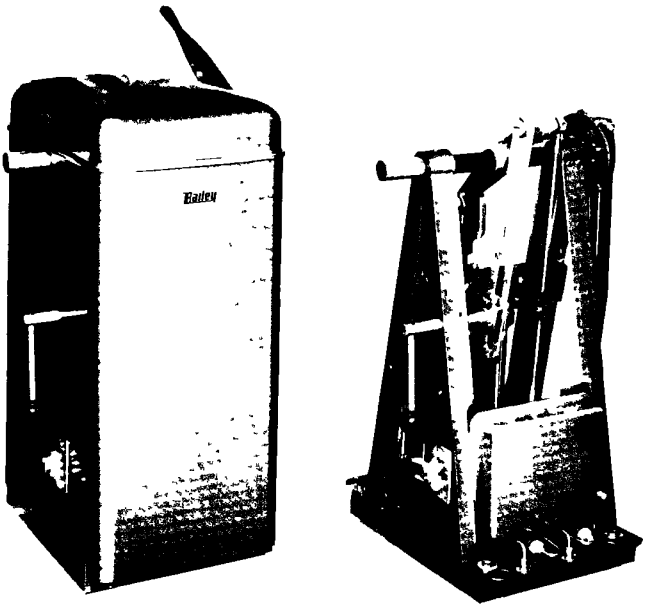
Bailey

SECTION
P81-18

PRODUCT INSTRUCTIONS

PNEUMATIC CONTROL DRIVE
TYPE AC0608



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FORM P81 8 666

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CROSS REFERENCES

Instruction or Equipment	Instruction Section
Bailey Control Linkage	Product Specification P81-5
Pneumatic Position Transmitter	P99 35

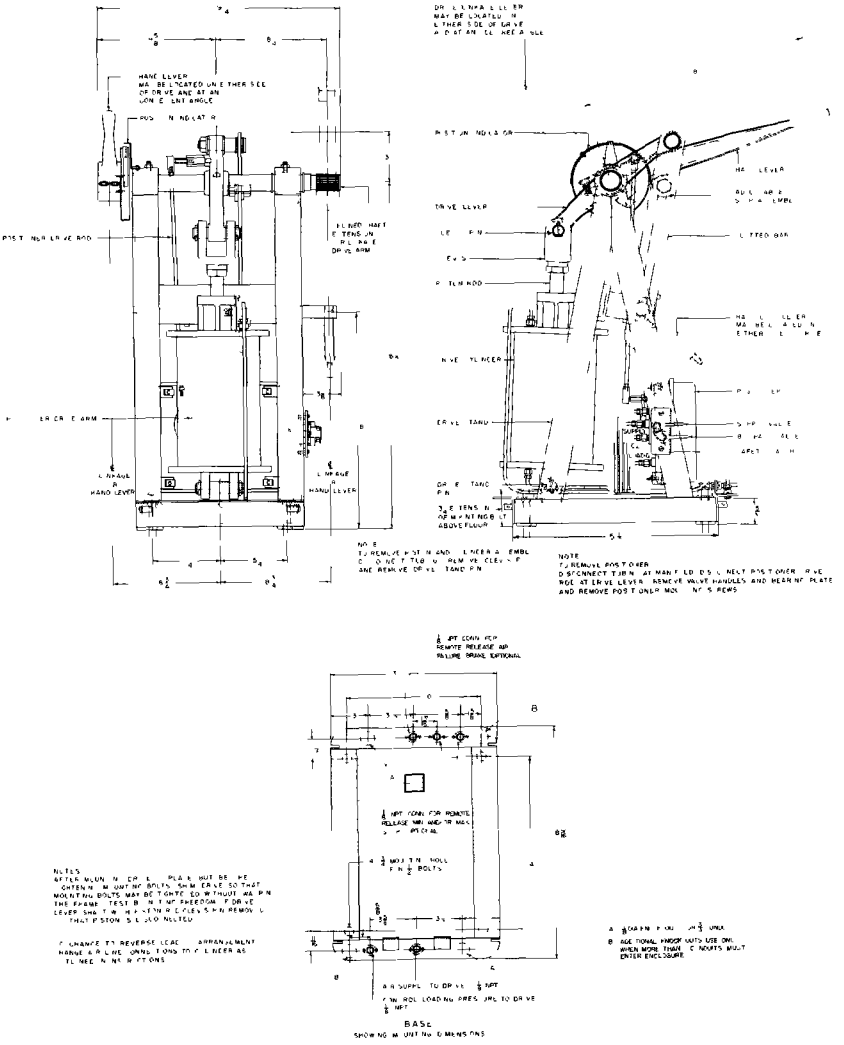


FIGURE 1 Mounting Dimensions, Type AC0608P□A Model 100 Control Drive

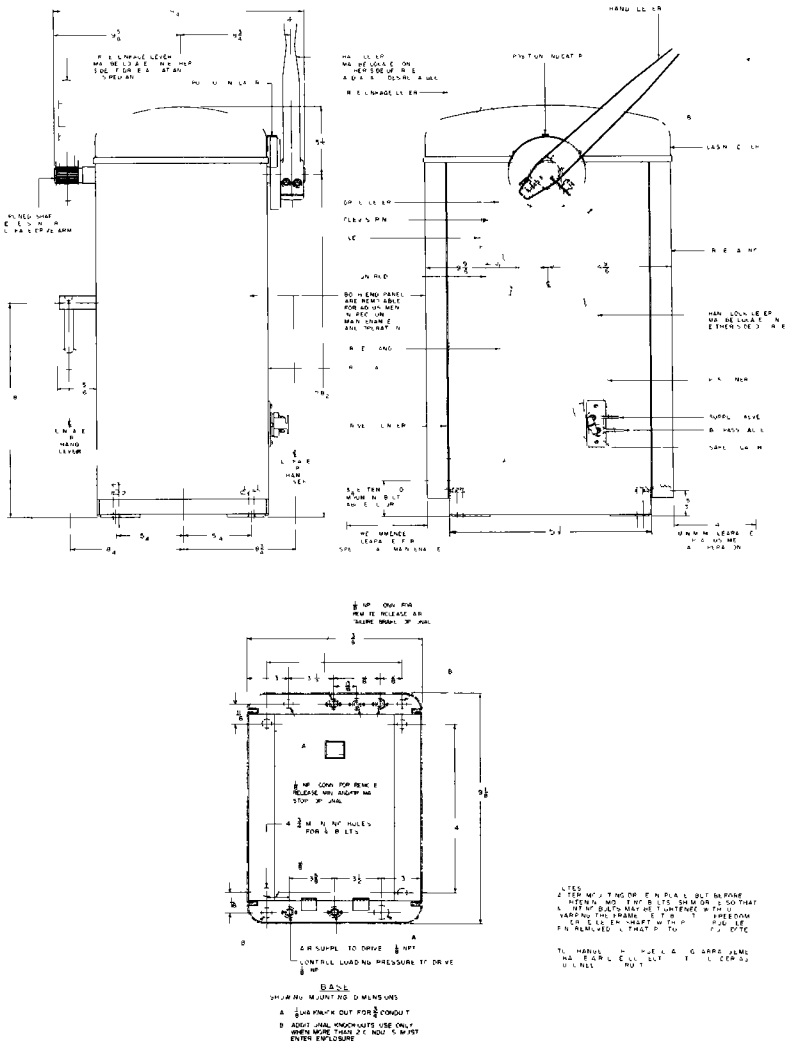


FIGURE 2 - Mounting Dimensions, Type AC0608P□A Model 200 Control Drive

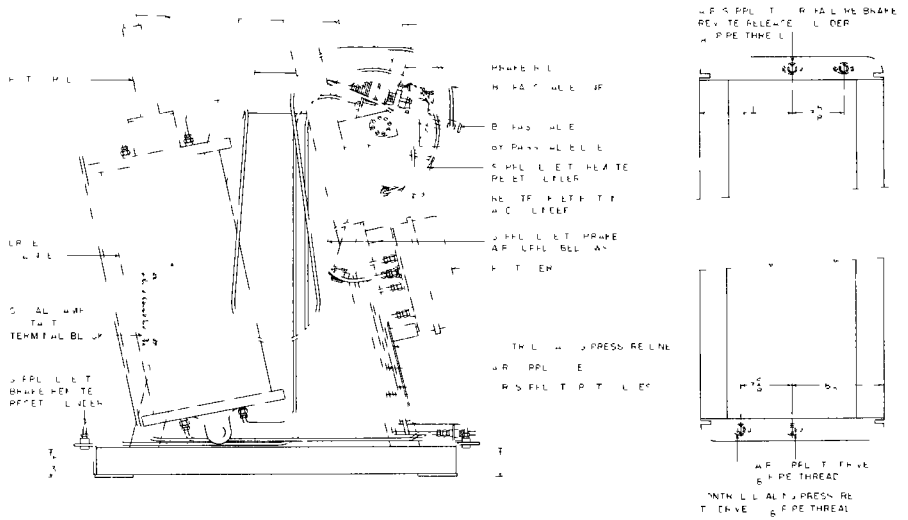


FIGURE 3 - Tubing Connections for Air Failure Brake

INSTALLATION

Location

1. Locate Drive in accordance with desired linkage arrangement (see "Connecting Linkage" page 8).

CAUTION. Standard Drive is designed for ambient temperature of 120F (a special design Drive is available for high temperature service to 250F). If Drive is subjected to extreme cold, protect compressed air lines and cylinder (trapped moisture in compressed air may freeze and make Drive inoperative). Drives equipped with a heater (Figure 17) are available for this purpose.

Mounting

2 Figures 1 thru 5 give Control Drive mounting dimensions and details For Drives with casings (Figure 2) see "Removing Casing Access Panels', page 20,for access to mounting base.

3. Mount Control Drive in any desired position

CAUTION: Before tightening mounting bolts and Drive connecting linkage, shim mounting base if necessary so it will not warp when bolts are tightened. Warping of the base will interfere with the freedom of motion of the Drive lever (see Figure 1 and 2)

Tubing Connections

4. Make supply and loading pressure connections as shown in Figure 1, 2, and 3. Use copper or aluminum tubing and suitable fittings

SUPPLY PRESSURE PSIG	MAXIMUM TORQUE FT LBS (NO LOAD)
40	280
50	400

5. If Drive is equipped with an Air Failure Brake with a remote release pushbutton (Figure 4), run a line from an air supply header thru the pushbutton to the connection shown in Figure 3. Use 1/4-inch copper or aluminum tubing and suitable fittings. Mount the remote release pushbutton on a panel near the operator

Positioner Control Loading Arrangements

6 The Positioner is normally furnished mounted on the Control Drive stand with all tubing connections made between the cylinder and Positioner for direct loading operation Depending upon the specific application, however, the Positioner may be adjusted for reverse loading operation as described below.

Direct loading (Figure 16) is that arrangement whereby the piston rod moves out of the cylinder as control pressure to the Positioner bellows increases Control air pressure from the upper port of the Positioner pilot valve is supplied to the underside of the piston. The positioning cam is assembled (black concentric and radial lines visible) so when the cam turns in a counterclockwise direction. tension on the positioning spring increases.

Reverse loading is that arrangement whereby the piston rod moves into the cylinder as control loading pressure to the Positioner bellows increases For applications requiring reverse loading, it is necessary to switch air line connections to the cylinder and reverse the positioning cam (red concentric and radial lines visable) so when the cam turns in a clockwise direction, tension on the positioning spring increases.

a To reverse air lines.

(1) Move air line connection C2 at top of cylinder to tapped hole on opposite side of cylinder. Plug original C2 connection hole

(2) Move air line connection C1 at bottom of cylinder to tapped hole on opposite side of cylinder. Plug original C1 connection hole

(3) Then exchange connections of the air lines running to the cylinder at manifold.

b To reverse positioning cam

(1) Remove cam (Figure 8)

(2) Remove locating set screw

(3) Reassemble set screw in tapped hole in other side of cam hub.

(4) Reassemble positioning cam so opposite side of cam faces outward

Lever Assembly

7. Locate the Hand lever (Figure 1) on the side of the Drive that is most convenient for operation. Then assemble the Drive linkage lever on the opposite side. Assemble both hand lever and Drive linkage lever at any desired angle on the splined ends of the Drive shaft Locate the hand lock lever on either side of the Drive

To change the location of the hand lock lever

a. Disassemble the hand lock and shaft

b. Reassemble lever and shaft in the identical holes and bracket in the opposite side of stand or casing.

c. Disassemble the slotted bar and re assemble it on the other side of the Drive lever.

Position Indicator

8 The Control Drive is provided with a position indicator (Figure 1) on which the position of the piston in the cylinder may be noted Any position of the driven device may also be determined The position indicator scale is divided into 10 equal parts, each division representing 10% travel of the Drive piston Install position indicator as follows

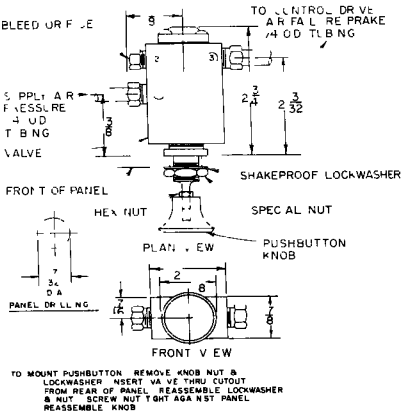


FIGURE 4 - Mounting Dimensions, Remote Pushbutton, Part No. 5315129 2

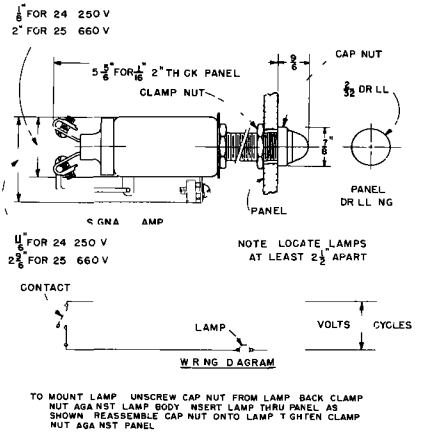


FIGURE 5 Mounting Dimensions, Remote Signal Lamp

a Assemble position indicator to hand lever between lever and stand or casing For a Drive with casing, the indicator pointer is welded to the casing cover and the cover may be assembled on the casing so the pointer is on the desired side For a Drive without casing assemble the indicator pointer on either side of the Drive (the assembly is identical in either case)

b Assemble indicator scale to indicator drum so OPEN and SHUT on the scale refer to the position of the driven device Then assemble indicator drum to operating lever

c Position scale in slots so one extreme end of scale is under the pointer when the piston is at its corresponding travel position

Connecting Linkage

9 Install connecting linkage in accordance with Product Specification P81 5, "Bailey Control Linkage" or in accordance with the special linkage arrangement drawing if provided for the control system

Air Failure Brake

10 For Control Drives equipped with an Air Failure Brake (Figure 3), no additional installation is required unless a remote release pushbutton or remote signal lamp is used See steps 5 and 11 for these additional installation requirements

For Control Drives with an Air Failure Brake, set the spring adjustment nut (Figure 18) which determines the air pressure at which the Brake will trip Turning the adjustment nut to decrease the spring compression decreases the pressure at which the Brake will trip. It is suggested that for a normal supply pressure of 40 psig to the Drive, the Brake should be set to trip at 25 psig, for a 50 psig supply pressure the Brake should trip at 30 psig

11 If Drive is equipped with an Air Failure Brake with a remote signal lamp, make wiring connections as shown in Figure 5 to the terminals designated in Figure 3 Use No 14 or larger building wire for protection against damage Run the wiring in conduit with at least the last two or three feet at the Drive end in flexible conduit so that the wire may be disconnected easily Mount remote signal lamp on a panel near the operator

Travel Limit Stops

12 The design of the travel limit stops furnished depends upon whether or not the Drive is equipped with an air failure brake

For Drives not equipped with an air failure brake, a slotted bar with an adjustable stop is provided (see Figure 1) To set the stop loosen the nut and slide the stop to the desired position then tighten nut To secure the stop, drill a hole thru the stop washer and slotted bar and insert a dowel pin in the hole

For Drives equipped with an air failure brake, either a fixed or releasable travel limit stop is provided in place of the slotted bar The fixed stop consists of one or two steel sleeves which fit over the brake rod (see Figure 26) and mechanically limit travel in either or both directions The releasable stop is essentially a spring loaded pin which butts against the clevis to limit piston travel These stops can be released pneumatically to permit additional travel under manual control Various combinations are possible using pins cut to varying lenghts to limit piston travel in either or both directions

Electric Position Transmitter

13 If the Control Drive includes an Electric Position Transmitter a drawing is included in

this Instruction Book to illustrate factory installation details (see Drive Specification Sheet for drawing number). Make external wiring connections as required.

Pneumatic Position Transmitter

14. If the Control Drive includes a Pneumatic Position Transmitter, a drawing is included in this Instruction Book to illustrate factory installation details (see Drive Specification Sheet for drawing number). Also refer to Instruction Section P99 35

Pre-Service Adjustment Checks

15. Make applicable adjustments as described under "Service Adjustments", page 12, before placing Drive in operation

OPERATION WITHOUT AIR FAILURE BRAKE

Positioner Supply and By-pass Valves

The operation of the Positioner supply and by-pass valves is shown in Figure 6 The arrangement shown is for use with either direct or reverse loading connections to the piston cylinder.

A safety latch is provided to lock the supply and by-pass valves in position when they are set for automatic operation The latch sets itself and prevents the valves from being bumped or jarred out of position.

Manual Operation

1. Supply valve in HAND-CLOSED position.

2 By pass valve in OPEN HAND position

3 Hand lock lever pulled up tight when hand lever is not being operated.

4. With the hand lock lever released, position the Drive by manual operation of the hand lever Pull the hand lock lever up tight to hold the Drive in any position. (Note position of piston in cylinder on position indicator.) To position the Drive in accordance with demand from the control system, remove Positioner access panel (see Corrective Maintenance"), remove Positioner cover, and operate Drive so Positioner balance beam is centered between stops (see Figure 8).

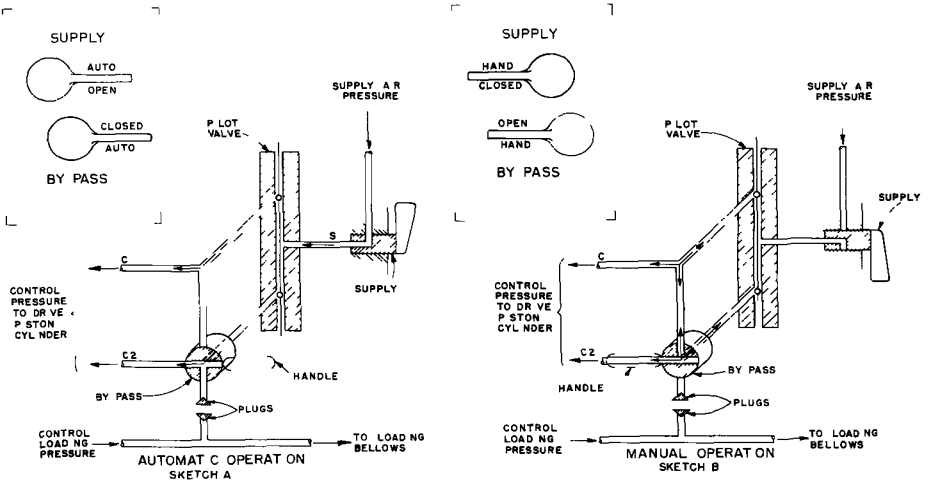


FIGURE 6 - Positioner Supply and By-pass Valve Operation

Transfer from Manual to Automatic

1 Remove Positioner access panel (see "Corrective Maintenance") and Positioner cover

2 Adjust loading pressure to Positioner so that balance beam is centered between upper and lower stops

3 Turn by pass valve to CLOSED AUTO

4 Release hand lock lever

5. Slowly turn Positioner supply valve to AUTO OPEN

The Drive is set for automatic operation in accordance with the loading pressure applied to the Positioner from the preceding controller in the system

NOTE The above procedure is awkward for routine transfers since the removal of covers and operation at the Drive and controller locations are involved If transfers are made frequently, determine Drive positions for various loading pressure values, and, then in place of step 1 and 2 above, note Drive position on position indicator and set the corresponding loading pressure without referring to Positioner balance beam Install a small pressure gage in loading pressure line at Drive for reference

Automatic Operation

1 Supply valve in AUTO OPEN position

2 By pass valve in CLOSED position

3 Hand lock lever released

4. The Drive piston is positioned automatically as described under "Description of Operation". Note piston position on position indicator

Transfer from Automatic to Manual

1 Pull the hand lock lever up tight.

2 Press IN on safety latch assembled with supply and by pass valve.

3 Turn by pass valve to OPEN HAND

4 Turn supply valve to HAND CLOSED. The Drive is set for manual operation

OPERATION WITH AIR FAILURE BRAKE

Positioner Supply and By pass Valves

The operation of the Positioner supply and by pass valves is shown in Figure 6. The arrangement shown is for use with either direct or reverse loading connections to the piston cylinder

A safety latch is provided to lock the supply and by pass valves in position when they are set for automatic operation The latch sets itself and prevents the valves from being bumped or jarred out of position

Manual Operation

1 Positioner supply valve in HAND CLOSED position

2 Positioner by pass valve in OPEN HAND position if desired

3 Brake operating lever (Figure 7) in MANUAL position

4 Position the Drive by manual operation of the hand operating lever Turn Air Failure Brake operating lever to LOCK position to hold Drive in any position Piston position may be noted on the Drive position indicator To position the Drive in accordance with demand from the control system, remove Positioner access panel (see Corrective Maintenance), remove Positioner cover and operate Drive so Positioner balance beam is centered between stops (see Figure 8)

Transfer from Manual to Automatic

1 Make certain that full air supply is available

2 Turn Positioner supply valve to AUTO OPEN

3 Turn Positioner by pass valve to CLOSED AUTO

4 Turn Brake operating lever to MANUAL

5 Whether or not Hand Auto Station for Control Drive is on HAND, slowly position Drive (by operation of hand lever) to approximately that point which will be held by the Positioner. This will keep the Drive from suddenly jumping to position when placed on automatic If Drive position vs control loading pressure is known, position Drive in accordance with control pressure noted on Hand Auto Station in loading line to Drive If not desired position

may be determined by observation of Positioner balance beam (Drive will be positioned correctly when balance beam is balanced approximately midway between its upper and lower stops.)

6 Turn Brake operating lever to RESET, hold this position momentarily, then turn lever to AUTO.

7 If Hand/Auto Station for Control Drive is on HAND, adjust Hand/Auto Station manually until its loading and control gages are matched, then, turn Hand/Auto Station to AUTOMATIC.

Automatic Operation

1. Supply valve in AUTO OPEN position.

2 By-pass valve in CLOSED-AUTO position

3 Brake operating lever in AUTO position.

4 Drive is now operated automatically by the control system.

NOTE Although every control system is different with regard to equipment and/or operating characteristics, the following generally is the recommended procedure when the control air supply has failed

Drive Operation Necessary During Failure Period:

1 Immediately turn all Hand/Auto Stations in control system to HAND.

2. Transfer Drive to manual mode as outlined below under 'Transfer from Automatic to Manual

3. Upon resumption of full supply air pressure, transfer Drive to automatic mode as outlined above under Transfer from Manual to Automatic'

Drive Operation Unnecessary During Failure Period.

1. Immediately turn all Hand/Auto Stations in control system to HAND.

2. Leave Drive Positioner valves and Brake operating lever as noted above for automatic operation.

3. Upon resumption of full supply pressure

a. Make certain that Drive Positioner valves are set for automatic operation.

b. Reset Air Failure Brake as outlined below (Control Drives should be reactivated

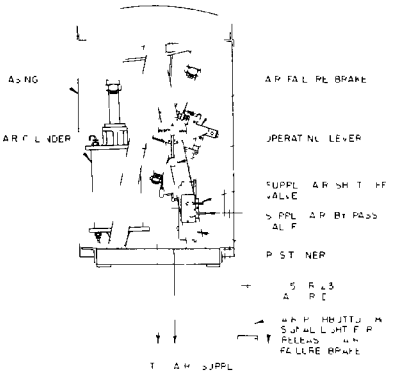


FIGURE 7 - Air Failure Brake Operation

in order of their effect on control system least effective first, most effective last)

c With Hand/Auto Station to Drive on HAND, manually set Hand/Auto Station at approximately the control loading pressure which would normally be applied to the Drive at existing load.

d Turn Brake operating lever to RESET, hold in this position momentarily, then turn lever to AUTO.

OR

If a remote reset mechanism is in with Brake, with Brake operating lever in AUTO position, press remote reset push button Hold pushbutton IN until manipulation of Hand/Auto Station causes Drive to show a response and then release pushbutton

e Position Control Drive by manual operation of its Hand, Auto Station until normal operation has been resumed.

f. Switch Hand/Auto Station back to Automatic in manner required for specific control system.

Transfer from Automatic to Manual

1 Turn Positioner supply valve to HAND CLOSED.

2 Turn Positioner by pass valve to OPEN HAND

3. Turn Brake operating lever to MANUAL or LOCK as desired.

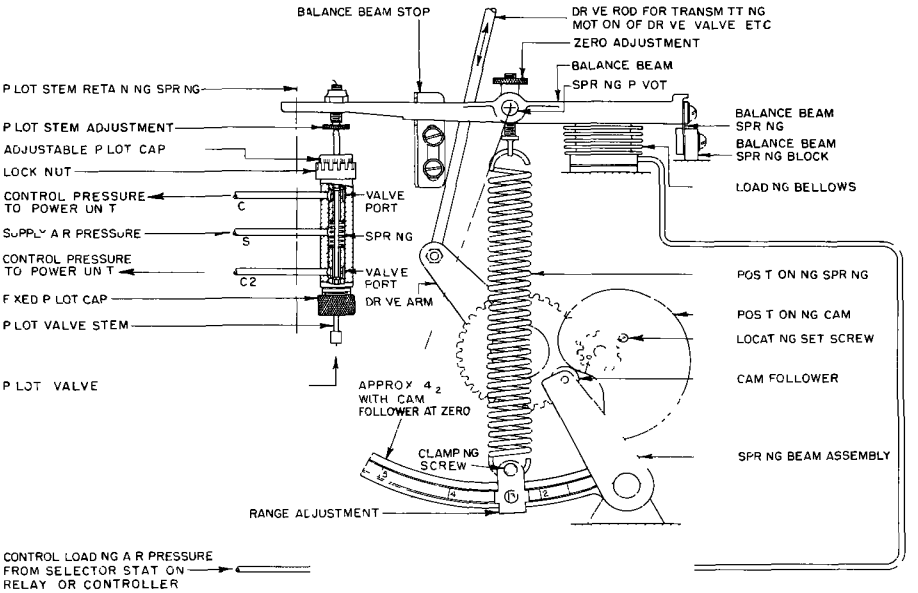


FIGURE 8 Positioner Adjustments

SERVICE ADJUSTMENTS

The Control Drive is shipped from the factory adjusted for a linear relationship, that is full piston travel for full range input signal If this is the desired service, the Control Drive may be placed directly in operation (see page 9 or 10) * If it is necessary to adapt the Drive to another application, the Positioner adjustments described below may be used to provide almost any desired combination of piston travel versus input signal pressure

Zero or Suppression Adjustment

By means of the zero adjustment (Figure 8) an initial tension may be imposed upon the positioning spring so that the piston will not start to move from its minimum position until the control loading pressure has increased from 3 psig to any value up to one half of the loading pressure range (9 or 15 psig) This adjustment is of value when two or more Drives are to be operated in sequence, where the Drive is equipped with a minimum stop, or where the characteristic of the device which the Drive is moving must be matched with that of another regulated device

Range Adjustment

The range adjustment (Figure 8) affords a variation of Drive motion for a given range of control loading pressure (For a 3 to 27 psig loading pressure range, the amount of variation extends, roughly from full piston travel for a 3 to 15 psig change in control loading pressure to one half piston travel for a 3 to 27 psig control loading pressure change In

*It is recommended that the Control Drive be stroked thru full travel to assure that factory calibration has not been disturbed in transit If calibration is non linear, refer to Recalibration of Drive and Positioner', page 21

combination with the zero adjustment described above, full piston travel may be obtained for as small a pressure change as 10 psi -- e.g., a range of 10 to 20 psig.) Range adjustments available with each of the three Positioner cams furnished are shown in Figures 9, 10 and 11. This adjustment is of value when the device being regulated by the Drive is oversized, since the adjustment allows operation of the Drive 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 Drive with those of related power devices in the same control system.

Speed Adjustment

When the system involves only a single Drive, a high positioning speed is usually an advantage. In a complex control system involving more than one drive, 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. However, the speed of operation of the Drive may be decreased if necessary (see Table 3 for normal and minimum decreased speeds of the Control Drive) If it is necessary to reduce the speed of operation, speed control orifices are available for insertion in the control lines from the pilot valve to the cylinder. As noted in Table 3, the orifice (No. 60 drill, .040" diameter) will increase the time required for full piston travel of the Control Drive with 1/8" pilot (40 psig supply pressure) to 25 seconds This operating time may be decreased, up to the normal value indicated, by drilling the orifice to a larger diameter. To insert a speed control orifice, proceed as follows

1. Remove pilot valve stem by springing open pilot stem retaining spring (Figure 8) and allowing stem to drop out (do not scratch stem lands during this process).

2 Remove pilot valve by removing attaching screws (Figure 21).

3 Remove O ring gaskets from both upper and lower holes on pilot valve block.

4. Insert speed control orifice in each of the upper and lower holes

5. Replace O-ring gaskets.

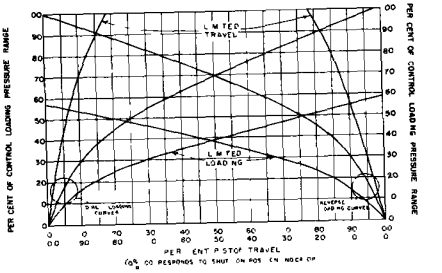


FIGURE 9 - Cam A, Square Root Relation

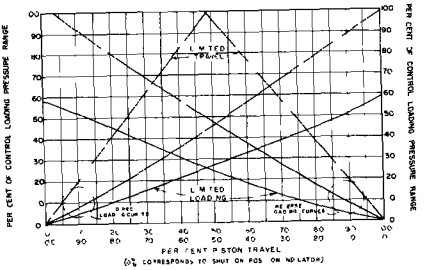


FIGURE 10 - Cam B, Straight Line Relation

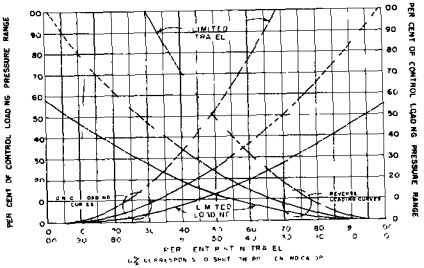


FIGURE 11 - Cam C, Square Relation

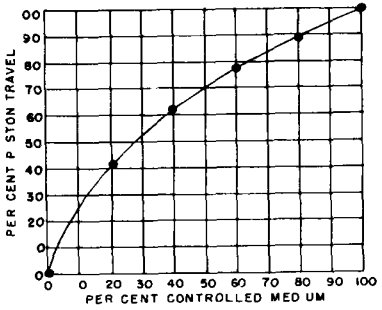


FIGURE 12 Drive Chaiacteristics

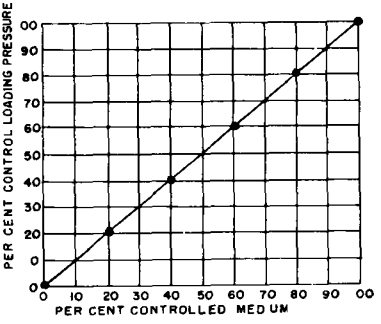


FIGURE 13 Desired Control

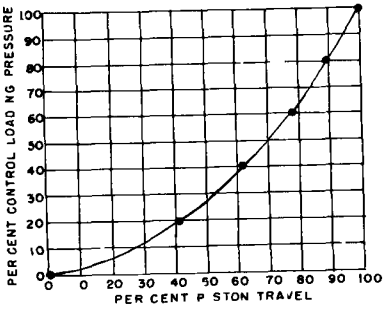


FIGURE 14 Cam Characteristics

6 Reassemble pilot valve to valve block

7. Reassemble pilot valve stem in pilot valve and replace pilot stem retaining spring

Cam Characteristic Adjustment

This adjustment involves selecting or shaping the proper positioning cam in order to obtain that characteristic of piston position vs. control loading pressure which will afford the desired characteristic of controlled medium vs. control loading pressure Positioning cams A, B, and C are furnished with each Positioner (the B cam is shipped assembled in place and the A and C cams are attached inside Positioner case) The characteristics for which the cams are shaped are listed in Table 1 and are shown in Figures 9, 10 and 11 The figures show a family of curves for each cam, each curve 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 value in Figures 9, 10 and 11

If the system involves a single Drive, it is probable that the B, straight line, cam will be satisfactory However, one of the other cams may be used to provide a more uniform controlled medium vs. loading pressure characteristic, providing stable control over a wide range of operation with a given gain or proportional band adjustment on the controller The definition of "controlled medium used here is the rate of action of that medium (water, air, etc .) being controlled.

For a Control Drive which is an integral part of a complex control system, the cams provide a selection of characteristics which, together with the range adjustment, should afford close paralleling of the controlled medium vs. loading pressure characteristic In order to match the inherent characteristics of the regulated device to that of a similar

Positioning Cam, Any Stroke	Piston Position (P) vs Control Loading, (L)	Fig. No
A	Square Root (L $\sqrt{P}$)	9
B	Straight Line (L P)	10
C	Square (L P^2)	11

TABLE 1 Positioning Cam Characteristics

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

auxiliary, valve, variable speed control, etc , it may be practical to reduce the controlled medium vs piston 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

1 Use straight line cam, B, to determine the actual controlled medium vs. power operator piston position characteristic (see Figure 12). (Determine piston position by observing the position indicator.)

2. Decide upon the exact controlled medium vs. control loading pressure characteristic desired (see Figure 13).

3. From steps 1 and 2 above, determine the exact control loading pressure vs. piston position characteristic (see Figure 14)

4. Select the positioning cam whose characteristic curve, shown in Figures 9, 10 and 11, most closely matches the loading vs. position characteristic determined in step 3.

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

6 If the required characteristic cannot be matched by the above procedure, or if a more exact characteristic is required, alter the shape of the cam as described below

Cam Shaping Method: To assist in the alternation process, cams are marked with radial lines spaced for equal Drive piston position increments and concentric lines spaced for equal control loading pressure increments. The ten concentric lines on the cam correspond to the actual control loading pressure increments shown in Table 2 for the specific control system range being used Alter the cam shape as follows

a On the cam selected in step 4 above, locate, for each increment of control loading pressure (concentric lines) that Drive piston position (radial lines) required for the specific loading pressure, as determined in step 4. Refer to Figure 15 for the method of locating these points

b. A curve drawn thru the points located on the cam in step 6a above is the desired cam shape. Either alter cam or cut a new cam to this shape. Caution There is danger of the cam follower becoming locked in case the cam rise is too steep When a cam shape is required that includes such a rise, it is necessary to introduce sufficient angularity in the regulating device linkage to allow a less radical cam shape.

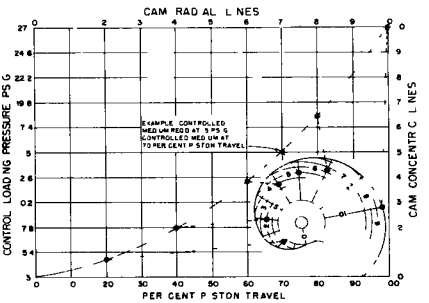


FIGURE 15 - Locating Points for Shaping Cam

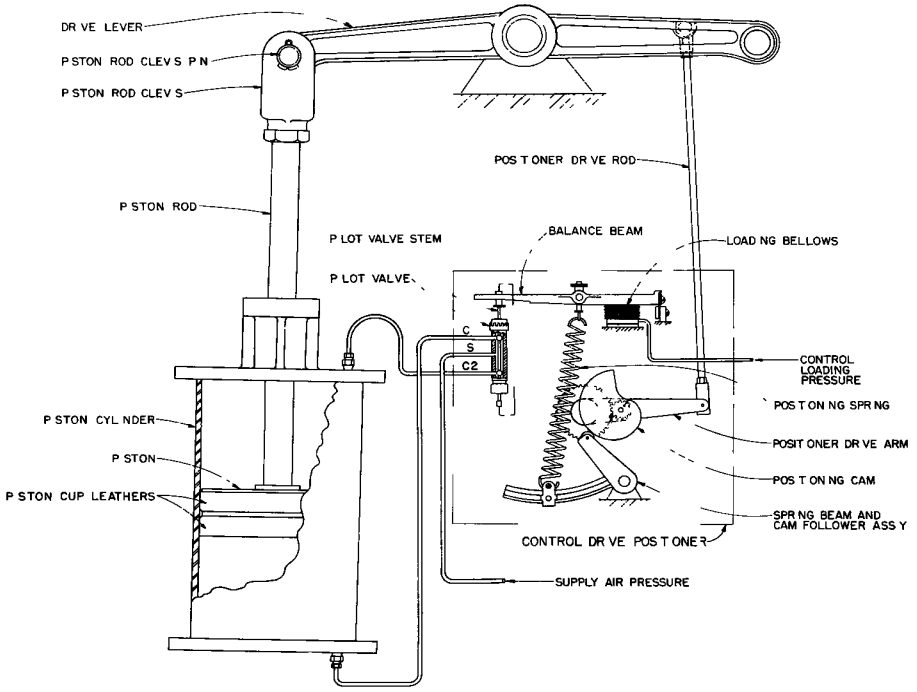


FIGURE 16 Schematic of Positioner

DESCRIPTION OF OPERATION

The power unit of the Control drive is a double acting air cylinder and piston assembly (Figure 16) A differential applied across the piston from the Positioner produces movement of the piston This movement is transmitted thru the piston rod to the Drive Lever which rotates the drive output shaft

The Positioner consists essentially of two opposing forces balanced against each other When the Positioner is balanced, 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 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 piston in the cylinder and the shape of the positioning cam The Positioner drive arm is connected to the drive lever by means of the Positioner drive rod. Thus, for every position of the Drive, the Positioner drive arm assumes a corresponding position The drive arm is geared to the positioning cam which is shaped to give the desired characteristic of piston position vs. control loading pressure

When the forces exerted by the loading bellows and positioning spring (Figure 16) are balanced against each other, the balance beam holds the pilot valve stem in its "neutral" position (that is, the pilot valve stem lands are centered at the pilot ports), creating equal pressures (under no load condition only) on either side of the piston. Thus, the position of the Control Drive is maintained.

When the loading pressure increases or decreases, the force exerted on the balance beam by the loading bellows increases or decreases. Movement of the beam raises or lowers the pilot valve stem, increasing or decreasing the air pressure applied to either side of the piston. As the piston is moved by the differential in pressure thus created, positioning spring tension increases or decreases until (1) the forces exerted by the bellows and spring are again at balance, (2) the pilot valve stem returns to its "neutral" position, and (3) the piston assumes a new position.

Manual Operation

By proper setting of the supply and by-pass valves (see Figure 6) the Control Drive can be positioned manually with the hand lever. When the Drive is in manual operation, the hand lock lever can be set to lock the Drive in the desired position.

Electric Position Transmitter

The Electric Position Transmitter output is applied to a remote-mounted, voltmeter-type indicator for position indication. A drawing of the Electric Position Transmitter assembly, if provided, is included elsewhere in this Instruction Book.

Solenoid Valves

If Solenoid Valves are provided with the Control Drives, the valves are used to position the Drives at either or both extreme positions

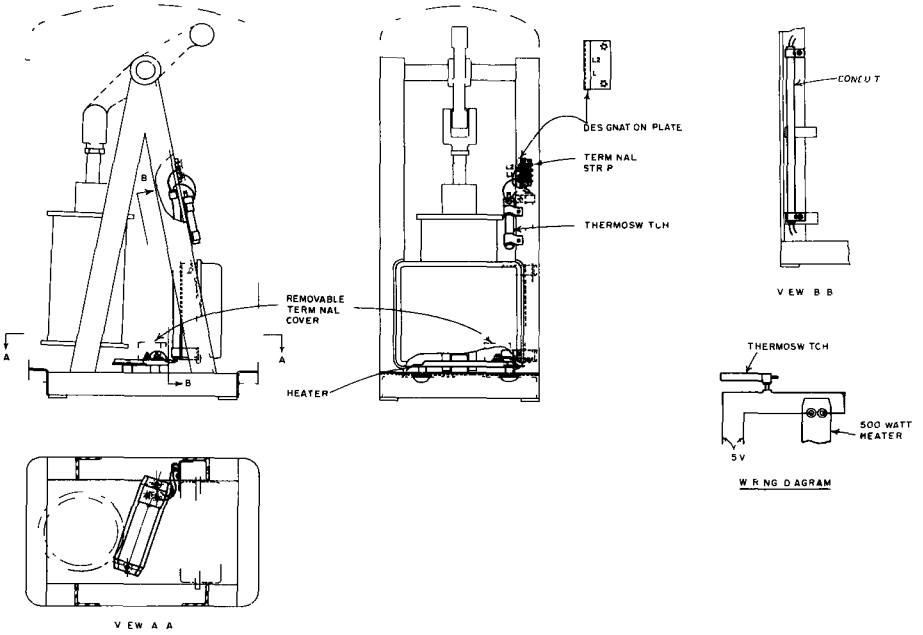


FIGURE 17 - Control Drive with Strip Heater

of the Drive, that is, full open or full closed A drawing of the Solenoid Valve Assembly is included elsewhere in this Instruction Book if the Valves are furnished with the Drive

Heating Elements

Refer to Figure 17 For operating in outdoor applications, heating elements are available for installation within the Drive enclosure Heating elements are recommended for ambient temperatures remaining below 32°F for extended periods A thermostat automatically maintains the temperature at approximately 45°F

Alarm Contacts

Electrical contacts are available to actuate alarm devices or to indicate the piston position for control purposes A description of electrical contacts for the specific Control Drive is given on the applicable Specification Sheet in front of this Instruction Book A drawing of the applicable switch assembly, if provided, is included elsewhere in this Instruction Book

Air Failure Brake

Figure 18 shows the Air Failure Brake in automatic position (operating lever at AUTO) and full air supply pressure available to Control Drive.

In this position the air supply bellows is expanded causing the trigger lever to engage with the brake set lever The tripping lever holds the two brake levers apart so they cannot clamp onto the brake rod, thus the Control Drive is free to operate automatically

In case of a supply air pressure failure with the operating lever in AUTO, the air supply bellows contracts and pulls the trigger lever out of engagement with the brake set lever The

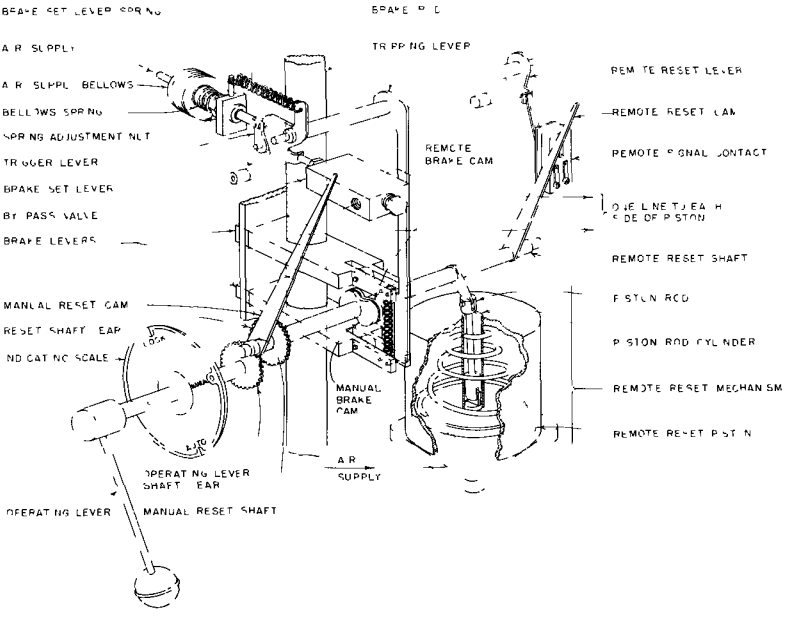


FIGURE 18 - Schematic of Air Failure Brake

brake set lever spring pulls the brake set lever and shaft counterclockwise, causing the tripping lever to release the brake levers so that they clamp onto the brake rod The Control Drive is locked in position. Also, the brake set lever has opened the by-pass valve so that the pressure on both sides of the Control Drive piston cylinder is equal

If a remote signal contact is furnished, air failure will cause the remote reset lever to close the contact This lights a remote signal lamp to denote that the Brake is locked or that the Control Drive is on HAND

After an air failure, the Control Drive may not be operated automatically again until the Brake has been reset, even though full supply air pressure is restored The Brake may be reset manually with the operating lever with the pneumatic remote reset mechanism, if furnished.

When the operating lever is in the RESET position, the operating lever shaft gear has moved the reset shaft gear so that the manual reset cam has contacted the lower end of the brake set lever This moves the brake set lever and shaft clockwise and raises the brake so that it may engage with the trigger lever At the same time, the reset shaft gear has turned so that the manual brake cam has spread the brake levers apart, and the tripping lever falls between the brake levers Also, the brake set lever releases the by-pass valve so that the valve closes, and the remote reset lever allows the remote contact to open turning off the remote signal lamp

If full air supply pressure has been resumed so that the air supply bellows is extended when the operating lever is in the RESET position, the trigger lever will engage with the brake set lever Then when the operating lever has been turned to AUTO, the Brake is reset and the Control Drive may be operated automatically However, if full supply air pressure has not been resumed, the trigger and brake reset levers will not engage and the brake levers will clamp onto the brake rod again when the operating lever is turned to AUTO.

The Brake may be reset from a remote point if a remote release mechanism is furnished With the operating lever in AUTO position, air supply is applied under the remote reset piston when the remote release push button is open (held in) This causes the piston, piston rod cylinder and piston rod to move up. The piston rod turns the remote reset shaft so that the remote reset cam has contracted the lower end of the remote reset lever This moves the brake set lever and shaft clockwise and raises the brake set lever so that it may engage with the trigger lever Further action of the various levers and cams is the same as noted above for the RESET position of the operating brake cam. When the release push-button has been closed (released), the air pressure under the remote reset piston will bleed off so that the piston will resume its normal position at the bottom of the cylinder

The Control Drive may be operated manually only if the Brake operating lever is in the MANUAL position and the Control Drive Positioner supply valve has been turned to HAND CLOSED (for the air supply has failed) so that the air supply is cut off and the air supply bellows has contracted. The Positioner by pass valve, also, may be in its OPEN-HAND position at this time if desired.

When the Brake operating lever is in its MANUAL position, the lever shaft gear has turned the reset shaft gear so that the manual brake cam has spread the brake levers apart to free the brake rod The brake set and remote reset levers remain in such a position, however, as to hold the by-pass valve open and the remote contact closed.

When the operating lever is in LOCK position, the brake levers are clamped onto the brake rod, the trigger lever is disengaged from the brake set lever, and the brake set and remote reset levers hold the by-pass valve open and the remote contact closed.

ROUTINE MAINTENANCE

1. Periodically check all air connections (while under pressure) for leakage with a soapsuds solution.

2. Maintain an air supply free of dirt, oil, or moisture.

3. Lubricate Drive shaft bearings (thru lubricating fittings) with a light grease at least once a year. To lubricate Drives with casings, remove top cover for access to fittings.

4. Apply penetrating oil to clevis pin and Drive stand pin areas to prevent the pins from freezing in the assembly. Frequency of this lubrication depends upon the operating conditions of each Drive.

5. For Control Drives equipped with an Air Failure Brake, whenever Drive is out of service, or at least once a year, test Air Failure Brake to make sure that it is working properly.

6. At least once a year, clean Positioner pilot valve stem and inner liners with a common solvent as follows

a. Lock Drive in position using hand lock lever.

b. Turn supply valve on Positioner to HAND-CLOSED position.

c. Remove pilot stem retaining spring from bottom of fixed pilot cap carefully to avoid bending spring (Figure 8). Remove pilot stem.

d. Remove fixed pilot cap and catch valve liners and spring. If valve liners stick in valve body, tap side of body to jar loose. If liners still stick in valve body, remove adjustable pilot cap and lock nut as a unit to avoid distrubing their positions relative to each other. Then push liners out with a pencil Never use a metal rod

e. Clean liners and stem with solvent. Do not use files, reamers, or abrasives on stems or liners.

f. If adjustable pilot cap and locknut were removed, replace and turn assembly by hand until locknut is tight against pilot body. Replace two upper liners, spring, and two lower liners in valve block.

g. Replace fixed pilot cap and tighten hand tight against valve body. Replace pilot stem spring.

7. If Positioner supply and by pass valves begin to stick, remove valve as noted below and lubricate with Bailey Petcock Lubricant (Part No 19987-1). Lubricate the valve at least once a year. To remove valve, turn nut (Figure 8) out of pilot valve body without changing the position of the handle.

NOTE The valves are not interchangeable, either with each other or other Positioner valves. The valves and valve bodies are marked "1 and "2" to prevent mixup in reassembly.

8. Annually check filters in pilot valve body (Figure 21), replace if necessary.

9. Check Positioner and Control Drive adjustment annually.

10. Completely disassemble and clean Control Drive every year or two. Refer to "Corrective Maintenance", below.

11. Change grease in Positioner gear case once every two or three years. Remove Positioner from Drive (as noted in Figure 1) and fill case half full with Vulcanlube, Grade No. 1, supplied by C. H. Clark Oil Company of Cleveland, Ohio. Rotate gears to work grease into teeth.

CORRECTIVE MAINTENANCE

Removing Casing Access Panels

1. For Control Drives with casings, only the end access panels (Figure 2) are removable. To remove either of the panels.

a. Remove casing cover.

b. With one hand on each casing latch spring and with thumbs on outside of panel to hold it firm, push down on both springs until panel gives way easily.

c. Lift unlatched panel away from bottom of stand.

Cylinder Diameter, Inches	Piston Stroke, Inches	Positioner Pilot Size, Inches	Supply Pressure, psig	Maximum Torque, *Ft. lbs.	Time for Full Piston Travel (Normal), *Seconds	Time for Full Piston Travel with 040" Orifice, *Seconds
6	8	1/8	40	280	12.0	25.0
6	8	1/8	50	400	10.0	25.0
6	8	3/16	40	280	6.0	25 0
6	8	3/16	50	400	5.0	25.0

*No Load

Table 3 - Control Drive Torque and Speed Control Data for Type AC0608□□A Control Drive

2. To replace panel, insert panel in bottom of stand and snap top of panel in place.

Removing Piston and Cylinder Assembly

1 Refer to Figure 1. Remove access panels from Drive casings outlined above (It is not necessary to remove side panels)

2 Disconnect air lines from top and bottom of cylinder.

3. Remove pin assembled thru piston clevis and Drive lever

4. Remove pin attaching cylinder to Drive stand and lift assembly out of stand.

Servicing Cylinder Assembly

1. Thoroughly clean piston and inside of cylinder. Then apply a coating of Molykote pow der mixed to a thin paste with mineral oil to cylinder walls. Apply Vulcanlube Grade No 1 around outside surface of piston cup leathers After assembly, apply 2 ounces of clear mineral oil to cylinder walls

NOTE The purpose of the lubricant is to protect the inside wall of the cylinder from rusting The piston cup leathers are impregnated with a high temperature wax This wax seals pores in the leather making them air tight and sealing the leather against oil and other liquids which do not act as solvents for the wax Therefore, do not attempt to make cup leathers soft and more pliable. Replace leathers if they become hard and brittle and begin to crack

2 If, between overhaul periods, there is reason to believe that piston leathers are stick ing to the cylinder wall causing jerky operation, or air is escaping from either side of the piston, remove 1/8 inch pipe plug from top flange and spray a light mineral oil around inside of cyl inder wall. Use a white mineral oil or liquid petrolatum. To perform this operation, trans- fer the Drive to manual operation and lock the Drive in position with piston at bottom of cylinder.

Removing Air Failure Brake Assembly

1. Refer to Figure 18. Set Brake operating lever in MANUAL position.

2. Remove all tubing connections at Brake and disconnect any wiring

3. Remove nut from bottom of brake rod.

4. Whichever is easier, either remove clevis pin inserted thru brake rod clevis and drive lever (so that brake rod is disassembled from Drive), or position Drive with piston all the way to bottom of cylinder so that brake rod may be swung out when Brake has been dis- mounted from stand.

5. Remove Brake operating lever handle Disassemble bearing at each end of operating lever shaft. Remove right-hand bearing and slide left hand bearing out along shaft. Lift Brake thru slots in mounting brackets and slide Brake off brake rod.

6. To reassemble, perform the above dis assembly steps in reverse order

Recalibration of Drive and Positioner

If the Control Drive has undergone complete maintenance and disassembly, it will be necessary to readjust the Drive in relation to the Po sitioner as outlined in steps 1 thru 13 below This procedure will restore the Drive and Po sitioner to their original factory calibration It may then be necessary to readapt the Drive to its particular application as described under Service Adjustments ', page 12.

Refer to Figure 8 The adjustments below are based on the direct loading arrangement shown in Figure 16 (If the Drive is arranged for reverse loading, its movements and positions are opposite from those for direct loading applications) For direct loading application the position indicator normally SHUT when the piston is at the bottom of the cylinder and OPEN when the piston is at the top The words OPEN and SHUT used below refer to these positions Check these adjustments with linkage to the driven device disconnected from the Drive

1 Use B, straight line, positioning cam, shipped in place in the Positioner

2 Make supply air and control loading pressure connections to Drive at bottom of Drive stand (see Figures 1, 2, and 3). Refer to Table 3 for correct supply air pressure for the specific Drive.

3 Make certain that fixed pilot cap (Figure 8) is tightened securely and that the adjustable pilot cap and lock nut are screwed up tight, with one finger of the locknut engaged in a groove in the cap. If adjustable cap becomes unlocked or if polit valve stem or pilot valve has been disassembled, refer to step 13 before proceeding with adjustment checks

4. Turn supply valve (Figure 6) to AUTO OPEN and by pass valve to CLOSED AUTO Set the control loading pressure at zero psig. Piston should move to SHUT position

5. If cam follower roller does not contact positioning cam at zero mark on cam with piston in SHUT position, disconnect Positioner drive rod and turn rod into or out of ball joint at either end of rod until Positioner drive arm assumes the position which places the follower exactly on zero mark Reconnect drive rod.

6. Set input loading pressure at 3 psig. Piston should remain in its SHUT position If piston begins to move away from its SHUT position, turn zero adjustment nut (Figure 8) clockwise (in half turn increments) to increase tension of positioning spring until piston just remains to SHUT position

7. Increase loading pressure to 3 5 psig Piston should begin to move away from shut position within 10 to 15 seconds If not, turn zero adjustment nut counterclockwise (in half turn increments) to decrease tension of positioning spring. Repeat steps 6 and 7 until correct results are obtained

NOTE for best operating results, when cam follower is at zero on cam, distance between top of spring beam, both at marks 1 and 5, and center of spring pivot on balance beam should be 4 1/2 inches, ±1/16 inch. Although this dimension is not critical, it is suggested that steps 5, 6, and 7 be repeated until dimension has been obtained. However, if any material has been removed from cam at zero point, it will be impossible to obtain this dimension

8 With Drive zero adjustment set properly (steps 5, 6, and 7) and 3 psig applied to loading bellows, balance beam should be mid way between balance beam stop If not, reset the stop to correct position

9 Set input loading pressure at maximum range value (15 or 27 psig). If piston does not move to its full OPEN position loosen clamp screw of range adjustmert and move adjustment along spring beam until piston reaches OPEN position. Lock adjustment in place.

10. Decrease loading pressure to 14.5 or 26.5 psig Piston should move away from its OPEN position within 10 to 15 seconds If not, readjust range adjustment (step 7) to obtain correct result.

11 Set loading pressure at midrange value (9 or 15 psig) Piston should move to its mid travel position. If not, adjust pilot stem adjustment until piston position is correct.

12. Repeat steps 6 thru 11 until piston positions at minimum, maximum, and midrange loading pressures are correct

13. If adjustable pilot cap becomes unlocked or if pilot valve stem or liners are changed, valve ports on liners must be realigned with lands on pilot stem as outlined below (the following assumes that B cam is installed in Positioners)

a. Turn off supply air to Positioner Remove pipe plug at top of piston cylinder (Figure 19), and mount an accurate pressure gage in pipe plug hole.

b Set Positioner by pass valve to CLOSED-AUTO position and set the supply valve for OPEN AUTO position with hand lock lever in AUTO position

c. Make certain fixed pilot cap is tightened securely.

d. Apply midrange loading pressure (9 or 15 psig) to loading bellows. Pressure gage in cylinder should read within ±2 psig of one half supply pressure (25 psig if supply pressure is 50 psig). If gage reading is in correct, disengage the finger of the locknut that is in place in the groove of the adjustable pilot cap (Figure 8). Adjust the pilot cap until gage reads on half supply pressure. Turn lock nut down on adjustable cap until it is tight against the pilot valve body then engage one of the locknut fingers in line with a corresponding groove in the adjustable pilot cap

e Remove pressure gage and place plug in tapped hole in cylinder

f. Repeat steps 1 thru 12 to check Positioner adjustments

REPLACEMENT PARTS

Spare Parts Kits

The Spare Parts Kits shown in Figures 19 thru 26 should be carried in stock Specify the Spare Parts Kit part number to order a complete kit.

Ordering Individual Parts

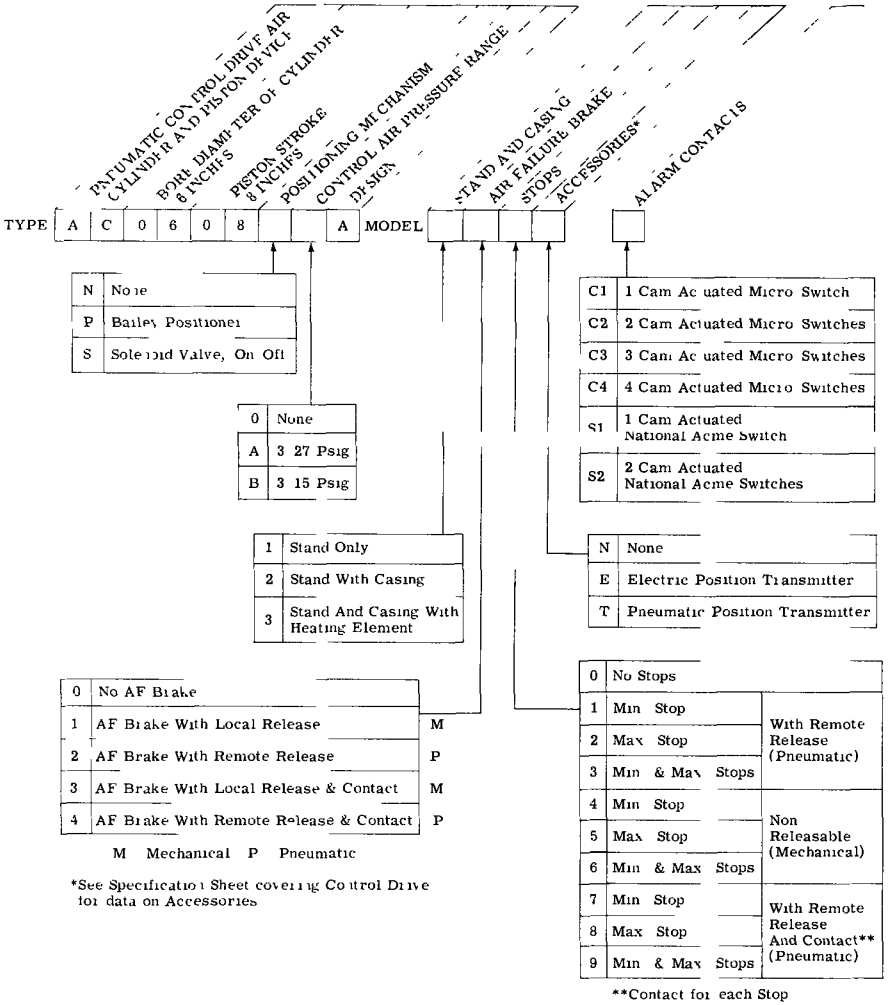
Figures 19 thru 26 are Parts Drawings of the Control Drive, Type AC0608□□A Normally, these Drawings apply to the Drive furnished However, there may be individual differences in specific Drives because of

a design changes made since the printing of this Instruction Section, or

b special design of the Drive to make it suitable for a special application

Therefore, when ordering parts, assure receipt of correct replacements by specifying the complete nomenclature and Serial Number (stamped on instrument nameplate) of the Drive for which parts are desired

EXPLANATION OF NOMENCLATURE



An "X" in any Nomenclature position indicates that the feature is special. An "X" as a suffix to the Type or Model indicates that the unit includes some special feature not covered by Nomenclature.

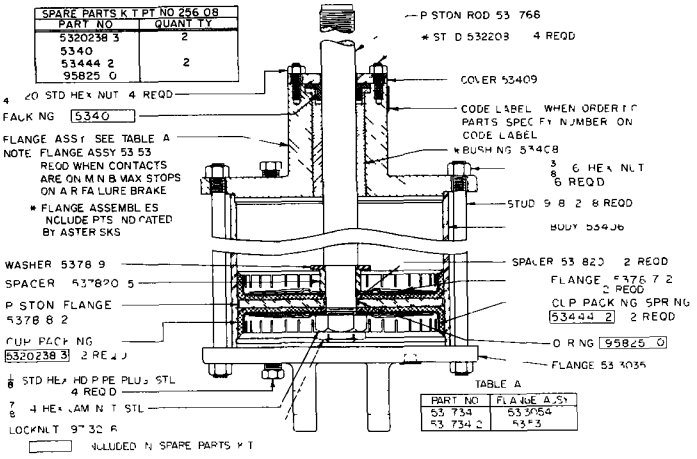


FIGURE 19 Parts Drawing P81-29, Piston and Cylinder Assembly

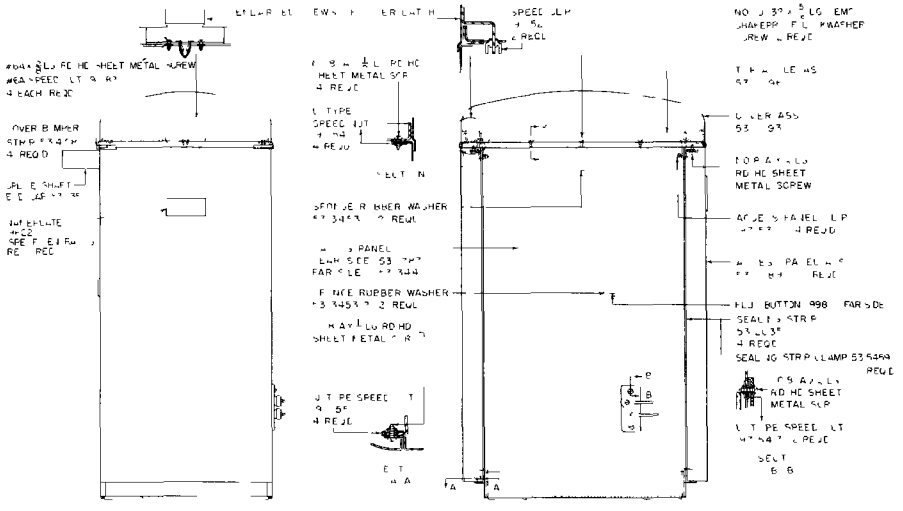


FIGURE 20 - Parts Drawing P81-26, Type AC0608P□A Control Drive Casing Assembly

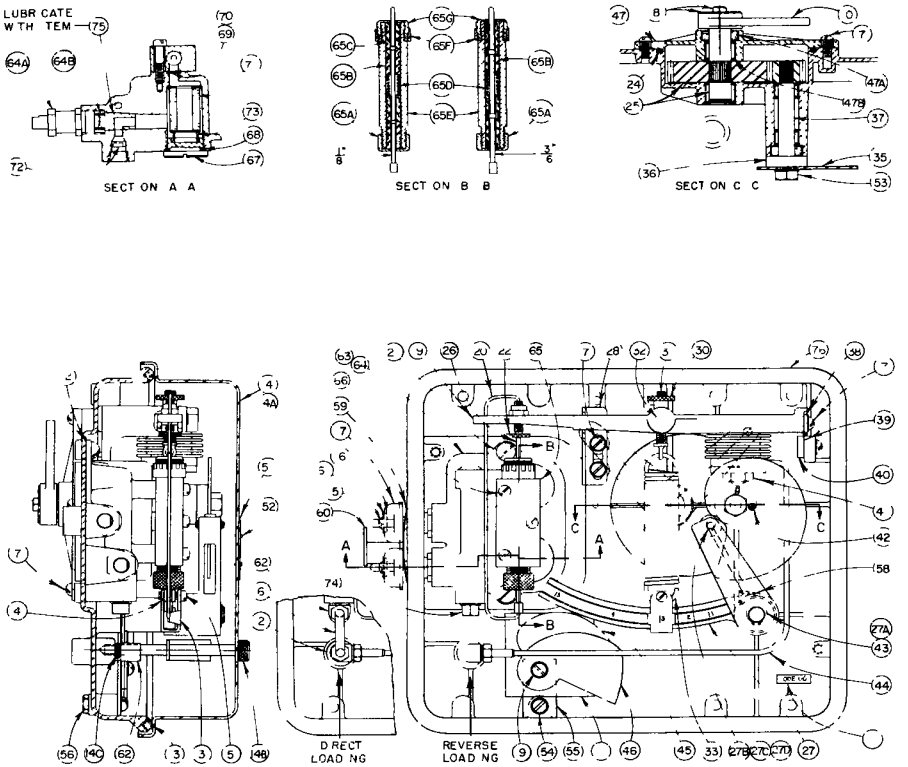


FIGURE 21 Parts Drawing P92 11, Positioner Part No 5311450 □

ITEM	PART NO	NAME
	CODE LABEL	GIVE NO ON LABEL WHEN ORDERING PTS
2	9[illegible] 4	TEE SEE TABLE
3	53 1651	SPRING SUPPORT
4	53 [illegible]06	SLEEVE
5	6 52 1 2	F L HD STN STL SCR
6	53 54	TUB ASSY SEE TABLE
7	] 32x3 8	EXT STN STL SEMS 11 REQD
8	197227	SPECIAL HEX HD S R
10	5311686 1	POSITIONER DR ARM
	53 1816	SPEED CONTROL WASH
12	53 1743 1	PILOT VALVE GASKET
13	3 304	SEALING STRIP
14	53 407 1	COVER ASSY NCL
14A	53 408	COVER
14B	53 1409 1	COVER SCR 2 REQ
14C	96 72 6	RET RING 2 REQ
15	8 32x5 16	RD HD STN STL SCREW 2 REQD
16	NO 8	PLAIN STN STL WASH 2 REQD
17	53 5 63	V HANDLE 2 REQ
19	53 1418	P LOT BEAM ASSY
20	5311458 1	PILOT STEM SPRING
21	1 4 20x3 8	RD HD STN STL SCREW 2 REQD
22	5311451 1	PILOT STEM ADJ SCR
24	5312316 1	SEALING TUBE
25	53 433	GEAR & SHAFT ASSY
26	SEE TABLE	P LOT STEM*
27	53 1423 1	SPG BEAM ASSY INCL
27A	5311424 1	CUMPO BR 2 REQ
27B	53 1425 1	CAM ROLLER
27C	197164 15	RET RING 2 REQ
27D	53 1446	CAM ROLLER PIN
28	5311457 1	P LOT BEAM STOP
29	NO 6 0 10	SHK LK WASH STN STL
30	5311443	ADJUST NG NUT
31	53 1436 1	EYE BOLT
32	53 447	ADJUST NG P VOT
33	SEE TABLE	SPRING
35	SEE TABLE	STRAIGHT LINE CAM B
36	53 1432 1	CAM HUB
37	53 428 1	CAM SHAFT & P NION
38	53 4 5 1	SPRING RETA NER
39	5311444 1	P LOT BEAM SPRING
40	53 875	SPRING RETA NER
41	5 16 18	HEX JAM STN STL NUT
42	97185	SET SCREW
43	197164 37	RETAINING RING
44	53 1452 1	BELLOWS & TUBE ASSY
45	SEE TABLE	SQUARE CAM
46	SEE TABLE	SQUARE ROOT CAM A
47	5312314 1	REAR BRG COVER INCL
47A	5312313	OIL SEAL
47B	5311421 2	NEEDLE BEAR NG
5	SEE TABLE	NAMEPLATE
52	NO 0x1 8	RD HD STN STL THD FORM NG SCR TYPE U 4 REQD
53	NO 1 4 20	EXT KEPS LK WASH STN STL
54	0 32x7 8	EXT RD HD SEMS STN STL
55	5318943 1	SP CAM MTG BRKT
56	10 32	HEX STN STL NUT
58	5317070 1	TORS ON SPRING
59	5311564 1	SPRING
60	53 2 8 2	LATCH
61	4804 09 0 4102	SHK LK WASH STN STL 2 REQD
62	1951187 1	ELBOW
63	SEE TABLE	PILOT V & BLK ASSY NCL ITEMS 64 THRU 73
64	SEE TABLE	PILOT V BLK ASSY INCL
64A	53 1401 1	VALVE NUT 2 REQ
64B	5311402 1	SPRING 2 REQ
65	SEE TABLE	P LOT VALVE ASSY NCL
65A	58108 1	CAP FOR 3 PILOT VALVE
	53 1959	CAP FOR 3 6 P LOT VALVE
65B	58687 2	VALVE SEAT 2 REQ FOR 8 PILOT V
	53118[illegible] 1	VALVE SEAT 2 REQ FOR 3 10 P LOT V
65C	58879 1	SLEEVE 2 REQ FOR 8 PILOT V ONLY**
65D	53 1426	PILOT VALVE SPO
65E	5311436 1	VALVE BODY
65F	536485 1	CAP LOCK NUT
65G	53648	ADJ CAP
66	10 32x7 8	EXT RD HD STN STL SEMS 3 REQD
67	531 4 9	FILTER CAP 3 REQ
68	5311428 1	O RING GASKET 3 REQ
69	5311802	CONN PLUG SEE TABLE
70	5311428 2	O RING GASKET 8 REQ
71	5321839 1	FIL WASH & DISC ASSY 3 REQ
72	5313030	F LTER CUP 3 REQ
73	5311427 1	FILTER SPO 3 REQ
74	1/8 2 NPT	SQ HD STD BRASS PIPE PL G
75	998 1	BAILEY PETCOCK LUBRICANT
76	SEE TABLE	BACKPLATE ASSY

TABLE OF VARIABLE PARTS

Positioner Part No.	USUAL USE	PILOT SIZE	CAM STROKE	RANGE PSIG	ITEM 26*	ITEM 76	ITEM 26*	ITEM 33	ITEM 35	ITEM 45	ITEM 46	ITEM 51	ITEM 63	ITEM 64	ITEM 65
53 1450 1	DRIVE	1 8	FULL	3 27 or 5 25	OMIT	5311412 1	5311439 1	5311444 1	5311448 1	531 341	5311449 1	196800 1	5311397 1	5310050 1	53 4879
53 450 2	VALVE	8	HALF	3 27 or 5 25	1 REQ	5311412 1	5311439	5311444	5311798 1	5311798 1	5312226 1	196800 2	5311397 2	5310050 2	5314879
531 450 3	DRIVE	3 16	FULL	3 27 or 5 25	OMIT	531 412 1	5311827 1	5311444 1	5311448 1	531134	53 1449 1	196800 3	5311397 3	5310050 1	5314880
53 450 4	DRIVE	1 8	FULL	3 15	OMIT	5311412 1	5311439 1	5316767 1	5311448 1	53 134 1	53 1449	196800 4	5311397 1	5310050 1	5314879
5311450 5	VALVE	8	HALF	3 15	1 REQ	53 1412	53 439	5316767 1	5311799 1	5311799 1	5312226 1	196800 5	53 1397 2	5310050 2	5314879 1
53 450 6	DRIVE	3 16	FULL	3 5	OM T	53 1412 1	5311827 1	5316767 1	5311448 1	53 34	531 449	196800 6	5311397 3	5310050 1	5314880 1
531145 7	DRIVE	8	FULL	3 27 or 5 25	OM T	5311412 1	5314747 1	5311444 1	53 448 1	5311341 1	5311449 1	196800 29	5311397 1	5310050	53 4879 1
531 450 8	DRIVE	1 8	FULL	3 15	OMIT	53 14 2	53 4747 1	5316767 1	5311448 1	5311341 1	5311449 1	196800 30	531 397 1	5310050 1	5314879 1
53 1450 9	VALVE	3 16	BLANK	3 27 or 5 25	1 REQ	5311412	5311827 1	5311444 1	5320078 1	53200 8	5320078	196800 8	5311397 4	5310050 2	5314880 1
53 450 0	VALVE	3 8	HALF	3 15	1 REQ	531 4 2	53 827	53 6787 1	53 1799 1	5311798 1	5312226 1	196800 9	5311397 4	53 6050 2	53 4880 1
5311450 11	**	1 8	HALF	3 27 or 5 25	OMIT	5311412 1	5311439 1	5311444 1	5311799 1	531 798	53 2228	196800 10	5311397 1	5310050 1	53 4879
5311450 2	VALVE	8	FULL	3 27 or 5 25	1 REQ	5311412 1	531 439	53 444 1	5311448	5311341 1	5311449 1	196800 17	531 397 2	53 6050 2	53 4879 1
531 450 13	VALVE	1 8	FULL	3 15	1 REQ	531 412	5311439	5316767 1	5311448 1	5311341 1	5311449 1	196800 18	5311397 2	5310050 2	5314879 1
5311450 14	DRIVE	1 8	FULL	3 15	OMIT	532198*	5314747 1	5316767 1	53 1448 1	531134	53 449 1	196800 31	5311397 1	5310050 1	53 4879
5311450 15	DRIVE	8	FULL	3 27 or 5 25	OM T	5321987 1	5314747 1	531 444 1	5311448 1	5311341	5311449 1	196800 32	5311397 1	53 6050	5314879 1

SPARE PARTS KITS

KIT NO 25600		KIT NO 25600 2		KIT NO 25600 3	
FOR POSITIONER PART NOS 5311450 1 2 4 5 12 13 1 8 PILOT SIZE		FOR POSITIONER PART NOS 5311450 3 6 9 10 3 16 PILOT SIZE)		FOR POSITIONER PART NOS 531450 7 8 14 15 1 8 PILOT SIZE)	
QUANTITY	ITEM NO SEE NOTE 1	QUANTITY	ITEM NO SEE NOTE 1	QUANTITY	ITEM NO SEE NOTE
EACH	20 26 27 45 47 50 54 55 58 59 60 61	EACH	20 26 27 45 47 50 54 55 58 59 60 61	1 EACH	20 26 27 45 47 50 54 55 58 59 60 61
2 EACH	27C 65B 65	2 EACH	27C 65B	2 EACH	27C 65B 65C
2	33 SEE NOTE 2	2	33 SEE NOTE 2	2	33 SEE NOTE 2
3 EACH	68 70 71 73	3 EACH	68 70 71 73	3 EACH	68 70 71 73

NOTES

1 WHERE THE ITEM SPECIFIED IS A VARIABLE PART THE PART APPLICABLE TO THE POSITIONER LISTED IS INCLUDED IN KIT

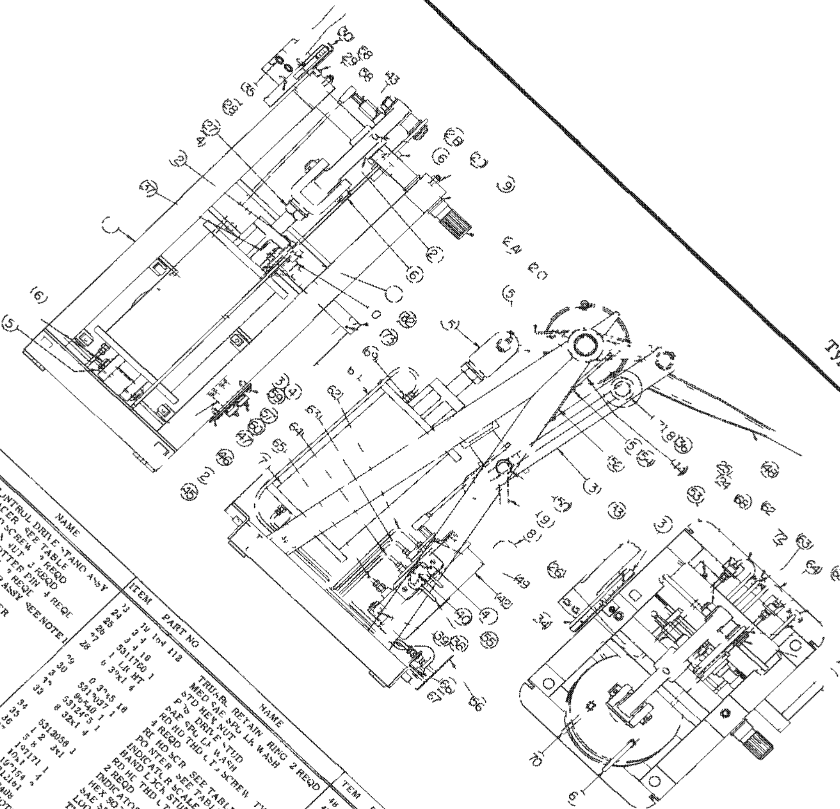
2 KIT INCLUDES RANGE SPRING 531 444 1 FOR 5 25 or 3 27 PSIG AND 5316767 1 FOR 3 15 PSIG)

*FOR PISTON OPERATED VALVES SUBSTITUTE STEM 5314747 1 FOR STEM 5311439 1 F HUNTING CYCLE OCCURS

**DUAL OPERATOR

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

List of Parts for Parts Drawing P92-11



ITEM	PART NO	NAME
1	53 4X) 1	CONTROL DRIVE STAND ASSY
2	5311163 1	SPACER SEE TABLE
3	8 32x3 4	RE HD SCREW 4 REQD
4	8 32	STD HEX NUT 2 REQD
5	531 63	STEEL COTTER PIN 2 REQD
6	5311 67 1 4	CLEVIS PIN 4 REQD
7	5311 34 1	AIR CYLINDER ASSY SEE NOTE 1
8	5313192 1	LEVER KNOB
9	51 ?45? 1	HAND LOCK LEVER
10	5312459 1	BUSHING
11	531?036 1	STOP PLATE SPACER
12	5312453 1	CLAMP PLATE ASSY
13	531?450 1	SLOTTED BAR
14	1 14	HEX JAM NUT
15	5311?56 1	CLEVIS
16	531 ?43 1	STOP PLATE ASSY
17	5 8	STD WROT WASHER
18	5 8 18x1 1 2	HEX HD CAP SCREW
19	197164 137	TRUARC EXT RETAINING RING 2 REQD
20	197105 1	ALEMITE FITTING 2 REQD
21	531 6? 1	CONTROL DRIVE SHAFT & LEVER ASSY INCLUDES
	5311?03 1	SPLINE SHAFT
	3DIA ?	ROLL PIN
	?1764 1	CYLINDER LEVER
	?51 1	SLOTTED BAR SHAFT

ITEM	PART NO	NAME
23	19 104 112	TRUARC RETAIN RING 2 REQD
24	3 4 18	MED SAE SPG LK WASH
25	5311760 1	STD HEX NUT
26	1 LK HT	P76 DRIVE STUD
27	6 32x1 4	SAE SPG LK WASH
28		RD HD THD CTG SCREW TYPE 4 REQD
29	0 3?45 18	RE HD SCR SEE TABLE
30	531?037 1	POINTER SEE TABLE
31	96540 1	INDICATOR SCALE
32	53124?5 1	HAND LOCK STUD
33	8 32x1 4	RD HD THD CTG SCR TYPE 2 REQD
34	5312058 1	INDICATOR DRUM
35	1 2 3x1	HEX SQ HD CAP SCR 2 REQD
36	1 5 8	SAE SP LK WASH
37	197171 1	LOCK NUT
38	1041	TYPE 2 THD FORM SCR 4 REQD
39	197154 4	SPEED NUT 4 REQD
40	5311161	SAFETY LATCH
41	53 3408	LATCH SPRING 2 REQD
42	SEE NOTE 2	POSITIONER
43	NO 1230 01	SHAKEPROOF LK WASH
44	5314334 1	POSITIONER LINK
45	53 103 1	VALVE EXTENSION 2 REQD
46	5312162 1	BEARING PLATE
47	8 32x2 1 4	RE HD SCREW 2 REQD

ITEM	PART NO	NAME
48	531 756	HAND OPR LEVER
49	1 1?	STL HEX NUT
50	981744 1	NAMEPLATE
51	7 97 ?1 1	FLAT SPEED NUT 4 REQD
52	7 62??	NAMEPLATE
53	? 3?x1 2	TYPE THD CT SCR SEE TABLE
54	2 56x1 4	RD HD SCREW 4 REQD
55	53 1453 1	VALVE HANDLE 2 REQD
56	5312454	CASTING ASSY SEE NOTE 3
57	GR4A1	SEE TABLE
58	NE 8	STD STEEL WASHER 2 REQD
59	1?U 6	SHAKEPROOF LK WASH SEE TABLE
60	NO 1303 00	SHAKEPROOF LK WASH 2 REQD
61	4808 09 01	AIR LINE ASSY
62	53 371 1	C1 AIR LINE ASSY
63	5313718 1	SUPPLY AIR LINE ASSY
64	53 3? 1	C2 AIR LINE ASSY
65	5313714 1	LOADING AIR LINE ASSY
66	5313 15 1	RE HD EXT SEMS 8 REQD
67	6 32x5 16	HEX NUT STEEL 8 REQD
68	6 32	CONN ASSY 6 REQD
69	532205 1	MALE CONN
70	1951054 3	AIR LINE ASSY
71	5313744 1	CONN ASSY
72	53 61? 8	CONN ASSY
73	537913 8	ROLL PIN
	3 16DIA ?	

ITEM	NO REQD
	...D FOR MODEL 1000 ...OR MODEL 2000 3
	...MODEL 1000 ...EL 2000 1
	...000
53	OMIT FOR MODEL 1000 1 REQD FOR MODEL 2000 3
56	OMIT FOR MODEL 1000 1 REQD FOR MODEL 2000 3
58	3 REQD FOR MODEL 1000 2 REQD FOR MODEL 2000 3

NOTES

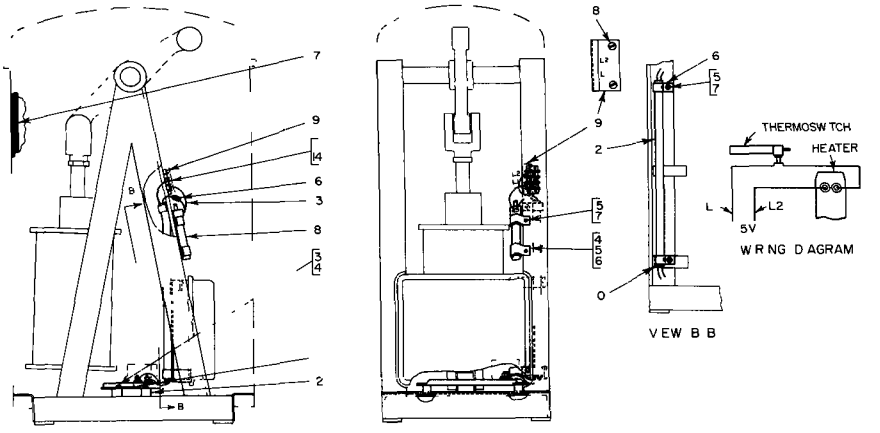
1 FOR DETAILS OF AIR CYLINDER FOR A 608PDA SEE PARTS DRAW NO PS 21

2 FOR PART NUMBER AND DETAILS OF POSITIONER SEE PARTS DRAW NO PS2 11

3 FOR DETAILS OF CASTING ASSEMBLY SEE PARTS DRAW NO PS 26

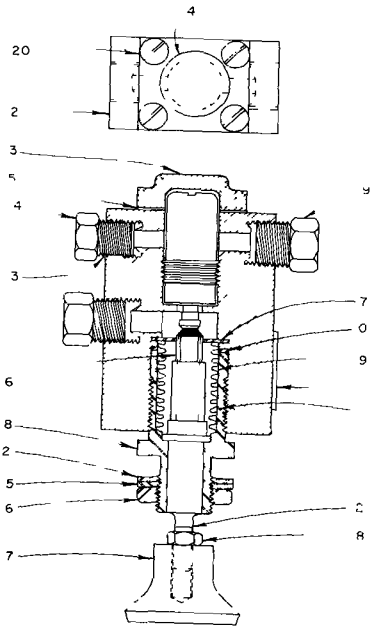
...31 25, Type AC0608PDA Control Drive and Stand Assembly

Ty...



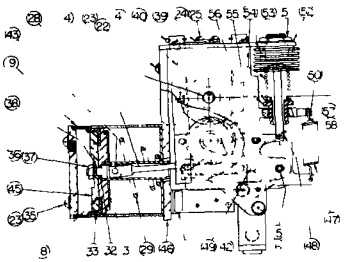
ITEM	PART NO	NAME
1	1943002 1	STRIP HEATER
2	5316458 2	SPACE SLEEVE 2 REQD
3	10 32x1 1 2	RD HD THD CUTTINC SCR 2 REQD
4	NO 10	WASHER 3 REQD
5	5316459 1	TUBE CLAMP PLATE
6	195105 10	TUBE CLAMP 3 REQD
7	10Zx5 8	RD HD SHEET METAL SCREW 3 REQD
8	662460 1	THERMOSWITCH
9	194956 3	TERMINAL STRIP
10	194928 1	FIBER BUSHING 2 REQD
11	8Zx3 4	RD HD SHEET METAL SCREW 2 REQD
12	R4524 0015	B M CO NO 11 CONDUIT 15 REQD
13	R2041 0250	B M CO NO 59 LEAD WIRE 4 REQD
14	C1778 8Z 1	TINNERMAN SPEED NUT FLAT TYPE 4 REQD
15	C1 79 10Z 1	T NNERMAN SPEED NUT FLAT TYPE 3 REQD
16	1941401 3	SOLDERLESS TERMINAL
17	5318366 10	FIBER GLASS INSULATION 8 3 REQD
18	8Zx1	RD HD SHEET METAL SCREW 2 REQD
19	661234 5 1	DESIGNATION PLATE ASSEMBLY

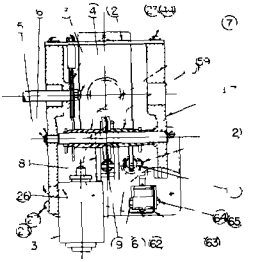
FIGURE 23 - Parts Drawing P81-39, Strip Heater



ITEM	PART NO	DESCRIPTION
1	CODE LABEL	SPECIFY NUMBER WHEN ORDERING PARTS
2	535751 1	BODY
3	535199 1	VALVE ASSEMBLY
4	53016 1	COVER
5	535744 1	GASKET
6	19783 1	NUT
7	532488 1	GUIDL WASHER
8	5313010 1	VALVE NUT
9	192179 1	BELLOWS
10	53710 2	WASHER
11	53736 1	SPACER
12	5313009 2	PUSH ROD
13	53211 1	ADAPTER WASHER (WITHOUT BLEED)
	53211 3	ADAPTER WASHER (WITH BLEED)
14	195158 1	CONNECTOR NUT
15	#1224 00	SHAKEPROOF LOCKWASHER
16	5313012 1	SPECIAL NUT
17	531311 1	PUSHBUTTON
18	8 32	HEX NUT
19	195156 2	CONNECTOR NUT 2 REQD
20	6 32×3, 8	ROUND HEAD SCREW, 4 REQD
21	19734 33	WASHER

FIGURE 24 Parts Drawing P99 116, Pushbutton, Part No 5315129 □





ITEM	PART NO	NAME
1	1961056 1	CODE LABEL
2	5312589 1	SUPPORT PLATE
3	5311774 1	DRIVING GEAR
4	197120 4	ELASTIC STOP NUT
5	5311783 1	CAM SHAFT
6	197164 25	TRUARC RETAINING RING
7	5312616 1	MANUAL SHAFT ASSY
8	5313773 1	BRAKE LEVER ASSY 2 REQD
9	5311773 1	SPRING
*10	5312615 1	RESET SHAFT ASSY
*11	1 16x1 2	COTTER PIN CAD PL STL
*12	5311682 1	CLEVIS PIN
13	535745 2	BY PASS VALVE
14	5311786 1	GEAR SHAFT
15	19"164 18	TRUARC RET RING 2 REQD
16	5312598 1	TRIGGER SHAFT
17	5312586 1	HOUSING
*18	5313795 1	STRIP EXPANDER
*19	5318578 1	RESET CYL & FLG ASSY
22	10 32x1 2	PAN HD CAD STL SCR 4 REQD
23	1210 00	CAD PLT STL SHKPRF LOCK WASHER 13 REQD
24	6 32x5 16	PAN HD CAD PLT STL SCR 2 REQD
25	1206-00	CAD PLT STL SHKPRF LOCK WASHER 2 REQD
26	1 8x1 2	TYPE I GROOVE PIN
27	10 32x9 16	PAN HD CAD PLT STL SCREW 2 REQD
*28	5313724 1	RESET CONN LINK
*29	5312608 1	RESET SPRING
*31	5312607 1	RESET PISTON & GUIDE ASSY
*32	5311428 3	O RING GASKET
*33	5313726 1	CUP PACKING
*35	10 32x3 1 4	PAN HD CAD PLT STL SCREW 4 REQD
*36	1,4 28	REG SF STN STL HEX JAM NUT
*37	1114 00	CAD PLT STL SHKPRF LOCK WASHER
*38	5313725 1	RESET PISTON CLEVIS
39	5313813 1	SPRING RETAINING PLATE
40	1,16x3 4	COTTER PIN CAD PLT 2 REQD
41	5311784 1	RATCHET SPRING
42	5312603 1	RESET LEVERS & SHAFT
*43	5313727 3	RESET CLEVIS PIN
44	10 32x3 8	PAN HD CAD PLT SCR 7 REQD
*45	5312606 1	PISTON FOLLOWER PLATE
46	5313334 .	BOTTOM PLATE
47	5312594 1	TRIGGER SPRING
48	5313733 1	TRIGGER LEVER & PIVOT ASSY
49	5312619 1	PUSH ROD ASSY
50	5313190 1	SPRING HOLDER
51	531757 1	LOCK NUT
52	5311779 1	BELLOWS END WASHER
53	5311771 1	TRIGGER BELLOWS ASSY
54	5313738 1	TRIGGER BELLOWS SPRING
55	5313737 1	SPRING BUSHING
56	5311777 1	SPRING ADJ NUT
57	49137 10	PIVOT SHAFT
58	19737 1	SNAP FASTENER 2 REQD
59	5313185 1	SPACER
61	6 32	HEX NUT 2 REQD
62	1941187 1	MICRO SWITCH
63	661643 1	SWITCH INSULATOR
64	6 32x7 8	RD HD SCREW 2 REQD
65	1206 00	SHKPRF LK WASH 2 REQD

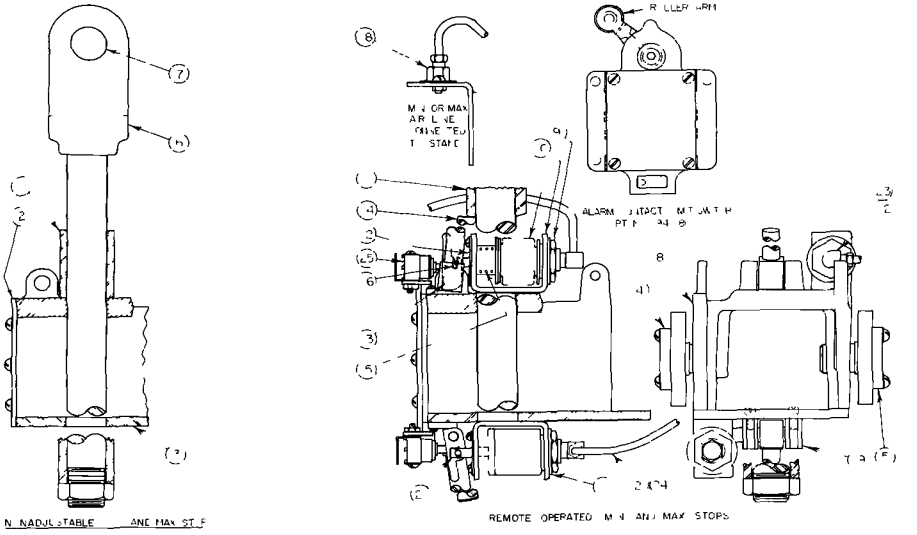
AIR FAILURE BRAKE	RELEASE	PARTS REQUIRED
PT NO 5312600 1 *PT NO 5312600 2	REMOTE MANUAL	ITEMS 1 THRU 58 ITEMS 1 THRU 59 EXCEPT THOSE MARKED BY ASTERISK

SPARE PARTS KITS PART NUMBERS

256120 1 FOR AIR FAILURE BRAKE 5312600 1	
QUANTITY	ITEM NO
1	32
1	33
1	47
1	53

256120 2 FOR AIR FAILURE BRAKE 5312600 2	
QUANTITY	ITEM NO
1	47
1	53

FIGURE 25 - Parts Drawing P81-65, Air Failure Brake, Part No 5312600-□



PARTS REQUIRED TO ADD MAXIMUM OR MINIMUM STOP TO AC0608PDA AC0816PDA AND AC1016PDA WHEN AIR FAILURE BRAKE IS NOT PROVIDED

ITEM NO	PART NO	NAME
1	5313820 1	STOP TUBE
2	5312589 1	SUPPORT PLATE
3	5313334 1	BOTTOM PLATE
4	5312597 1	TRUNNION SHAFT
5	5311785 1	TRUNNION SHAFT
6	5313987 1	ROD & CLEVIS ASSY
7	5313852 1	CLEVIS PIN
8	5312586 1	HOUSING

PARTS REQUIRED TO ADD REMOTE OPERATED MAXIMUM AND OR MINIMUM STOP TO AC0608PDA AC0816PDA AND AC1016PDA DRIVES WHEN AIR FAILURE BRAKE IS NOT PROVIDED

ITEM NO	PART NO	NAME	ITEM NO	PART NO	NAME
1	5317066 1	STOP TUBE	16	661453 1	SHAFT RETAINER
2	5312589 1	SUPPORT PLATE	17	5311779 1	BELLOWS END WASHER
3	5313334 1	BOTTOM PLATE	18	537612 1	CONNECTOR ASSY
4	5312597 1	TRUNNION SHAFT	19	5312629 1	LOWER BEARING 2 REQD
5	5311 85 1	TRUNNION SHAFT	20	196158 1	CONNECTOR NUT 4 REQD
6	5317069 1	ROD & CLEVIS ASSY	21	53 2621 1	PUSH ROD ASSY
7	5313852 1	CLEVIS PIN	22	196118" 1	ELBOW CONN
8	5312586 1	HOUSING	23	195174 3	INVERTED TEE CONN SEE NOTE
9	53175" 1	LOCK NUT	24	3 16 O D	FLASH NICKEL PLATED COPPER TUBING 18 REQD SEE NOTE
10	5312592 1	BELLOWS SUPPORT			
11	5312595 1	BELLOWS ASSY	25	1941187 1	MICRO SWITCH
12	5312590 1	SPRING RETAINING PLATE			
13	5319624 1	SHAFT & HUB ASSY			
14	5313986 1	STOP PIN			
15	5311772 1	SPRING			

NOTE ITEMS 23 & 24 ARE REQUIRED ONLY WHEN BOTH MINIMUM AND MAXIMUM STOPS ARE USED

FIGURE 26 Parts Drawing P81 43, Accessories