Jordan CONTROLS

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INSTALLATION & MAINTENANCE INSTRUCTIONS FOR MV-1100 SERIES LINEAR ELECTRIC VALVE ACTUATOR

Due to wide variations in the terminal numbering of actuator products, actual wiring of this device should follow the print supplied with the unit.

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I. Description

A. General

A single phase, reversible, three wire, capacitor run motor produces torque at the motor pinion gear. This torque is further increased (with a corresponding decrease in speed) through 3 or 4 stages of spur gearing. The final output shaft is supported with bronze bushings and thrust needle bearings. This rotary output shaft protrudes thru the gearbox housing and provides an acme power thread.

Running along the thread is a drive nut (manufactured of a low friction, long wearing, self-lubricating, plastic material) which allows the high torque, low speed rotary shaft output to be converted to linear thrust and also prevents the unit from back-driving when the motor is de-energized. The drive nut is retained from turning by a shoulder screw which projects radially from the nut and rides in a precision machined groove. In addition to preventing the drive nut from rotating, the shoulder screw provides a direct indication of linear movement. The drive nut is housed in a cast aluminum housing which provides a means of mating a valve to the actuator. Located in the opposite end of the drive nut is a preloaded compression spring and a drive nut coupling which is threaded to mate up to the valve stem. The spring and drive nut coupling are retained by a snap spring and are protected from contaminants by a seal. This spring provides "soft-seating" of the valve: with the valve in the fully closed position the spring is further compressed .03" which guarantees a positive seating force with the drive nut positioned with reasonable accuracy. The housing is gasketed to the gearbox housing and features a gasketed "lexan" window over the position indicator (shoulder screw) and a seal around the O.D. of the drive nut.

Also a fine pitch gear is affixed to the rotary output shaft which provides feedback indication (position switches and a potentiometer if required.)

II. Installation

A. Storage

If the actuator will not be installed immediately, it should be stored in a clean, dry area where the ambient temperature is not less than -20° F. The actuator should not be stored in a corrosive environment.

B. Customer Valve Mounting Procedure

NOTE: The MV-1100 series actuator has been preset for your stroke requirement.

1) Run actuator to the full extend (valve closed) position.
2) Insert the valve through the hole in the linear thrust assembly housing. Drop body nut and packing nut over valve stem but do not thread on.

    a) most valves are mounted with a body nut supplied with the valve.
    b) some valves will require removal of the stem packing nut to allow removal of the body nut.

3) Run two hex jam nuts onto the valve stem as far as possible and "jam" together to provide a means of rotating the valve stem.
4) Using an open wrench, begin to carefully thread the valve stem into the drive nut coupling. Thread and tighten valve body nut and packing nut.
5) Continue to thread valve stem into drive nut coupling using an open end wrench on the nut coupling "flats" to resist rotation until the nut coupling is moved toward the actuator .030". Check with straightedge. See page 12 for drawing.
6) Run actuator full open and return to the fully closed position. Recheck with straightedge. Readjust and repeat if necessary.

NOTE: If valve does not fully open, check for proper limit switch settings or vale stem interference. Shorten valve stem if it touches the rotary output shaft when valve approaches the full open position.

7) Apply thread sealant to valve stem/nut coupling to create watertight seal. Loosen jam nuts and run up against nut coupling.

B. Customer Valve Mounting Procedure cont.

8) The valve mounting is now complete and the valve is "soft-seated" at the rated output thrust.
9) Reverse above procedures to remove valve.

C. Calibration

For the unit to function properly, the 4 mA end of the feedback potentiometer must be preset to 50 ohms. This will ensure linearity across the active region of the feedback potentiometer. Both the RANGE and the ELEVATION adjustments interact. The ELEVATION sets the 4 mA point and the RANGE sets the 20 mA point.

1) Position the actuator to the valve "closed" position.
2) Adjust ELEVATION for 4 mA.
3) Position the actuator to the valve "open" position.
4) Adjust RANGE to 20 mA.
5) Repeat all steps until no further adjustment is necessary, as RANGE and ELEVATION do interact.
6) To reverse the 4 - 20 mA output, interchange the blue and yellow transmitter wires and adjust ELEVATION with the valve "open" and RANGE with the valve "closed".

III. Actuator Alignment

A. General (With gearbox removed from linear thrust assembly and all field wires disconnected)

1) Connect an ohm meter across terminals 4 and 5 of the actuator.
2) Trace the wire from actuator terminal 3 to a position limit switch. This switch is the actuator clockwise end of travel switch. When the actuator is mounted on the valve operator assembly, this switch will be referred to as the valve "CLOSE" position limit switch.
3) Apply ac power across terminals 1 and 3. The actuator output shaft will rotate clockwise until the switch is tripped. With the ohm meter monitoring terminals 4 and 5, adjust the switch to stop the actuator with approximately 50 ohms at terminals 4 and 5.
4) With a pen or pencil, mark the face of the actuator and the output shaft. This will be the starting position to count the number of output shaft turns for preliminary setting of the counterclockwise or valve "OPEN" position limit switch. At this time it is beneficial to know the stroke length of the stem on the valve to be positioned. the drive screw in the valve operator assembly requires three turns to stroke a valve stem .25 inch. The maximum stroke of the valve operator is .75 inch, which represents 9 turns of the actuator output shaft. The chart below can be used to determine the output shaft revolutions for any stroke from 0 through .75 inch.

	Actuator Output Shaft Revolutions	Valve Stroke (inches)
	0	0"
	1	.08"
	2	.17"
plus 1/3	3	.25"
revolution	4	.33"
if valve is	5	.42"
"soft-	6	.50"
seated"	7	.58"
	8	.67"
	9	.75"

Apply ac power to actuator terminals 1 and 2, count the number of output shaft revolutions and adjust the counterclockwise (open) position limit switch to stop the actuator at the number of revolutions selected. while the actuator is running to this position, the ohm meter monitoring terminals 4 and 5 should show a steady linear increase of resistance. the final resistance read when the limit switch is activated should fall between 650 and 950 ohms for a 1000 ohm feedback potentiometer. If the resistance does not end up within this range, recheck Step 3. Failure to fall within these ranges could indicate a defective potentiometer, incorrect gearing or improper alignment.

A. General cont.

5) Remove ac power from terminals 1 and 2 and apply power across terminals 1 and 3. The actuator output shaft should rotate clockwise until the close switch trips, and the potentiometer resistance across terminals 4 and 5 should again be about 50 ohms. Remove the power from the terminal 3 and apply it to terminal 2. With the actuator again running counterclockwise, recount the number of revolutions until the open switch stops the actuator. Leave the actuator in this position and disconnect the power.

B. Alignment - Gearbox to Linear Thrust Assembly

1) Run actuator to full clockwise position (looking at rotary output shaft) - valve closed.
2) Lubricate rotary output shaft threads with AMOCO-RYKON PREMIUM GREASE No.2.
3) While supporting linear thrust assembly carefully thread rotary output shaft into drive nut (*be careful not to strip threads in plastic drive nut.*)
4) continue to rotate linear thrust assembly until indicator is aligned with closed position on indicator label and install two 5/16" socket head cap screws and lockwashers.
5) Assembly is now complete. Run actuator fully open and return to fully closed to verify proper operation.
6) Install valve per Customer Valve Mounting Procedure

C. Potentiometer and Switch Alignment

Follow the feedback alignment for the actuator on page 3. When adjusting the potentiometer for 50 ohms at the valve "closed" position, remove the blue and yellow wires from the transmitter at terminals 4 and 6. The potentiometer should now be set for 50 ohms between terminals 4 and 5, if the transmitter signal is to increase as the valve opens. If it is desired that the transmitter signal decrease as the valve opens, the potenntiometer should be adjusted for 50 ohms between terminals 5 and 6, with the actuator at the full "open" position.

IV. Replacement Procedures

A. Lubrication

The gearbox and linear thrust assembly are permanently lubricated with AMOCO-RYKON PREMIUM GREASE No.2. Relubrication is only required if the unit is disassembled for repair, at which time all parts must be completely and thoroughly cleaned.

B. Disassembly for Repair

The gearbox and linear thrust assembly are serviced as separate items. To disassemble the unit, the following steps must be performed:

1) Disconnect all power.
2) Remove valve from the actuator (See Customer Valve Mounting Procedure)
3) Remove the gearbox from the linear thrust assembly by removing the two 5/16" socket head cap screws and carefully rotating the linear thrust assembly counterclockwise. Support linear thrust assembly while rotating.

C. Replacing the Feedback Assembly

1) Remove three screws which hold the feedback assembly to base housing.
2) Remove the feedback assembly from housing by lifting straight out.
3) A gear will be positioned on the shaft of the feedback assembly. It is held in place with two set screws. Note the location of the gear on the shaft.
4) Loosen the set screws, remove the gear, and transfer it to the new feedback assembly. Position the gear to the same location on the new feedback assembly as it was on the original feedback assembly.
5) Insert the assembly in the housing, being sure the gear is properly meshed with its mating gear.
6) Install the three screws removed in Step 1.
7) Using a 25 watt solder iron, transfer the wires one at time from the original feedback assembly to the new one. Transferring the wires one at a time helps to ensure proper wiring.
8) Align the feedback following the alignment procedure on page 3.

D. Replacing the Feedback Potentiometer

NOTE: The potentiometer used with a multi-turn feedback assembly is a 10 turn potentiometer with built-in stops at each end. Incorrect mechanical orientation of the potentiometer shaft or setting of the limit switches can cause the potentiometer shaft to be driven into the stops, breaking the potentiometer internally.

1) Remove three screws which hold the feedback assembly to the housing.
2) Remove the feedback assembly from the housing by lifting straight out. A gear will be positioned on the shaft of the feedback assembly.
3) While holding the feedback frame in one hand, turn the feedback shaft clockwise until the lower limit switch is activated. The aluminum multi-turn screw has two set screws through its side. One holds the lower shaft in position and the other holds the potentiometer shaft. Loosen the set screw nearest the potentiometer.

NOTE: In some instances, a broken feedback potentiometer will not allow you to turn the feedback shaft. In that instance, loosen the set screw nearest the potentiometer first, so the shaft may be rotated. Or loosen the potentiometer body nut and allow the entire potentiometer to rotate.

4) With the upper set screw loosened, loosen the potentiometer body nut and let it slide down the shaft until it lays on top of the multi-turn screw. Lift the potentiometer off the frame.
5) Turn the shaft of the new potentiometer to its full clockwise end stop, and back the shaft off of the stop 1/2 turn counterclockwise.
6) While pulling downward on gear with the multi-turn screw held against the bottom boss of the frame, rotate gear clockwise until the lower limit switch just trips.
7) Holding the mechanism in this position, insert the new potentiometer into the frame with the lockwasher and nut in place. Tighten the set screw to hold the potentiometer shaft to the multi-turn screw. Without rotating the body of the potentiometer or shaft, spin the body nut onto the potentiometer bushing and snug it up.
8) Using a 25 watt solder iron, transfer the wires from the old potentiometer to the new one. Transfer the wires one at a time to ensure proper wiring.
9) Turn gear counterclockwise until either the upper limit switch trips, or the counterclockwise end stop of the potentiometer is just touched. If everything was done properly, the switch will trip first, leaving at least 1/2 turn on the potentiometer shaft before the end stop in the potentiometer is touched. There may be as much as 3 1/2 turns left on the potentiometer after the switch is tripped. If the potentiometer end stop is touched before the switch trips, the switches and potentiometer must be mechanically readjusted before proceeding any further. Failure to do so will cause potentiometer damage to occur during operation.
10) With the preceding procedure accomplished, insert the feedback assembly into the housing with the feedback mechanism turned to approximately its mid-travel position. Install screws.
11) Refer to page 3 for final alignment.

E. Replacing Limit Switches

1) Limit switches are held in position with two screw. Remove the screws to replace a switch. Using a 25 watt solder iron, transfer the wires, one at a time, from the old screw to the new screw.
2) Minor re-alignment of the switch settings may be required, refer to the alignment instructions.

F. Motor Replacement

1) Remove all power to the actuator.
2) Remove the motor mounting screws.
3) Remove the old motor from the housing, leaving the wires connected, and install the new motor. Tighten the screws evenly to ensure motor alignment with the first stage power gear. If the motor is not mounted straight, bearing binding may occur.
4) Using a 25 watt solder iron, transfer the soldered wires one at a time.
5) Transfer any other motor wires, apply power and check for proper rotation and operation.

G. Repairs to Gearbox

The picture on page 9 is only a general location picture and may or may not represent your actuator accurately. Access to the gears is obtained by removal of three cap screws.

1) With the gearbox removed from the linear thrust assembly and power disconnected, remove the three screws from the gearbox.
2) Holding the output shaft in place, remove the gear case cover.
3) Replace any worn or broken parts.
4) Bushing replacement is accomplished by using a machinist thread tap and handle, threading into the bushing hole and bottoming the tap, allowing the bushing to walk up the tap.
5) When inserting bushing use a properly sized mandrill while pressing the bushing into the housing or cover, sizing the bushing bore at the same time. (Failure to "size" new bushings will hinder the operation of a rebuilt actuator.) Page 7 shows suggested mandrill sizes for the different bushings used.

H. Repair of the Linear Thrust Assembly (with gearbox and valve removed)

1) Remove "lexan" inspection window and gasket.
2) Remove indicator (shoulder screw).
3) Slide drive nut out of housing. Remove seal from housing.
4) Remove seal from drive nut.
5) With arbor press (with up to 300 lbs. capacity) or equivalent, press nut coupling until snap ring can be easily removed. Slowly release pressure. Remove spring and spacer (if present).

CAUTION: ***Compression spring inside drive nut is precompressed.***

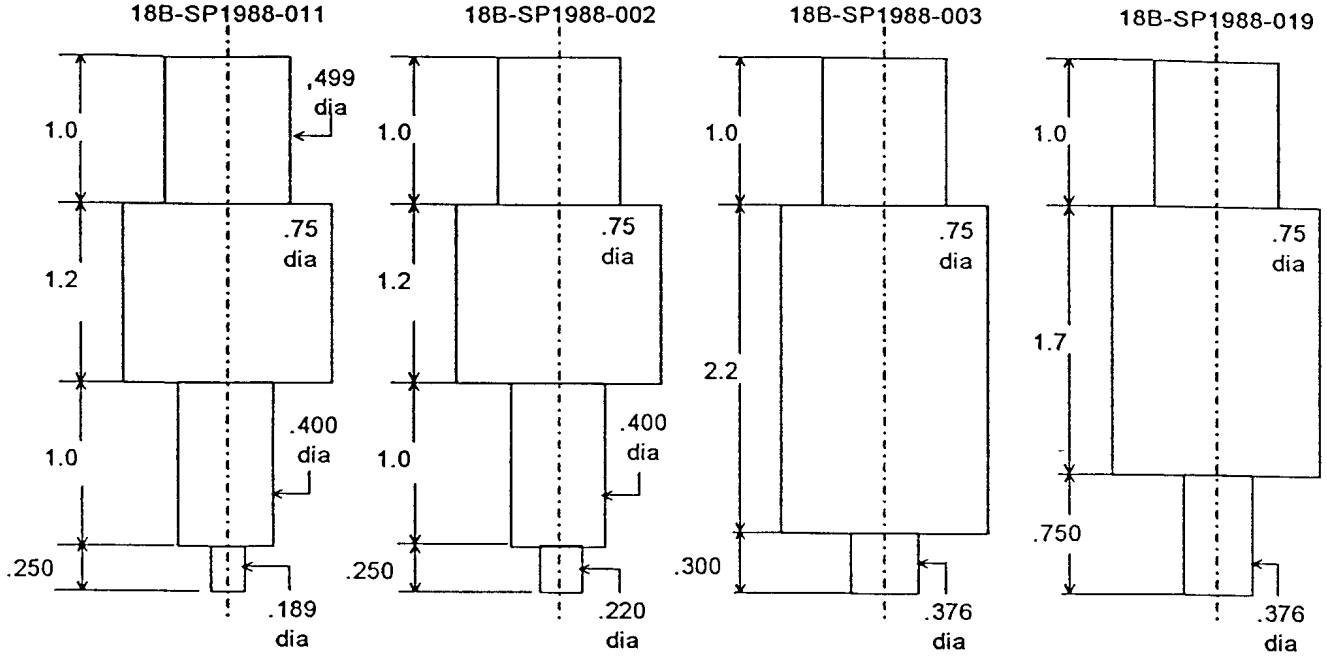
6) Clean and inspect parts. Replace if necessary. Replace *all* seals and gaskets.
7) Reverse above procedure to reassemble. Lubricate drive nut/ housing interface. (AMOCO-RYKON PREMIUM GREASE No. 2)

V. Suggested Spare Parts

A. Assembly

For Electric Actuator	For Linear Thrust Assembly
1. Motor	1. Drive Nut
2. Potentiometer	2. Indicator Cover Gasket
3. Limit Switches	3. Gearbox Gasket
4. Limit Switch Actuator	4. Drive Nut Seal
5. Power Gears	5. Drive Nut Coupling
6. Feedback Gears	
7. Terminal Strip	
8. Motor Capacitor	
9. O-rings	
10. Bushings	
11. Seal	
12. Thrust Bearings.	

B. Suggested Mandrills for Pressing Bushings

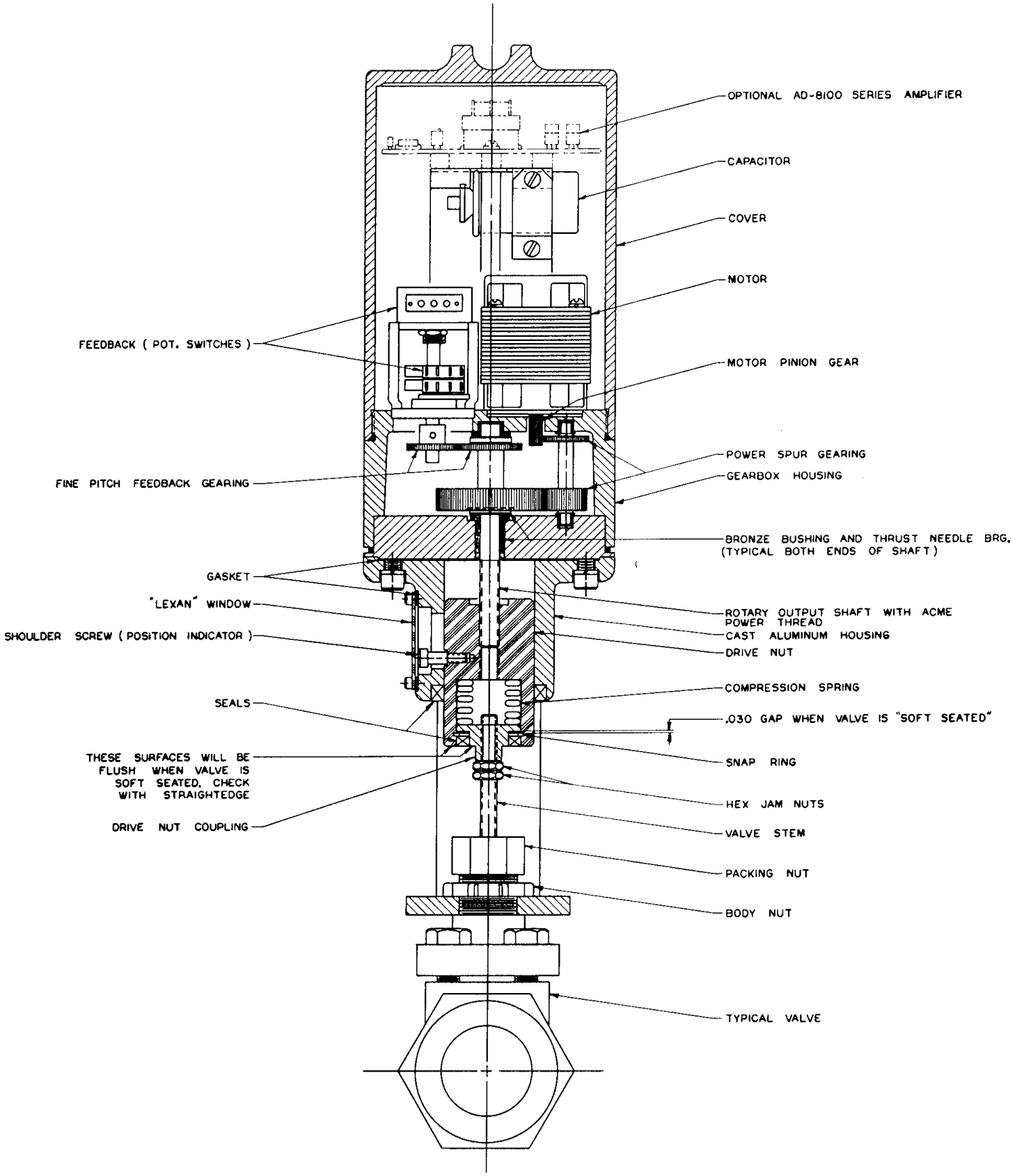


VI. Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	SOLUTION
Valve won't position	1) No power to electric actuator 2) Actuator not aligned with valve stroke 3) Electric actuator defective 4) Valve operator assembly jammed or not aligned with electric actuator 5) Valve jammed 6) Actuator not properly sized for valve used	) Apply power 2) Align 3) Repair electric actuator 4) Align or repair 5) Repair or replace valve 6) Recalculate valve thrust required and change actuator to proper gear ratio.
Valve won't seat or drive full closed	1) Close position limit not set with .030 deflection of valve operator coupling and valve seated 2) Valve seat defective or dirt in valve 3) Broken gearing in electric actuator	1) Adjust 2) Repair or replace valve 3) Repair
Electric motor runs but valve doesn't move	1) Broken gear in electric actuator 2) Traveling nut in valve operator assembly is bad	1) Repair 2) Replace

PROBLEM	POSSIBLE CAUSE	SOLUTION
Electric actuator will not run with power applied (actuator removed from valve operator assembly)	1) Burnt out motor 2) Bad motor run capacitor 3) Gears jammed or broken 4) Limit switch open 5) Power applied to both direction s at same time electrically stalling motor 6) Solenoids or lights connected in parallel with motor	1) Replace motor 2) Replace capacitor 3) Repair 4) Adjust 5) Correct wiring 6) Remove (upsets phase shift of motor)
No signal from feedback potentiometer	1) Feedback potentiometer not wired or incorrectly wired 2) Feedback potentiometer is positioned in dead region (10T potentiometer - broken, has mechanical stops at each end) 3) Potentiometer element open or burnt out 4) Signal monitor device defective	1) Rewire 2) Replace 10T potentiometer 3) Replace 4) Repair or replace

MV-1100 Series Assembly Drawing



VALVE SHOWN IN CLOSED "SOFT-SEATED" POSITION