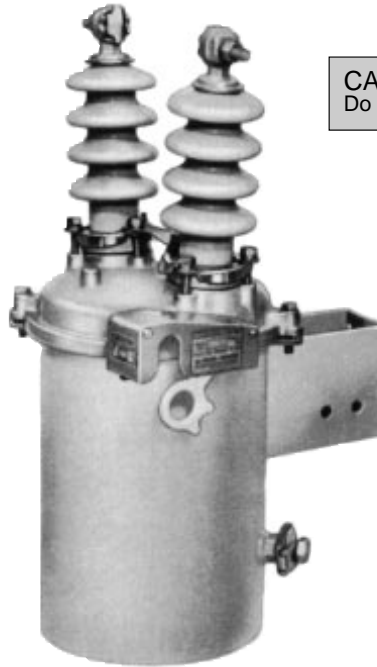


# Sectionalizers

## Type GH (Form 2) Maintenance Instructions

# S270-10-6

Applies to Type GH (Form 2) single-phase, hydraulically controlled sectionalizers above serial number 35700.  
For Type GH (Form 1) sectionalizers below serial number 35700, see S270-10-1.



**CAUTION**  
Do not energize this equipment out of oil.

**Figure 1**  
Type GH single-phase sectionalizer.

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## INTRODUCTION

Service Information S270-10-6 covers the maintenance instructions for the Type GH (Form 2) hydraulically-controlled sectionalizer. This includes a general description of operating principles, and instructions for periodic inspection, testing, trouble-shooting, and shop repairs. A service parts list keyed to an exploded-view drawing of the unit is included at the back of the manual.

## GENERAL DESCRIPTION

The Type GH sectionalizer is an automatic protective device used to isolate permanent faults on single-phase distribution branch circuits. Applied in combination with a backup recloser, the sectionalizer does not interrupt fault current but counts the fault interrupting operation: of the backup recloser. When a preset number of counts (1, 2 or

These instructions do not claim to cover all details or variations in the equipment, procedure, or process described, nor to provide direction 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 Cooper Power Systems sales engineer.

3) are registered within a definite time period, the sectionalizer will automatically open during the open interval of the backup recloser's operating cycle. If the fault is cleared before the required count total is reached, the counting mechanism of the sectionalizer resets automatically. The unit is then ready to count another cycle of operations should a new fault occur.

Once open, the sectionalizer must be manually operated to reclose the circuit after the fault has been cleared. Although the sectionalizer does not interrupt faults, it can be closed into a faulted line without damage to the unit.

The unit can also be opened and closed manually and is capable of interrupting load currents within its switch rating.

### RATINGS AND SPECIFICATIONS

#### Voltage Ratings

- Nominal system voltage, kv rms .....14.4
- Rated maximum voltage, kv rms .....15.0
- Rated impulse withstand voltage (BIL) kv crest ....95
- 60-Hertz insulation level withstand, kv rms
  - Dry, one minute .....35
  - Wet, 10 seconds .....30

### Current Ratings

Continuous Current (amps)	Actuating Current (amps)	Short-Time Ratings		
		Momentary and Making (asym amps)	1-second (sym amps)	10-second (sym amps)
5	8	800	200	60
10	16	1600	400	125
15	24	2400	600	190
25	40	4000	1000	325
35	56	6000	1500	450
50	80	6500	2000	650
70	112	6500	3000	900
100	160	6500	4000	1250
140	224	6500	4000	1800
Max. Interrupting Loadbreak Rating (rms sym amps) .....308				

### DESCRIPTION OF OPERATION

The Type GH hydraulic sectionalizer is actuated when its solenoid coil (connected in series with the main contact) is subjected to a current flow that exceeds 160 percent of its continuous current rating. The response of the hydraulic mechanism to an overcurrent is illustrated in Figures 3 through 6.

In Figure 3, the hydraulic control components are shown in their usual at rest condition. The actuating component is

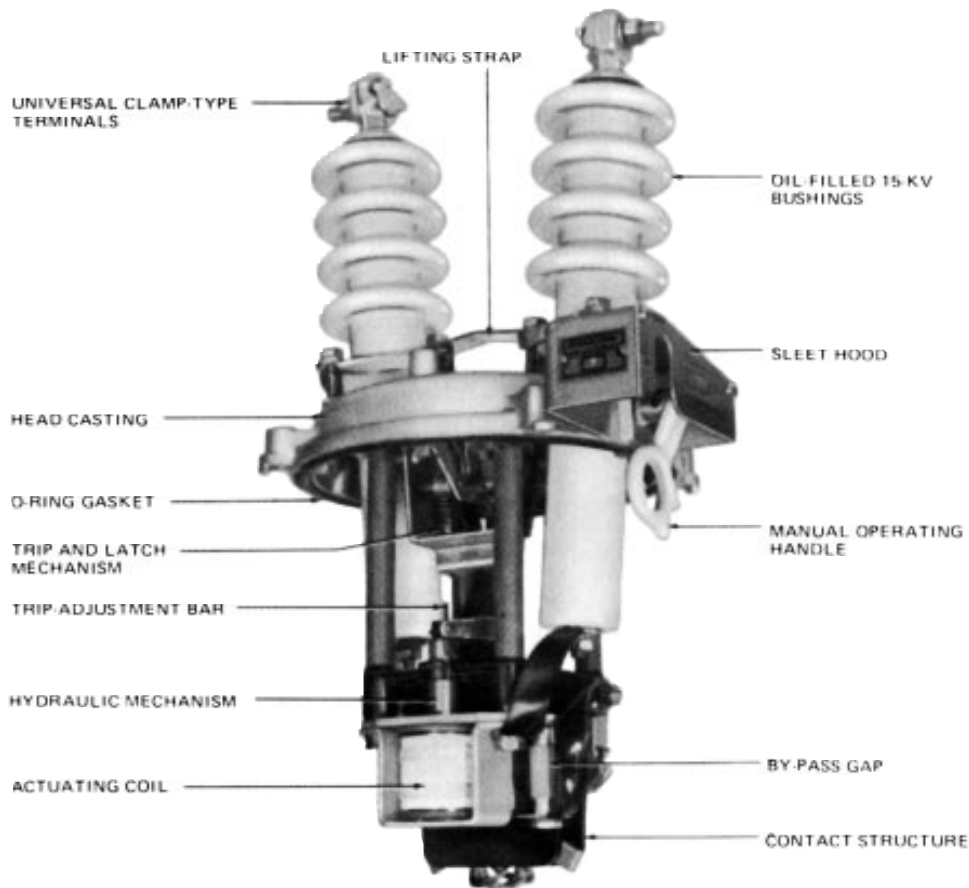


Figure 2  
Untanked view of Type GH sectionalizer.

the solenoid plunger, which functions as a pump. With normal load current flowing through the solenoid coil, spring pressure holds the solenoid plunger at the top of its stroke.

When the current flow reaches actuating level, the resultant magnetic force pulls the plunger down as shown in Figure 4. This downward movement closes the check valve at the bottom of the mechanism and forces a charge of oil upward through the plunger into the space vacated by the plunger. Upward pressure of the oil opens the check valve at the top of the plunger to permit oil flow. The plunger is held in the down position and the sectionalizer is now "armed-to-count".

When the backup recloser interrupts the overcurrent, the current flow through the series solenoid coil is interrupted. With the coil deenergized, the magnetic field is lost and the plunger is returned to its up position by the compressed

spring as shown in Figure 5. Upward movement of the plunger closes the top check valve and forces the oil charge above the plunger upward to raise the trip piston a measured amount. The sectionalizer has now registered a count.

If the sectionalizer is set for more than one count-to-open, the sequence is repeated with each overcurrent until the trip piston engages the trip lever and opens the sectionalizer contacts (Figure 6).

After each count, the trip piston begins to slowly resettle to its original position. The time during which it remembers previous counts is sectionalizer memory time. If the fault is temporary and is cleared before the sectionalizer opens, the piston will resetttle completely and the unit is ready for another sequence of operations. If the programmed number of counts is completed within the memory period, the sectionalizer will open. It then must be closed manually.

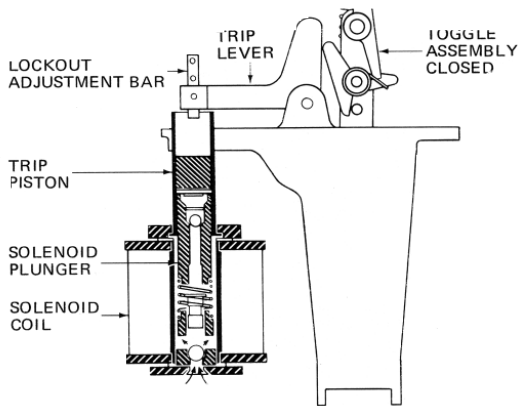


Figure 3

Hydraulic mechanism in normal at rest condition. Solenoid plunger is held at the top of its stroke by spring pressure.

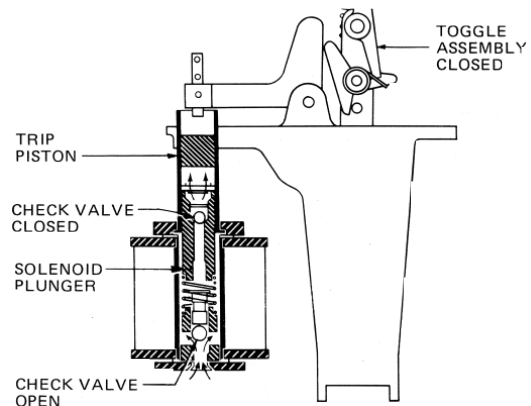


Figure 5

Solenoid plunger returns to at rest condition when overcurrent is interrupted. Held by the upper check valve, oil in the space above the plunger is forced through the impulse valve raising the trip piston a measured amount. Oil simultaneously enters space under solenoid plunger.

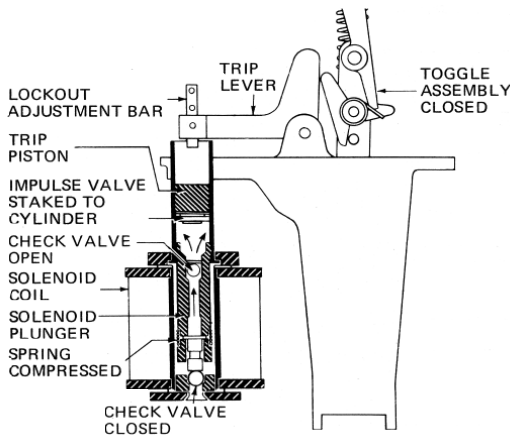


Figure 4

Overcurrent pulls down solenoid plunger against spring pressure. Held by the lower check valve, the oil is forced through the plunger into the space above it.

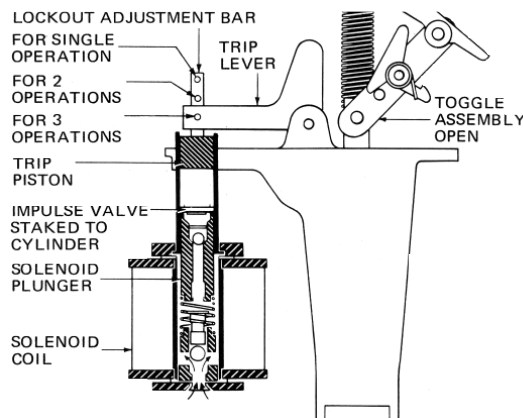


Figure 6

When overcurrent is interrupted on the final count, trip piston engages the trip lever to open the toggle assembly which opens the sectionalizer contacts.

## PERIODIC INSPECTION AND MAINTENANCE

Frequency of inspection and maintenance depends upon the local climatic conditions and the manual switching duty imposed on the unit. The sectionalizer does not interrupt fault currents, so contact wear and oil contamination due to arcing will be minimal. Thus, maintenance efforts should be directed primarily toward keeping the unit in operating order and maintaining the dielectric strength of the insulating oil.

Cooper Power System's recommends that, initially, a maintenance check be made after one year of service. A study of maintenance records for similar equipment, along with the results of the initial maintenance check can then be used to establish realistic maintenance intervals.

Each periodic maintenance check should include at least the following steps:

1. Bypass, trip and deenergize the sectionalizer and remove it from service.
2. Inspect the external components.
  - A. Check for broken or cracked bushings, paint scratches, and other mechanical damage.
  - B. Close and trip the sectionalizer manually several times to check mechanical operation. Leave the unit in the open position.
3. Remove the bolts and clamps that secure the head casting to the tank and remove the mechanism from the tank. Carefully pry apart the head and tank to break the gasket seal.
4. Allow the oil to drain off the mechanism.
5. Clean the internal components.
  - A. Remove all traces of carbon by wiping with a clean, lint-free cloth.
  - B. Flush the hydraulic mechanism with clean transformer oil.

### CAUTION

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

6. Check the moving and stationary contacts.
  - A. Slight pitting and discoloration can be dressed with crocus cloth or a fine-tooth file.
  - B. Replace the moving and stationary contacts if they are severely eroded (see "Shop Maintenance Procedures" section of this manual).

NOTE: The amount of erosion permissible is difficult to define. Good judgment must be used when deciding whether to replace the sectionalizer contacts.

7. Operate the control lever manually, and observe if all components operate properly. When tripping the sectionalizer in air, hold or cushion the moving contacts with one hand to eliminate impact and overstressing of contact box.
8. Inspect tank liners. Soft or spongy areas indicate that water has been absorbed. Replace both the tank wall

liner and tank bottom liner if this condition is detected.

NOTE: The 125-kv BIL unit has an additional wall liner between the standard liner and the tank which must also be replaced when new liners are installed.

9. Check the dielectric strength of the insulating oil.
  - A. The dielectric strength should not be less than 22 kv when tested with an 0.1-inch gap in accordance with methods specified in ASTM D-117.
  - B. Low dielectric strength usually indicates the presence of water or carbon deposits; replace the oil.
10. If oil must be replaced, drain the tank and clean out all sludge and carbon deposits.
11. With the mechanism removed, fill the tank with clean insulating oil to the top of the tank wall liner. Capacity is approximately 1-1/2 gallons.

Use only new, or like-new reconditioned transformer oil which conforms to the specifications in Cooper Power System's Reference Data R280-90-1, "Oil Specifications and Test".
12. Examine the head gasket. Replace the o-ring gasket if it has taken a permanent set.
13. Before retanking the sectionalizer, invert and prime the hydraulic mechanism by introducing new transformer oil with an ordinary squirt can through the hole in the bottom of the coil frame. Then, quickly place the mechanism into the tank far enough to cover the hydraulic mechanism with oil. With a slender tool, such as a small Allen wrench, push down the trip piston to clear air from the hydraulic parts.
14. Reuse the head bolts and tank clamps and torque to 10-14 ft -lbs. Clamping forces must be applied gradually and equally in rotation to each bolt. This results in an evenly distributed gasket sealing pressure.
15. Manually close and open the unit several times to expel all air from the hydraulic system and to check the mechanical operation.
16. Check if the unit is operating properly. With the sectionalizer closed, momentarily connect a six-volt storage battery across its bushing terminals. Repeat this procedure at about one-second intervals and note if the sectionalizer opens after the correct number of operations has occurred. If the unit does not lock out properly, wait about three minutes and repeat the test. Air entrapped in the hydraulic system can cause incorrect operation.

If the unit still fails to operate properly, disassemble the hydraulic mechanism as described in "Shop Maintenance Procedures". Check carefully for sludge accumulation, dirt, or scratches on any of the parts. Clean the parts and carefully reassemble the mechanism. Cleanliness is very important. Recheck the unit for proper operation.

## OIL CONDITION

Oil plays an important role in the proper functioning of the sectionalizer. It provides the internal insulation barrier from phase-to-ground, and it acts as an arc quencher during manual load switching. For effective sectionalizer operation, the

oil must be replaced before it deteriorates beyond a safe level. Oil that has been contaminated with carbon sludge or has a dielectric strength of less than 22 kv should be replaced.

New oil should always be filtered before using, even though it may be obtained from an approved source. Passing the oil through a blotter press will remove free water and solid contaminants such as rust, dirt or 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.

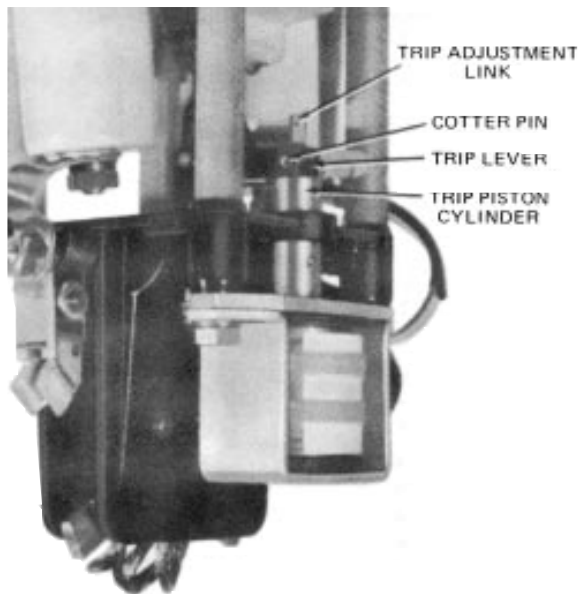
Used oil must be treated before reusing. Filtering may remove absorbed and free water and other contaminants to raise the dielectric strength to acceptable levels. However, filtering does not always remove water-absorbing contaminants and the dielectric strength of the oil may fall rapidly after being returned to service. Therefore, the sectionalizer should be filled with new oil or oil that has been restored to like-new condition.

### OPERATING SETTINGS

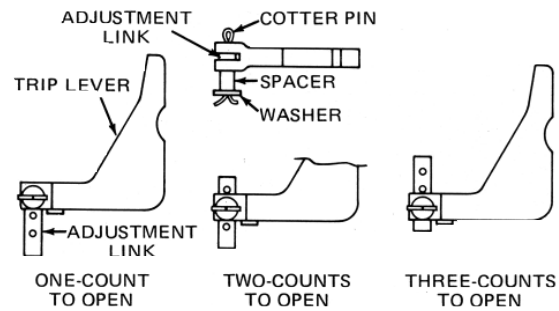
The minimum actuating current and the number of counts-to-open can be changed to reprogram the operation of the sectionalizer.

The **minimum actuating current** rating is determined by the rating of the solenoid coil. To change the minimum actuating current rating of the sectionalizer, replace the solenoid coil as described in the "Shop Maintenance Procedures" section.

The **number of counts-to-open** is determined by the position of the adjustment link attached to the trip lever with a cotter pin (Figure 7). Figure 8 shows the position of the adjustment link for one, two, and three counts-to-open.



**Figure 7**  
Adjustment for number of counts-to-open.



**Figure 8**  
Position of adjustment link.

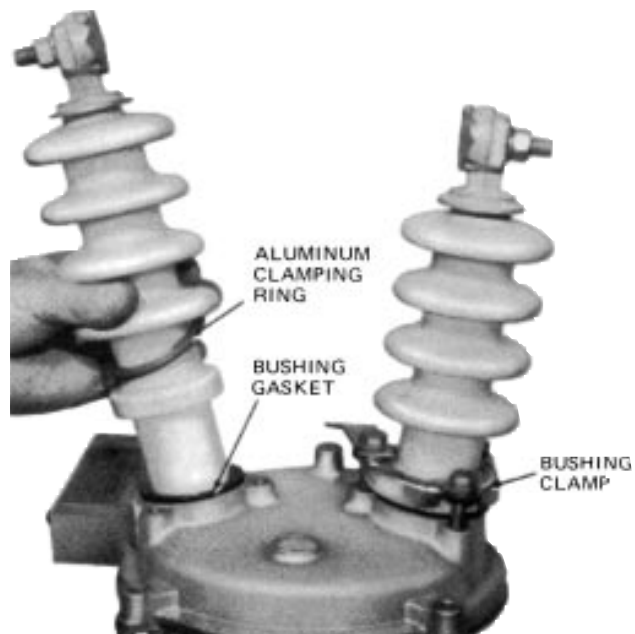
### SHOP MAINTENANCE PROCEDURES

The procedures 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 can be inverted (bushings down). No special tools are required for any of the repair procedures.

#### BUSHINGS

Bushing maintenance is generally limited to a thorough cleaning during the regular maintenance inspection. If a bushing is cracked or broken, it must be replaced. To replace a bushing, the following procedure may be used (Figure 9):

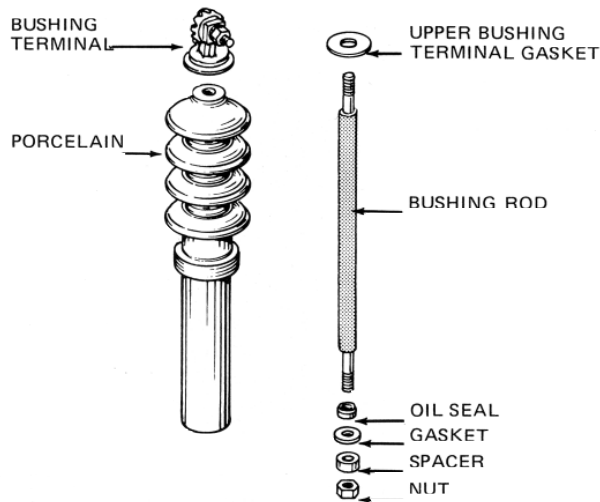
1. Untank the sectionalizer and disconnect the lead from the bottom of the bushing.
2. Remove the three capscrews and lockwashers that secure the bushing clamps to the head and lift out the bushing assembly.



**Figure 9**  
Bushing removal.

3. Remove and discard the lower bushing gasket.
4. Twist off the aluminum clamping ring from the old bushing. If it is in good condition install it on the new porcelain. If the ring is damaged, a new clamping ring must be installed.

NOTE: The clamping ring cushions the pressure between the bushing porcelain and the clamps and **must not** be omitted.



**Figure 10**  
Bushings assembly components.

5. The complete bushing assembly can be replaced or new porcelain only can be installed.

If new porcelain only is to be installed, see Figure 10, and proceed as follows:

- A. Remove the nut, spacer, gasket, and oil seal from the lower end of the bushing and pour out the transformer oil.
- B. Unscrew the bushing terminal assembly and withdraw the bushing rod.
- C. Remove and discard the upper bushing terminal gasket.
- D. Insert the rod all the way into the new porcelain and assemble the terminal to the rod using a new terminal gasket.

NOTE: Apply a very small amount of petrolatum jelly to the inside face of the terminal before reassembly. It is necessary to cover the knurled surface only.

- E. Slowly fill the bushing with new, clean transformer oil.
  - F. Install a new oil seal and gasket and secure with the spacer and hex nut.
6. Replace the bushing assembly into the head using a new gasket between the bushing and head casting. Position the bushing with the stud end of the terminal pointing outward.
  7. Position the aluminum clamping ring with the split in the ring centered between two clamping bolts.

8. Reinstall the bushing clamps and tighten the clamping bolts evenly, a little at a time, with 3-7 ft -lbs torque.

#### HYDRAULIC MECHANISM

1. Disconnect the contact lead from the bottom of the coil gap by removing the brass jam nut that secures it.
2. Grasp the insulating stringer with a pair of pliers and loosen the two capscrews that secure the coil frame to the molded contact box. This procedure is necessary to prevent breakage of the molded lugs on the contact box.

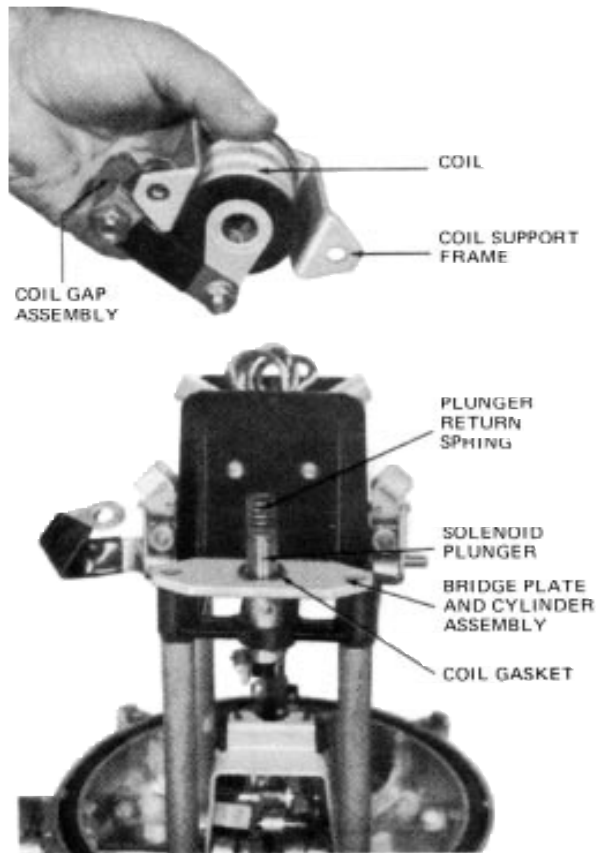
#### CAUTION

Be sure to pad the pliers jaws with heavy cardboard or similar material to prevent marring the surface of the stringer.

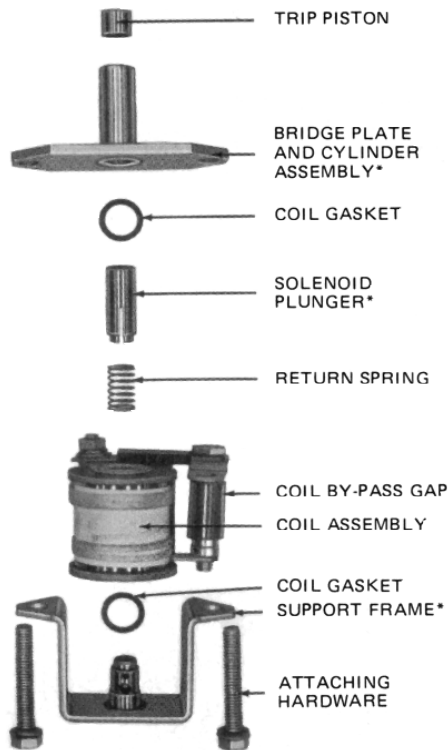
3. Lift off the support frame and coil as shown in Figure 11.

NOTE: The support frame, solenoid plunger, and bridge plate solenoid assembly are a matched set. Replace all three parts if any one is to be replaced.

4. Then lift off, in order, the plunger return spring,



**Figure 11**  
Lifting off coil support frame and coil.



\*Matched set — cannot be ordered separately.

**Figure 12**  
Components of hydraulic assembly.

plunger, and cylinder-bridge plate assembly. The disassembled hydraulic mechanism is shown in Figure 12.

5. Clean all hydraulic parts thoroughly and flush all passages with clean degreasing fluid.

**CAUTION**

Use extreme care to remove all traces of the degreasing fluid and keep all parts clean and free from nicks or scratches.

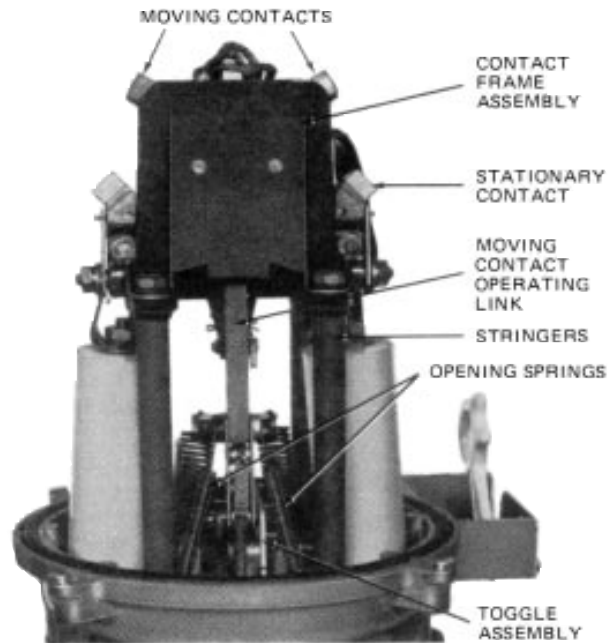
6. If the contact box assembly is to be replaced, do not reassemble the hydraulic mechanism at this time. Reassemble in the reverse order of the disassembly procedure.

NOTE: Use two new solenoid coil gaskets (top and bottom) when the coil is replaced or a new coil is installed.

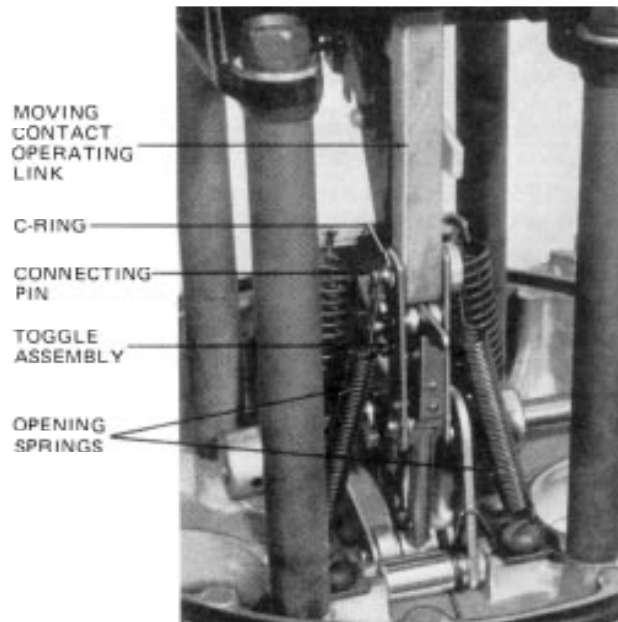
**CONTACT STRUCTURE**

The contact structure and associated parts are shown in Figure 13. To replace the moving contacts the entire molded contact box must be replaced. Proceed as follows:

1. Unhook the opening springs shown in Figure 14.
2. Remove the C-ring and pin that connects the moving contact operating link to the toggle assembly (Figure 13).

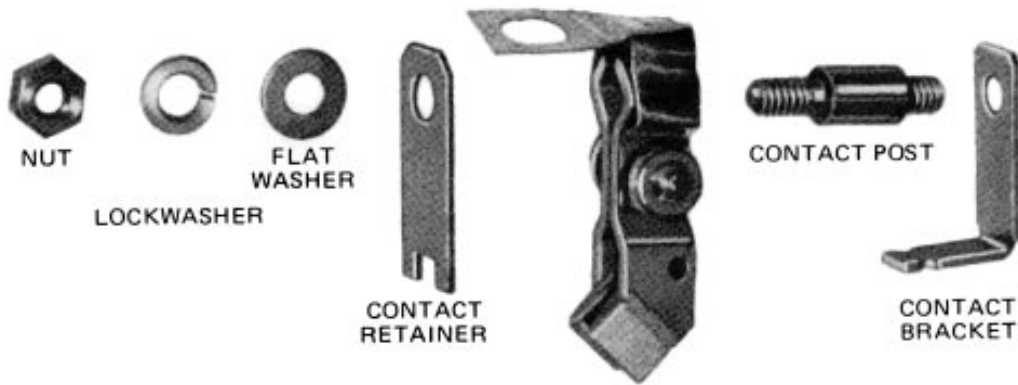


**Figure 13**  
Contact structure.



**Figure 14**

3. Remove the two capscrews that secure the contact box to the insulating stringers. Again, use pliers to hold the stringers.
4. Lift off the entire contact structure.
5. Assemble new stationary contacts to the new contact box. Components of the stationary contact assembly are



**Figure 15**  
Components of stationary contact assembly.

shown in Figure 15.

NOTE: Before tightening the stud, make sure that each arm of the stationary contact assembly deflects an equal amount as moveable contacts are brought into engagement. Adjust by slight movement of the contact bracket and retainer.

6. Reassemble the contact box assembly in the reverse order of disassembly.

#### HEAD MECHANISM

Normally the trip and latch mechanism assemblies mounted in the head will require very little or no maintenance and need not be disassembled. If replacement of a worn or broken part is necessary, disassemble only to the extent required to install the new part.

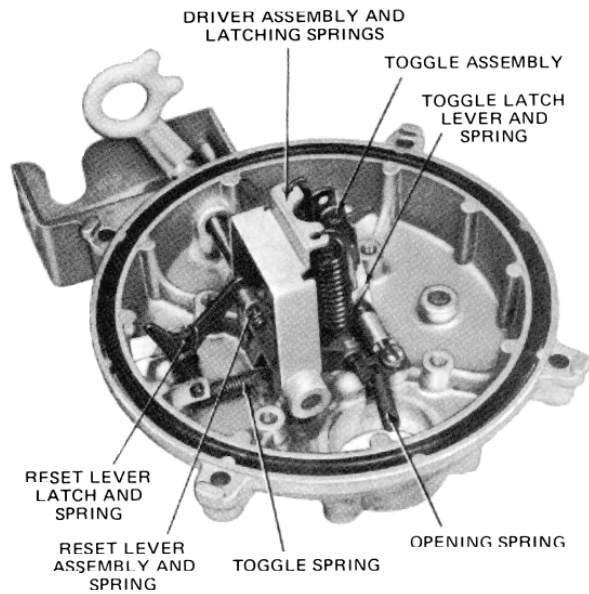
Figure 16 identifies and locates the various components of the trip and latch mechanism.

#### RETANKING THE SECTIONALIZER

Follow steps 11 through 16 in the "Periodic Inspection and Maintenance" section to retank and test the repaired sectionalizer.

#### SERVICE PARTS LIST

When ordering service parts, always include the sectionalizer type and serial number. Because of Cooper Power System's continuous improvement policy, there may be occasions where parts furnished may not be the same as the parts they are replacing; however, they will be interchangeable. All service parts have the same warranty as any whole item of switchgear; i.e., against defects in material or workmanship within one year from date of shipment.



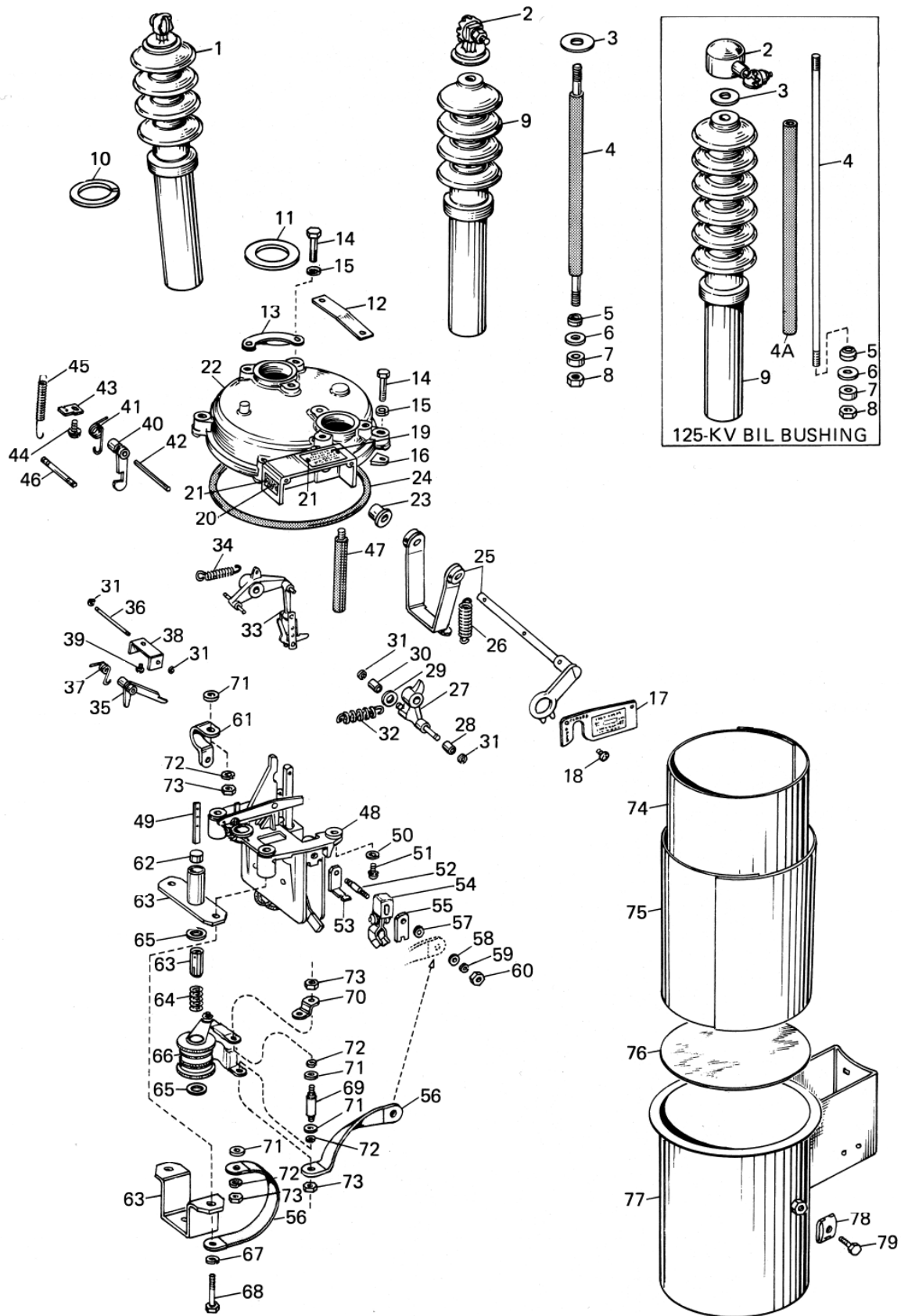
**Figure 16**  
Components of trip and latch mechanism.

For service parts list and catalog numbers, see pages 10 and 11.



NOTES

Lined area for notes with horizontal ruling lines.



## Type GH (Form 2) Sectionalizer Parts List

Item	Description	Catalog Number	Number Required
1.	Bushing assembly, standard	KA346NR3	2
	Bushing assembly, 17-inch creepage	KA346N R5	2
	Bushing assembly, 125-kv BIL (above include items 2 thru 9)	KA360NR	2
2.	Bushing terminal assembly	KA45NR	2
	Bushing terminal assembly (for 125-kv BIL bushing)	KA355NR	2
3.	Upper bushing terminal gasket	KP2090A50	2
	Upper bushing terminal gasket (for 125-kv BIL bushing)	KP2090A97	2
4.	Bushing rod assembly (for standard bushing)	KA347NR3	2
	Bushing rod assembly (for 17-inch creepage bushing)	KA347NR5	2
	Bushing rod (for 125-kv BIL bushing)	KP3149A45	2
4A.	Insulating tube (for 125-kv BIL bushing)	KP3230A1	2
5.	Oil seal	KP118GH2	2
	Oil seal (for 125-kv BIL bushing)	KP275NR	2
6.	Gasket	KP2090A43	2
7.	Spacer	KP3013A45	2
8.	Hex nut, 5/16-18, brass	KP283	2
9.	Ceramic bushing, standard	KP109NR	2
	Ceramic bushing, 17-inch creepage	KP189NR	2
	Ceramic bushing, 125-kv BIL	KP303NR	2
10.	Bushing clamping ring	KP110NR	2
11.	Lower bushing gasket	KP2090A40	2
12.	Lifting strap	KP421 H	1
13.	Bushing clamp	KP83NR	6
14.	Capscrew, hex hd., 5/16-18 x 1-3/8, stl.	KP1279	10
	Lockwasher, med. 5/16-in., stl.	KP1109	10
16.	Clamp	KP276NR	4
17.	Nameplate	KP280GH	1
18.	Self-tapping screw, rd. hd., No.10 x 3/8, sst.	KP52	2
	Coil data plate	KP190GH	1
20.	Lockout data plate	KP207GH	1
21.	Self-tapping screw, rd. hd., No. 2 x 3/16, sst.	KP69	4
	Head casting	KP215GH2	1
23.	Shaft bushing	KP3036A1	1
24.	Head gasket	KP2103A12	1
25.	Handle and driver assembly	KA147GH	1
26.	Spring	KP269GH	2
27.	Reset lever assembly	KA133GH	1
28.	Spacer	KP3004A57	1
29.	Bushing	KP3038A11	1
30.	Spacer	KP3004A32	1
31.	Retaining ring, 3/16, Type C. WA-510	KP72	4
	Reset lever spring	KP267GH	1
33.	Toggle assembly	KA135GH	1
34.	Toggle spring	KP268GH	1
35.	Reset lever latch assembly	KA131 GH	1
36.	Groove pin	KP3123A32	1
37.	Reset lever latch spring	KP11GH	1

Item	Description	Catalog Number	Number Required
38.	Bracket	KP261 GH	1
39.	Maching screw, rd. hd., 10-32 x 3/8, stl.	KP698	1
	Toggle latch lever assembly	KA132GH	1
41.	Toggle latch lever spring	KP286GH	1
42.	Pin	KP3054A2	1
43.	Latch bracket	KP13GH	2
44.	Machine screw, 1/4-20 x 3/8, stl., with preassembled lockwasher	KP108	2
	Contact opening spring	KP40GH	2
46.	Groove pin	KP49GH	1
47.	Spacer assembly	KA6GH	4
48.	Contact frame assembly	KA144GH	1
49.	Adjustment link	KP86GH	1
50.	Flat washer, 5/16, SAE, stl.	KP350	2
51.	Capscrew, hex hd., 5/16-18 x 1, stl., with preassembled lockwasher	KP2	4
	Contact post	KP170GH	2
53.	Contact bracket	KP172GH	2
54.	Stationary contact assembly	KA141GH	2
55.	Contact retainer	KP171GH	2
56.	Lead	KP3251 A4	4
57.	Flat washer, No. 20S, brass	KP342	2
58.	Flat washer, No.14S, brass	KP339	2
59.	Lockwasher, med., 1/4-inch, bronze	KP1347	2
	Hex nut, light jam, 1/4-20, brass	KP1225	2
61.	Lead	KP3251 A36	4
62.	Trip piston	KP79GH	1
63.	Coil support assembly	KA44GH	1
64.	Return spring	KP84GH	1
65.	Solenoid gasket	KP2090A51	2
66.	Replacement solenoid coil kit (includes coil, 2 of item 65 and 1 of item 19)		
	For 5 thru 50 amp (state coil rating as suffix)	KA106GH	1
	For 70 thru 140 amp (state coil rating as suffix)	KA793GH	1
67.	Lockwasher, med., 5/16-in., stl.	KP1109	2
68.	Capscrew, hex hd., 5/16-18 x 2, stl.	KP183	2
	Coil gap assembly	KA116GH	1
70.	Lead	KA291GH	2
71.	Flatwasher, 5/16-in., stl.	KA336	1
72.	Lockwasher, med., 5/16, bronze	KP348	4
73.	Hex nut, light jam, 5/16-18, brass	KP1226	4
	Tank wall liner	KP115NR	1
75.	Tank wall liner (125-kv BIL only—in addition to item 74)	KP289NR	1
76.	Tank bottom liner	KP114NR	1
77.	Tank assembly	KA21NR	1
78.	Ground clamp	KA227H	1
79.	Capscrew, hex hd., 1/2-13 x 1, stl.	KP1282	1



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