

# ELECTROMECHANICAL

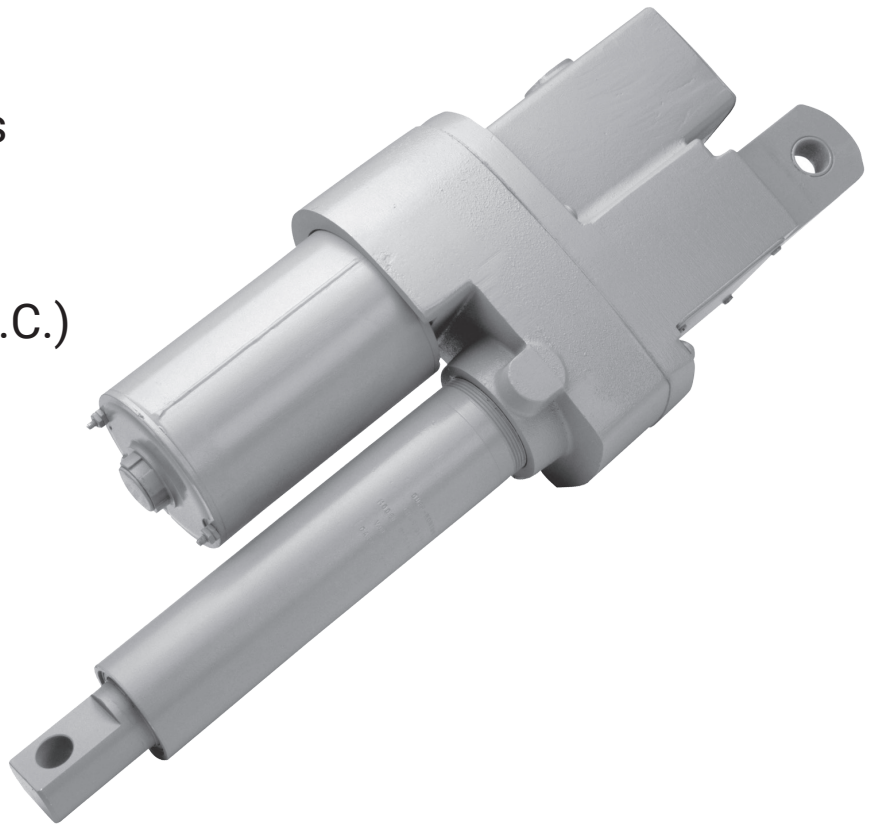
## Linear Actuators

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Installation, Operation &  
Maintenance Instructions

6415 Series  
7415 Series  
(115 Volt A.C./220 Volt A.C.)



Publication Part No. SK-6415-200



### CAUTION

This manual contains important information for the correct installation, operation and maintenance of the equipment described herein. All persons involved in such installation, operation, and maintenance should be thoroughly familiar with the contents. To safeguard against the possibility of personal injury or property damage, follow the recommendations and instructions of this manual and keep it for further reference.

### WARNING

The equipment shown in this manual is intended for industrial use only and should not be used to lift, support, or otherwise transport people.

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# Section 1 Introduction

## 1-1. General

This manual provides instructions for the installation, operation and maintenance of the Duff-Norton 6415 & 7415 Series AC actuator. It includes proper procedures for the disassembly, cleaning, inspection, rebuilding and assembly of the actuator. To ensure efficient, long, satisfactory use of this unit, these instructions should be followed closely.

## 1-2. Industrial Use Only

The actuators described and illustrated in this manual are intended for industrial use only and should not be used to lift, support or otherwise transport people, unless you have a written statement from Duff-Norton Company which authorizes this actuator unit, as used in your application, as suitable for moving people.

## 1-3. Factory Preparation

Each actuator is carefully assembled and tested at the factory to ensure that the motor and the mechanical components will function properly and that the actuator will lift its rated load.

The brake is preset at the factory and no further adjustment is required. With proper maintenance, this brake prevents the actuator from self-lowering.

The actuator is pre-lubricated at the factory and thus requires minimum maintenance.

Limit switches are checked at the factory for proper functioning.

External wires are provided for customer hookup. Wires are color coded as to direction of travel of the actuator (see wiring diagram, Figure 1-2).

## 1-4. Warranty and Warranty Repair

Subject to the conditions stated herein, Duff-Norton will repair or replace, without charge, any parts proven to Duff-Norton's satisfaction to have been defective in material and workmanship. Claims must be made within one year after date of shipment. Duff-Norton will not repair or replace any parts that become inoperative because of improper maintenance, eccentric loading, overloading, chemical or abrasive action, excessive heat, or other abuse.

Equipment and accessories not of Duff-Norton's manufacture are warranted only to the extent that they are warranted by their manufacturer, and only if the claimed defect arose during normal use, applications and service. Equipment which has been altered or modified

by anyone without Duff-Norton's authorization is not warranted by Duff-Norton. EXCEPT AS STATED HEREIN, DUFF-NORTON MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

If you have any questions concerning warranty repair, please contact the Duff-Norton Company. Authorization for return must be received from the Duff-Norton Company before returning any equipment for inspection or warranty repair.

## 1-5. Specifications

**Table 1-1. 6415 Series DC Actuator Specifications**

Applied Load (lbs)	Speed (in.min)		Amps	
	Standard 115 Volt Motor (60 Hz)	Standard 220 Volt Motor (50 Hz)	Standard 115 Volt Motor (60 Hz)	Standard 220 Volt Motor (50 Hz)
500	52	44	5.00	1.70
1000	51	42	5.50	1.70
1500	50	41	6.20	2.00

**Table 1-2. 6415 Series DC Super Pac Actuator Duty Cycle**

Applied Load (lbs)	# Duty Cycle (in/hour)	
	Standard 115 Volt Motor (60 Hz)	Standard 220 Volt Motor (50 Hz)
500	560	675
1000	540	625
1500	500	600

# Total inches of travel (up and down) per hour with equally timed intervals between cycles.

### **WARNING**

1. Some actuator external surface temperatures may reach 230°F at or near max. allowable duty cycle.
2. Do not operate actuator before setting limit switches.
3. Position hooded vent to prevent moisture and dirt from entering actuator (see instruction and maintenance sheet).
4. The actuator is not recommended for use in applications where it can be jammed. Examples of jamming include overtraveling the limit switches and jamming the nut and screw internally at the extreme ends of the stroke, or driving the actuator against an immovable object and thus overloading the actuator severely. Therefore consult Duff-Norton Engineering if jamming is expected.

# 1-6. Dimensions and Specifications

AC Motor is enclosed, permanent split capacitor induction type. Load/no-load speeds are approximately

equal. Equipped with thermal overload which opens and resets automatically. Standard motor requires capacitor for applies loads up to 1500 pounds.

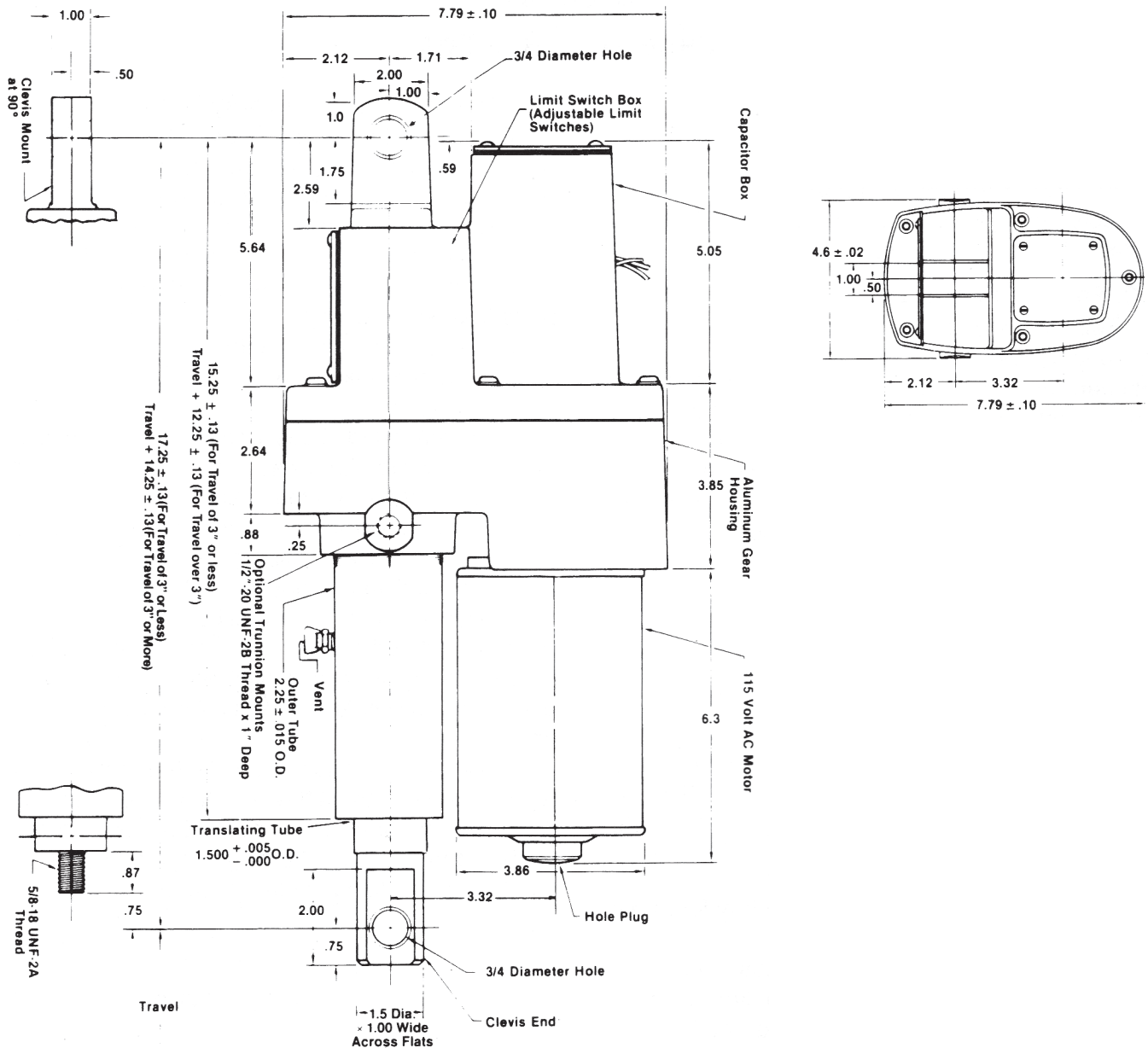


Figure 1-1. SPA-6415 and SPA-7415 Technical Illustration

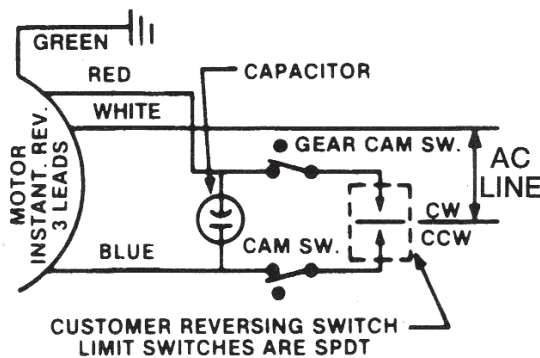


Figure 1-2. Limit Switch Wire Color Diagram

## Section II Installation

### 2-1. Installation Procedures

Use Figure 1-2 as a guide to properly attach the SPA 6415 & 7415 AC actuator to your power source.

### 2-2. Limit Switch Adjustment

#### CAUTION

Disconnect power before making any adjustments to the limit switches.

#### IMPORTANT

Before attempting to set limit switch nuts by these instructions, be certain that the red and blue motor leads and the switch leads are connected properly per Figure 1-2. Unless leads are connected exactly as shown, the following steps will be meaningless.

1. Setting Retracted Position
  - A. Do not install actuator in the intended application at this time.
  - B. With nut retainer (A) installed in actuator and the translating tube unstrained, operate actuator toward retracted position until limit switch nut (B) trips limit switch (see Figure 6-3).

#### NOTE

Translating tube may jam and rotate prior to tripping limit switch.

- C. Rotate the translating tube by hand until distance between the housing clevis hole centerline and the translating tube clevis hole centerline equals the desired closed height. This centerline to centerline dimension is not to be less than the retracted centerline to centerline dimension listed in Figure 1-6. If the two clevis end holes are not oriented as required, rotate the translating tube no more than 1/2 turn in either direction until they are properly oriented.
    - D. Install actuator in application and check drift. Slight readjustment in switch actuation may be attained by removing nut restrainer (A) and rotating limit switch nut (B) (1 notch of rotation = .05 in. of screw travel). Replace nut restrainer, (A).
2. Setting Extended Position
  - A. Restrain the translating tube against rotation by hand. Operate the actuator, toward the extended position, until the distance between

the housing clevis hole centerline and the translating tube clevis hole centerline equals the desired extended height. This centerline to centerline dimension is not to exceed the

- B. Remove nut restrainer (A) and rotate limit switch nut (C) (see Figure 6-3) until it activates the limit switch.
    - C. Replace nut restrainer (A).
    - D. Install actuator in application and check the unit's drift. Slight readjustment in switch actuation may be attained by removing nut restrainer (A) and (1) rotating limit switch nut (B) to adjust retracted position or (2) rotating limit switch nut (C) to adjust extended position (1 notch of rotation = .05 in. of screw travel).
    - E. After adjusting limit switch nuts, replace nut restrainer (A). Operate the actuator and readjust limit switch nuts as necessary to achieve desired travel.

### 2-3. Post-Installation Procedures

After actuator installation, position the air vent to prevent moisture and dirt from entering the actuator. Vent can be repositioned by loosening the set screw and rotating the outer air tube into which the air vent is threaded. Spot drill and re-tighten set screw. If necessary, an elbow (1/8 in female x 1/8 in male pipe thread) can be used for more effective positioning.

### FOR UNITS WITH POTENTIOMETER

#### 2-4. Potentiometer Installation

1. Loosen pot locknut and remove from actuator.
2. For best accessibility, solder leads to pot at this time.
3. Limit switches should be set for extreme limits of travel per instructions. Limit switch cam adjustments should be made per paragraph 2 prior to potentiometer installation.

#### CAUTION

**DO NOT ENGAGE POTENTIOMETER SHAFT GEAR TEETH WITH PLASTIC WORM BEFORE READING THE FOLLOWING PROCEDURE. FAILURE TO ADHERE TO THE FOLLOWING PROCEDURE COULD CAUSE DAMAGE TO THE POTENTIOMETER.**

4. Retract actuator translating tube until stopped by limit switch.
    - 5a. **FOR TRAVELS UP TO 9 inches** (single turn pot):

- i. Turn pot shaft counterclockwise until resistance between terminal **S** and **CCW** is approximately 100 ohms. This will be the pot's full retracted position.
  - ii. Being careful not to turn the pot shaft, slide it into engagement with the plastic worm and tighten locknut.
  - iii. Re-check resistance. If necessary loosen locknut slightly and twist pot to re-establish 100 ohm resistance. Pot does not have end of travel stops, but has a 20° deadband between the two ends of the resistive element. No continuity will be measured to terminal **S** if the slider is in the deadband.
  - iv. Run actuator to full extension (do not let tube rotate) until it is stopped by its limit switch.
  - v. Check resistance between **S** and **CCW** to be sure the slider is still on the element and the resistance is greater than 100 ohms. The pot has enough rotation for 9.43 inches of travel. (For strokes shorter than 9 inches, the retracted resistance can be increased so that pot adjustment is less critical.
- i. Turn pot shaft counterclockwise until it reaches its stop. Now turn shaft back clockwise 1/4 turn.
  - ii. Without turning pot shaft, slide pot onto engagement with the plastic worm and tighten locknut.
  - iii. Starting 1/4 turn from the end, the 3-turn pot has enough rotation for 25" of actuator travel.
6. With this set-up, potentiometer will have increasing resistance from **S** to **CCW** (and decreasing resistance from **S** to **CW**) as the actuator extends.

## 2-5. Digital Position Indicator (Duff-Norton part no. SK6300-4K)

The model SK6300-4K is a highly versatile, panel mount, digital readout device that provides a very precise indication of actuator position. It can be programmed to display percentage, inches, or any other desired unit. The indicator is self calibrating with no need for measurements or calculations.

See detailed instructions with the SK6300-4K indicator for installation and programming instructions.

Potentiometer terminal **CCW** should be connected to indicator Common, **CW** to Excitation Voltage, and S to Signal Voltage Input.

### 5b. FOR TRAVELS GREATER THAN 9 inches (multi-turn pot):

## Section III Operation

### 3-1. Operational Procedures

This motor is an intermittent duty type motor. Since the motor draws approximately the same amperage at no load as at full rated load, it only takes 10 minutes of continuous running, regardless of how light the load may be, before the thermal overload relay cuts out. It then takes about 10 minutes before the motor cools sufficiently for the thermal relay to close. Make sure that the duty cycle to which the actuator is subjected is not too severe for the motor.

Avoid using low voltage supply for the motor. All wiring, switches etc. must be of sufficient capacity to carry the required current.

The axis of the clevis pins should be parallel so that the actuator can pivot without binding. The preset brake will provide consistent braking for the actuator. However, in the event the brake friction surfaces become worn as indicated by excessive drift, the brake will require rebuilding. To aid in rebuilding, a repair kit with step by step instructions is available through Duff-Norton Company under repair kit part number SK-6415-41.

The repair can be performed by the customer or by any authorized repair station.

### WARNING

**This actuator is not recommended for use in applications where it can be jammed. Examples of jamming include overtraveling the limit switches and thus jamming the nut and screw internally at the extreme ends of the stroke, and driving the actuator against an immovable object and thus severely overloading it. This actuator can jam a limited number of times without damage. Therefore, consult Duff-Norton Engineering if jamming is expected.**

**Do not operate actuator before setting limit switches.**

**Some actuator external surface temperatures may reach 230°F at or near maximum allowable duty cycle.**

## Section IV Maintenance

### 4-1. Lubrication

Duff-Norton recommends the use of the following lubricant in conjunction with proper maintenance procedures of this unit: Exxon Ronnex Extra Duty #1.

### 4-2. Required Tools

A bearing puller, press, soft jaw table clamp and common hand tools are required for proper disassembly and assembly.

### 4-3. General Procedures

Duff-Norton recommends following these procedures during disassembly and assembly:

1. Tag critical parts to facilitate reassembly.
2. Mark mating surfaces to ensure proper meshing.
3. Clean and lubricate parts as required.
4. All seals must be replaced at time of rebuild, if damaged.
5. All screws, washers and other small common parts must be replaced if mutilated in any way.

### 4-4. Disassembly

Disassemble the actuator as follows while referring to Figure 5-1. Read instructions thoroughly before disassembling.

NOTE
Disassembly should be accomplished on a clean cloth.

1. Clamp actuator housing (42) in vise (use soft jaws). Unit should be in horizontal position with outer tube (55) up.
2. Remove screws (1) from limit switch box cover (11) and remove limit switch box cover (11) and gasket (12).
3. Remove nut retainer (14).

NOTE
If unit has potentiometer assembly (26) and potentiometer (26a) or gear (26b) is not damaged proceed to Step 4.

- a. Loosen nut (26c) and remove potentiometer assembly from nut retainer (14).
- b. Remove gear (26b) from potentiometer (26a). Washer and nut do not have to be removed from potentiometer (26a).

CAUTION
Take care not to damage potentiometer when removing gear.

4. Remove screws (1) from capacitor box cover (2) and remove cover (2) and gasket (3). Remove insulation (4) from capacitor box.
5. Discharge capacitor (5). Disconnect motor (53) lead wire terminals from capacitor (5). Remove capacitor from box.
6. Disconnect jumper wires (17 and 18) and motor (53) lead wire terminals from switches (16). Remove jumper wires (17 and 18) and pull motor (53) lead wires into capacitor box.
7. Remove set screw (38) from housing (42).
8. Remove button head cap screws (7) & lock washer (8).
9. Lift cover (9) from housing (42) passing motor (53) lead wires through hole in bottom of capacitor cavity in cover (9). Slight tapping with soft hammer may be necessary to overcome dowel pins (27).
10. Remove thrust washer (35) and thrust bearing (36) from cover (9). Thrust washer (35) and thrust bearing (36) may stay on spacer nut (37) in housing (42) and can be removed in Step 18.
11. Remove limit switch shaft assembly, consisting of limit switch shaft (22), limit switch nuts (23) and worm (24), from cover (9). Allow limit switch shaft (22) to drop out of flange bearing (25). Tilt shaft assembly and remove from cover (9).

NOTE
If limit switch nuts (23) or worm (24) do not have to be replaced, proceed to Step 14.

12. Thread limit switch nuts (23) off of limit switch shaft (22)
13. Remove worm (24) from limit switch shaft (22).

NOTE
If switches (16), insulation (19) or limit switch bracket (21) do not have to be replaced, proceed to Step 16.

14. Remove screws (20) and bracket (21) from cover (9).
15. Remove screws (15), switches (16) and insulation (19) from bracket (21).
16. Press clevis end bushing (6) out of cover (9). If bushing (6) is not damaged it should not be removed.

17. Remove bearing (28), bushing (34) and flange bearing (25) from cover (9).

**NOTE**

Bushing (34) and flange bearing (25) should not be removed unless they are damaged. Bearing (28) may stay on pinion (29) and can be removed in Step 18.

18. Remove thrust washer (31) from intermediate pinion shaft (32). Bearing (28) from pinion (29), thrust washers (35) and thrust bearing (36) from spacer nut (37) may have been removed in Step 10.

19. Remove spring (61) from end of screw (62).

20. Remove intermediate cluster gear (33), intermediate pinion shaft (32) and thrust washer (31).

21. Remove socket head cap screws (45), lock washers (46) and disassemble motor (53) from housing (42).

**⚠ WARNING**

Care must be taken not to damage motor lead wires.

22. Remove "O"-Ring (52) and rubber grommet (50).

23. Disassemble outer tube (55) and slip off over translating tube and clevis (66).

24. Remove air vent (58), wiper scraper (60) and guide bushing (59) from outer tube (55).

**NOTE**

If wiper scraper or guide bushing are not damaged they should not be removed.

25. Remove set screw (68) from spacer nut (37) and disassemble spacer nut (37) from screw (62) by clamping screw (62) between soft jawed vise.

**⚠ WARNING**

Care must be taken not to damage bearing journal of spacer nut (37).

26. Remove output gear (39), key (40), thrust washers (35), thrust bearing (36), and gear spacer (43).

27. Remove screw (62), translating tube and clevis (66) and nut assembly (64).

28. Remove washer (44) from screw (62).

29. Thread screw (62) into the translating tube until the screw bottoms out and cannot rotate farther, or until the screw thread becomes disengaged from the lifting nut thread (64).

30. Drive the four pins (65) just far enough into the lifting nut (64) to clear the translating tube wall; then remove the translating tube from the nut.

31. Remove the lifting screw (62) from the lifting nut (64).

32. Remove the four pins (65) by pressing each one the rest of the way through the lifting nut wall.

33. Remove the stop pin (63) from the lifting screw (62) if necessary.

34. Removing the brake (49) .(Required only if drift is excessive. If brake removal is not necessary, proceed to Step 35).

a. Push on the pinion(29) and coupling (47) until it slips back enough to make the spring (49) tang accessible.

b. Remove the spring (49) by grabbing the tang with pliers and twisting out. (Spring must now be replaced and can no longer be used.)

c. Remove the brake insert (51). Remove retaining ring (48) from input pinion (29). Input pinion (29) and bearing (30) can now be removed from housing (42).

d. The brake inset (51) has straight knurls on its O.D. which prevent it from rotating. Therefore, the insert can only be removed by pulling straight out.

e. One method of removing the insert (51) is to use a blind hole bearing puller. This tool expands into the internal spring cavity and pulls against the lip of the insert (51).

35. If coupling (47) on motor (53) shaft must be replaced, remove retaining ring (48) from motor (53) shaft and remove coupling (47).

**DISASSEMBLY IS COMPLETE.**

**4-5. Assembly**

Assemble the actuator as follows while referring to Figure 5-1. Read instructions thoroughly before assembling.

**NOTE**

Be sure all components are clean and dry before assembling.

1. Assemble coupling (47) on motor shaft, then install retaining ring (48) on motor shaft.

2. Press bearing (30) on input pinion (29) (press load should be applied to inner race of bearing to avoid damage to bearing).

3. Press bushing (34) into housing (42).

4. Install input pinion (29) and bearing assembly (30) in housing (42) (press load should be applied to outer ring of bearing to prevent damage to bearing).



5. Assemble coupling (47) on input pinion (29) and install retaining ring (48).
6. Brake Assembly
  - a. Grease O.D. of spring (49) and pocket of insert (51) (chamfered end) with Aeroshell #6 grease.

<b>⚠ CAUTION</b>
When using replacement parts, make sure you have correct spring. (Part No. SK-6415-18). Red spring designates DC unit. If your replacement spring is red, contact your local distributor or the Duff-Norton Factory for immediate replacement.

- b. Install spring (49) into insert (51) pocket (chamfered end).
  - c. Align pinion coupling (47) and spring (49) as shown in Figure 6-1A and press insert (51) and spring (49) assembly into housing (42) (alignment must be as shown in Figure 6-1A).
7. Press bushing (34), bushing (6) and flange bearing (25) into cover (9).
8. Assembly of Limit Switch Components (refer to Figure 6-3).
  - a. Assemble insulation (19), limit switch (16) and screw (15) on limit switch bracket (21).

<b>NOTE</b>
Limit switch (16) leads should face each other. Insulation (19) should be folded up and behind common terminal of switches (16). See Figure 6-3.

- b. Assemble limit switch nuts (23) on limit switch shaft (22) (care should be taken not to cross-thread nuts). Nut hubs should be facing away from each other. See Figure 6-3.
  - c. Assemble worm (24) on limit switch shaft (22). Unthreaded hub on worm should be away from limit switch shaft (22) threads. See Figure 6-3.
9. Assembly of Limit Switch Components in cover. Refer to Figures 6-2 and 6-3.

<b>NOTE</b>
Cover (9) should be in a soft-jaw vise with limit switch box cover up.

10. Assemble limit switch bracket (21), insulation (19) and switch (16) assembly into cover (9) with screws (20).
11. Assemble limit switch shaft (22), limit switch nuts (23) and worm (24) assembly into cover (9). Tilt shaft and insert into I.D. of bushing (34). Then straighten and assemble shaft into flange bearing (25).

<b>NOTE</b>
Worm (24) should be facing up toward flange bearing (25). See Figure 6-3 (shaft will be loose in cover).

12. Attach red terminal wire (17) to common terminal of left side switch (16). Attach blue terminal wire (18) to common terminal of right side switch (16). Feed ends of terminal wires (17) and (18) through 5/8" dia. hole into cover (9) capacitor box.
13. Press guide bushing (59) and wiper scraper seal (60) into outer tube (55). (Scraper part of scraper seal should be facing outward away from guide bushing.)
14. Install the stop pin (63) in the end of the lifting screw (62), taking care to center the pin in the screw.
15. Screw the lifting nut (64) on to the lifting screw (62) with the flange end away from the stop pin (63).
16. Fill the translating tube (66) approximately 1/2 to 3/4 full with DuBoise M.P.G. grease (no substitutes).
17. Slide the translating tube over the lifting screw (66) and on to the lifting nut (64), lining the four holes in the translating tube up with the four holes in the lifting nut (64). Install pins (65) flush with translating tube O.D.
18. Assemble washer (44) and gear spacer (43) on screw (62). Install key (40) in key groove of screw.
19. Clamp sides of housing (42) in vise (use soft jaws with input pinion up).
20. Install screw (62), gear spacer (43), washer (44), translating tube (66), and tube nut (64) assembly into housing (42) through bushing (34).
21. Apply a generous amount of Aeroshell #6 grease (no substitutes) to thrust washers (35) and thrust bearing (36) and assemble over gear spacer (37).
22. Aligning keyway in output gear (39) with key (40) in screw (62), assemble output gear (39) on screw (counter-bore in gear facing up away from thrust bearing).
23. Clamp screw (62) between soft jawed vise. Thread spacer nut (37) on screw (62) and tighten against output gear (39). Spacer nut flange should be in counterbore of output gear. Do not grip on bearing journal of spacer nut when tightening spacer nut.
24. Check alignment of tapped holes in spacer nut (37) with holes in output gear (39). Use two 9/64 dia. pins approximately 11/2" long. One pin should drop into hole in output gear (39). If pin does not drop into hole, tighten or loosen spacer nut until hole is aligned

and one pin drops into hole. (Note: spacer nut should not be rotated more than 22 1/2 before pin drops into hole in gear.) It is preferable to tighten spacer nut down instead of loosening.

25. Remove pin from aligned hole. Install half dog set screw (68) and tighten half dog point into hole in output gear (39). Remove remaining pin and proceed with assembly. Note: One hole must be in alignment to have proper assembly.
26. Lightly grease O.D. of translating tube (66) with Duboise M.P.G. grease (no substitutes) and assemble outer tube (55) assembly over translating tube (66) and thread into housing (42) (a sealing compound such as Non-Hardening Permatex 2 should be used on threads).
27. Insert intermediate pinion shaft (32) in housing (42) and place thrust washer (31) over shaft (32). Assemble intermediate cluster gear (33) on shaft and place thrust washer (31) on top.
28. Assemble bearing (28) on input pinion (29) (press on inner bearing ring to prevent damage to bearing).
29. Pack housing (42) gear box cavity with Aeroshell #6 grease (no substitutes).
30. Assembly of Motor (53) to Housing (42)
  - a. Note location of flat on input pinion by marking spot on the housing. See Figure 6-1B.
  - b. Insert grommet (50) on input pinion (29) between coupling (47) posts and install "O"-Ring (52) in cavity of insert (51).
  - c. Pack cavity with Aeroshell #6 grease.
  - d. If hole plug (54) is in rear end of motor, remove.
  - e. Feed motor (53) lead wires through hole in housing (42) lining up couplings (47) on input pinion (29) and motor (53) shaft. (Alignment is critical at this point. See Figure 6-1B.)

NOTE
Input pinion (29) and motor (53) shaft flats are opposite each other.

- f. Assemble motor (53) into housing (42) . Before assembling lock washers (46) and socket head screws (45), hold motor firmly in place and, with a screwdriver, turn motor shaft by using screwdriver slot in end of motor shaft.

NOTE
Before turning motor shaft, make sure pinion shaft has not been pushed out. It may be necessary to hold pinion shaft down while turning motor shaft. If couplings are properly installed, the motor can be turned freely in both directions. If motor shaft will not turn, this is an indication that couplings are not properly aligned and assembly should be corrected.

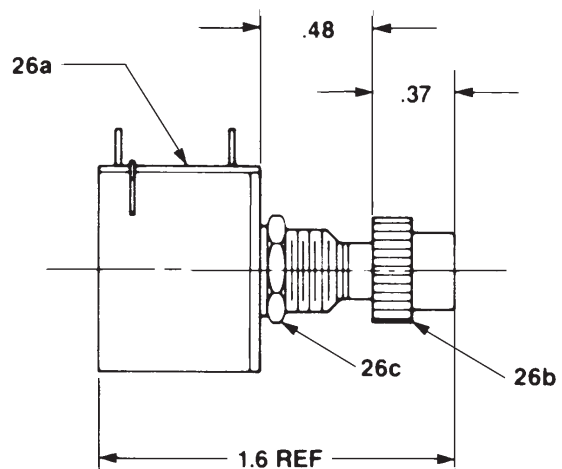
- g. Install lock washers (46) & socket head screws (45).
31. Insert dowel pins (27) in housing (42) and place gasket (41) in place over dowel pins (27).
32. Install air vent (58) in outer tube (55) ( it may be necessary to back outer tube out in order to install air vent or to have vent in a more desirable position). Spot drill tube and install set screw (33) to hold tube in place.
33. Install spring (61) into end of screw (62).

NOTE
If unit has potentiometer assembly (26) and gear (26b) does not have to be replaced or if unit has no potentiometer feature, proceed to Step 35.

34. Potentiometer Assembly (26)
  - a. If nut and washer were removed from potentiometer, assemble washer (26d) and nut (26c) on potentiometer (26a). Nut (26c) should not be tightened on potentiometer (26a) face.
  - b. Assemble gear (26b) on potentiometer (26a) shaft.

NOTE
Gear should be assembled with a very light press. See sketch for required dimension of gear on potentiometer. Take care not to damage potentiometer.

35. Assembly of Cover (9)



**Figure 4-1. Potentiometer Nut & Washer Assembly**

- a. Feed motor (53) lead wires into capacitor box cover (9). Care should be taken not to damage lead wires. Assemble cover on housing (42), aligning dowel pins (27) with bore in cover and flats of limit switch shaft (22) with bore and slot in end of screw (62).

<b>NOTE</b>
Limit switch shaft should be able to spring up when a light pressure with finger is applied downward on limit switch nut and removed.

- b. Install lock washers (8) and button head cap screws (7).
- c. Feed motor lead wires (red and blue small terminal ends only) into cover switch box through 5/8" diameter hole. Install terminal of red lead wire on normally closed terminal of left side of switch. Install terminal of blue lead wire on normally closed terminal of right side of switch. (Wires going to switches should be same color.) It may be necessary to install terminals on switch terminals tabs with needle-nose pliers and care should be taken not to damage terminal tab or switch (see Figure 6-3).
- d. Feed terminal wires, (17) red, (18) blue, fuse jumper wire, and motor lead through 1/2" tapped hole in cover capacitor box outside of cover.
- e. Moving wires out of the way, insert capacitor (5) into box (terminals up) and attach motor lead wire (large connectors) to capacitor terminals. (Red on one pair of capacitor terminals and blue on the other pair of capacitor terminals.)
- f. Insert insulation (4) and assemble gasket (3) and cover (2) with screws (1).
- g. Adjust actuator limit switch settings per instructions in paragraph 2-2.
- h. If actuator has potentiometer, refer to position indicator installation and calibration instructions in Paragraph 2-4.
- i. Attach gasket (12) and cover (11) with screws (1).

**ASSEMBLY IS COMPLETE.**

## Section V Parts List and Technical Illustration

**Table 5-1. Parts List for 6415 and 7416 AC Actuator**

Index No.	Part Name	Qty. Req.	Part Number
1	Screw	8	H-2979
2	Cover	1	SK6415-142
3	Gasket	1	SK-6415-37
4	Insulation	1	SK-6415-47
5	Capacitor – 115 V	1	SK-6405-7-6
6	Capacitor – 220 V	1	SK-6405-7-8
7	Bushing	1	SK-6415-96
8	Button Head Cap Screw	5	H-2986
9	Lock Washer	5	S-42-9
10	Cover	1	SK-6515-134
11	Tapered Closure	1	SK-6000-46
12	Switch Cover	1	SK-6415-36
13	Gasket	1	SK-6415-35
14	Instruction Decal	1	SK-6905-15
15	Nut Restrainer	1	SK-6415-136
16	Screw	4	H-2984
17	Switch	2	SK-6415-131
18	Jumper Wire (Red)	1	SK-6415-32-1
19	Jumper Wire (Blue)	1	SK-6415-32-2
20	Insulation	2	SK-6415-132
21	Screw	2	H-2979
22	Limit Switch Bracket	1	SK-6415-137
23	Limit Switch Shaft	1	SK-6415-135
24	Limit Switch Nut	2	SK-6425-9
25	Worm	1	SK-6905-3
26	Flange Bearing	1	SK-6425-11
26a	Potentiometer Assembly	1	††
26b	Potentiometer	1	††
26c	Gear	1	SK-6415-62
26c	Nut	1	furnished with
27	Lock Washer	1	26a
28	Dowel Pin	2	H-5391
29	Bearing	1	SK-6415-5
30	Input Pinion	1	SK-6415-3
31	Bearing	1	SK-2374-5
32	Thrust Washer	2	255K14
33	Intermediate Pinion Shaft	1	SK-6415-9
34	Intermediate Cluster Gear	1	SK-6415-4
35	Bushing		
36	Thrust Washer	2	SK-6415-11
37	Thrust Bearing	4	255K10
38		2	511K11

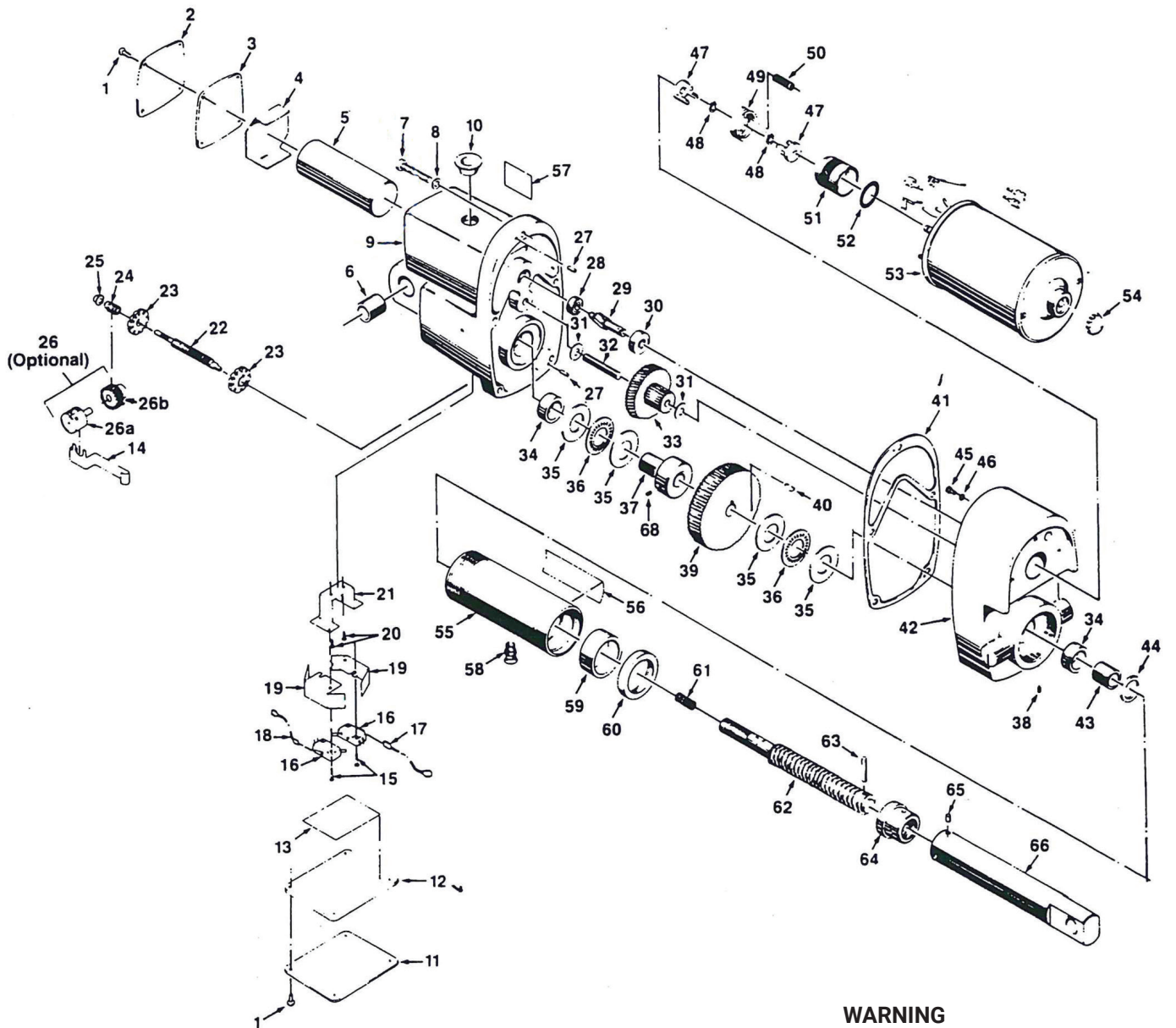
Index No.	Part Name	Qty. Req.	Part Number
37	Spacer Nut	1	SK-6415-17
38	Set Screw	1	H-2594
39	Output Gear	1	SK-6415-92
40	Woodruff Key	1	S-23-12
41	Gasket	1	SK-6415-7
42	Housing	1	SK-6415-1
43	Gear Spacer	1	SK-6415-91
44	Washer	1	H-4011
45	Socket Head Cap Screw	3	S-49-94
46	Lock Washer	3	H-4081-P
47	Coupling	2	SK-6415-20
48	Retaining Ring	2	SK-2374-8
49	Spring	1	SK-6415-18
50	Rubber Grommet	1	SK-6415-29
51	Insert	1	SK-6415-21
52	“O”-Ring	1	X-6477-72
53	Motor – 115 V	1	SK-6415-19
54	Motor – 220 V	1	SK-6515-96
55	Hole Plug	1	
56	Outer Tube	1	SK-6415-111**
57	Warning Decal	1	SK-6415-59
58	Actuator Deal	1	SK-6415-67
59	Air Vent	1	SK-2015-218
60	Guide Bushing	1	SK-6415-23
61	Wiper Scraper	1	SK-6415-16
62	Spring	1	JF-343-3
63	Screw	1	SK-6415-113*
64	Stop Pin	1	H-5122
65	Nut	1	SK-6415-15
66	Pin	4	H-5164
67	Translating Tube & Clevis	1	SK-6415-109-A*
68	Half Dog Set Screw	1	H-2612

\* Denotes dash number is equal to travel

\*\* Denotes dash number is 3 for travel. 3 inches or less. Otherwise denotes dash number is equal to travel in inches.

†† **Optional**

Travel	Potentiometer (26a)	Ohms	Ohms/Inch Change	Potentiometer with gear (26)
9 in or less	SK-3275-24	5000	530	SK-6415-70-10A
Over 9 in	SK-6200-18	5000	167	SK-6415-70-5A



**WARNING**

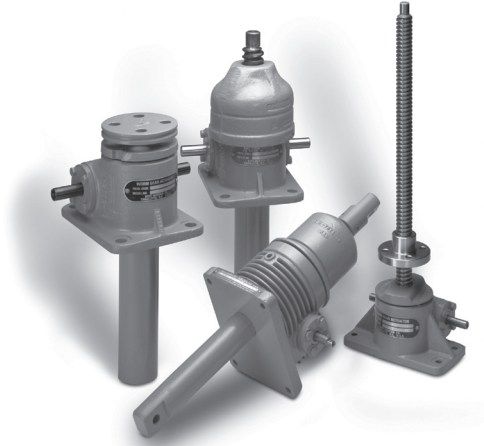
Use only replacement parts supplied by or approved by Duff-Norton. Non-authorized parts may be inadequate, resulting in serious injury or death in event of failure.

**Figure 5-1. Exploded Parts Illustration 6415 & 7415 Series AC Actuator**

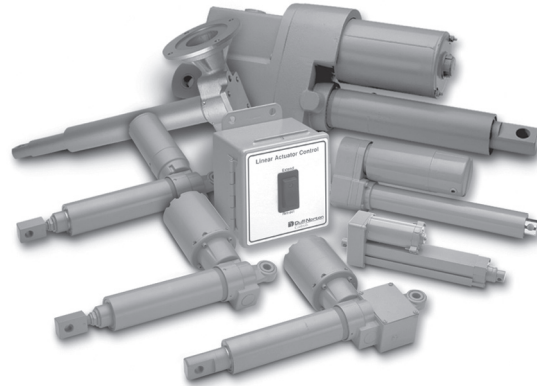




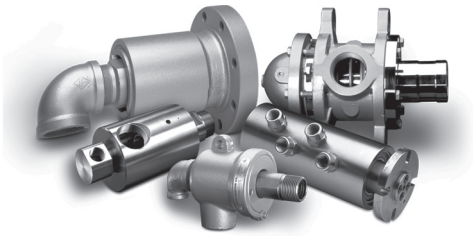
## Duff-Norton also Manufactures



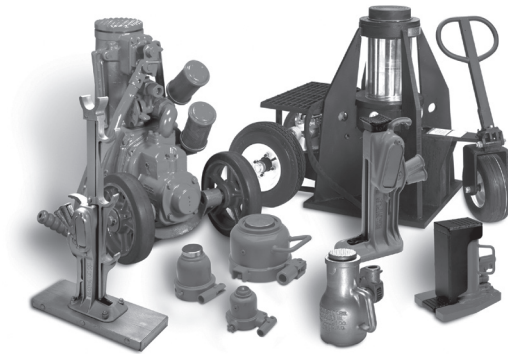
**Mechanical Actuators**



**Electromagnetic Actuators**



**Rotary Unions**



**Mechanical Jacks**