND 531676? 1 FOR 3 5 PSG

*FOR PISTON OPERATED VALVES SUBSTITUTE STEM 531474 1 FOR STEM 5311439 IF HUNTING CYCLE OCCURS

**DUAL OPERATOR

***SEE PILOT S ZE COLUMN IN TABLE FOR APPLICABLE P LOT VALVE S ZE

Parts List for Figure 14, Parts Drawing P92-11

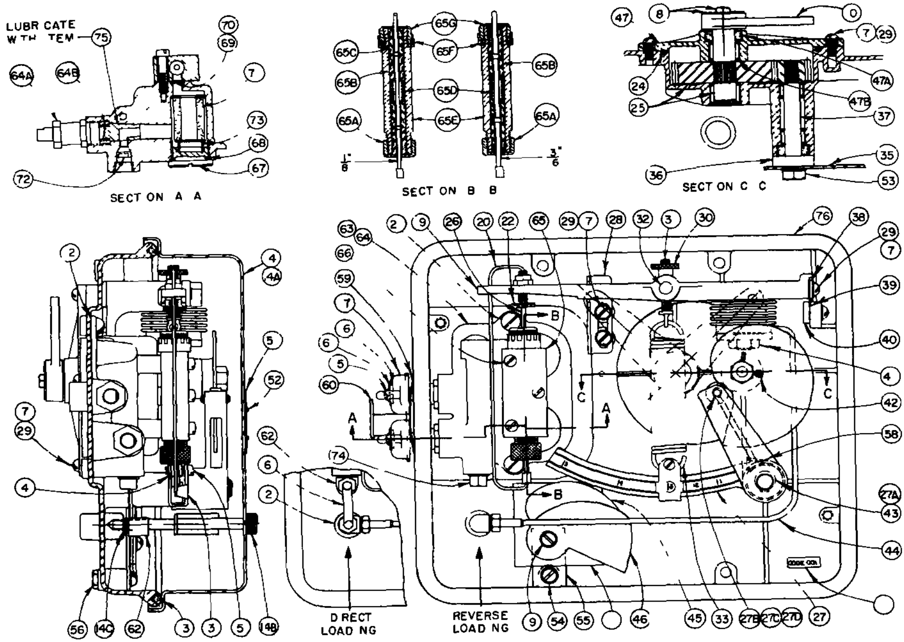


FIGURE 14 - Parts Drawing P92-11, Positioner Assembly

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