

## Types 4H and V4H recloser plunger return spring kit KA721H4 installation instructions



*Powering Business Worldwide*

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## Safety for life



Eaton meets or exceeds all applicable industry standards relating to product safety in its Cooper Power™ series products. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high-voltage lines and equipment, and support our “Safety For Life” mission.

## Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

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 may contain four types of hazard statements:

#### DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

#### WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

#### CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

**CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

### 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.

#### DANGER

**Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.**

G103.3

#### WARNING

**Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage.**

G101.0

#### WARNING

**This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage.**

G102.1

#### WARNING

**Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage.**

G122.3

## Product information

### Introduction

*Service Information MN280016EN* provides installation instructions and testing procedures for the plunger return spring kit for Eaton's Cooper Power™ series Types 4H and V4H reclosers.

### Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

### Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described nor to provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, please contact your Eaton representative.

### Acceptance and initial inspection

Each plunger return spring kit is in good condition at the factory and when accepted by the carrier for shipment.

Upon receipt, inspect the carton for signs of damage. Unpack the kit(s) and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

**Table 1. Ordering Information**

Description	Kit Part No.	4H Serial No.	V4H Serial No.
Plunger Return Spring Kit for 4H and V4H Reclosers. Basic Kit.	KA721H4-1	62966-94800	4491-14800
<b>Note:</b> If plunger and/or plunger stops are worn or damaged, order Kit-2.			
Plunger Return Spring Kit for 4H and V4H Reclosers. Basic Kit plus replacement plunger and plunger stop.	KA721H4-2	25479-62965	100-4490
Plunger Return Spring Kit for 4H and V4H Reclosers. Basic Kit plus replacement plunger and solenoid frame assembly	KA721H4-4	100-25478	

**Note:** The Plunger Return Kit KA721H4 has three different configurations as noted by the "-1, -2, or -4" after the part number. Be sure to install the correct version of the kit according to the recloser serial numbers listed above in Table 1. The differences in kit parts and installation procedures are noted throughout these installation instructions.

### Handling and storage

Be careful during handling and storage of the kit to minimize the possibility of damage. If the valve is to be stored for any length of time prior to installation, provide a clean, dry storage area.

### ANSI standards

Eaton's reclosers are designed and tested in accordance with ANSI standards C37.60 and C37.85 and ANSI guideline C37.61.

### Quality standards

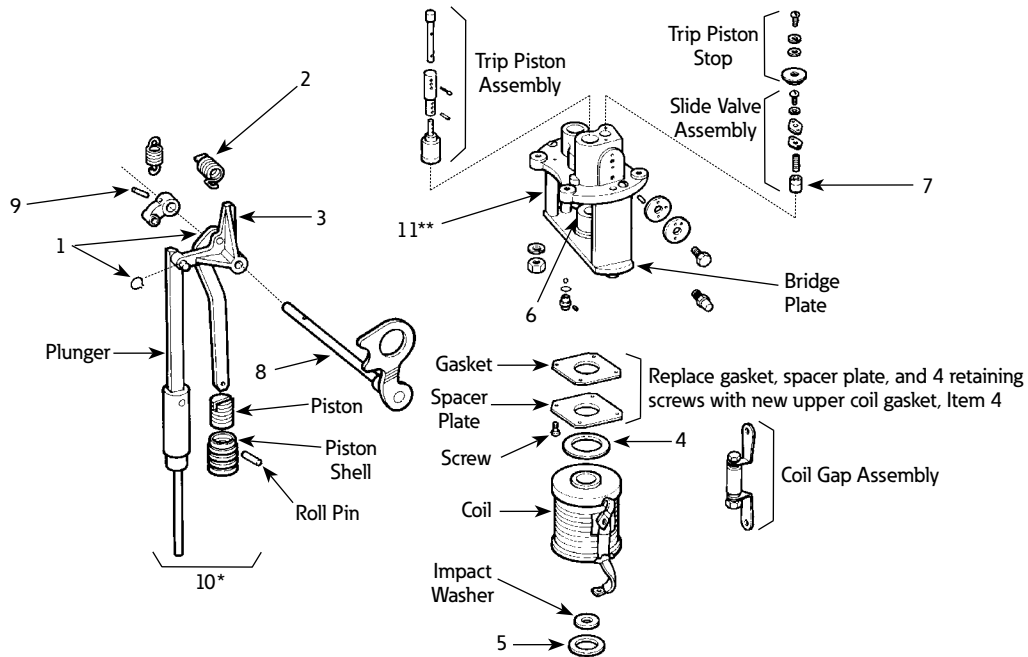
ISO 9001 Certified Quality Management System

### Description

The plunger return spring applies a counterbalance force to the solenoid plunger and pump piston to return the recloser to the closed position. As fault current pulls the plunger downward to open the recloser contacts, the spring is tensioned and provides additional force to return the plunger to its normal (closed) position as the solenoid coil is de-energized.

Refer to Table 1 to determine the correct version of this service kit according to specific recloser model, serial number, and plunger condition. Kit parts are provided (refer to Figure 1) for major components, as well as wear items such as gaskets and retaining rings. Disassembly of the recloser is required for installation of the parts in this kit.

## Kit parts



Item	Description.	Part No.	-1	-2	-4
1	Retaining Ring	KA2013-8	2	*	*
2	Plunger Return Spring	4H-239A	1	1	1
3	Plunger Lever	H-15B	1	*	*
4	Upper Coil Gasket	KA-2090-23	1	1	1
5	Lower Coil Gasket	KA-2090-60	1	1	1
6	Plunger Stop	4H-236A-2	1	1	**
7	Slide Valve Assembly	4HA-16-2	1	1	1
8	Handle and Shaft Assembly	HA-121A	1	1	1
9	Taper Groove Pin	KA-2001-12	1	1	1
10	Plunger Assembly	4HA-9A	–	1*	1*
11	Solenoid Frame Assembly	4HA-5B-1	–	–	1**
12	Slide Return Spring (not shown)	H-469	1	1	1

\* Plunger assembly (item 10) contains the plunger lever (item 3) and Qty. 1 of retaining ring (item 1).

\*\* Solenoid frame assembly (item 11) contains the plunger stop (item 6).

**Note:** Above part numbers are for identification purposes only. Individual parts cannot be purchased by ordering these part numbers.

**Figure 1. Plunger return spring kit for 4H and V4H reclosers.**

## Kit installation

### CAUTION

**Equipment damage. Keep work areas clean to prevent debris from accumulating on or in the hydraulic mechanism during disassembly and reassembly procedures. Failure to comply can result in hydraulic failure and recloser misoperation.**

T254.0

### Disassembly

Refer to *Service Information S280-10-9 Types 4H and V4H Maintenance Instructions* for specific disassembly and reassembly procedures.

### WARNING

**Hazardous voltage. De-energize the switchgear before installing this kit. Follow all locally approved safety practices and procedures when working around high-voltage lines and equipment. Failure to comply can result in contact with high-voltage, which will cause death or severe personal injury.**

T232.3

### CAUTION

**Follow all locally approved safety practices when lifting and mounting the equipment. Use the tapped lifting provisions provided. Lift the load smoothly and do not allow the load to shift. Improper lifting can result in equipment damage.**

G126.0

The entire installation process should be conducted in a clean environment, such as a repair shop.

1. Bypass, trip, and de-energize the recloser.
2. Carefully transport the unit to a suitable service facility.

### CAUTION

**Equipment damage. Recloser must be open (yellow operating handle, under sleet hood, down) before un tanking. Tripping the mechanism out of oil will cause excessive mechanical shock to the operating mechanism, which will cause accelerated wear and/or damage to the mechanism.**

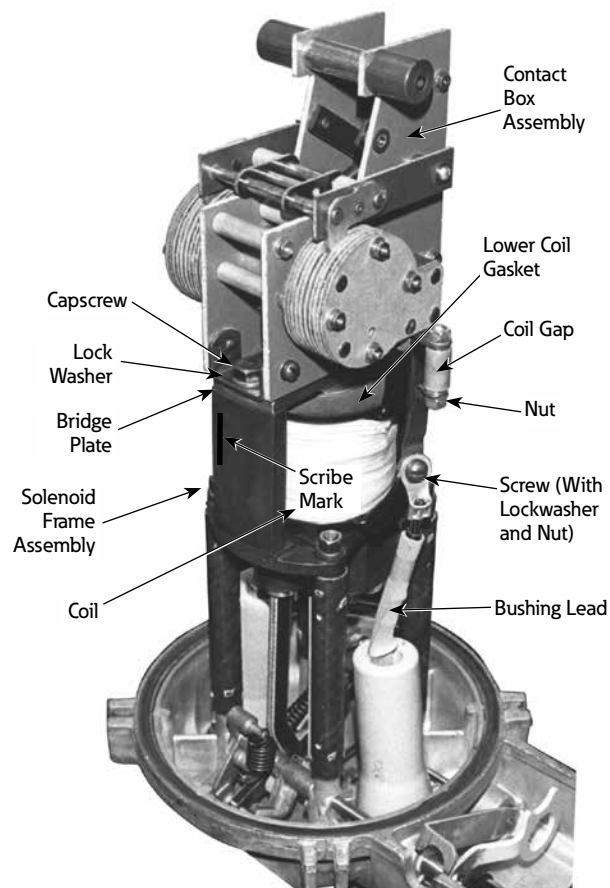
T202.0

### CAUTION

**Equipment damage. Refer to the specific switchgear unit maintenance manual for tanking/untanking procedures and related instructions. Failure to follow these instructions could result in equipment damage or personal injury.**

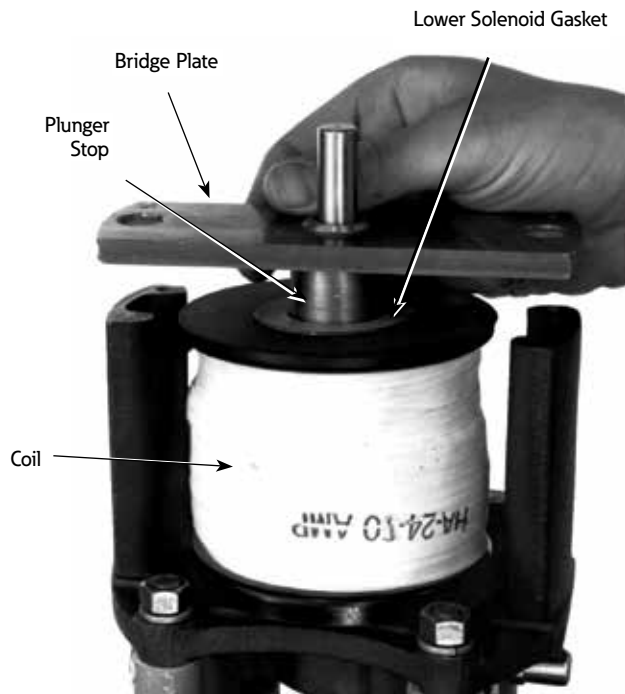
T238.0

3. With the recloser in the open position, untank the recloser by loosening the head bolts and washers on the head casting. Carefully lift the head assembly out of the tank using the lifting lug(s).
4. Drain all oil from head assembly.
5. Securely mount the mechanism upside down in a repair station.



**Figure 2. Recloser disassembly.**

6. Refer to Figure 2. Remove the contact box assembly.
  - A. Remove two large capscrews and lockwashers securing assembly to solenoid frame.
  - B. Remove two nuts securing top coil lead and bushing lead to contact box.
  - C. Remove the screw, nut and lockwasher securing the coil gap to bottom coil lead. Retain coil gap and all hardware.
7. Mark the bridge plate and solenoid frame with marker or scribe as shown in Figure 2. Remove the bridge plate from solenoid frame. On early models, plunger stop may be retained in bridge plate.
8. Press plunger stop (if present) out of bridge plate, lower coil gasket and coil. Discard gasket and plunger stop.
9. On pre-1983 70 Amp coils, check coil for spacer that is permanently affixed to the coil. Spacer is 1/4" thick and is in the shape of a half-circle. If spacer is present on coil, replace coil with a standard 70 Amp coil (2 3/4" height). The thickness of the spacer will affect the minimum pickup level. Make sure to check any 70 Amp coil taken out of shelf stock for spacers. Early model coils have a height of 2 1/2" as shown in Figure 4.



**Figure 3. Solenoid frame assembly.**

10. Examine bottom edge of coil for warpage. Examine top edge for cracks in the plastic. Replace coil if either of these conditions are present.
11. Remove upper coil gasket and impact washer. Discard old gasket. Retain the impact washer.

**Note:** If installing a -4 kit, the new solenoid frame provided in kit will not have spacer plate. Proceed to step 9.

12. If reusing the solenoid frame, remove the four screws retaining the spacer plate and gasket. Discard the spacer plate, gasket, and screws.
13. Remove the four nuts and lockwashers that secure solenoid frame to stringers.

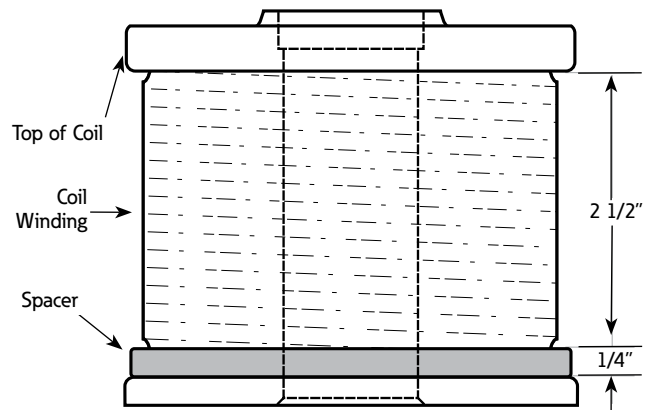
### CAUTION

**Equipment damage. Raise the solenoid assembly slowly to withdraw the plunger and pump piston assembly from their cylinders. Be careful to keep them from falling and being damaged. If either the solenoid assembly, plunger, or pump piston are nicked or damaged, the recloser can misoperate or fail to operate.**

T243.1

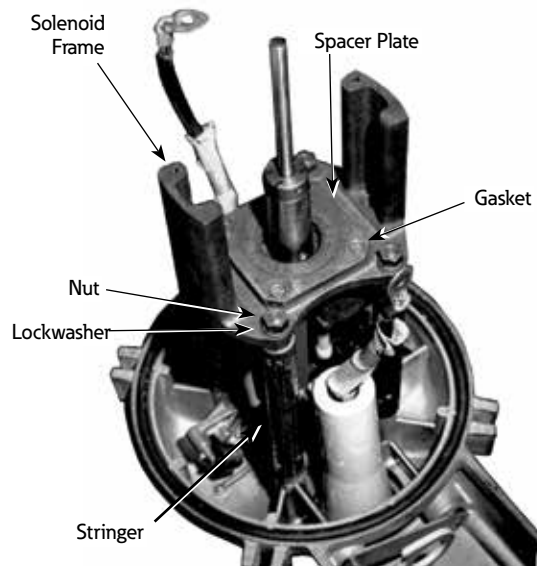
**Note:** Before removing solenoid frame, close the handle and examine inspection hole. Record the amount of piston shell visible in the hole. This will be used to pre-set the pump piston. To slow open the recloser, hold the handle and break the toggle latch. Slowly release the handle to allow the recloser to open gradually until fully open.

14. Remove the solenoid frame assembly.



**Figure 4. Early model solenoid coil.**

15. Remove the stringers and bushings to provide adequate clearance for head disassembly and kit part installation.
16. Refer to Figure 7. Remove plunger from plunger lever. Discard the retaining ring. If installing -2 or -4 kits, discard the existing plunger. (A new replacement plunger is provided in kit.)
17. Remove pump piston link assembly from plunger lever. Discard the retaining ring. If installing -2 or -4 kits, the existing pump piston link(s) may be discarded during reassembly. The pump piston and shell will be reused. (A new set of replacement links are provided in kit.)
18. Make sure the operating handle is the open position. Remove the sleet hood cover. Remove counter assembly by unscrewing two round head mounting screws (not shown).
19. Unhook the lockout spring.



**Figure 5. Spacer plate and gasket.**



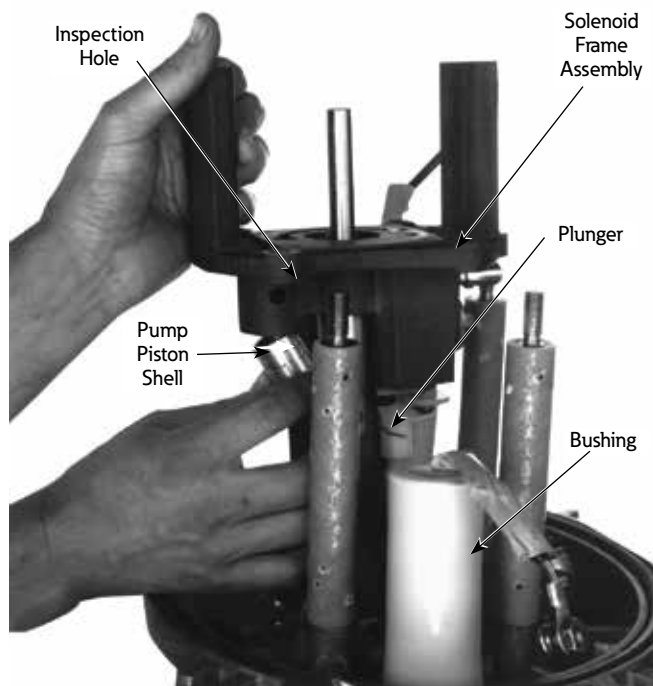


Figure 6. Solenoid frame assembly.

20. Remove the operating handle spring.
21. Using a drift punch, drive out the reset lever taper pin. Discard the pin. The wide taper of groove pin is driven out through the narrow hole of the shaft. For this reason, a new groove pin and operating handle shaft are provided in the kit parts.

**Note:** Refer to Figure 7. Note the assembled position of the three assemblies on the operating lever shaft: plunger lever, reset lever, and trip lever assembly. The front side of plunger lever must push against slide and the back side of lever must contact the latch assembly.

22. To disassemble head assemblies, proceed as follows:
  - A. Slowly pull out operating handle and shaft assembly. Discard handle shaft assembly.
  - B. Leave the trip lever assembly in position attached to lockout spring.
  - C. Remove the reset lever.
  - D. Remove the plunger lever. Discard lever.
23. Refer to Figure 8. If early model slide return spring is used, replace with new kit slide return spring. The long leg of new spring should be mounted in the small hole in slide and the short leg must be secured by retaining screw in head casting.

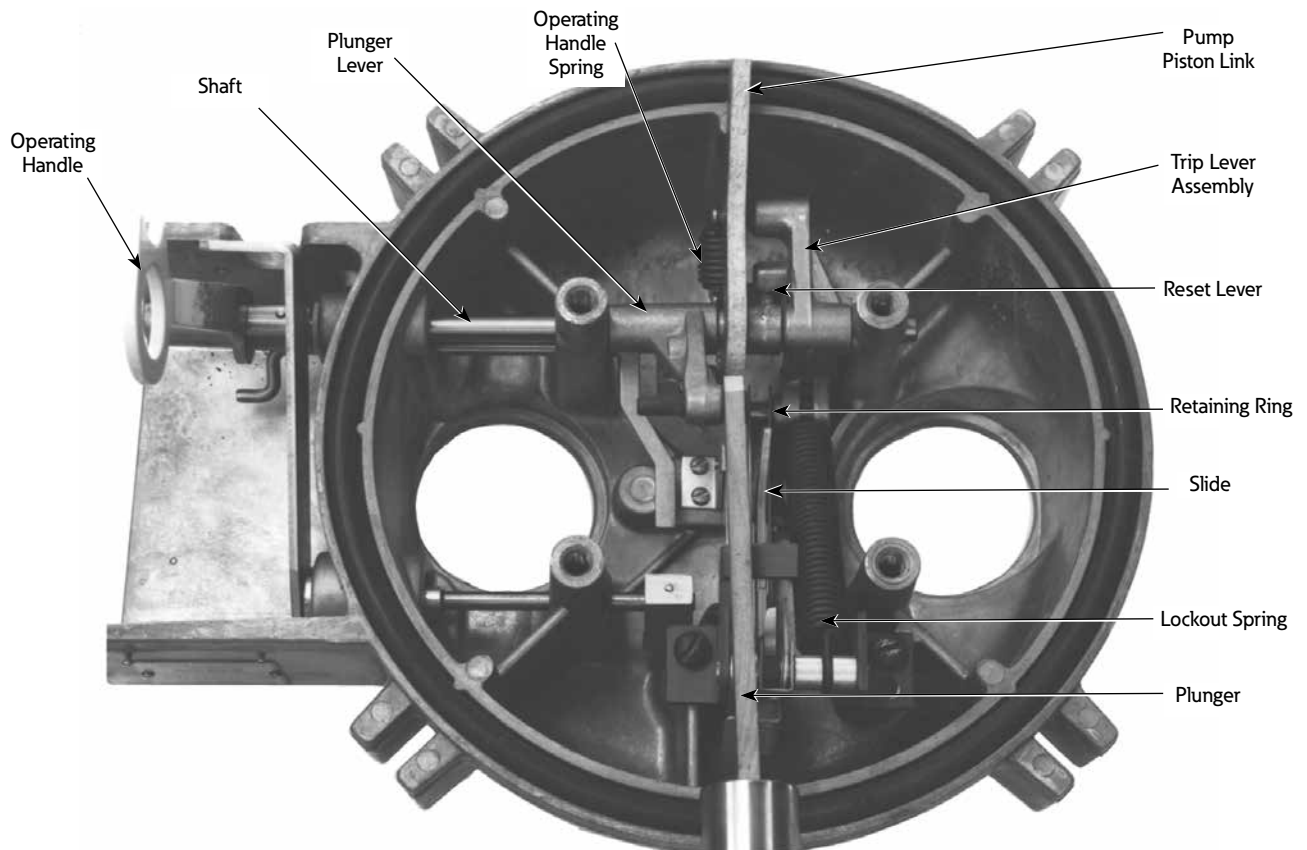


Figure 7. Recloser head.

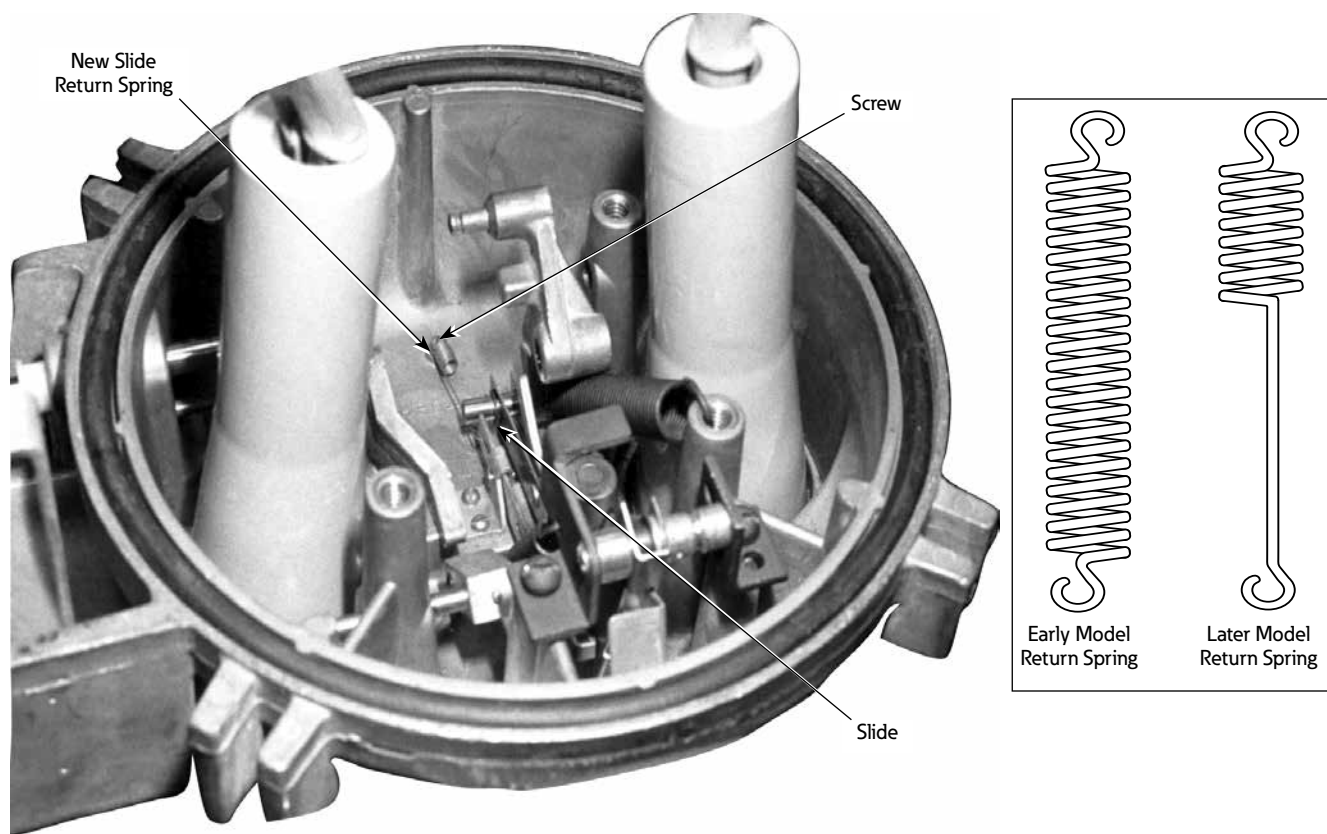


Figure 8. Slide return spring.

## Cleaning

### CAUTION

**Equipment damage. Keep work areas clean to prevent debris from accumulating on or in the hydraulic mechanism during disassembly and reassembly procedures. Failure to comply can result in hydraulic failure and recloser misoperation.**

T254.0

### ⚠ CAUTION

**Dielectric failure, equipment damage. Never use volatile solutions, detergents, or water-soluble cleaners when cleaning the interior of this equipment. These cleaners will contaminate the insulating oil, reducing its dielectric strength. Operation with contaminated insulating oil can result in internal flashovers that will cause equipment damage and possible personal injury.**

T201.2

### IMPORTANT

Use a clean, lint free cloth to prevent contamination of the hydraulic mechanism.

Clean all the locations in head casting and solenoid assembly where operating handle shaft, pump piston, plunger, or bushings are installed. Make sure areas are clean of any dirt particles or shavings.

## Reassembly

1. Refer to Figure 9. Install new operating handle shaft through head casting and through first stringer support.

**Note:** If installing -1 kit, install new plunger lever in next step. The existing plunger will be reinstalled in step For -2 or -4 kits, install the new plunger lever assembly containing a new plunger and pump piston link preassembled.

2. Hold plunger lever (-1 kit) or plunger lever assembly (-2, -4 kits) as shown in Figure 9 and position lower finger of lever between slide and latch. Push the operating handle shaft through lever assembly.
3. Install the new plunger return spring around the reset lever as shown in Figures 9 and 10. Spring is symmetrical and can be positioned in either direction. Install the lever in the head casting with the finger down.
4. Install operating handle shaft through the reset lever, trip lever assembly, and second stringer support.

**Note:** Refer to Figure 9. Check that trip lever, reset lever, and plunger lever are correctly positioned as previously assembled. The front side of plunger lever must push against slide and the back side of lever must contact the latch assembly. Make sure that plunger lever is underneath tab on slide assembly.

5. Rotate the reset lever upwards approximately 45° to pre-load the plunger return spring as shown in Figure 10. Rotate the lever until the hole in shaft is aligned with the taper pin hole.
6. Install the taper pin with the tapered end first. Drive pin until flush with the reset lever on both ends.
7. Reinstall lockout spring into spacer groove. A small piece of string is can be used to easily install spring.
8. Reinstall the operating handle spring.
9. For the **-1** kits, reinstall the existing plunger to plunger lever and secure with new retaining ring. (For **-2** and **-4** kits, the new plunger is preassembled onto the plunger lever and was installed in step 2.

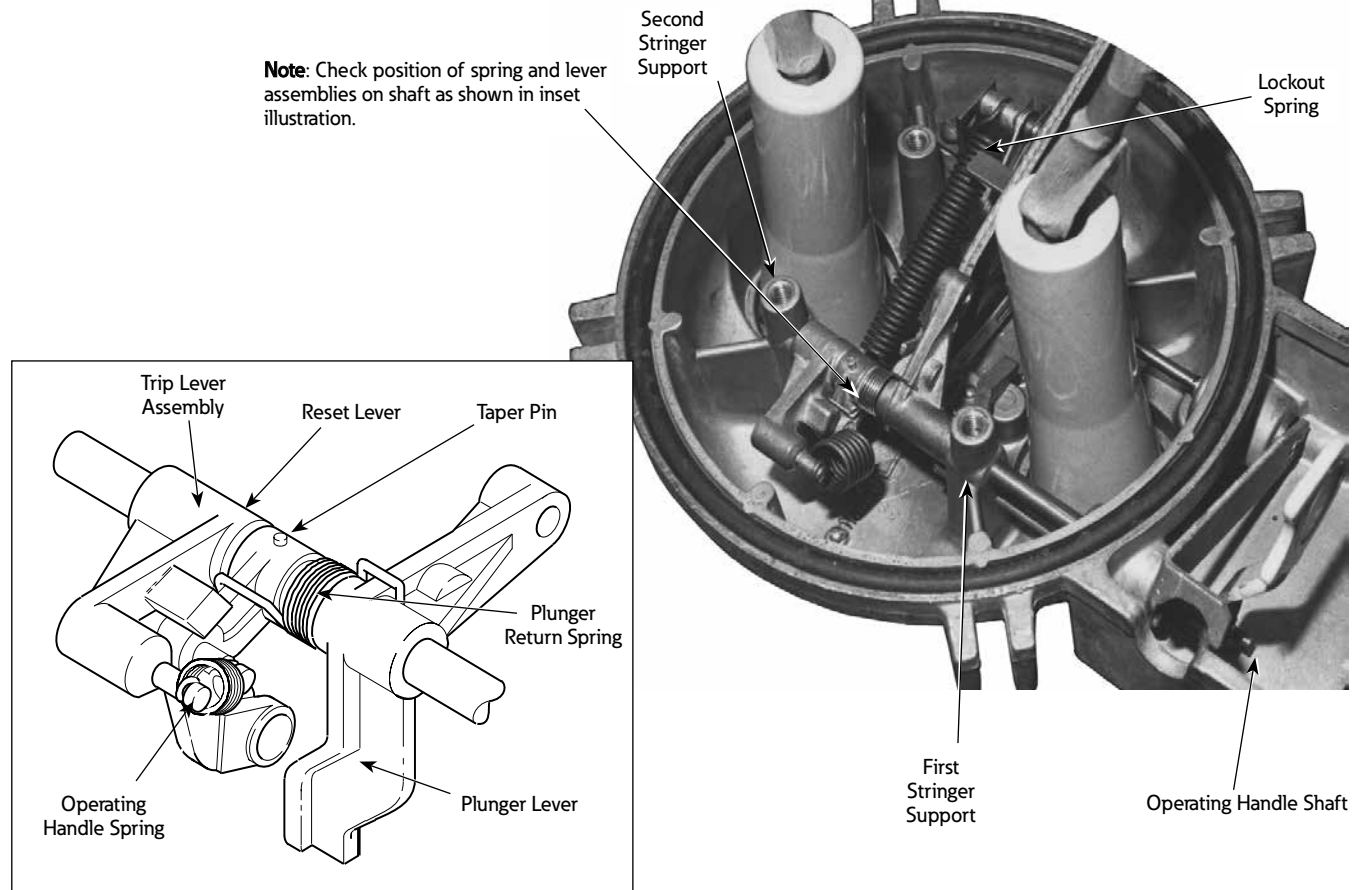
**Note:** In the following step, the tapered edge of the plunger assembly must be oriented towards the pump piston link (the straight side would be oriented towards the outside of head casting).

10. For the **-1** kits, reinstall the existing pump piston assembly (links, pump piston, piston shell) to plunger lever and secure with new retaining ring. If installing **-2** or **-4** kits, inspect the existing pump piston link. If there are two (green) links, the existing pump piston assembly can be reused. Remove the piston links on the new plunger

lever and reinstall the existing pump piston assembly (links, pump piston, piston shell) to plunger lever. Secure with new retaining ring. Proceed to step 11.

If the existing piston link is a single (red) link, the new piston links preassembled onto the plunger lever must be used. To reinstall the existing pump piston and shell onto new piston links, follow these steps:

- A. Note the position of the pump piston shell with respect to the piston link. Count the number of exposed threads on the piston and record information.
- B. Refer to Figure 11. Drill out the stake punch in the pump piston shell. Make sure the shavings do not fall into mechanism or head casting. Cleanup all particles before reassembly.
- C. Unscrew shell far enough to expose the piston pin.
- D. Push out pin.
- E. Reinstall piston onto new piston link and secure with piston pin. Turn shell onto piston until number of threads are exposed that were recorded in step a. Do not stake the piston shell until after timing sequence has been tested. Stake shell after adjustment is correct.



**Figure 9. Head reassembly.**

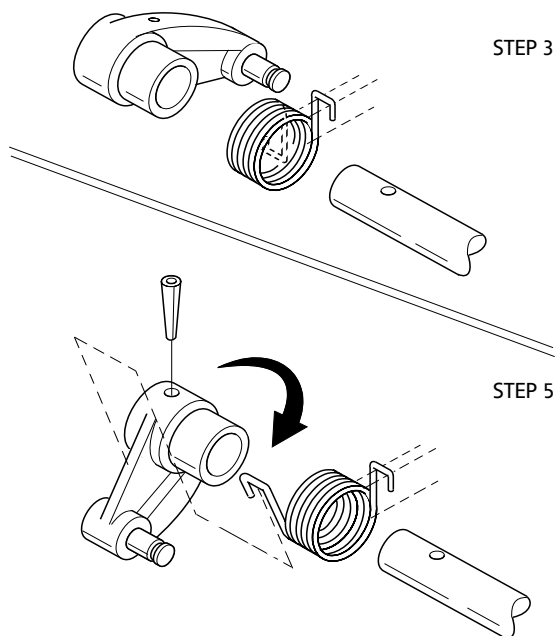


Figure 10. Plunger return spring.

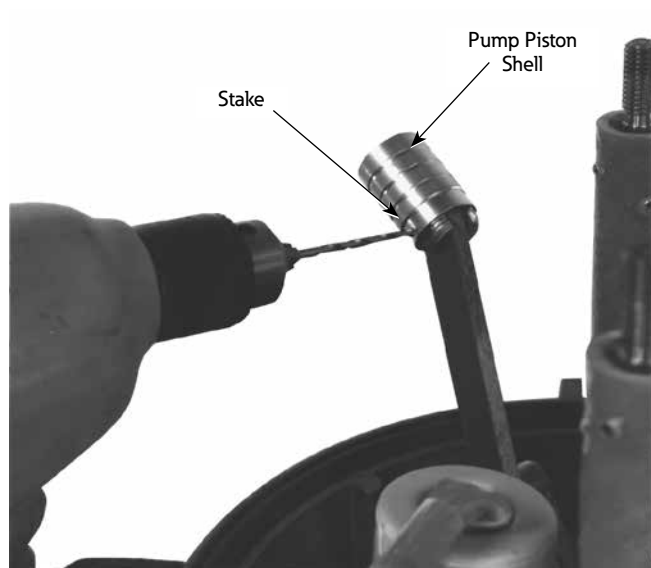


Figure 11. Drilling out plump piston stake.

11. Reinstall the four stringers to threaded holes in head casting. Use a pair of pliers around the roll pin location to tighten the stringers snug (threads should be bottomed out in casting).

**Note:** If installing a **-4** kit in the step 12-14, use the new (kit) solenoid frame provided and reuse the trip piston, timing plate, and control valve from the previous solenoid frame. Install new slide valve in the replacement (kit) solenoid frame following step 12, a-e.

12. For **-1** and **-2** kits, replace the slide valve in the solenoid frame with the new (kit) valve. For **-4** kits, install new (kit) slide valve in new solenoid frame. New valve has a smaller hole to offset the force of return spring and keep the reclosing time unchanged.

- A. Remove the screw securing trip piston stop. Remove stop.
- B. Loosen screw securing slide valve cover and swing cover out of the way.
- C. Install the new slide valve, reusing the existing spring, into solenoid frame.
- D. Pivot the slide cover back into position and tighten screw.
- E. Raise trip piston and reinstall trip piston stop. Make sure that the trip piston travels freely up and down and is not trapped in frame by stop. Make sure trip piston stop does not interfere with piston travel. If necessary, file off stop.

13. Tighten the screws securing the slide valve cover and trip piston stop.

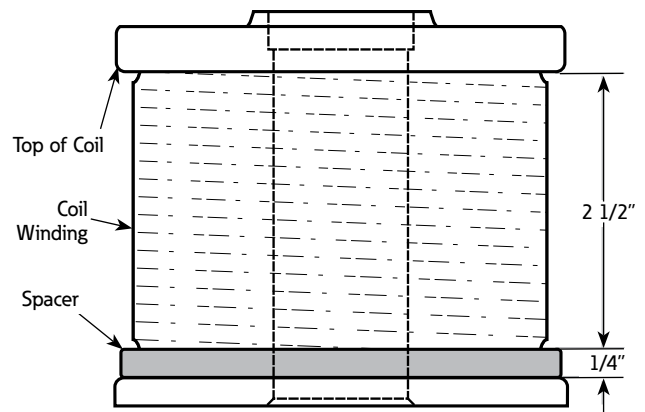
14. Reinstall solenoid frame as follows:

- A. Make sure the plunger is positioned through the center hole of solenoid frame assembly.
- B. Refer to Figure 6. Position the pump piston shell in frame opening.
- C. Slowly position the solenoid frame onto stringers studs and secure with lockwasher and nut.
- D. Examine the inspection hole to determine if the same amount of piston shell is visible in hole after installation of new parts. Adjustment can be made by removing solenoid frame above pump piston and turning shell on piston until initial adjustment looks correct.

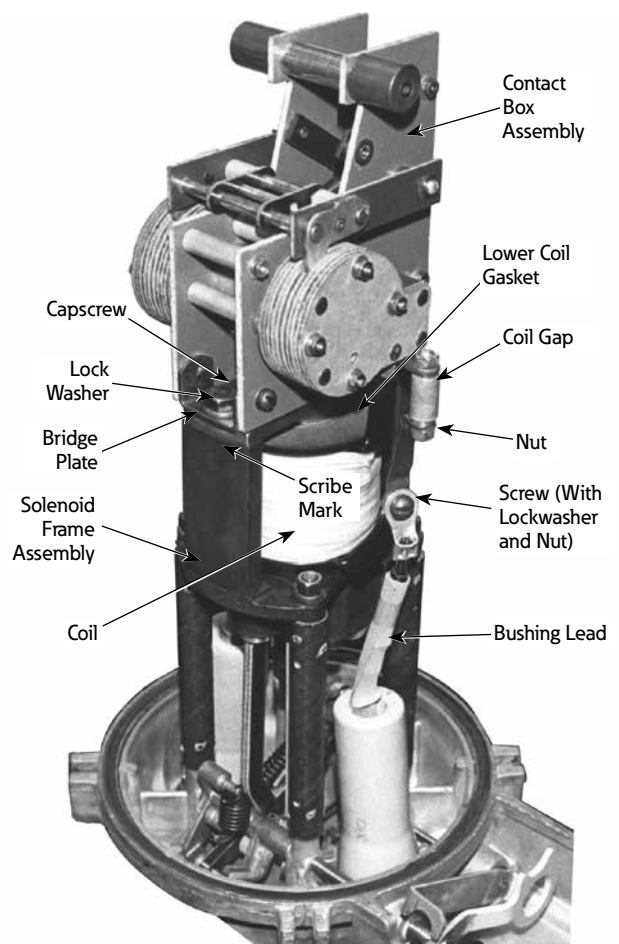
15. Install new upper solenoid gasket. (The upper solenoid gasket is the larger of two kit gaskets.)

**Note:** If solenoid coil has not been checked during disassembly, check coil for spacer that is permanently affixed to the coil (pre-1983 70 Amp coils only). Spacer is 1/4" thick and is in the shape of a half-circle. If spacer is present on coil, replace coil with a standard 70 Amp coil (2 3/4" height). The thickness of the spacer will affect the minimum pickup level. Make sure to check any 70 Amp coil taken out of shelf stock for spacers. Early model coils have a height of 2 1/2" as shown in Figure 12.

16. Refer to Figure 3. Reinstall coil into solenoid frame and rotate back and forth to make sure upper gasket is correctly seated.
17. Reinstall impact washer onto plunger.
18. Install lower solenoid gasket onto top of coil.
19. On **-1** and **-2** kits, install the new (kit) plunger stop into bridge plate. If existing plunger stop is pressed into bridge plate, drive out the stop with a punch or suitable tool. (**-4** kits have the correct plunger stop in the new solenoid frame.)
20. Position bridge plate onto solenoid frame according to alignment marks made during disassembly.
21. Refer to Figure 13. Reinstall contact box assembly:
  - A. Close yellow operating handle.
  - B. Position contact box over solenoid frame and thread two large capscrews (with lockwashers) into frame. Tighten capscrews snug.
  - C. On side without coil gap, install the bushing lead with lockwasher and nut.
  - D. On side with coil gap, assemble the coil gap lead and coil lead to the bushing lead with round-head screw and nut. Make sure the coil gap vent points upward (toward the contact box end of recloser). Secure the assembled lead to contact box stud with lockwasher and nut.
22. Install the counter with mounting screws and attach sleet hood cover. If any problem exists with the counter after reassembly of parts, refer to the adjustment procedure in the Maintenance Manual.
23. Retank unit in oil.
24. Manually slow-open and slow-close the yellow operating handle until handle will not stay in closed position. Raise handle slowly and hold the operating handle with resistance and allow the contacts to open gradually until fully open. Repeat several times. Contacts should open and close smoothly without sticking and there should be an audible noise as contacts open and close. If there is any problem with operation, untank recloser and inspect the pump piston, plunger, and contact box assembly for cause of hangup.



**Figure 12. Early model solenoid coil.**



**Figure 13. Early model solenoid coil.**

## Testing

After the plunger return spring kit has been installed, the recloser must be tested to verify proper operation prior to installation. Refer to *Service Information S280-10-9 Types 4H and V4H Maintenance Instructions* for maintenance instructions.

## Safety requirements

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### WARNING

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**Hazardous voltage. The switchgear (apparatus and control) and high-voltage transformer must be in a test cage or similar protective area to prevent accidental contact with high-voltage parts.**

**Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage.**

T221.5

To prevent accidental contact with high-voltage parts, the recloser and high-voltage transformer must be placed in a suitable test cage and all proper grounding procedures must be observed.

Refer to the recloser nameplate (located on the sleet hood) for the recloser serial number and product type and perform the following tests as instructed in the applicable recloser maintenance manual.

For additional information on low-voltage AC testing of reclosers, refer to *Reference Data R280-90-2*.

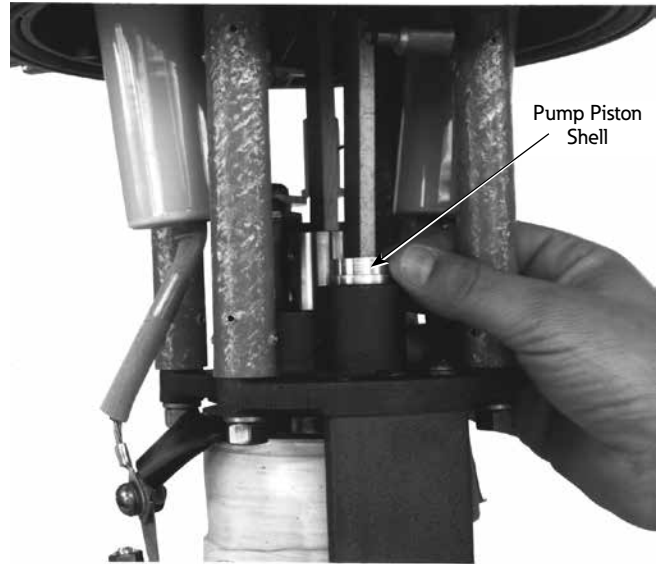
1. Mechanical Operation Test.

If the number of operations to lockout or the number of fast and delayed operations is not correct, perform the pump piston adjustment.

2. High Potential Insulation Level Withstand Test.

3. Minimum-Trip Current Test.

4. Timing Characteristics Test.



**Figure 14. Pump piston adjustment.**

### Pump piston adjustment

1. Adjust the pump piston (Figure 14) as required:
  - If the recloser is performing too many operations to lockout, turn the piston shell counterclockwise a little off the pump piston.
  - If the recloser is performing too few operations to lockout, turn the piston shell clockwise a little onto the pump piston.
2. Stake the pump piston shell with a small punch after the adjustment is correct.

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