



Differential Pressure

PILOT CONTROLLERS

ADJUSTABLE PROPORTIONAL BAND - CLASSES UDDVP, UDRV, ETC.

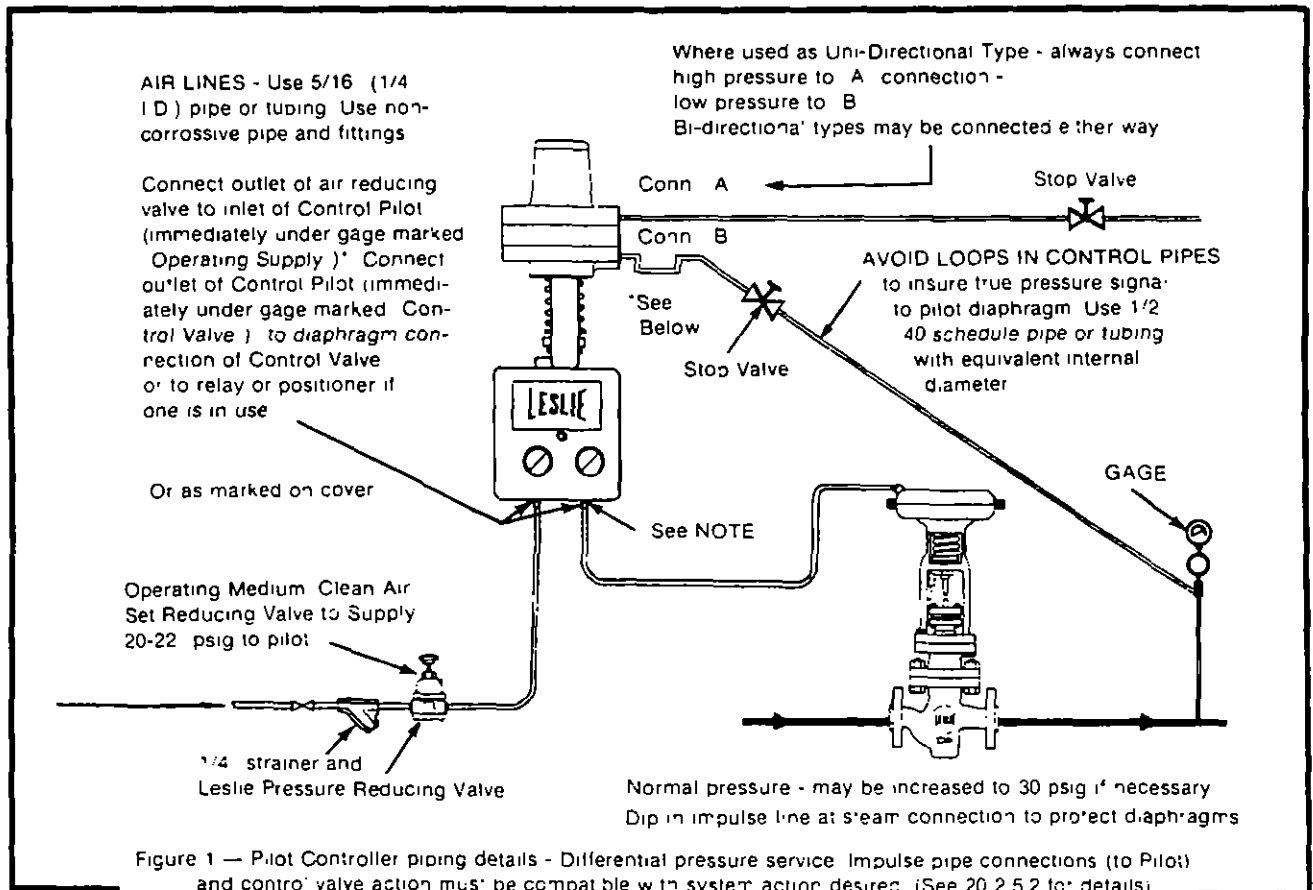
INSTALLATION - OPERATION - MAINTENANCE

STOP - LOOK - READ

ADHERENCE TO THESE INSTRUCTIONS GUARANTEE OPTIMUM RESULTS INSIST ON THEIR BEING FOLLOWED

SECTION I — INSTALLATION

Install Control Pilot vertically in an accessible location. Allow removal space for ease of maintenance. Control Pilot may be located above or below line controlled. Note: Differential ranges quoted for above pilots are total pressures. Whenever hydrostatic head exists on diaphragm, effect must be considered with relation to obtainable differentials.



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Figure 3 through 6 show typical installations of accessory equipment used in conjunction with Leslie Adjustable Proportional Band Control Pilots

PIPING DETAILS - Figure 1 shows control pilot piping details **NOTE:** Control Valve piping shown in figures is schematic only Consult Control Valve Instructions for piping details

***NOTE: AIR CONNECTIONS** - Control pilot is equipped with stainless steel air supply and output fittings **DO NOT** remove Connect air lines directly to these fittings

CONTROL PIPES - CONNECTION AND LENGTH

Connect control pipes from diaphragm cover and

base (see figure 1) to the reference pressure points Make connection in the control valve outlet line at least 3 feet from the valve body outlet or the end of the expander (where used)

Best results are obtained where length of control pipes do not exceed 30 feet

Avoid connections near turbulent areas such as those created by orifices elbows sharp bends, or other flow direction changing components For installation recommendations applying to FUEL OIL ATOMIZATION SERVICE see 20/2 5 2 (Old Code CPI-28)

NOTE Volume Boosting accessories or positioner usable with Adjustable Proportional Band Types only

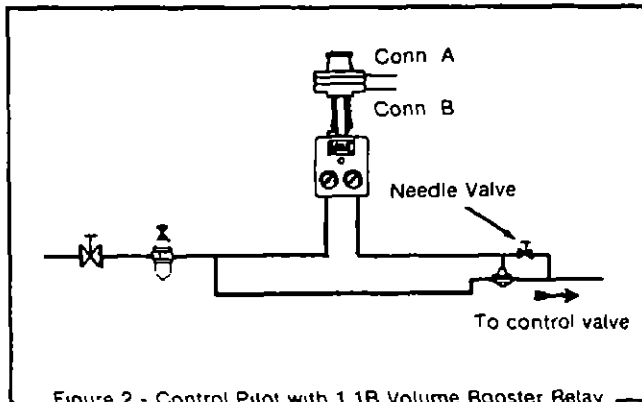


Figure 2 - Control Pilot with 11B Volume Booster Relay with By-pass Needle Valve

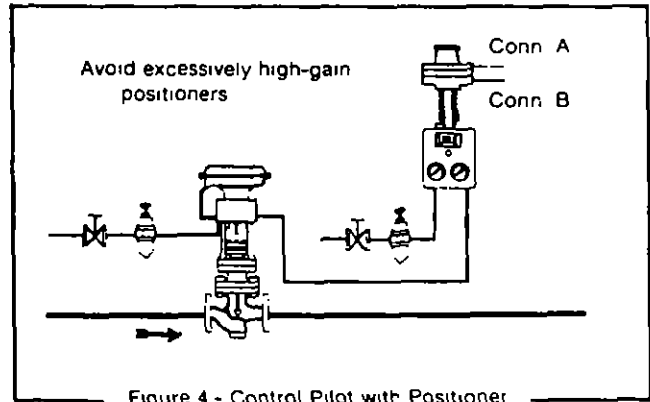


Figure 4 - Control Pilot with Positioner Split ranging may also be done

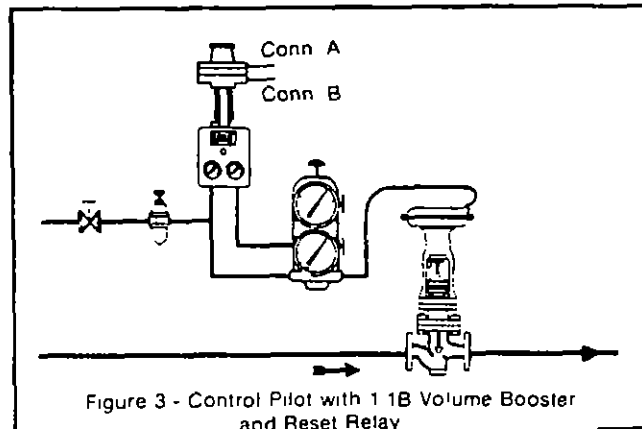


Figure 3 - Control Pilot with 11B Volume Booster and Reset Relay

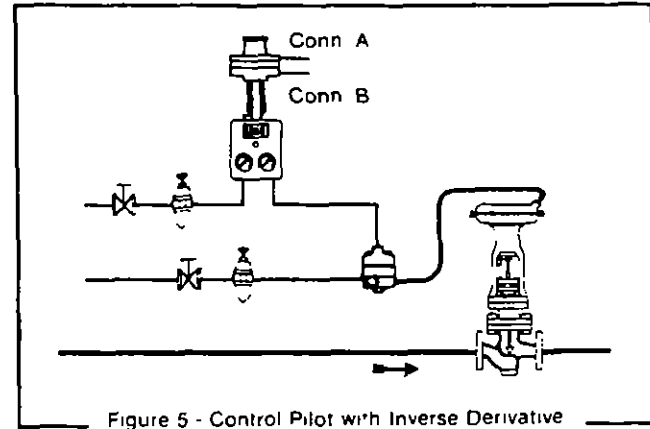


Figure 5 - Control Pilot with Inverse Derivative

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PITCH OR SLOPE OF CONTROL PIPES

Pilot Above Lines Controlled

Slope control pipes downward, away from control pilot. Provide at least 6' of vertical pipe at diaphragm cover. Where steam impulse is connected to lower diaphragm, place a dip in line (as shown in figure 1)

Pilot Below Lines Controlled

Slope control pipes downward toward control pilot. Where the control pilot is to be installed under the line controlled (and liquids or condensible gases are to be controlled) total pressure resulting from hydrostatic head and controlled pressure on either side of the diaphragm must not exceed maximum range of the control pilot (shown in figure 10)

ACCESSORY EQUIPMENT

Volume booster relays, positioners, reset relays, derivative units, etc. may be used with LESLIE ADJUSTABLE PROPORTIONAL BAND CONTROL PILOTS where system process lags, need for increased air volume or pressure, or other system characteristics require their use.

SECTION II — OPERATION

(Refer to figures 6, 7 or 8 or proper drawing)

NOTE All parts numbers used in instruction refer to figures shown in instruction

The control pilot is furnished with internal parts suitable for air as operating medium. Diaphragm and adjusting spring are suitable for the controlled pressure conditions specified. The Control Pilot is factory set and requires no adjustments other than those necessary to obtain the differential or controlled pressure desired or the width of proportional band required by the system.

- 1 Close inlet and outlet stop valves around the control valve
- 2 Open air supply line stop valve. Adjust 1/4" reducing valve to supply 20-22 psig pressure to control pilot

- 3 Turn knob (57) counterclockwise until pointer is at 'MINIMUM' band on scale
- 4 Turn adjusting nut of control pilot to adjust compression on adjusting spring until control valve is wide open
- 5 Open outlet stop valve partially and control pipe stop valves fully
- 6 Open inlet stop valve slowly, until controller takes hold and begins to close the control valve. Readjust the adjusting nut of the control pilot to obtain desired differential. To **increase** differential, when highest pressure is on top of diaphragm screw adjusting nut **upward**, to **decrease** differential screw adjusting nut **downward**. When highest pressure is on underside of diaphragm screw adjusting nut upward to decrease differential, downward to increase. After desired differential setting is obtained open inlet and outlet stop valves fully.

NOTE. When systems are in full operation use caution in cutting a controller in so that system differential will not be disturbed

Adjustment for Required Proportional Band

- 7 Control pilot is now ready for operation. Where Pilot is of the Adjustable Proportional Band type adjust width of band as follows (where necessary to use band wider than minimum)

Turn adjusting knob (57) clockwise moving pointer toward 'Maximum' band setting until required proportional band setting is obtained. At maximum band position sliders will be apart the approximate distance noted in chart in figure 10. Use band width necessary to satisfy requirements. **DO NOT** set sliders any closer than distance shown in chart for Maximum Proportional Band. Approximate distances between sliders (79 and 80) for minimum and maximum bands are shown in figure 10.

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For Pressure Reducing Service

Where air or other fluid pressure is used on side of diaphragm opposite to the controlled pressure side for remote adjustment

Follow steps 1 through 6 (on page 3) then adjust control pilot for desired minimum controlled pressure value To increase controlled pressure, screw adjusting nut of control pilot upward To decrease controlled pressure screw adjusting nut downward

Remote Adjustment

TO INCREASE CONTROLLED PRESSURE above minimum value, supply air pressure to side of diaphragm opposite to controlled pressure side Controlled pressure will increase above minimum value in a 1:1 ratio as air is increased to diaphragm To decrease controlled pressure value toward minimum or to bring system back to minimum value decrease air pressure on diaphragm appropriately

**SECTION III — ALL TYPES
DISMANTLING — ALL TYPES**

(Refer to figures 6, 7 or 8 or proper drawing)

- 1 Bypass control valve if operation of system is necessary during maintenance work Close air supply and control pipe stop valves Disconnect control pipes from control pilot
- 2 Remove cover screw (64) and cover (63) Remove bottom plug (55)

PILOT BODY ASSEMBLY

- 3 Take out body screws (44) Slide pilot body (46) with assembled parts off base (32) in a downward direction away from the adjusting pin (36)
- 4 Disassemble diaphragm plate (38) (with proportional band parts intact), from the body by removing cap screws (39) **DO NOT DISTURB PROPORTIONAL BAND PARTS ON THE DIAPHRAGM PLATE UNLESS WORK IS REQUIRED ON THEM** Remove diaphragm nozzle disc complete (37) and take out screws

(42) Lift out flange ring (45) and gasket (76) Remove nozzle valve (75) and spring (53), in UDRV types

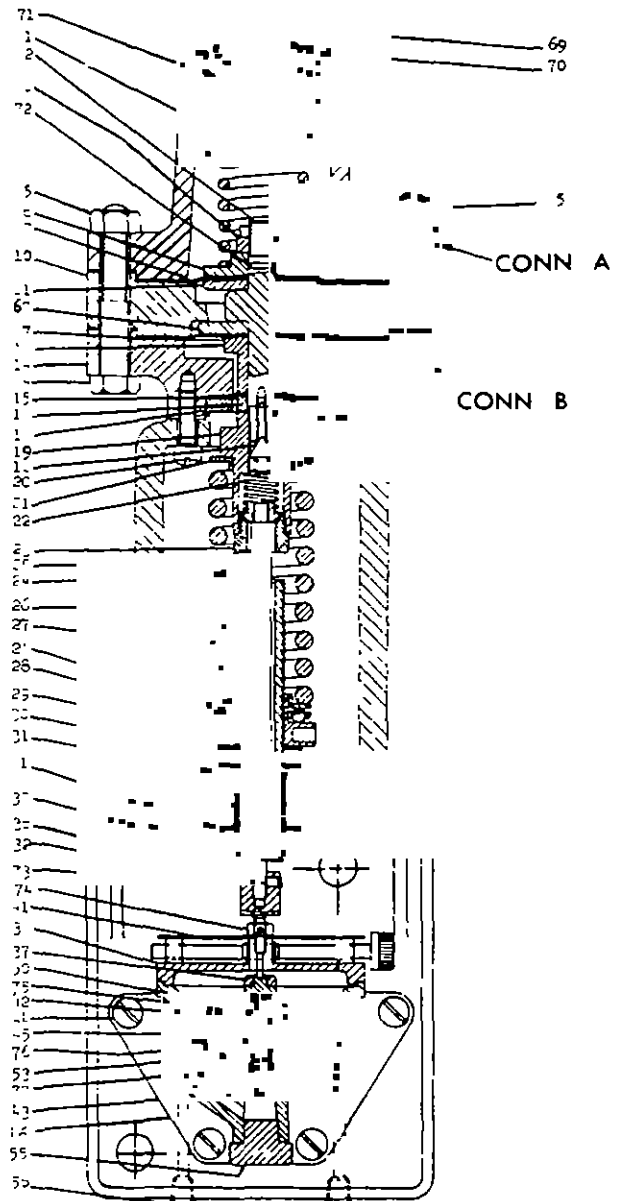


Figure 6 - Differential Control Pilot with Adjustable Proportional Band

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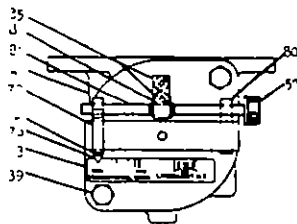
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Figure 7 - View of pilot body -
UDDVP etc types



Figure 8
Plan view showing
arrangement of adjustable
proportional band



CLEANING

Wipe all parts clean and be sure to check that ports in pilot body nozzle and orifice are clear

Clean nozzle disc and nozzle **DO NOT use sharp abrasives**

Open operating air supply line valve and blow out pipe line and inlet port of base

RE-ASSEMBLING PILOT BODY ASSEMBLY

- 1 Replace bottom plug (55) in body. Tighten plug
- 2 Replace gasket (76) (in UDRVP types - nozzle valve (75) and spring (53) also) in body. Position flange ring (45) on gasket with nozzle upward. Insert flange ring screws (42). Tighten evenly and with sufficient firmness to seal air. Insert diaphragm nozzle disc complete in body with disc end toward nozzle. Replace diaphragm plate (38) on pilot body, with knob (57) on the right hand side. If blade spring (41) was removed from the assembly, be sure to reassemble it with the preformed end bends pointing upward away from the proportioning sliders. Insert cap screws (39) and tighten. Insert "O" Ring gaskets (43) in grooves in body.

Use new "O" Ring gasket if necessary

NOTE Before reassembling pilot body to control pilot perform any maintenance work which may be necessary on the superstructure. Then follow reassembly procedure.

CLEANING OR REPLACING PARTS AND DIAPHRAGMS IN SUPERSTRUCTURE

NOTE If maintenance work on superstructure alone is necessary, remove valve body assembly from base as described in Dismantling. Then proceed as shown below.

DISMANTLING

- 1 Remove spring compression. Remove cap (69) and gasket (70) from spring case then disassemble bolts and nuts (4 and 5) and upper spring (71) in U' types from superstructure. Take out yoke screws (20) and lift balance of assembly of yoke (27). Hold assembly rigidly on locknut (3). Grasp hex of connector nut (19) with wrench and loosen stem nut (23). Remove stem nut (23), stem complete (24) and yielding spring (22). Then insert hex setscrew wrench into set-screw (18) and loosen set-screw.
- 2 Dissassemble connector nut (19), diaphragm washer (16), diaphragm ring (17), diaphragm small (15), diaphragm base (14), diaphragm seal spacer (13), lower diaphragm (7), lower diaphragm disc (67) and vent chamber (10) from connector bolt (2). Grasp connector bolt (2) on hex, loosen locknut (3) and remove from connector bolt along with upper diaphragm disc (6), upper diaphragm (7) and diaphragm disc (11). Remove "O" Ring (72) from connector bolt.
- 3 Clean all parts. Replace any worn or damaged part. Balance of superstructure parts may be examined and cleaned at this time if necessary. Parts are — spring seat (21), adjusting spring (25), adjusting nut (29), locknut (30), lower spring seat (21), thrust bearing (28) and stem complete (24). Replace in opposite order. **DO NOT** remove yoke (27), adjusting sleeve (26) or nut (33) unless replacement of one of these parts is necessary.

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REASSEMBLING SUPERSTRUCTURE

- 1 Insert 'O' ring (72) in groove in connector bolt (2) Lubricate Hold connector bolt rigidly on hex with slotted end upward Place diaphragm disc lower (67) on connector bolt (2) Follow with lower diaphragm (7) and stem seal spacer (13) with flanged end toward diaphragm (7) Position diaphragm base (14) over connector bolt with large recess toward diaphragm
- 2 Place one small diaphragm (15) over connector bolt and in recess of diaphragm base (14) Position diaphragm ring (17) on small diaphragm and assemble diaphragm washer complete (16) to connector bolt (2) Screw connector bolt nut (19) on connector bolt and tighten firmly against washer complete (16) Insert set-screw (18) in connector bolt nut (19) and screw down tightly against connector bolt (2)
- 3 Insert yielding spring (22) in connector bolt nut (19) Assemble stem nut (23) to stem complete (24) with threaded end toward stem head Insert stem head end of stem complete in connector bolt nut (19) Press stem down to compress yielding spring (22) Engage threads of stem nut with connector bolt nut threads and screw in until tight against connector bolt nut
- 4 Invert assembly and hold rigidly on hex of connector bolt nut (19) Place vent chamber (10) over connector bolt (2) with large recess over lower diaphragm disc (67) Position diaphragm disc (11) on connector bolt (2) Place upper diaphragm (7) and upper diaphragm disc (6) on lower diaphragm disc (11) with wide face of disc on diaphragm Assemble locknut (3) to connector bolt (2) Tighten locknut firmly down against upper diaphragm disc to lock components tightly together **DO NOT** tighten to point where diaphragms become distorted
- 5 Position assembled parts on yoke (27) with stem down through yoke Make sure all parts are positioned correctly Insert screws (20) through

yoke and into diaphragm base Tighten firmly
NOTE When screws are tightened a small gap will remain between the diaphragm base and the yoke **DO NOT** attempt to tighten screws enough to close this gap Assemble diaphragm cover (1) (and upper spring (71) in 'U' Types) *Line up holes in diaphragm cover vent chamber and diaphragm base* Insert bolts (4) through parts Assemble nuts (5) to bolts Reassemble cap (69) and gasket (70) Tighten pin (36) to stem complete (24)

REASSEMBLING PILOT BODY ASSEMBLY TO BASE

Slide pilot body assembly upward on base (32) so that adjusting pin (36) passes smoothly through proportional band blade spring Insert screws (44) through body and into base Tighten screws firmly

After completion of reassembly reconnect control pipes to pilot open air supply line to pilot, re-engage proportional band mechanism and reset adjusting pin as described in Section IV (if they have been disturbed)

Readjust for desired pressure or differential value as described under 'OPERATION' Replace cover (63) and cover screw (64) Tighten screw

FINAL ASSEMBLY AND ADJUSTMENT OF THE COMPLETE PILOT

Proper operation and maximum sensitivity will be obtained only if the upper diaphragm assembly is operating at or near its mean position, i.e. midway between its top and bottom stops This position is determined by adjusting the length of the adjusting pin Adjusting pin adjustments are **factory set** and **should never be disturbed during maintenance work** unless parts replacement is essential in these assemblies The following readjustment instructions are supplied **solely** for that purpose Follow instruction in exact detail as outlined

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**SECTION IV
RE-ENGAGEMENT OF PROPORTIONAL BAND
MECHANISM AND SETTING
OF ADJUSTING PIN**

NOTE. Steps 1, 2 and 4 are common to all types

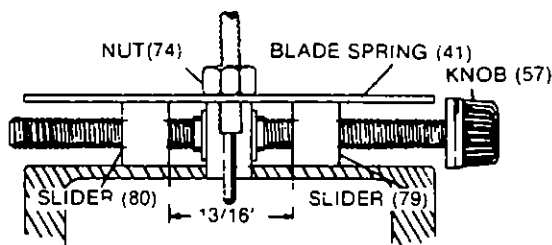


Figure 9 - Position of sliders for nut/blade spring adjustment

- 1 Supply 20 psig air pressure to pilot
- 2 Screw adjusting nut (29) upward to compress adjusting spring (25) and to move diaphragm assembly up against top stop (if controlled pressure exists on diaphragm relieve it or compress spring sufficiently to overcome it) In U Types upper spring force must be overcome also

Set sliders (79 and 80) 13/16' apart Move 'Nylok' nut (74) upward on stem of adjusting pin (36) sufficiently to keep it clear of blade spring (41) when setting adjusting pin (36) Then make adjustments shown for the particular type of pilot

3 UDDVP Types —

Loosen lockscrew (73) and turn adjusting pin (36) downward on stem (24) toward pilot body until air output pressure increases from 0 psig to 21 psig Lock set-screw (73)

Turn Nylok (74) toward proportional band blade spring (41) until it engages blade spring just enough to cause air output pressure to decrease from 21 psig to 18 psig

UDRVP Types —

Loosen lockscrew (73) and turn adjusting pin (36) downward on stem (24) toward pilot body until air output pressure decreases from 21 psig to 0 psig Lock setscrew (73)

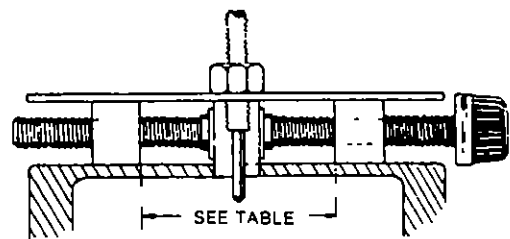
Turn "Nylok" nut (74) toward proportional band blade spring (41) until it engages blade spring just enough to cause air output pressure to increase from 0 psig to 3 psig

4. All Types —

Loosen set-screw (73) Turn adjusting pin (36) upward on stem (24) and away from pilot body approximately 1-1/2 turns Lock set-screw

Figure 10 - TABLES - Position of sliders for Maximum/Minimum bands pilot ranges and proportional bands

Approximate distance between sliders	Min Band	Max Band
	2-3/4	13/16



Types UDRVP UDDVP
Bi-directional-Differential)

High pressure at Conn A	Adj Diff	0-100 PSI
High pressure at Conn B	Adj Diff	0-35 PSI
Adjustable Proportional Band PSI	Static Pressure PSI	
	Min	Min
	Max	Max
	Max	Max
Maximum static pressure on either A or B = 600 PSI		