Oil Switches

COOPER Power Systems

Types NR, NRV Maintenance Instructions

S260-20-8
Service Information

Type NR: Serial No. 309900 and after
Type NRV: Serieal No. 10500 and after

NOTICE: This document is also applicable to Cooper Power Systems product serial numbers beginning with the characters CP57.

89991KMA

Figure 1.
Kyle® Type NR switch

89992KMA

Figure 2.
Kyle® Type NRV switch

WARNING: Do not energize this equipment out of oil. Operation out of oil will result in flashovers that will damage the equipment and may cause severe personal injury.

CONTENTS:

These instructions do not claim to cover all details or variations in the equipment, procedure, or process described, nor to provide directions for meeting every contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your Cooper Power Systems sales engineer.

November 1989 • New Issue
Printed in USA

SAFETY INFORMATION

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual contains two types of hazard statements:

WARNING: Refers to hazards or unsafe practices which could result in severe personal injury, or death, and equipment damage.

CAUTION: Refers to hazards or unsafe practices which could result in damage to equipment or in personal injury.

Safety Instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

CAUTION: Before installing, maintaining, or testing this equipment, carefully read and understand the contents of this manual.

WARNING: Do not operate this equipment out of oil. Operation out of oil will result in flashovers that will damage the equipment and may cause severe personal injury.

CAUTION: Follow all locally approved safety practices when lifting and mounting the equipment. Use the lifting strap on the switch head casting. Lift the load smoothly and do not allow the load to shift. Improper lifting can result in equipment damage.

WARNING: Be sure to follow all locally approved procedures and safety practices when installing the switch. Improper handling may result in severe personal injury and equipment damage.

WARNING: High voltage. Contact with high voltage will cause serious personal injury or death. Follow all locally approved safety procedures when working around high voltage lines and equipment.

ADDITIONAL INFORMATION

These instructions to not claim to cover all details or variations in the equipment, procedure, or process described, nor to provide directions for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your sales engineer.

INTRODUCTION

Service information S260-20-8 covers the maintenance instructions for Type NR and NRV electrically-operated, single phase, oil switches. This includes their general description, operating principles and instructions for periodic inspection and shop repairs. Service parts lists, keyed to exploded-view drawings of the switch, are included at the back of the manual.

GENERAL DESCRIPTION

The Type NR and NRV switches are single-phase, electrically-operated with a quick-close, quick-open mechanism which also provides the switch with close-and-latch capability.

The switches are electrically operated. The standard actuator can be operated by any three-wire control device employing a set of SPDT contacts. It can also be operated by a two-wire (SPST) control device by adding a SPDT relay accessory to the actuator mechanism.

DESCRIPTION OF OPERATION

With the main switch contacts closed, energizing the opening circuit will operate the actuator motor to release a toggle which allows the preloaded opening springs to snap open the switch contacts and load the closing spring. It also drives the cam to position the selector switch for a closing operation and interrupts the opening circuit to stop the motor. The opening circuit must remain energized for at least 4.0 seconds for the actuator to perform these functions.

With the main switch contacts open, energizing the closing circuit will operate the actuator motor to allow the preloaded closing spring to snap closed the switch contacts and load the opening spring. It also drives the cam to position the selector switch for an opening operation and interrupts the closing circuit to stop the motor. The closing circuit must remain energized for at least 0.5 seconds for the actuator to perform these functions.

A holding switch accessory installed in the actuator reduces to one second the minimum time the control must be energized to effect an opening or closing operation.

RATINGS AND SPECIFICATIONS

Table 1
Voltage and Current Ratings

Description	Type NR	Type NRV	
		At 14.4 KV	At 20 KV
Nominal voltage class, (kv rms)	14.4	20.0	20.0*
Rated maximum voltage, kV rms)	15.0	15.0	22.0*
Impulse withstand (BIL), (kV crest)	95.0**	125.0	125.0
60-Hz dielectric withstand			
Dry, 1 minute, (kV)	35	60	60
Wet, 10 seconds (kV)	30	50	50
Continuous current, (amps)	200	200	60
Rated capacitive switching current, (amps)	200	200	60
Inductive load switching current, (amps)			
75 to 100% power factor	200	200	60
50 to 75% power factor	100	100	—
Under 50% power factor	50	50	—
Rated making current (amps asymmetrical)	9000	9000	9000
Momentarycurrent (amps asymmetrical)	9000	9000	9000
Short time current ratings (amps sym)			
1/2-second	6000	6000	6000
1-second	4500	4500	4500

*Can be used for switching solidly grounded capacitor banks on 20/34.5—kV systems.
**For 1 25-kV BIL version of the Type NR switch, available as an accessory, 60-Hz dielectric withstand; dry, 1 minute is 42 kV; wet, 10 seconds is 36 kV.

Table 2
Electrical Data (Control)

Description	Rating
Nominal operating voltage (Vac)	120
Operating voltage range (Vac)	95 to 130
Closing-motor current (amp)	1.9
Switch response time, opening (see)	4.0
Switch response time closing (see)	0.5

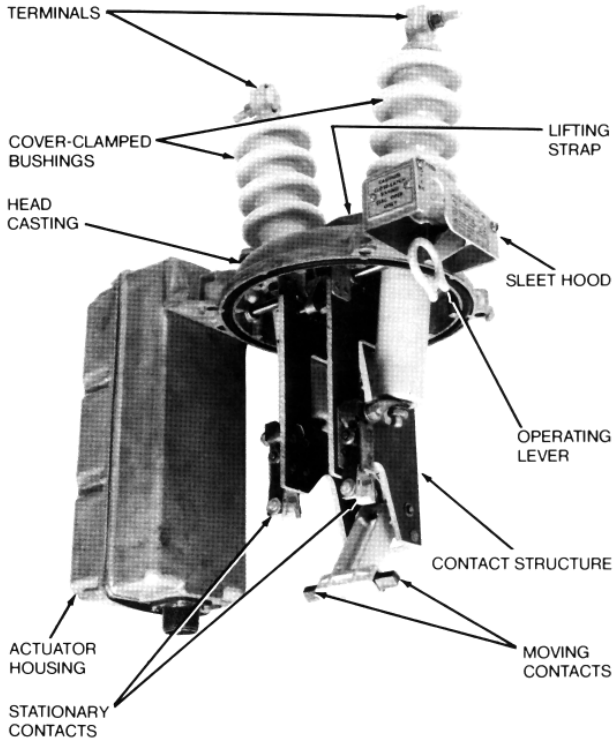

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Figure 3.
Untanked Type NR oil switch.

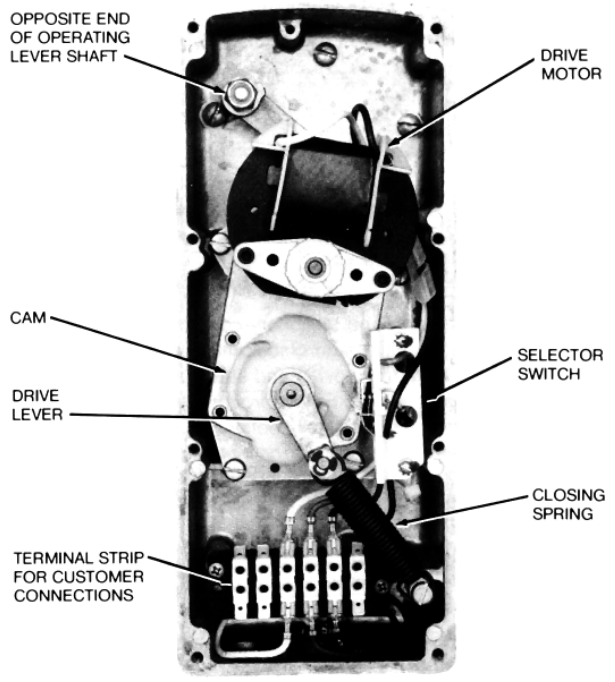

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Figure 4.
Standard actuator mechanism.

MAINTENANCE

Frequency of Maintenance

Because these switches are applied under widely varying operating and climatic conditions, maintenance intervals are best determined by the user based on actual operating experience. Cooper Power Systems recommends the switch be inspected and serviced yearly until experience indicates a more advantageous schedule. In no case should the service interval, between periodic maintenance and inspection, extend beyond 1200 operations.

WARNING: Continuous use of a switch without regular routine inspection and repair, can affect reliability. This could lead to equipment failure and possible personal injury.

Each periodic maintenance inspection should include at least the following:

1. By-pass and remove the switch from service.
2. Inspect external components.
   A. Clean the bushings and inspect for chips, cracks and breaks. Replace as necessary, following procedure in "Shop Repair Procedures—Bushings" section.
   B. Check for paint scratches and other mechanical damage. Paint to inhibit corrosion.
3. Perform a dielectric withstand test to determine the insulation level. Follow procedures in "Insulation Level Withstand Tests" section.
4. Loosen the head bolts and remove the mechanism from the tank. Be careful not to damage the gasket if the tank and head must be pried apart to break the seal.
5. Allow the oil to drain off the mechanism.
6. Clean the intemal components:
   A. Remove all traces of carbon by wiping with a clean, lint-free cloth.
   B. Flush the intemal components with clean transformer oil.

CAUTION: Never use volatile solutions, detergents, or water-soluble cleaners.

7. Check the moving and stationary contacts.
   A. Dress slight pitting and discoloration with crocus cloth.
   B. Replace **both** the moving and stationary contacts if they are severely eroded. Follow procedures in "Shop Repair Procedures—Contacts" section.
   NOTE: The contacts should be replaced before the erosion of the load current transfer surfaces impairs their effectiveness.
8. Manually close and trip the switch several times to check that all components perform properly.
9. Inspect the tank wall liners. Soft or spongy areas indicate that water has been absorbed. Replace liners if this condition is detected or even suspected.
10. Check the dielectric strength of the insulating oil.
    A. A sample taken near the bottom of the tank should have a dielectric strength of not less than 22 kV.
    B. Low dielectric strength indicates the presence of water or carbon deposits; replace the oil. (See "Oil Condition" section.)
11. If oil must be replaced, drain the tank and discard the tank wall liners.
12. Thoroughly clean out all sludge and carbon deposits and rinse the tank with clean oil.
13. Install new tank wall liners and fill the tank with clean, new insulating oil to within one inch of the top of the tank flange. Oil capacity is approximately 1.5 gallons.

    NOTE: Use only new, or like-new reconditioned transformer oil which conforms to the specifications in Cooper Power Systems Reference Data R280-90-1, "Oil Specifications and Test."

14. Clean and examine the head gasket. Replace if it is damaged or has taken a permanent set.
15. Clean the head gasket seat and retank the switch.
    A. Replace the head bolts and torque to 10-14 ft-lbs. Apply clamping force gradually and equally, in rotation, to each bolt to achieve an evenly distributed gasket sealing pressure.
16. Electrically operate the switch to check for proper operation. See "Operating Instructions — Electrical operation" section.
17. Repeat the high voltage dielectric withstand test (Step 3) to make sure the dielectric clearances within the tank have not been compromised.

OPERATING INSTRUCTIONS

Electrical Operation

The switch may be opened and closed electrically by applying rated control voltage to the proper terminals of the actuator terminal block. Figures 5, 6, and 7 show the connection diagrams for the three electrical operating modes.

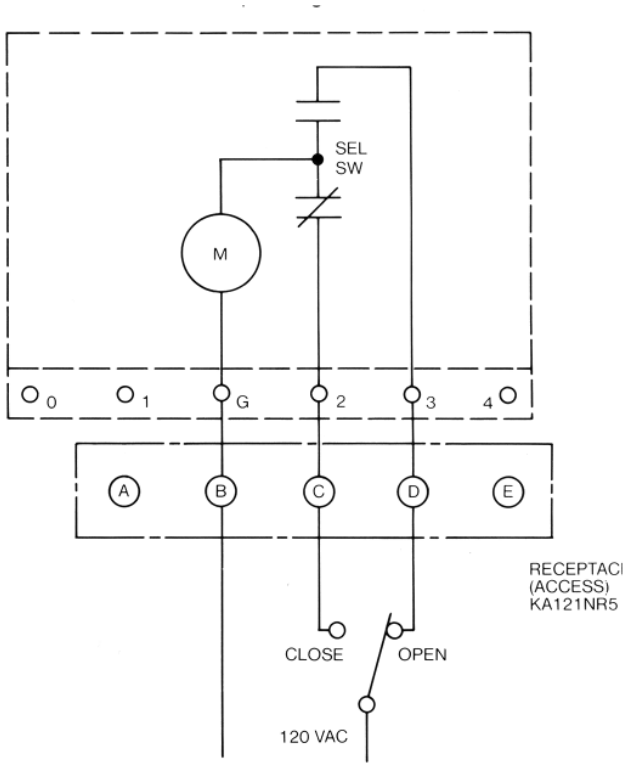

Figure 5.
Typical connection diagram for three-wire control.

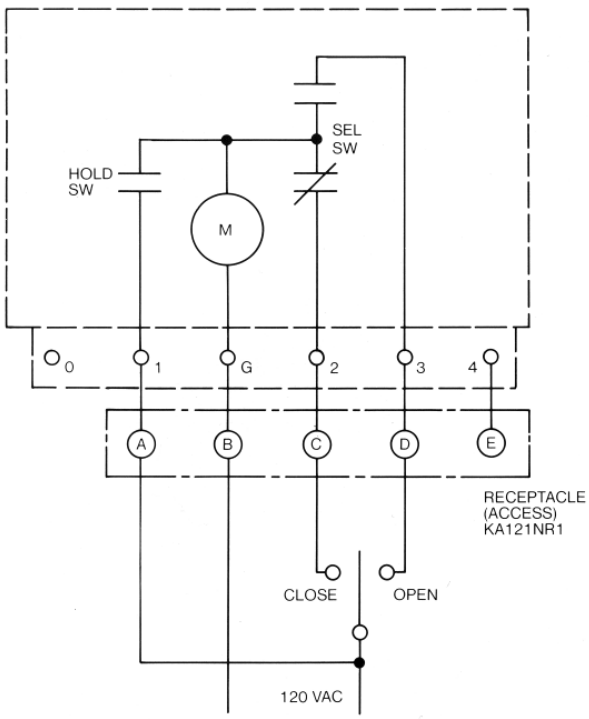

Figure 6.
Typical connection diagram for three-wire control with holding switch.

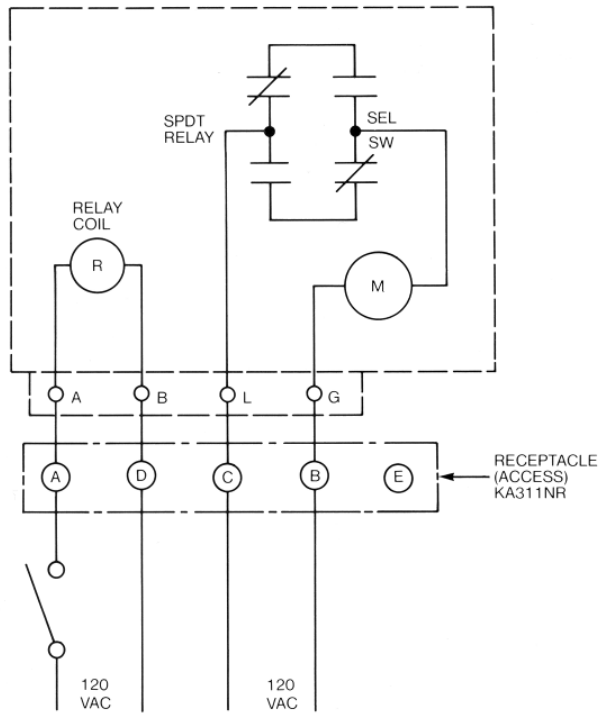

Figure 7.
Typical connection diagram for two-wire control.

Manual Operation

The switch may be manually opened and closed by operating the yellow handle under the sleet hood.

NOTE: Manual operation does not affect the status of the electrically operated actuator. To electrically close a switch which has been manually opened, the electrical open circuit must be first activated to change the status of the selector switch for a close operation.

OIL CONDITION

Oil plays an important role in the proper functioning of the switch. It provides the internal insulating barrier from phase to ground, and acts as an arc quencher. Switching operations cause reductions of some of the oil into chemical compounds, free carbon and gases. Some of these compounds form water-absorbing particles which reduce the dielectric strength of the oil. For effective switch operation the oil must be replaced before it deteriorates below a safe level. Oil that has been contaminated with carbon sludge or has a dielectric strength of less than 22 kV should be replaced.

Used oil must be reconditioned before using. Filtering may remove absorbed and free water, and other contaminants to raise the dielectric strength to an acceptable level. However, it does not always remove water-absorbing contaminants. Thus, the dielectric strength of the oil may fall rapidly after the switch is returned to service. Therefore the switch should be filled with new oil or oil that has been restored to like-new condition. oil used in these switches conforms to ASTM Standard D3487, Type 2; its property limits are listed in Reference Data R280-90-1, “Oil Specifications and Tests.”

New oil should always be filtered before using even though it is obtained from an approved source. Passing oil through a blotter press will remove free water and solid contaminants such as rust, dirt, and lint. When filtering the oil, aeration should be kept to a minimum to prevent moisture in the air from condensing in the oil and lowering its dielectric strength.

INSULATION LEVEL WITHSTAND TESTS

High-potential withstand tests provide information regarding the dielectric condition of the switch. Testing is performed at 75% of the rated low-frequency withstand voltage (See Table 3).

Table 3
Test Voltages for Insulation Level Withstand Test

Switch Type	BIL (kV)	Test Voltage (kV)
NR	95	26.25
NR*	125	31.5
NRV	125	45.

*Accessory 125-kV BIL version

TEST 1: Proceed as follows:
1. Close the switch.
2. Ground switch tank and head.
3. Apply proper test voltage to one of the bushing terminals.
• The switch should withstand the test voltage for 60 seconds.

TEST 2: Proceed as follows:
1. Open the switch.
2. Ground switch tank and head.
3. Ground the bushing on one side of the switch.
4. Apply proper test voltage to the ungrounded bushing.
• The switch should withstand the test voltage for 60 seconds.
5. Reverse the test and ground connections to the bushings.
6. Again apply proper test voltage to the ungrounded bushing.
• The switch should withstand the test voltage for 60 seconds.

TEST RESULTS: These high potential withstand tests provide information on the dielectric condition of the switch.

1. If the switch passes the closed-contacts test (Test 1) but fails the open-contacts test (Test 2) the cause is likely to be in the main contact assembly.
2. If the switch fails the closed-contacts test (Test 1) the cause is likely to be a diminished electrical clearance or failed insulation.
3. After correcting the problem, retest to confirm the repair.

SHOP REPAIR PROCEDURES

The operations described in this section should be performed under the cleanest conditions possible. The repair work, except for bushing replacement, will be simplified if the work bench is arranged so the mechanism/head assembly can be inverted (bushings down). No special tools are required for any of the repair procedures.

Bushings

Bushing maintenance generally consists of a thorough cleaning and a careful examination for chips, cracks, or other mechanical damage during the periodic maintenance inspection. Bushings must be replaced whenever damage is discovered.

The NR-NRV switch bushings are oil-filled. The special fixtures and procedures required to assemble these bushings is beyond the scope of normal shop maintenance repair. Therefore if a bushing is in any way damaged, the complete bushing assembly must be replaced. Refer to Figure 8 and proceed as follows:

1. Disconnect the appropriate bushing lead from the bottom end of the bushing rod.
2. Remove the three hex head capscrews and bushing clamps that secure the bushing to the head casting and lift out the complete bushing assembly.
3. Remove and discard the lower bushing gasket.
4. Twist off the split aluminum ring from the old bushing and install on the new bushing assembly if ring is in good condition; replace ring if damaged.
   NOTE: The clamping ring cushions and distributes the pressure between the porcelain and the clamps. DO NOT OMIT.
5. Install the new bushing assembly into the head using a new lower bushing gasket. Position the bushing with the stud-end of the terminal pointing outward.
6. Position the clamping ring with the split centered between two clamping bolts.
7. Reassemble the bushing to the head casting. Tighten the clamping bolts evenly, a little at a time, to a torque of 3-7 ft-lbs.
   NOTE: Clamping forces must be applied gradually and equally, in rotation, to each bolt. This results in an evenly distributed gasket pressure.
8. Reconnect the lead to the bushing rod.

Contacts

The Type NR and NRV switches have an open-type, double-break contact arrangement as shown in Figure 9. Depending upon the extent of damage, the stationary and moving contacts only, the moving contact and arm assembly, or the complete contact box assembly may be replaced.

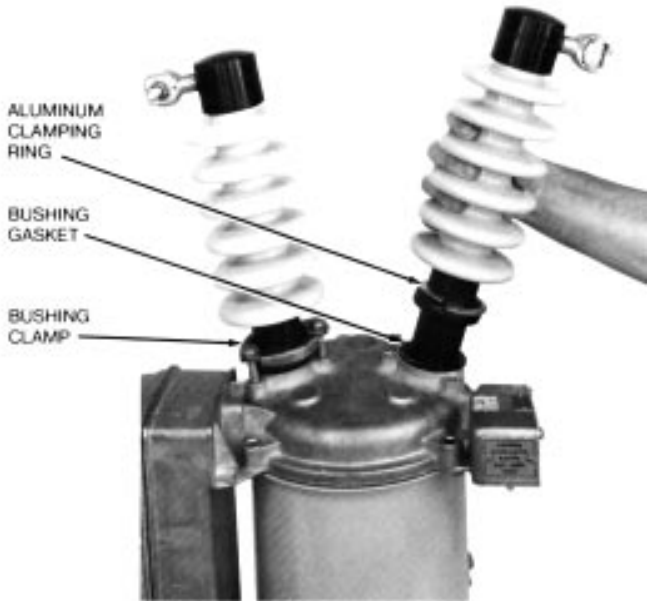

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Figure 8.
Bushing removal.

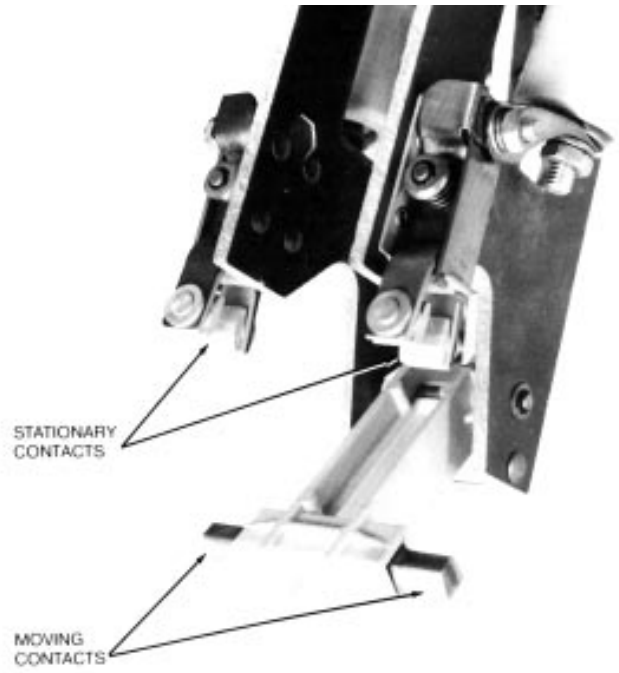

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Figure 9.
Open-type double-break contact arrangement of Type NR and NRV switches.

MOVING CONTACTS

Minor pitting can be smoothed with crocus cloth. If contacts show appreciable wear due to arc erosion, replace as follows:

1. Remove the round head screws and lockwashers that secure the moving contact bar to the contact arm. Remove the bar from the contact arm.
2. Reassemble the new moving contact bar to the contact arm and secure with round head screws and lockwashers. Apply one drop of Loctite #242 to each threaded hole of the contact bar prior to assembly.

STATIONARY CONTACTS

Smooth minor pitting with crocus cloth. If contacts are excessively eroded, replace as follows:

1. Remove hex nut, lockwasher and flatwasher from contact stud. Loosen nut on bushing rod slightly and slip terminal lead from contact stud.
2. Open flexible contact leads and remove contact retainer. Pull the stationary contact assembly and contact roller from contact stud.
3. Install contact roller within new contact assembly and mount on the contact stud. Install following parts in order: contact retainer, flexible contact leads, terminal leads, flat-washer, lockwasher and hex nut. Tighten hex nut on bushing rod.

CAUTION: Be sure not to pull contacts or contact structure out of alignment when tightening the jumper lead to the bushing terminal rod. To test alignment, wet the contacts with oil. Then, with the actuator mechanism prepared for a closing operation, push the contacts closed by hand and hold for a few seconds. When the moving contacts are released, they should be pulled open by the spring in the head mechanism. If not, adjust stationary contacts as described in Step 4 until they do so.

4. With the moving contacts in the open position, the space between the stationary contacts should measure 0.281 ± 0.010 inch.
   NOTE: The stationary contact assembly is normally pre-adjusted during manufacture to obtain this clearance. Bend the contact fingers as required if this spacing is not within specified tolerances.

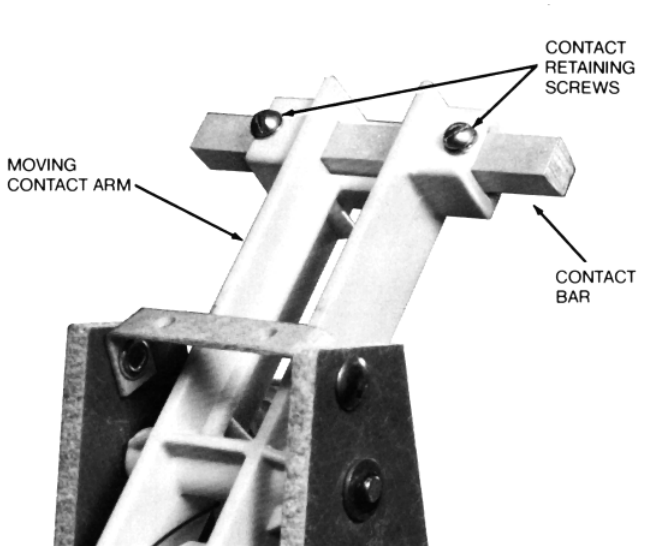

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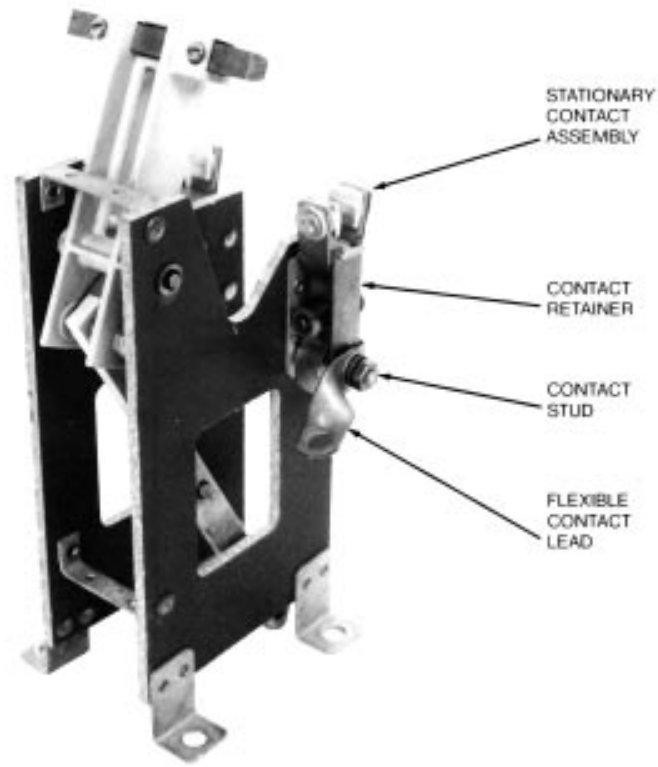
Figure 10.
Removing moving contact.



89997KMA

Figure 11.
Removing stationary contact.

MOVING CONTACT ARM ASSEMBLY

To replace the moving contact arm assembly proceed as follows:

1. Detach both opening springs from toggle link (Figure 12).
2. Pull back latch lever assembly and remove C-ring which secures the toggle link to the bell crank lever.
   NOTE: The latch assembly can be held back with a screwdriver as shown in Figure 13.

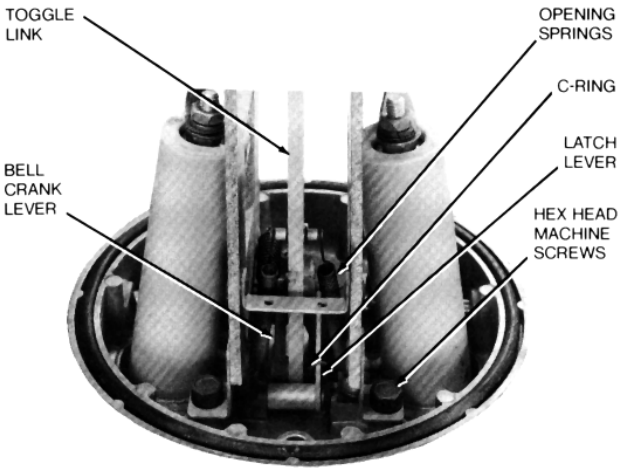


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Figure 12.
Components of toggle mechanism assembly.

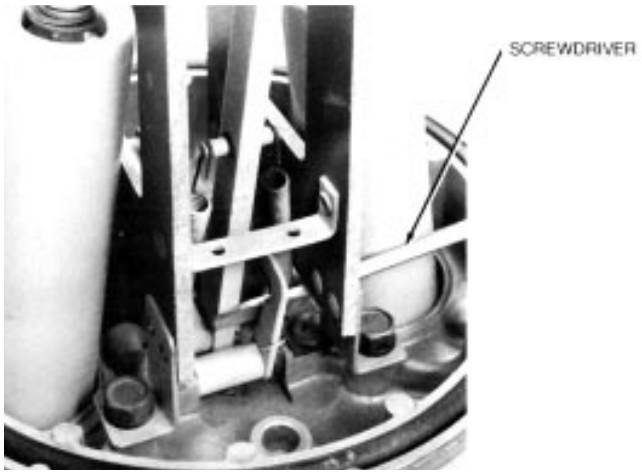

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Figure 13.
Holding back latch lever with screwdriver.

3. Remove the pivot pin attaching the contact arm assembly to the side plates of the contact box.
4. Remove the contact arm assembly.
5. Reassemble the new contact arm assembly, which includes the moving contact bar, to the contact box.
6. With the mechanism closed, the moving contacts should be within 1/16-inch of full engagement, as measured between the top edge of the moving contact insulator and the bottom edge of the contact box side plate as shown in Figure 14. To obtain this dimension, adjust the effective length of the insulated operating link by adjusting the attaching point for the contact arm assembly in the slotted hole of the link. Be sure to retighten the elastic stop nut when adjustment is completed.

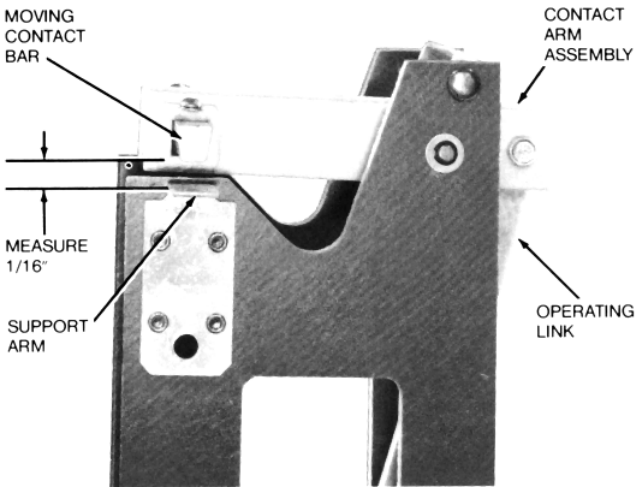

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Figure 14.
Contact engagement adjustment (stationary contact removed to show measuring point).

COMPLETE CONTACT BOX ASSEMBLY

To replace the complete contact box assembly proceed as follows:

1. Detach the opening springs and disconnect the toggle link from the bell crank as described in “Moving Contact Arm Assembly” section, Steps 1 and 2.
2. Remove the hex nuts, lockwashers and flatwashers that retain terminal leads to bushing rods.
3. Remove four hex head machine screws with pre-assembled lockwashers that secure the contact structure to the: head casting. Contact structure removed from switch is shown in Figure 15.

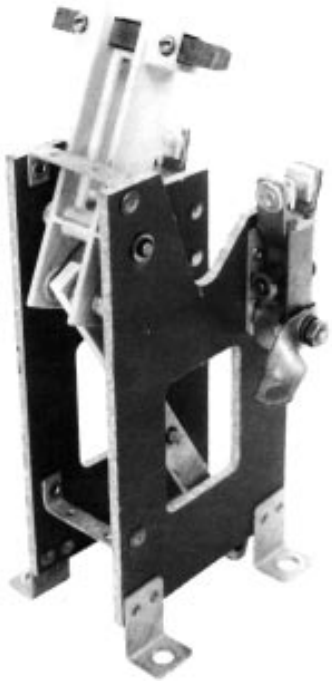

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Figure 15.
Contact structure removed from head mechanism.

4. To replace contact structure:

A. Slip toggle link over bell crank lever and secure with C-ring.

B. Attach contact structure to head casting with four hex head machine screws with lockwashers.

C. Attach opening springs to toggle link.

D. Install moving and stationary contact assemblies, if necessary, as described previously.

E. Attach terminal leads to bushing rods with flatwashers, lockwashers and hex nuts.

Actuator Mechanism

The actuator mechanism requires little attention. When the switch is removed from service for its periodic maintenance inspection, check the condition of the selector switch contacts, and holding switch contacts if so equipped. Also check the condition of the wiring, motor and cams. Components of a standard actuator mechanism are shown in Figure 16. Figure 17 shows the wiring diagram of the switch actuator with the various accessory connections shown in dotted lines.

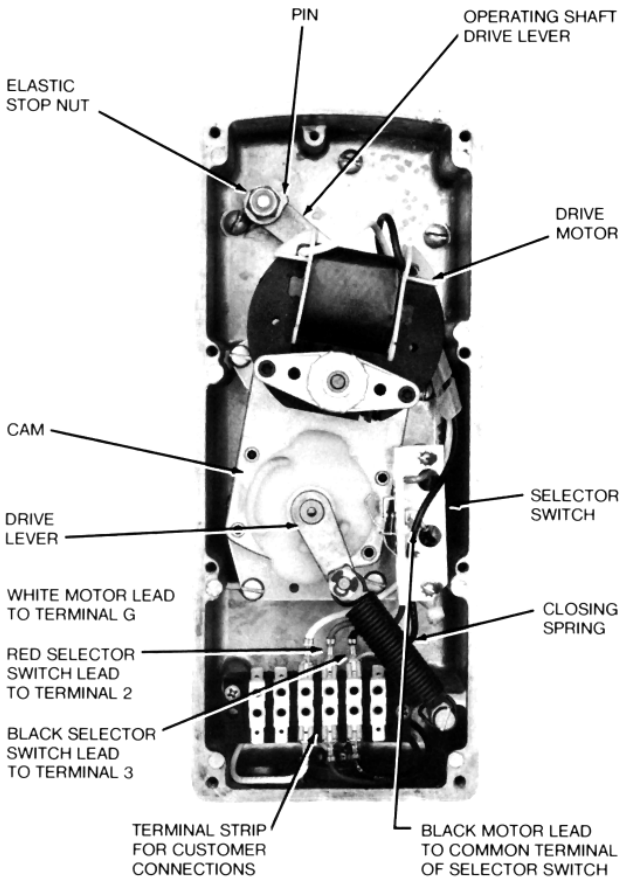

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Figure 16.
Standard actuator mechanism.

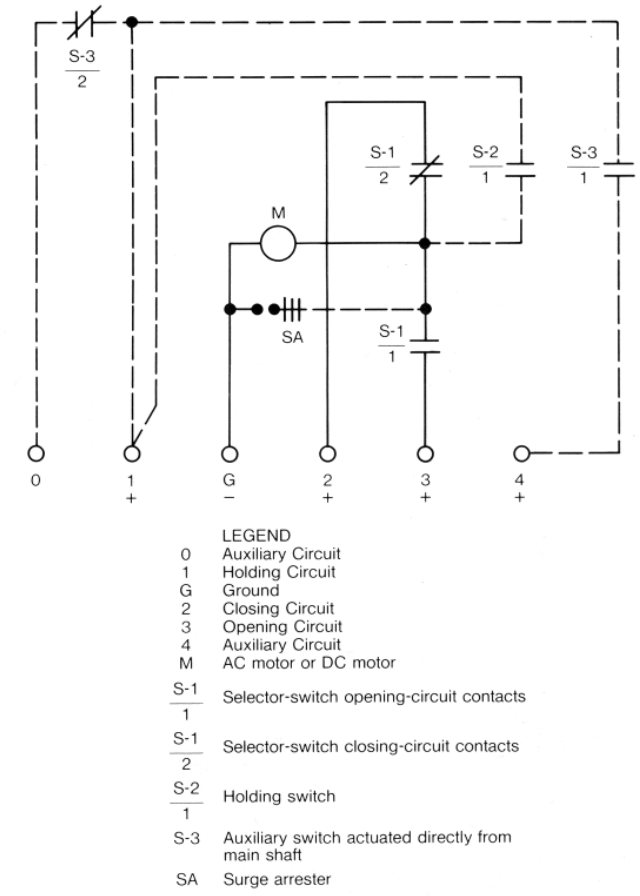

Figure 17.
Wiring diagram with accessory connections indicated by broken lines.

SELECTOR AND HOLDING SWITCHES

To replace the selector switch, or holding switch if so equipped, proceed as follows:

1. Heat the solder joint at the common terminal of the selector switch to disconnect black lead (See Figure 16). Use a gun rated no higher than 100 watts and use only 50-50 or 40-60 rosin core solder for repair work.

2. Disconnect leads from terminal strip: red and black from terminals 2 and 3 for selector switch, green from terminal 1 for holding switch.

3. Remove two round head screws with lockwashers that secure the switch to the support bracket. Mounting spacers and a nut bracket (on underside of support) will also be released.

4. Attach new switch to support bracket, securing it loosely with two round head screws so that it is free to move for adjustment.

5. Connect wire lead(s) to terminal strip. Solder black lead(s) to common terminal of selector switch.

6. Operate cam electrically and adjust selector switch so contact actuation takes place relatively early on cam lobe, and that an over-travel (movement of operator arm after contact actuates) of approximately 3/64-inch is achieved.

7. Check that main contacts open before the selector switch actuates. Main contact and selector switch are properly coordinated when an audible click is heard, from within the tank, before selector switch contact actuates.

8. Adjust holding switch (if so equipped) so actuation takes place after selector switch actuation and operator arm over-travel is observed. A definite time lag between the actuation of the selector switch and holding switch must be observed.
NOTE: It may be necessary to readjust selector switch to obtain proper sequence and overtravel.

9. When selector switch and holding switch (if so equipped) are properly adjusted, tighten screws to secure switch(es) to support bracket. Run actuator through 25 opening and closing operations to be sure switch adjustments hold.

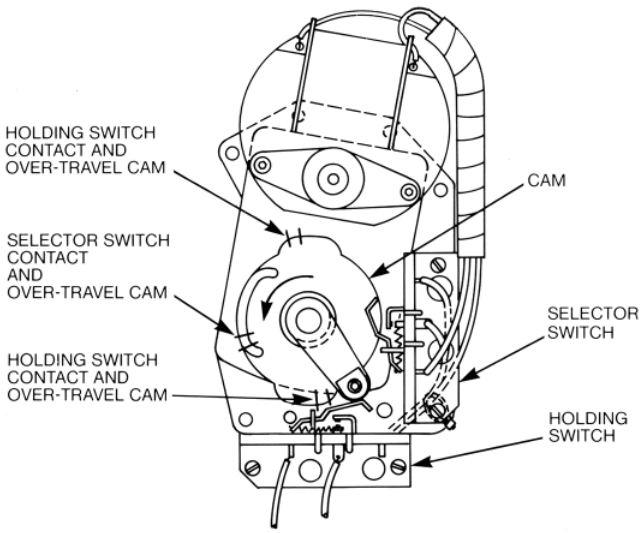

Figure 18.
Adjustment procedure for selector and holding switches.

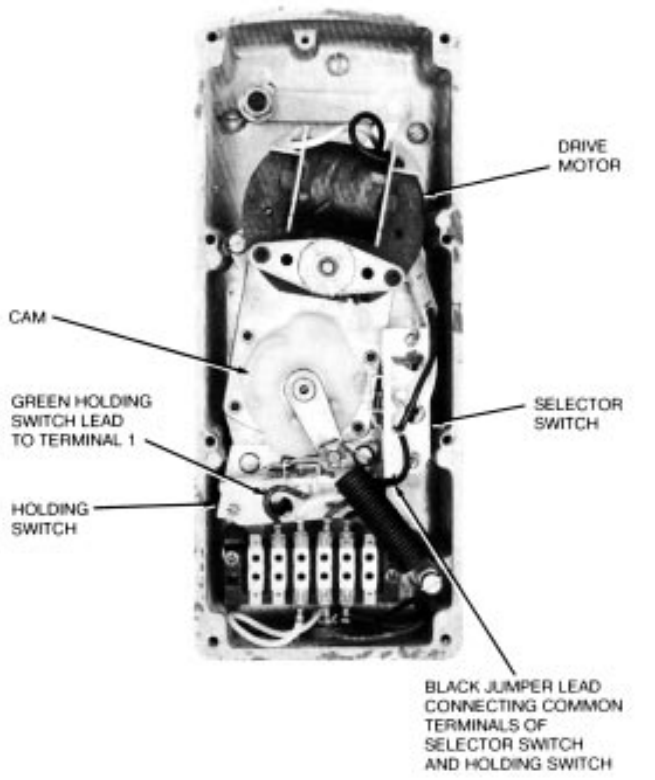

Figure 19. 891000KMA
Actuator mechanism equipped with holding switch.

ACTUATOR ASSEMBLY REPLACEMENT

To replace the actuator assembly proceed as follows:

1. Pull yellow handle down to open switch contacts.

2. Remove elastic stop nut, lockwasher and flatwasher from operating shaft.

3. With a right angle punch or alien wrench force out straight pin as shown in Figure 20.

4. Disconnect wire leads from terminal strip.

5. Remove four screws that secure actuator base plate to housing. Carefully lift actuator assembly from housing, pulling the drive lever straight from the operating shaft.

6. Place actuator assembly in mounting position and slip drive lever over operating shaft. Loosely install the four mounting screws that secure the base plate to the housing.

7. Insert straight pin through drive lever and operating shaft. Install flatwasher, lockwasher and elastic stop nut. Tighten stop nut firmly to prevent straight pin from backing out. Moderate force is sufficient to tighten stop nut. Extreme force on nut can break straight pin.

8. Tighten four actuator assembly mounting screws.

9. Attach wire leads to terminal strip, as shown in Figure 16.

10. Operate the switch electrically and check for binding. Check adjustment of selector switch (and holding switch if equipped) as described in “Shop Repair Procedures—Selector and Holding Switch” section.

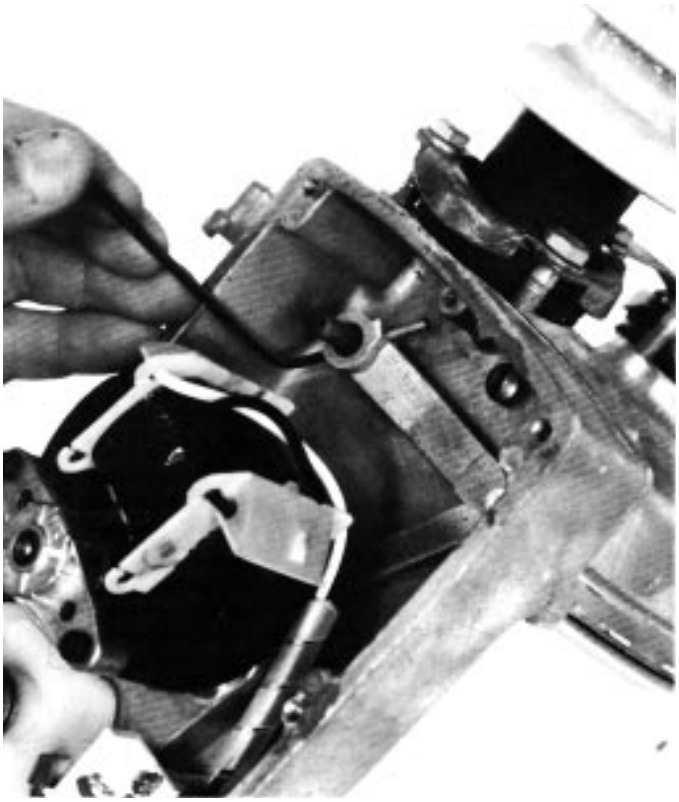

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Figure 20.
Removing straight pin with allen wrench.

GREASING RECOMMENDATIONS

When a Type NR or NRV switch is removed from service, check these points in the actuator for sufficient lubrication:

- Spring anchor boss
- Actuator drive lever spring anchor
- Mechanism shaft through cam center
- Pinion gear on motor shaft and mechanism gears

Apply "MOBILGREASE 28" or a similar low-temperature grease to these areas. Well-lubricated mechanisms will reduce subsequent wear and preserve smooth actuator operation.

NOTE: Grease need only be applied to these points when the switch is removed from service. Do not remove switch from service for sole purpose of applying lubrication to the actuator mechanism.

Head Mechanism

The head mechanism requires no periodic maintenance. observe the following procedure when disassembling the head mechanism:

1. Remove the contact structure as described in "Shop Repair Procedures—Complete Contact Box Assembly" section.

2. Remove the bushings as described in "Shop Repair Procedures—Bushings" section.

NOTE: This step is not mandatory, but is suggested to simplify working on the head mechanism if a service rack is not available.

3. Perform Steps 1 and 2 in "Actuator Assembly" section to free the actuator mechanism from the operating shaft.

4. With a hammer and punch, drive out the roll pin that secures the reset lever to the operating shaft (Figure 21).

5. Remove the sleet hood cover and slip the operating handle spring from the reset lever. Slide out the operating shaft.

6. Install new parts as required. Be sure roll pin that fixes reset lever to operating shaft is driven in until 3/16-inch of pin projects as shown in Figure 21.

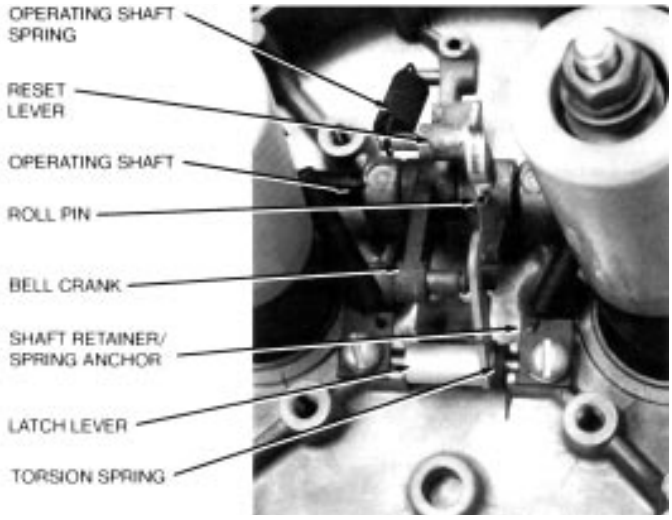

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Figure 21.
Components of head mechanism assembly.

7. To replace the latch lever assembly:

A. Remove screws that secure the shaft retainers to the head casting.

B. Lift out the latch lever assembly.

C. When reassembling, slip the latch lever torsion spring and latch lever onto the latch lever shaft.

D. Screw the two shaft retainers to the head casting to secure the latch lever shaft.

E. Hook the torsion spring on the latch lever assembly. Be sure the two shaft retainers are positioned as in Figure 22, and that the latch lever is retarded when moved away from the head casting.

8. Install the contact structure and bushings to complete assembly.

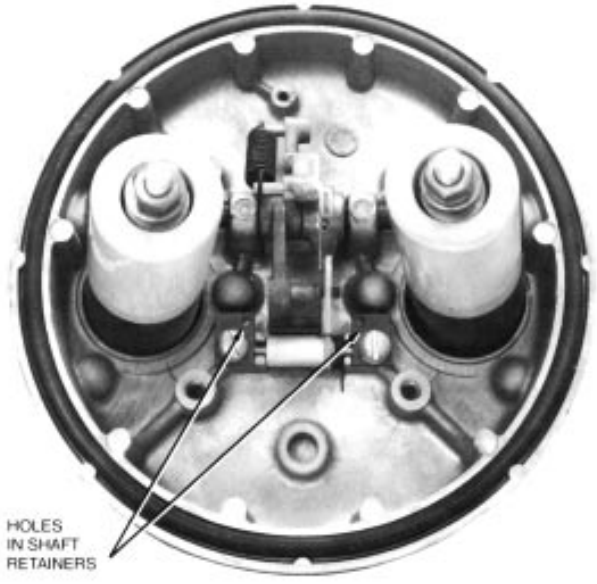

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Figure 22.
Correct position of shaft retainers

SERVICE PARTS LIST

The service parts and hardware listed and illustrated include only mose parts and assemblies usually fumished for repair or involved in the maintenance procedures described in this manual. Further breakdown of listed assemblies is not recommended.

Dimensions of all common hardware parts have been carefully checked so that they may be locally acquired. The suffix letter of the 14 character catalog number of common hardware parts code the plating of the part:

A - No plating; raw material
H - Silver
M - Black oxide
Q - Cadmium + zinc + chromate
Y - Zinc + chromate
Z - Eiectro zinc + bronze irridite

A hardware kit, Catalog No. KAS49R1, contains an assortment of roll pins, cotter pins, retaining rings, stop nuts, etc.—common hardware parts used in Kyle switches that may not be readily locally available.

To assure correct receipt of any part order, always include switch type and serial number. Because of Cooper Power Systems' continuous improvement policy, there may be instances where the parts furnished may not look exactly the same as the parts ordered. However, they will be completely interchangeable without any rework of the switch.

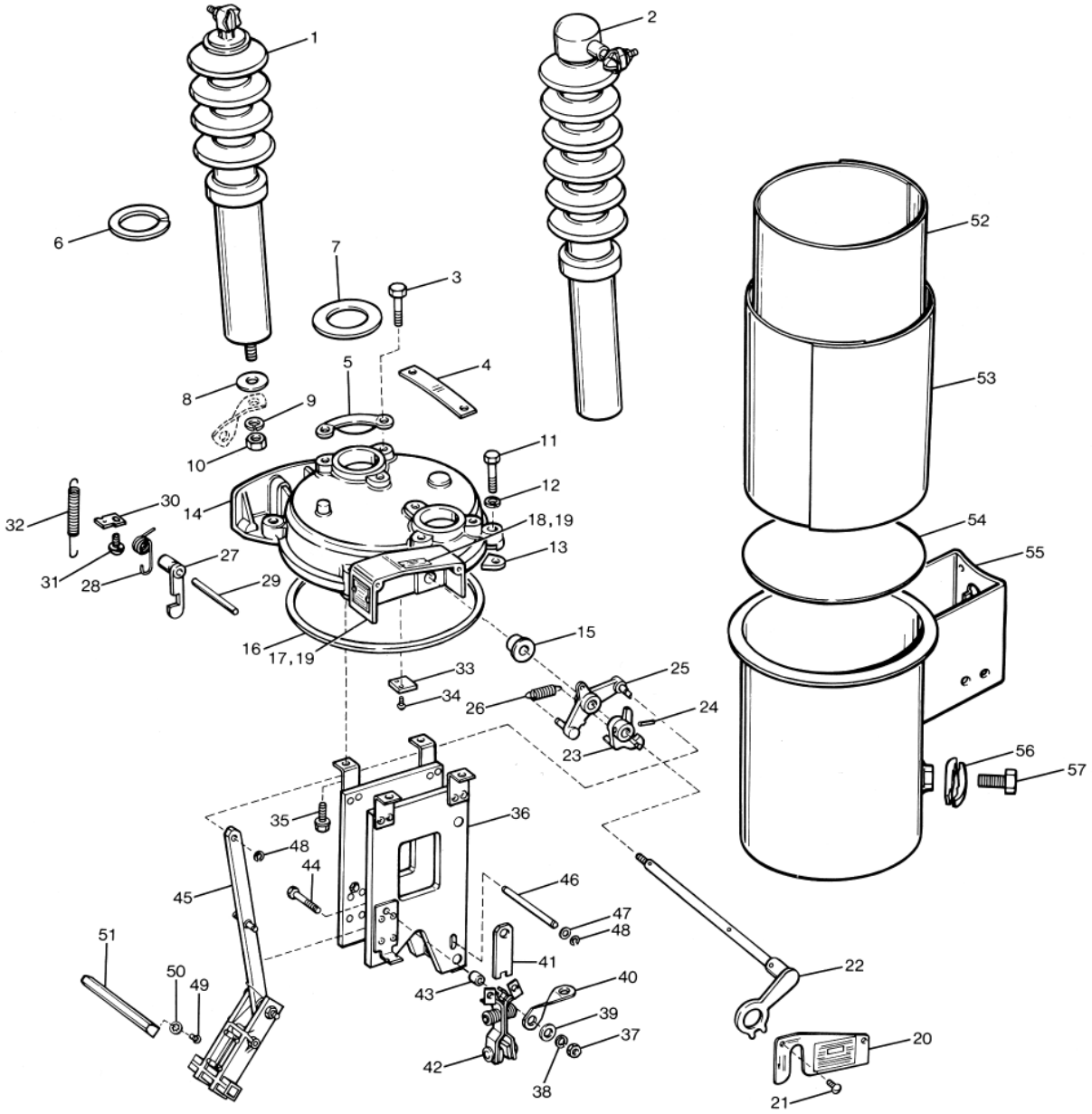

Figure 23.
Types NR-NRV switches service parts.

Type HR-NRV Switches Service Parts (Figure 23)

Item No.	Description	Catalog No.	Qty. Per Assy
1	Bushing assembly, Type NR Standard Bushing	KA346NR3	2
	15” Creepage Bushing	KA346NR4	2
2	Bushing assembly, Type NRV 17” Creepage Bushing	KA360NR1	2
3	Capscrew hex hd, 5/16-18 x 1-3/8 stl	K730101131137Q	6
4	Lifting strap	KP421H	1
5	Bushing clamp	KP83NR900	6
6	Clamping ring	KP110NR	2
7	Bushing gasket	KP2090A40	2
8	Plain washer, #20S, brass	K900525033075A	2
9	Split lockwasher, med 5/16, bronze	K900830031000A	2
1 0	Nut, Hex, 5/16-1 8, brass	K881025118031 A	2
11	Capscrew, hex hd, 5/16-18 x 1-3/8 stl	K730101131137Q	4
12	Lockwasher, 5/16 stl	K900801031000Z	4
13	Clamp	KP276NR	4
14	Head casting	KP293NR2	1
15	Shaft insert	KP3036A1	1
1 6	Head gasket	KP2103A12	1
17	Caution plate	KP295NR	1
1 8	Control rating plate	KP172NR2	1
19	Screw, sheet metal, Type Z, #2 x 3/16	K801515002018A	4
20	Nameplate	KP122NR900	1
21	Self-tapping screw, rd hd, Type Z # 10 x 3/8	K801515010037A	2
22	Operating handle assembly	KA33NR1	1
23	Reset iever	KA9GH902	1
24	Roll pin	K970801125093C	1
25	Bell crank assembly	KA40NR902	1
26	Operating handle spring	KP296NR	1
27	Latch lever	KP78GH	1
28	Latch lever spring	KP11GH1	1
29	Latch lever pin	KP3054A2	1
30	Pin retainer and spring anchor	KP120NR	2
31	Machine screw, rd hd, with pre-assembled split lockwasher 1/4-20 x 3/8, stl	K8315011250372	2

Item No.	Description	Catalog No.	Qty. Per Assy.
32	Toggle spring	KP40GH	2
33	Shock absorber	KP107NR	1
34	Self-tapping screw, rd hd, Type F, 4-40 x 5/16, stl	K751501104031 Z	2
35	Screw, hex hd, with pre assembled split lockwasher, 5/16-18 x 1/2, Parkerized	K830101131050L	4
36	Contact box assembly	KA385NR	1
37	Hex nut 1/4-20, brass	K881025120025A	2
38	Split lockwasher, med, 1/4 bronze	K900830025000A	2
39	Plain washer, #14S, brass	K900525026056A	2
40	Terminal lead	KP257NR	4
41	Contact retainer	KP214NR	2
42	Contact assembly	KA64GN3-2	2
43	Contact roller	KP256NR	2
44	Capscrew, hex hd,1 /4-20 x 1-1/4 brass	K730125125125A	2
45	Moving contact arm assembly (includes items 49,50, and 51)	KA386NR	1
46	Pin	KP3123A11	1
47	Plain washer, #10S, brass	K900525020043A	2
48	Retaining ring	K970901188000M	2
49	Machine screw, rd hd, #6-32 x 1/2, sst	K721515106050A	2
50	Lockwasher, Intemal tooth #6 bronze	K901032006000A	2
51	Contact bar	KA384NR	1
52	Tank liner	KP115NR	1
53	Tank liner NRV	KP289NR	1
54	Bottom liner	KP114NR	1
55	Tank assembly	KA21NR	1
56	Parallel ground clamp	KA227H900	1
	Ground clamp assembly	KA226H	1
57	Capscrew, hex hd 1/2-13 x 1, stl	K730101150100Q	1

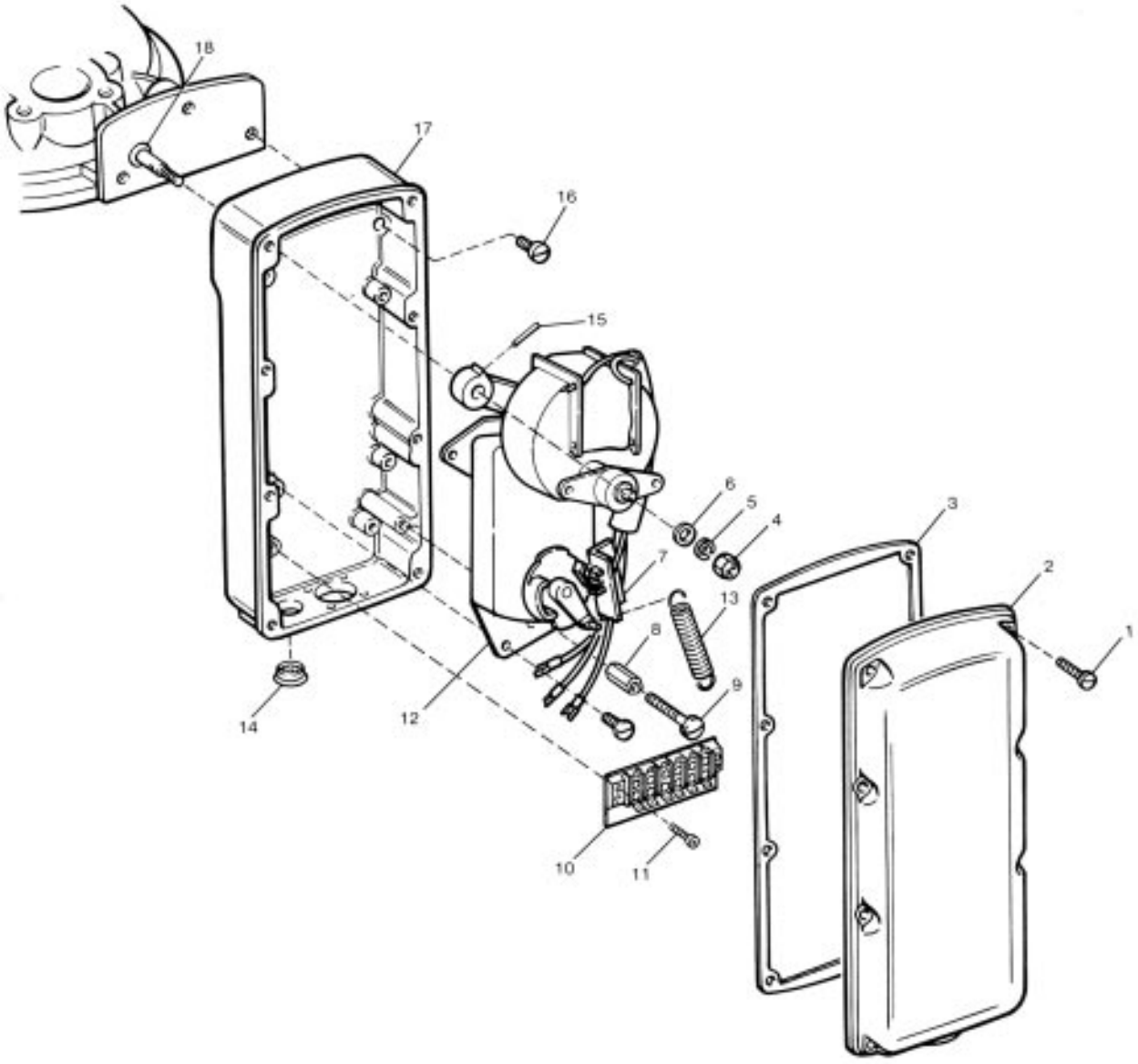

Figure 24.
Actuator and housing service parts.

Actuator and Housing Service Parts (Figure 24)

Item No.	Description	Catalog No.	Qty. Per Assy.
1	Machine screw, Fil hd.		
	#10-24 x 7/8 sst	K999904250369A	8
2	Cover	KP323NR	1
3	Gasket	KP121NR	1
4	Nut	KP2020A3	1
5	Split lockwasher, med		
	1/4 bronze	K900830025000A	1
6	Plain washer, #14S, brass	K900525026056A	1
7	Switch Assy.		
	Holding	KA741NR1	1
	Selector	KA741NR2	1
	Holding and selector	KA741NR3	1
	Auxiliary (SPDT)	KA745NR	1
8	Spacer	KP324NR	1
9	Screw, pan hd mach		
	# 10-24 x 1-1/2 sst	K721715110150A	1
10	Terminal strip	KP226NR	1
11	Screw, self-tapping, phillips pan hd		
	Type F, #6-32 x 5/8, sst	K753315106062A	2
12	Actuator (includes item 13 and standard selector switch)	KA744NR1	1
	Actuator repair kit, 240 Vac (includes item 13 and standard selector switch)	KA744NR3	1
13	Spring	KP302NR	1
14	Vent screen plug	KP38NR	1
15	Pin	KP3052A3	1
16	Machine screw, Fil hd		
	1/4-20 x 3/8 stl	K721 801125037Z	3
17	Housing	KP319NR	1
18	Oil seal	KP2000A3	1

COOPER Power Systems

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