Andco Eagle Actuator

Installation Manual



Approved Personnel Protective Equipment for the site must be worn.



WARNING

GROUNDING LUG

Unit must be grounded with minimum size 10 AWG wire.

NOTICE

The information contained in this manual is essential to safe, successful, long term operation of your Andco Eagle linear actuator. Read and follow the requirements concerning storage, installation and adjustments. Failure to do so could void the warranty covering your actuator.

This manual gives instructions for storing, installing, operating and servicing the Model 3100 Eagle linear actuator.

Refer all questions not covered in this manual to:

GE Oil & Gas 16240 Port Northwest Drive Houston, Texas 77041 Tel: 832-590-2306 Fax: 713-849-2879

Be sure to include the model and serial number located on the nameplate of your Eagle actuator in all communications and parts orders. The nameplate is located on the gear housing cover.

Intent of Usage

The Andco Eagle Linear Actuator is a completely selfcontained electro-mechanical device. Its compact design is equivalent in size to hydraulic or pneumatic cylinders. Designed and fabricated for easy installation and dependable long-life operation. re:

These actuators feature:

- High-starting torque motor with thermal overload protection
- Non-rotating extension rod
- Non-back driving acme screw
- All metal gearing

1.0 Storage Requirements

- 1. Actuators should always be stored in a clean dry environment, in a location where mechanical damage to the actuator can't accidentally occur.
- 2. All covers must remain in place and securely fastened.
- 3. All pipe plugs must remain in place and be kept tight.
- 4. Actuators equipped with controllers can be damaged by excessive moisture. Units so equipped should be stored in a controlled environment prior to installation. If the units are equipped with compartment heaters, the heaters must be continuously energized while in storage.

1.1 Lifting Instructions

- 1. Do not lift Eagle actuator by limit switch compartment.
- 2. Follow applicable safety guidelines when lifting or moving actuator.

2.0 Mounting Arrangements

NOTICE

While it is possible to mount the actuator in any position, it is not recommended that the control compartment cover be positioned face down. In order to maximize seal integrity, the unit should be mounted with the extension rod pointed up (vertical installations) or with motor on top (horizontal installations).

- 1. The body tube adapter (57) is used for face flange or trunnion-type mounting.
- 2. The actuator can be clevis-mounted utilizing the clevis (29) in the extension rod (6) and the rear clevis bracket, located on the gear compartment cover (21).

Refer to Figure 1 on page 6.



3.0 Installation Requirements



point hazard. Keep hands clear during operation.

CAUTION

SERVICE PERSONEL

Service operators must be licensed/trained and authorized before being allowed to perform maintenance on the actuator.

CAUTION

VOLTAGE SUPPLY

Verify that the supply voltage to the actuator matches the voltage on the nameplate (33) on the gear compartment cover (21).

CAUTION

CONDUCTOR TEMPERATURE RATING

All conductors used for field wiring connections to the actuator shall carry a rating for a minimum temperature of 90°C.

CAUTION

LIFTING HAZARD

Single person lift could cause injury. Use assistance when moving or lifting.

- 1. To prevent premature wear of the drive nut (7) or extension rod seal/wiper (2), verify that the alignment between the actuator mounting support and the driven equipment places no side loading on the extension rod (6) at any point throughout the full stroke length. Refer to Figure 2 on page 7.
- Do not hammer or gouge the outside surface of 2. the extension rod (6). This may damage the plating integrity or cause surface irregularities which can damage rod seals.
- 3. Face flange or trunnion mounted:
 - a. Position the body tube adapter (57) to the desired orientation.

- b. Verify that the pins of the trunnion mounting configuration are parallel with the clevis pin.
- c. Tighten the nut and bolt arrangement of the body tube adapter to 50-55 ft-lbs. of torque.
- 4. For Clevis mounting: Verify the pins of the Clevis bracket and for Clevis (29) are parallel.
- 5. Apply a light film of lubricant to all pinned connections.

NOTICE

In all mounting situations, the final trimming adjustment of the actuator installation is $\pm 1/8$ inch.

6. After Installation the actuator length can be adjusted +/-1/8 inch

a. Loosen the jam nut (28).

b. Turn the Clevis (29) clockwise to decrease or counter clockwise to increase the actuators installed length.

CAUTION

Because the thread grip is limited, make sure the clevis (29) is engaged by a minimum of four threads and that it does not contact the drive screw (4) when the extension rod (6) is fully retracted.

- 7. Upon completion of all mounting operations verify that the jam nut (28) is tight, and that all cotter pins have been secured.
- The actuator must be installed and wired in 8. accordance with all local electrical codes and the most current edition of the National Electrical Code.
- Route the electrical conduit up into the actuator to 9. prevent internal condensation from running into the limit switch compartment.

CAUTION

VOLTAGE SUPPLY

Verify that the supply voltage to the actuator matches the voltage on the nameplate (33) on the gear compartment cover (21).

- 10. Keep limit switch compartment dry and clean. To minimize the possibility of condensation damage, it is suggested that moisture/gas tight conduit seals be installed at the conduit connections.
- 11. Dust Ignition Proof Enclosure, Class II, Division 1, Groups E, F & G.

Indoor and Outdoor Locations.

All actuators provided with dust-ignition proof enclosures must have properly installed electrical access covers to exclude ignitable amounts of dust. When reinstalling these covers make sure the mating seating surfaces and gaskets are clean and the attachment bolts are securely tightened. If the motor end bell pipe plug has been removed to adjust the actuator, the pipe plug must be reinstalled tightly. The actuators must be able to operate at full rating without developing surface temperatures high enough to cause excessive dehydration or gradual carbonization of any organic dust deposits on the actuator enclosure.

The grounding lug on the actuator enclosure exterior must be wired to a suitable grounding system with a minimum of #10 AWG wire as noted in the electric wiring diagram provided with the actuator.

4.0 Geared Position Limit Switch Adjustment

The geared position limit switches have been preset at the factory to trip and interrupt the electric control for the extend and retract positions according to specified stroke. Final limit switch adjustment must be done at installation. Set the extended and retract limit switches to the positions required per the application, the setting is to be done in accordance with the following procedure.

CAUTION

BURN HAZARD

Possible hot surfaces. Keep hands clear of surface. Allow surface to cool before performing any maintenance.

WARNING

Disconnect all electrical power to the actuator prior to removing the limit switch compartment cover and performing any setting adjustments. Unit may have more than one live circuit. Refer to wiring diagram supplied with unit.

- 1. Remove the limit switch compartment cover (38) to gain access to the position switch assembly.
- 2. Remove the motor pipe plug (46) for access to slot "A" located in the end of motor shaft.
- 3. With a manual or power screw driver rotate the motor shaft in a clockwise direction to extend or counterclockwise direction to retract the extension rod.
- 4. To set the extend limit switch, turn the motor shaft in a clockwise direction. Note the direction the slotted shaft (48) is turning while extending extension rod to its desired position.
- 5. Depress the position switch plunger (47) and turn the slotted shaft (48) in the same direction it was turning as in step 4 and continue to turn in this direction until the cam (50) flat comes in contact with the limit switch (52) lever.
- 6. Repeat steps 4 and 5 to set the retract limit switch utilizing the slotted shaft (49), limit switch (53) and cam (51). Turn the motor shaft in a counterclockwise direction.
- 7. Replace the motor pipe plug (46).
- 8. Replace the limit switch compartment cover (38).
- 9. Re-energize electrical power to the actuator.

NOTICE

If damaged, replace the complete geared position limit switch assembly rather than attempting field repair.

5.0 Disassembly



WARNING MOVING PARTS

Internal moving parts. Pinch point hazard. Keep hands clear during operation.

WARNING

HAZARDOUS VOLTAGE

Disconnect all electrical power to the actuator prior to performing any service or maintenance. Unit may have more than one live circuit. Refer to wiring diagram supplied with unit.

CAUTION

BURN HAZARD

Possible hot surfaces. Keep hands clear of surface. Allow surface to cool before performing any maintenance.

5.1 Limit Switch Assembly

- 1. Remove the limit switch compartment cover (38).
- Disconnect the leads to the limit switches (52) and (53) in the gear position limit switch assembly (36), making sure they are marked for reconnection to the proper terminals. The geared position limit switch assembly (36) is retained by hardware (39 and 40). Remove the limit switch assembly by removing the hardware and pulling the switch assembly out of the housing (58).

5.2 Motor

- 1. Disconnect the motor leads noting where they are connected, make sure they are marked properly for reconnection.
- 2. Remove the motor (27) by removing the retaining hardware (41 and 42) and pulling the motor out of the actuator motor housing, carefully feed the motor leads from the limit switch compartment into the motor compartment.
- 3. To remove the motor pinion, remove the retaining ring (43), loosen the set screw (45), and the slide pinion (44) off the shaft.

5.3 Rod End Clevis

- 1. Loosen the jam nut (28) from face of extension rod (6).
- 2. Remove the clevis (29) by unthreading it from the extension rod (6).

5.4 Drive Screw

- 1. Clamp the actuator housing (26) in a soft jawed vise. With a strap wrench on the body tube (5), unthread the body tube from the actuator housing. The threads are Loctited, so it may be necessary to apply heat in this area. Do not exceed 350°F maximum surface temperature.
- 2. Slide the body tube assembly off the extension rod.
- 3. Remove gear compartment cover (21).
- 4. Use non-ferrous block to hold main drive gear (19) from rotating and remove flex nut (17) and gear.

- 5. Remove the intermediate gear (23).
- 6. Remove the woodruff key (14) and gear spacer (13) from the drive screw.
- 7. Install a flex nut (17) 2–3 turns and tap lightly with a soft face hammer on the end of the drive screw (4).
- 8. Once the drive screw moves freely through the bearings (12), remove the flex nut from Step 6 and complete the removal of the drive screw/extension rod assembly.

5.5 Drive Nut

- Clamp the drive nut (7) in a soft jawed vise. With a spanner wrench in the holes of extension rod (6) unthread the rod. The threads are Loctited, so it may be necessary to apply heat in this area. Do not exceed 350°F maximum surface temperature.
- 2. Remove the extension rod, removed bearing assembly from the end of acme screw and unscrew the acme nut.

6.0 Reassembly

- 1. To reassemble the actuator reverse the above procedures with the following instructions.
- Clean the threads and apply Loctite 242 when reassembling the drive nut (7) to the extension rod (6) and the body tube (5) to the main housing (26).
- 3. If disassembled per previous steps, discard the flex nuts (1 and 17) and replace with new.
- 4. The actuator is to be lubricated before being returned to operation. Use acceptable lubricant given in Table 3. The drive screw (4) is lubricated by filling the body tube (5) with the proper amount of lubricant per Table 2 through the hole in the main housing (26) where the limit switch assembly (36) drive engages the helical gear (9).
- 5. After completing reassembly, mounting adjustments can be made by threading the clevis (29) in or out of the extension rod (6) to the suit.

Note: The thread grip is limited, make sure the clevis is engaged by a minimum of four threads and that it does not contact the drive screw (4) when the extension rod (6) is fully retracted.

6. Rest the geared position limit switch before operating the actuator if the limit switch assembly has been removed from the actuator.

6.1 High Potential Test

- 1. Do not apply this test to units equipped with motor control cards. Tests which involve putting electrical power to units equipped with motor control cards are covered by a separate procedure.
- 2. Select the voltage setting for the appropriate motor voltage as indicated on nameplate. Set the selected test equipment to the selected volts.

3. With the test equipment ground wire contacting the gear case plate, contact each test point shown on wiring diagram. The actuator shall be capable of withstanding for one second per test point, without breakdown, the applied voltage from Table 1.

Table 1 - HIPOT Testing Specifications

Circuit Voltage	Test Duration/Test Point	Test Voltage (AC) setting	Max Acceptable Leakage	
12 VDC	One Second	1000 Volts	10.33 mA	
24 VDC	One Second	1000 Volts	10.33 mA	
120 VAC 1PH	One Second	1200 Volts	10.33 mA	
220 VAC 1PH	One Second	1200 Volts	10.33 mA	
220 VAC 3PH	One Second	1200 Volts	10.33 mA	
460 VAC 3PH	One Second	1200 Volts	10.33 mA	
575 VAC 3PH	One Second	1200 Volts	10.33 mA	

Note: Motor power circuits are to be tested based on the motor voltage (AC). Dielectric strength tests may be made by applying a direct current (DC) voltage instead of an alternative current (AC) voltage, provided that the voltage used is 1.414 times the values specified above. See wiring diagram for test points.

6.2 Ground Continuity

1. Verify continuity between actuator ground lug and ground.

6.3 Functional Test

- 1. Electrically energize the actuator.
- 2. Drive the actuator over the full range of motion.

7.0 Lubrication Instructions

Every Eagle linear actuator has been lubricated for life at the factory and should not require further lubrication if operated at published duty cycle, rated thrust and in appropriate environmental conditions. However, if the unit is disassembled, it should be cleaned and lubricated as given in step 4 of Section 6.0. The amount of lubricant in each actuator depends on the stroke of the actuator as shown in Table 2.

Table 2 - Actuator lubricant amo	unt per stroke length
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Stroke (Inches)	Actuator Lubricant Amount (Body Tube) (Pounds)
6	.22
12	.36
18	.51
24	.66
30	.81
36	.96

7.1 Acceptable Lubricants

Standard lubricants and acceptable substitutions for use in the actuator in Table 3.

Recommended	Manufacturer		
AeroShell Grease 6	Shell Oil Products		
Substitute	Manufacturer		
Lubriplate MAG-1	Fiske		
Litholene HEP1	ARCO		
Mobilux EP1	Mobil		
Gulfcrown EP1	Gulf		

Table 3 - Standard and Substitute Lubricants

8.0 Troubleshooting Guide

In the event of a problem with your Andco actuator, make the following preliminary checks before calling the factory for assistance.

- 1. The actuator's rod will not extend or retract.
 - a. Check for a blown fuse or circuit breaker in the wiring.
 - b. Check for loose wiring.
 - c. Check if the motor has overheated and activated the thermal switch.
 - d. Check that the limit switches are set correctly.
 - e. Check the binding in the load being actuated.
 - f. Check if a capacitor lead is open.
 - g. Check if the drive nut is damaged or worn, by disconnecting the actuator from the load and pulling or pushing on the extension rod.
- 2. The actuator only actuates in one direction.
 - a. Check that all wiring connections are secure.
 - b. Check that the position limit switches are set correctly.
 - c. Check for an excessive external load on the actuator in one direction.
- 3. The actuator is excessively noisy.
 - a. Check for a damaged bearing.
 - b. Check for a damaged gear (chipped tooth, missing teeth, etc.)
 - c. Check for a damaged screw.
- 4. Actuator exhibits high motor current.
 - a. Check for low line voltage.
 - b. Check for external binding related to the load being actuated.
 - c. Check for excessive external load being actuated.
 - d. Check for loss of lubricant.
 - e. Check the extension rod for excessive contaminates.

If you still have a specific problem with your Andco Eagle Actuator after making all of the above checks, contact GE for further assistance.

9.0 Optional Equipment

9.1 Gear Driven Potentiometer

This optional assembly is directly driven by the operation of the actuator and gives the capability of providing a continuous, linear output signal directly proportional to the actuator's stroke. The signal can be interfaced with automatic control equipment to position or sense the actuator at any desired stroke between fully extended and fully retracted. The potentiometer assembly is mounted directly to and driven by the geared position limit switch assembly. Characteristics of the potentiometer are 1000 ohm total resistance ±2.0% linearity, 1 watt at 40°C power rating. Input gearing to the potentiometer is factory selected to accommodate the full range of the actuator's strokes and the acme screw pitches. The potentiometer has been factory adjusted so the 0 and 1000 ohm resistance points correspond, respectively, to the fully extended and fully retracted rod positions. Field adjustments may be made by loosening the jam nut holding the potentiometer (64) to the mounting bracket (65). Rotate potentiometer to the desired position and tighten the jam nut. Potentiometer only to be connected to a class II power source.

For units that utilize the last portion of the actuator stroke only; the potentiometer gearing must be disconnected if the unit is to be retracted beyond the "zero" point.









Figure 2 - Eagle Actuator Parts Drawing

Parts List

1. Flex nut	24. Pin
2. Wiper seal	25. Motor gasket
3. Support washer	26. Actuator body housing
4. Drive screw	27. Motor
5. Body tube/End Cap	28. Jam nut
6. Extension rod	29. Clevis
7. Drive nut	30. O-ring
8. Key	31. O-ring
9. Helical gear	32. Fastener
10. Spacer	33. Nameplate
11. Retaining ring	34. Screw
12. Bearing	35. Seal washer
13. Gear Spacer	36. Position limit switch assembly
14. Woodriff key	37. Capacitor/terminal strip
15. Hex bolt	sub-assembly
16. Lock washer	38. Limit switch compartment cover
17. Flex nut	39. Machine screw
19. Main drive gear	40. Lock washer
20. Unassigned	41. Socket head screw
21. Gear compartment cover	42. Lock washer
22. Unassigned	43. Motor pinion retaining ring
23. Intermediate gear	44. Motor drive pinion

Table 4 - Suggested Spare Parts List

Description	Item
1. Drive nut	(7)
2. Limit switch	(52) + (53)
3. Body tube/End cap	(5)
4. Motor	(27)
5. Gasket and Seal kit to include: Wiper rod seal O-Rings Sealing washer Gaskets	(2) (30), (31), and (55) (35) (25), (56)

45. Motor pinion set screw 46. Motor pipe plug 47. Position switch plunger 48. Slotted shaft 49. Slotted shaft 50. Cam 51. Cam 52. Limit switch 53. Limit switch 54. Bearing 55. O-Ring 56. Limit switch cover gasket 57. Body tube adapter 58. Limit switch housing 59. Clevis pin 60. Cotter pin 61. Flat washer 62. Grounding lug 63. Gear driven potentiometer (optional) 64. Potentiometer (optional)

65. Potentiometer mounting bracket (optional)



Figure 3 - Typical Wiring Diagram for Single Phase, Please refer to the wiring diagram came with your units before you work on the actuators.



Figure 4 - Typical Wiring Diagram for three Phase, Please refer to the wiring diagram came with your units before you work on the actuators.

T		-40 to 150°F					
Ratina	-40 to 65°C						
Rating	90% Relative Humidity						
	Car	nadian Applicat	tions		US Applic	Applications	
Electrical Ratings	Voltage	Current (FL)	Frequency	Voltage	Current (FL)	50 60HZ)	Frequency
	115 V 1Ph	2.6 A	60 HZ	110-120 1Ph	2.6 A	3.0 A	50/60 HZ
				208-240 1Ph	1.7 A	1.7 A	50/60 HZ
	230 V 3Ph	0.52 A	60 HZ	208-240 3Ph	0.6 A	0.6 A	50/60 HZ
	460 V 3Ph	0.26 A	60 HZ	380-480 3Ph	0.4 A	0.4 A	50/60 HZ
	575 V 3Ph	0.2 A	60 HZ	575V 3Ph		0.2 A	60 HZ
	Class B Insulation						
Motor	Inte	rnal Thermal Sv	witch				
		NEMA D Desigi	n				
Stroke Lengths	6, 12, 18, 24, 30, and 36 inches						
	Velocity Force (lbs)		_				
	(in/sec)	Breakaway	Running				
Speed and	0.2	2000	1000				
Force	0.4	1500	750				
	0.8	750	340				
	2.0	500	200				
Duty Cycle		25%		_			
	C2D1 Groups E, F, and G Dust Ignition Proof, T5						
	Type 4 Watertight						
Certifications -	CSA Certificate			US Certi	ificate		
North America	CSA C22.2 No. 0			ANSI/UL 61010-1			
	CSA C22.2 No. 25		UL50 and UL50E				
	CSA C22.2 No. 94		FM 3600 an	d FM3616			
	CSA C22.2 No. 142						
	Clevis and pin on drive rod end						
Mounting	Clevis mount on motor end						
Types	Trunnion (adjustable)						
	Face/Flange (Adjustable)						
	Positran V051 (4–20 ma)						
Control and	SCC05 Modbus (US only)						
Position Cards	SCC10 (US only)						
	ACT-100 w/Modbus						
Weight	35 – 75 lbs depending on length of extension rod and options			_			
Ontions		Oversize Clevis	5				
Options	Manual Override						

Table 5 - Andco Eagle Technical Specifications



GE Oil & Gas

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