

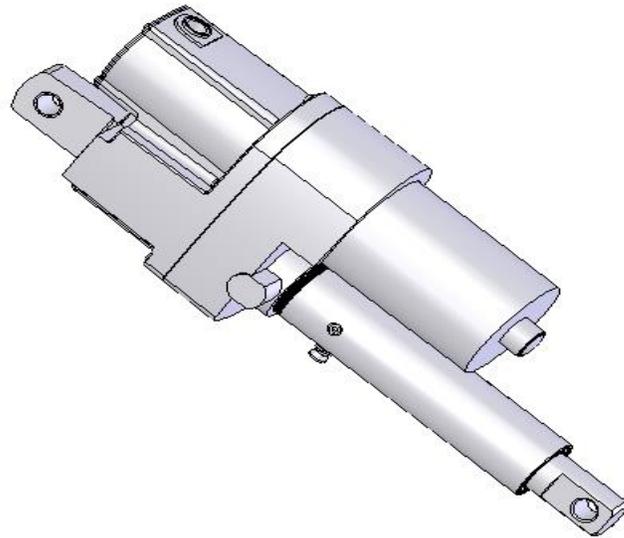


Joyce/Dayton Corp.

Operation and Maintenance Manual for

Joyce/Dayton Linear Actuator

1500 Pound Capacity AC Actuator (with limit switch and potentiometer)



WARNING !

The recommendations in this manual for installation, operation and maintenance must be followed to ensure safe use. All persons responsible for the installation and use of Joyce/Dayton Linear Actuators must be familiar with the contents of this manual.

Customer is responsible for guards and other protective devices and ensuring that Linear Actuator usage conforms with local and national operating and safety codes appropriate to the class of equipment into which the Linear Actuator is installed.

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Section I

General Information

1-1 Contacting Joyce/Dayton Corp.

Joyce/Dayton Corp.
P.O. Box 1630
Dayton, OH 45401
(800) 523-5204 (US and Canada only)
(937) 294-6261 (937) 297-7173 Fax
Email: sales.jacks@joycedayton.com
Website: www.joycedayton.com

1-2 Purpose and Scope

This manual provides installation, operation and maintenance instruction for the standard 1500 pound capacity Joyce/Dayton Linear Actuator. Although this manual covers the standard Linear Actuators, some may vary significantly from this manual. For special units not covered, please contact Joyce/Dayton Corp. for assistance.

1-3 Receipt of Product

All equipment should be immediately inspected upon receipt for any damage and to verify correct product and quantities. Any problems should be reported to Joyce/Dayton Corp. and the freight carrier as soon as possible. Products returned without a *Return Goods Authorization (RGA)* form will not be accepted.

1-4 Warranty

Seller warrants its products to be free from defects in material and workmanship under normal and proper use in accordance with instruction of seller for a period of one year from the date of shipment to buyer. Seller's liability under such warranty or in connection with any other claim relating to the products shall be limited to the repair, or at seller's option, the replacement or refund of the purchase price, of any products or parts or components thereof which are returned to seller freight prepaid and which are defective in material or workmanship. Products or parts or components thereof which are repaired or replaced by seller will be returned to buyer freight collect. This warranty is not intended to cover consumer products, as defined in the Magnuson-Moss Warranty-Federal Trade Commission Improvement Act, 15 U. S. C. Sections 2301-12, which are purchased by buyer for purposes other than resale. If buyer is not intending to resell the products, and if the products are consumer products as defined in the Magnuson-Moss Act, the foregoing warranty, but not the limitation of seller's liability, shall be null and void. EXCEPT AS EXPRESSLY STATED ABOVE, SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE OR OTHERWISE, ON THE PRODUCTS, OR ON ANY PARTS OR LABOR FURNISHED DURING THE SALE, DELIVERY OR SERVICING OF THE PRODUCTS.

1-5 Precautions of Use and Installation

1. Travel is limited using the limit switches provided. It is imperative that the limit switches be set within the designed limits of the Linear Actuator. Exceeding the design limits can cause damage to the internal linear actuator mechanism. Follow the procedure in Sections 1-7 and 1-8 of this manual.
2. In most applications, factory or manufacturer-assisted installation is not required. However, it is necessary that appropriate, qualified personnel perform the installation of Joyce/Dayton products.
3. Joyce/Dayton Linear Actuators are not rated for shock-loading or extreme vibration. It is the responsibility of the user to ensure these conditions are not imposed on the actuator.
4. In the event that service or maintenance is required, the load must be secured or removed before any work can begin.

5. The Linear actuators can be mounted and operated in any orientation. Standard Linear actuators will come with all holes plugged. Follow the procedure in Section 1-9 to properly plug or vent the holes to prevent dirt and moisture from contaminating the actuator.
6. Never allow the actuator to retract beyond the minimum closed position or extend beyond the maximum open position, as damage to the unit can occur. Refer to the Travel Limit Chart provided in Section 4-4 for a list of dimensional limits.
7. External temperature may exceed 200 Degrees F. near maximum duty cycle. Use caution to prevent personal injury.
8. Do not use actuator in applications where the unit can be jammed; that is, where the limits can be over-traveled or the linear actuator can be pressed against an immovable object.
9. The capacitor may retain an electrical charge. Touching the terminals may result in an electrical shock. **Exercise caution when handling the capacitor.**
10. Ambient operating temperature range 40F to 220 F. Contact Joyce Dayton for alternate range.

1-6 General Installation Instructions

1. Ensure that all personnel who will service or operate equipment are familiar with its use and limitations.
2. Secure or remove the load before any installation procedures begin.
3. Be certain the rating of the actuator meets or exceeds the load.
4. The actuator must be mounted on a rigid structure sufficient to support the maximum possible load. An under-designed structure could lead to premature wear or failure.
5. When fastening the load to an actuator, make sure the actuator is in the retracted position. This positions the load accurately with respect to the lifting screw centerline. Never pull the translating tube to one side to make connection with your structure. Fully extend the actuator to make sure the load is aligned with the translating tube.
6. Limit switches are NOT pre-set. They require field adjustment before use (See Section 1-7 and 1-8).
7. The capacitor may retain an electrical charge. Touching the terminals may result in an electrical shock. **Exercise caution when handling the capacitor.**

1-7 Limit Switch Adjustment – Initial Adjustment Procedure

1. The travel limits must not be exceeded when setting the limit switches. This means that you do not want to set the extended or the retracted position beyond the designed travel limits of the unit.
2. Remove the screws (47), switch cover gasket (62) and switch cover (63). On units equipped with a potentiometer, remove the nut retainer (59).
3. Rotate both Limit Switch Nut Cams (56) toward the center of the threaded shaft (55) to clear the switches.
4. Rotate the translating tube (33) until the distance between both clevis eyes equals the minimum closed dimension you require. This can be fine adjusted via the slot at the end of the motor. **Do not exceed the designed travel limits of the unit.** Refer to the Travel Limit Chart in Section 4-4.
5. If the clevis holes are not properly aligned, use a screwdriver to rotate the motor (3) and drive the translating tube (33) to its proper retracted position.
6. Now adjust the limit switch nut cam (56) that controls the retracted limit. This switch has a red electrical lead attached to it. To make this adjustment, rotate both limit switch nut cams together on the threaded shaft until the switch is activated. You will see the switch lever depress and hear it “click” when it is activated.
7. If a potentiometer is included on the linear actuator, it will need to be adjusted before reinserting the nut retainer (59) as described in the next step. Holding the potentiometer so the small pinion gear (60A) is facing you, gently rotate it clockwise until it reaches the end of travel. Now rotate the pinion counter-clockwise ½ turn. This protects the potentiometer from being “jammed” and its travel limits exceeded.
8. Temporarily insert the retainer nut (59) into the proper slots in the limit switch cavity and in the slots in the cams (56). Using a marking pen, mark the slot on the limit switch nut cam (56) of

- the lower limit switch. **Do not mark the upper cam (56) at this time.** Use screw (47) to install the limit switch gasket and cover (62, 63) to hold the retainer nut (59) in place.
9. Next, extend the jack to the upper limit position. This will need to be done electrically or with a screwdriver through the electric motor. **Do NOT rotate the translating tube (33).** (Make sure the two clevis ends are oriented properly.) The extended position is the maximum distance between the two clevis eyes. **Do not exceed the designed travel limits of the unit.** Refer to the Travel Limit Chart in Section 4-4.
 10. Remove the limit switch gasket, cover (62, 63), and retainer nut (59). Use care not to disturb the position of the lower cam nut (56).
 11. Now adjust the upper limit switch nut cam (56). It is located nearest the translating tube (33) and controls the extended position. This switch has a blue lead on it. Rotate this limit switch nut cam until the switch is activated. You will see the switch lever depress and hear it “click” when it is activated.
 12. Insert the retainer nut (59) into the marked slot (for the lower setting) and the slot closest to the position you have set (for the upper setting). Using a marking pen, mark the slot on the limit switch nut cam for the upper limit setting.
 13. **If the unit has a potentiometer, do not rotate the worm.** Make sure the threads on the potentiometer pinion fully engage the potentiometer worm (57) before assembling the gasket and cover.
 14. Replace the limit switch gasket and cover (62, 63), using screws (47).
 15. The travel limits are now set to their initial settings. Activate the motor to check for proper adjustment. Sometimes after installing this actuator in your application, a fine adjustment is required on the limit switches. To achieve the fine adjustment, follow the procedure outlined below.

1-8 Limit Switch Adjustment – Fine Adjustment Procedure

1. Remove the limit switch gasket and cover (62, 63) and retainer nut (59). You will see the limit switch nut cams that you marked for position. Each notch on the limit switch nut cam is equal to approximately .050 inch of screw travel. By rotating the limit switch nut cams you can fine-tune the limit settings.
Viewing the Limit switch cavity with the lifting screw and gearbox on your right the following adjustments can be made:
2. To retract the translating tube (33) more, that is to shorten the distance between the clevis eyes, rotate the right-hand limit switch nut cam away from the switch lever. This activates the switch with the red leads. **Note: It is critical that you are not setting the limit beyond the minimum travel of the actuator.** Refer to the Travel Limit Chart in Section 4-4.
3. To extend the lower limit, that is to increase the distance between the clevis eyes, rotate the right-hand limit switch nut cam toward the switch lever. This activates the switch with the red leads.
4. To shorten the maximum travel so the travel is slightly less at the extended position, rotate the left-hand limit switch nut cam toward the switch with the blue leads.
5. To extend the upper limit so the travel is slightly greater, rotate the left-hand limit switch nut cam away from the switch. This activates the switch with the blue leads. **Note: It is critical that you are not setting the limit beyond the maximum travel of the actuator.** Refer to the Travel Limit Chart in Section 4-4.
6. When the fine adjustment is complete, insert the retainer nut (59) into the closest slot and mark with a marking pen. Note: The retainer nut may now be inserted in notches other than those you previously marked.
7. NOTE: When a potentiometer is included, it will be mounted to the retainer nut (59). Make sure the threads on the potentiometer pinion (60B) fully engage the potentiometer worm (57) before assembling the gasket and cover.
8. Replace the limit switch gasket and cover (62, 63) using the correct fasteners.
9. Activate the actuator electrically to test the limit switch stops. The adjustment procedure can be repeated as needed.

1-9 Final Installation of Actuator

1. Check the drift by extending and retracting the actuator, electrically.
2. Make small adjustments in the limit switch setting by following the steps outlined above in Section 1-8.
3. Now you can install the actuator in your application.
4. Place the air vents (36) in the correct orientation based on the application and mounting position of the actuator. In a vertical application, the vents may be placed in any of the available holes. If the Linear Actuator is mounted horizontally, install the vent on one of the sides, i.e.: not the lowest position. Place the vent on a side that is most accessible for servicing.

Section II Maintenance

2-1 Lubrication – Gear Box

1. Actuators are lubricated before leaving the factory, and under normal operating conditions these are lubricated for life.
2. The upper and lower housing cavities are lubricated with Mobil grease XHP 221, or equivalent.
3. The lifting screw and translating tube assembly is lubricated with Mobil grease XHP 461, or equivalent.
4. The spring brake assembly (7, 8, 9, 10, 11, 12) is lubricated with Mobil grease XHP 221 or equivalent.
5. The products listed are recommended by the lubricant manufacturers to meet the requirements for normal operation. The listing of brand names is solely for the convenience of users of Joyce equipment and their lubricant suppliers; it does not constitute any endorsement. Joyce/Dayton assumes no responsibilities for the quality, performance or availability of any listed products.

Upper and Lower Housing Cavities	Mobil Grease XHP 221
Spring Brake Assembly	Mobil Grease XHP 221
Translating Tube assembly	Mobil Grease XHP 461

2-2 Repair Parts

Repair parts may be obtained by calling Joyce/Dayton Customer Service at (800) 523-5204, (937) 294-6261, (937) 297-7173 (facsimile) or your local sales representative. When ordering repair parts, please supply the item description (i.e., LA155L-12), and the manufacture date. See Section 5.2 Maintenance Log.

The following parts are available only as assemblies for rebuild or spares. For a complete list of repair parts available, see Section 3-1 Exploded View and Section 3-2 Parts List.

- A. (1) Motor (3)
- B. (3) Mounting screw (5) and Lock washer (6)
- C. (1) Motor coupling kit (7,8,9,10,11, and 12)
- D. (1) Capacitor (43)
- E. (1) Capacitor insulation (44)
- F. (1) Capacitor gasket and cover (45,46)
- G. (4) Screw (47)
- H. (1) Tapered plug (48)
- I. (1) Limit switch bracket (49)
- J. (1) Limit switch insulation (50)
- K. (2) Limit switches and mounting screws (51,52)

- L. (1) Potentiometer Assembly (60)
- M. (1) Limit switch gasket and cover (62,63)
- N. (1) Translating Tube assembly (28,29,30,31,32,33,34,35, and 36)

2-3 Disassembly of a Linear Actuator

Motor Disassembly

1. The motor included with the Linear Actuator is not user-serviceable.
2. Disconnect power from the Actuator before proceeding.
3. To remove the motor, secure the Linear Actuator in a work holding device such as a bench vise. Do not clamp on the outer tube (34) or the upper housing (2).
4. Remove the screws, cover and gasket (47, 46, 45) and carefully disconnect and remove the capacitor (43). **Exercise caution when handling the capacitor.** Touching the terminals can result in electrical shock. Follow the advice of an electrician when discharging the stored charge of the capacitor.
5. Remove the screws, cover and gasket (47, 63, and 62) to open the limit switch cavity.
6. Remove the (5) screws and washers (40, 41) from the upper housing (2).
7. Set these aside and carefully remove the upper housing. (It may require effort to pull the upper and lower housings apart.)
8. Remove the (3) screws and lock washers (5, 6) that attach the motor to the lower housing (1).
9. Feed the motor lead wires through the housing and disconnect the motor lead wires from the limit switch.
10. Remove the motor (3).
11. Replace any worn or damaged parts upon re-assembly.

2-4 Assembly of Linear Actuator

Limit Switch Assembly

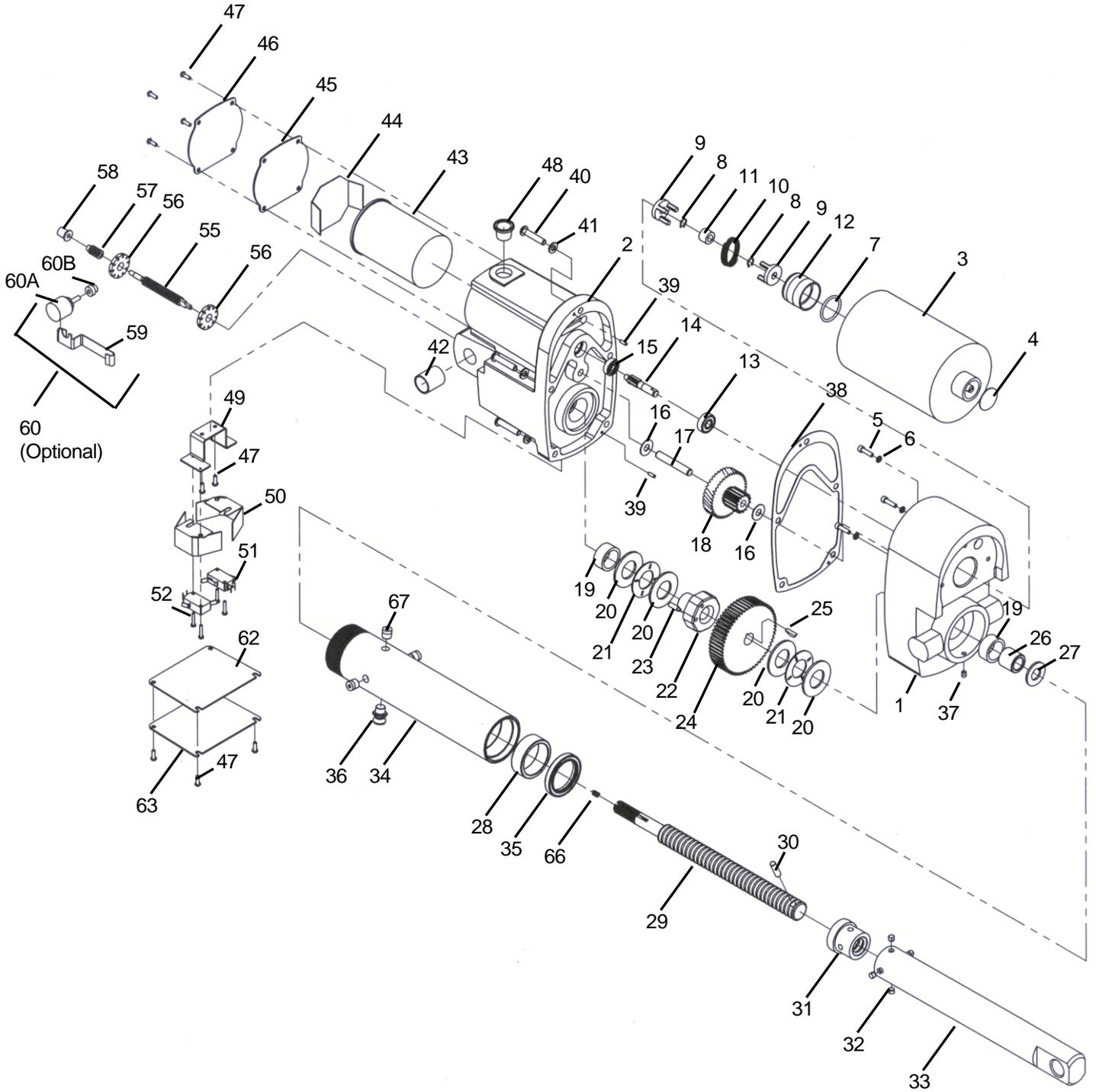
1. When assembling these parts, take care not to damage the small limit switches by bending the metal plungers or by overextending them.
2. Using a flat bit screwdriver and two screws (47), attach the limit switch assembly (51, 52, and 53) snugly to the back of the limit switch cavity.
3. Assemble the shaft (55) to the limit potentiometer worm (57) by pressing together. The threaded end of the potentiometer worm should be oriented toward the threads on the shaft.
4. Thread the two limit switch nut cams (56) onto the shaft (55). It may be best to rotate them toward the center of the shaft to protect the switches from being bent or overextended
5. Check that the slot in the end of the screw is aligned vertically to the switches. If it is not so aligned, rotate through the motor using a screwdriver in the motor slot until the alignment is correct.
6. Insert the compression spring (66) into the cavity recess at the slotted end of the lifting screw.
7. Insert the flat end of the shaft assembly (55, 56, 57) into the slot on top of the compression spring (66) and rounded end into the bronze bearing (58) on the opposite side of the cavity.
8. Insert the nut retainer (59) into the grooves on the edges of the limit switch cavity. If this unit includes a potentiometer (60), it will be attached to the retainer nut (59). The potentiometer is optional and your unit may not have one.
9. The small pinion on the potentiometer will mesh with the potentiometer worm (57).
Caution: it is possible to damage the potentiometer by “jamming” it beyond the intended number of pinion rotations in a single direction. Follow the procedure for setting the limit switches before operating the linear actuator. Refer to Section 1-7 and Section 1-8.
10. Cover the limit switch cavity using the four screws (47) and the gasket and switch cover (62, 63).

Capacitor Cavity

1. The capacitor cavity adjoins the limit switch cavity and provides a wiring access hole. Various wiring will need to be carefully routed through this cavity to the access hole on the other side. Keep this in mind when attaching the electrical leads to and from the limit switches, potentiometer, motor, and capacitor.
2. Using the wiring diagram in Section 4-1, and this manual, connect the various wires and pass the leads through the capacitor cavity and out the access hole.
3. Insert the capacitor with the terminals upward toward the cover. **Exercise caution when handling the capacitor.** Touching the terminals may result in electrical shock. To safely discharge the stored energy in the capacitor consult an electrician.
4. Double-check all electrical connections before attaching the gasket (45) and the cover (46) with screws (47).

Section III Views & Parts List

3-1 Exploded View



Linear Actuator 1500 AC Assembly

3-2 Parts List – Linear Actuator 18030090

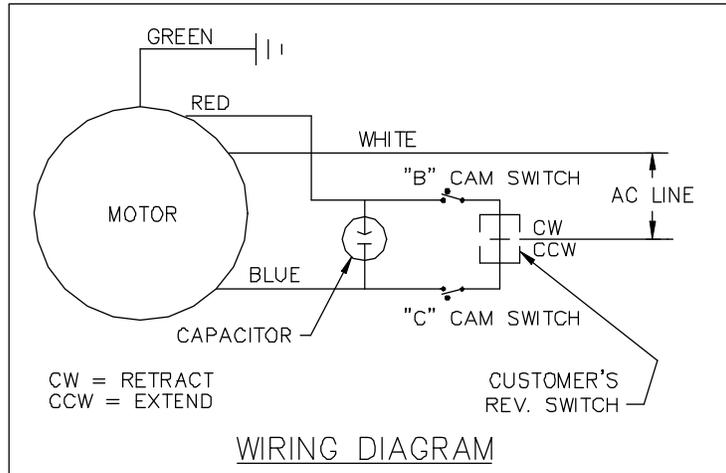
Table 3-2 Parts list

Item		Item	
1	AC Lower Housing (1)	36	Air Vent (2)
2	AC Upper Housing (1)	37	Set Screw (1)
3	Motor (1)	38	Gasket (1)
4	Hole Plug (1)	39	Dowel Pin (2)
5	Screws (3)	40	Screw (5)
6	Lock Washers (3)	41	Lock Washer (5)
7	O Ring (1)	42	Upper Bushing (1)
8	Retaining Ring (2)	43	Capacitor (1)
9	Coupling Half (2)	44	Capacitor Insulation (1)
10	Drive Spring (1)	45	Cover Gasket (1)
11	Rubber Grommet (1)	46	AC Cover (1)
12	AC Insert (1)	47	Screw (10)
13	Miniature Bearing – 8mm (1)	48	Tapered Plug (1)
14	Input Pinion (1)	49	AC Limit Switch Bracket (1)
15	Miniature Bearing – 6mm (1)	50	Limit Switch Insulation (2)
16	Thrust Washer (2)	51	Switch (2)
17	Dowel Pin (1)	52	Pan Head Screw (4)
18	Cluster Gear (1)	53	Red Jumper Wire (1)
19	Casting Bushing (2)	54	Blue Jumper Wire (1)
20	Thrust Washer (4)	55	AC Limit Switch Shaft (1)
21	Thrust Bearing (2)	56	AC Limit Switch Nut, Cam (2)
22	Spacer Nut (1)	57	Potentiometer Worm (1)
23	Set Screw (1)	58	Flanged Bronze Bearing (1)
24	Output Gear (1)	59	AC Nut Retainer (1)
25	Woodruff Key (1)	60	Potentiometer Assembly (1)
26	Gear Spacer (1)	60A	Potentiometer Gear (1)
27	Washer (1)	61	Instruction Decal (1)
	Translating Tube Assembly. Components 28-35	62	Switch Cover Gasket (1)
28	Guide Bearing (1) *	63	AC Switch Cover (1)
29	Lifting Screw (1) *	64	Warning Decal (1)
30	Dowel Pin (1) *	65	Large Decal (1)
31	Translating Tube Bushing (1) *	66	Compression Spring (1)
32	Retaining Ring (4) *	67	Pipe Plug (4)
33	AC Translating Tube Assy (1) *	68	Small Name Plate (1)
34	Outer Tube (1) *	69	Drive Screw (2)
35	Seal (1) *		

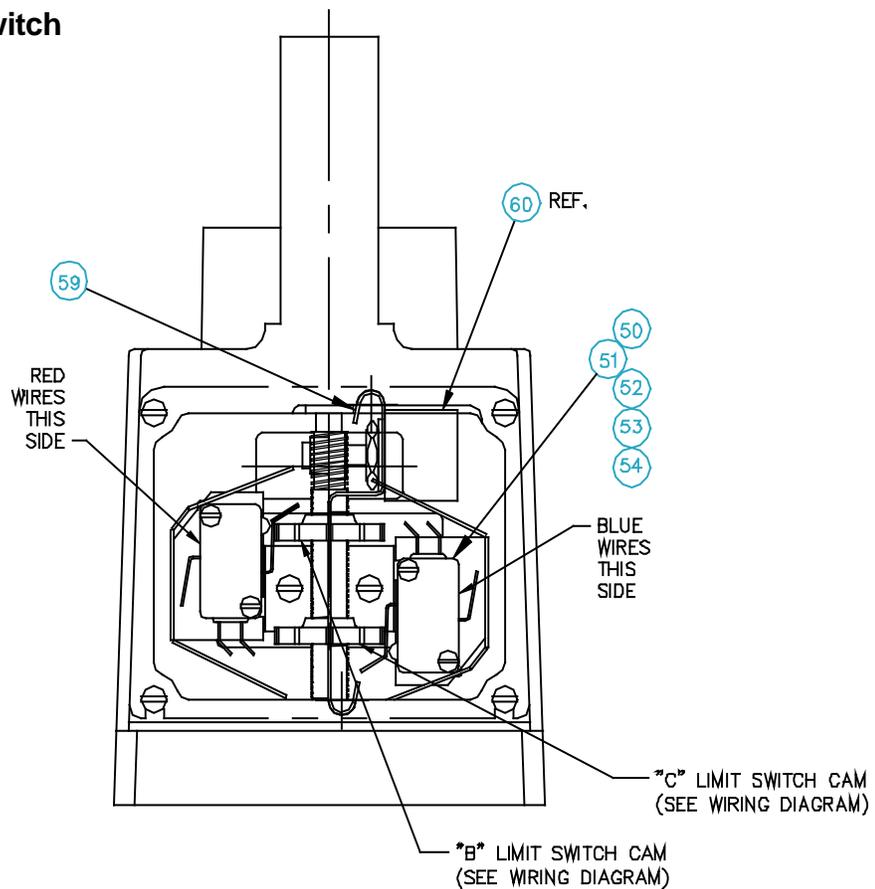
* Replacement and spare parts available only an assembly, see Section 2-2 Spare Parts.

Section IV Technical Drawings and Illustrations

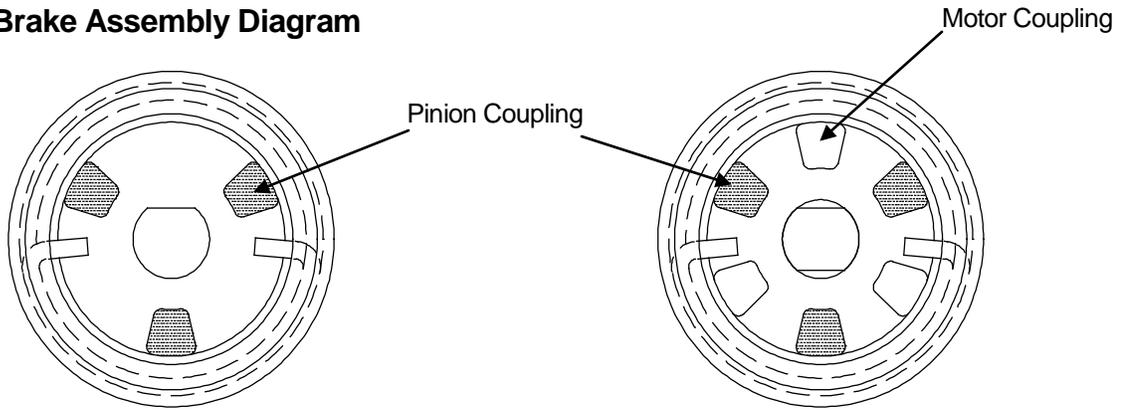
4-1 Wiring Diagram



4-2 Limit Switch



4-3 Brake Assembly Diagram



View A

This is a view of the brake assembly installed from the motor end with one coupling half. It is the view looking into the lower housing before the motor coupling half or rubber grommet is assembled.

When properly assembled, this coupling will not rotate in the CW or the CCW direction. This braking action allows the actuator to hold position when the motor is stopped.

View B

This is a view of the installed brake assembly from the motor end with both coupling halves shown. The unshaded coupling tangs are the motor half coupling.

When properly assembled, this coupling half will rotate in both the CW and CCW direction. This allows the motor to be reversed.

4-4 Travel Limit Chart

Models with limit switches (089030090) based on clevis end condition

Effective travel (rise)	Minimum dimension	Maximum dimension
3"	17.13"	20.13"
6"	20.13"	26.13"
12"	26.13"	38.13"
18"	32.13"	50.13"
24"	38.13"	62.13"

Minimum dimension and maximum dimensions are measured from clevis eye to clevis eye. Use these formulae to calculate the dimensions.

Minimum = Rise" + 14.13"

Maximum = (Rise" x 2) + 14.13"

Section V Part Numbers and Ordering

5-1 Ordering Information

	Capacity	Voltage	Options	Base Mounting	Screw end	Travel
L A	05 (500#)	2 (12-VDC)	G Clutch	SC Standard Clevis	CL Clevis	03 06 09 12 18
				RG Rotated Clevis	TE Threaded	
			L Limit Switch	SC	CL Clevis	
		5 (115-VAC)	G Clutch	SC Standard Clevis	CL Clevis	
				RG Rotated Clevis	TE Threaded	
			L Limit Switch	SC	CL Clevis	
	15 (1500 #)	2 (12 VDC)	C Clutch	SC Standard Clevis	CL Clevis	03 06 12 18 24
				TM Trunnion Mount	TE Threaded	
			L Limit Switch	SC Standard Clevis	CL Clevis	
				TM Trunnion Mount	TE Threaded	
		5 (115 VAC)	L Limit Switch	SC Standard Clevis	CL Clevis	
				TM Trunnion Mount	TE Threaded	
			P Limit Switch w/Potentiometer	SC Standard Clevis	CL Clevis	
				TM Trunnion Mount	TE Threaded	

Linear Actuator Part Number Structure:

Product – Size – Motor Voltage – Options – Mounting – End Condition - Travel

EXAMPLE – LA155PSCCL-12

Product – LA

Size – 1500# (15)

Motor Voltage – 115 VAC (5)

Options – Potentiometer and limit switches (P)

Mounting – Standard Clutch (SC)

End Condition – Clevis (CL)

Travel – 12”

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