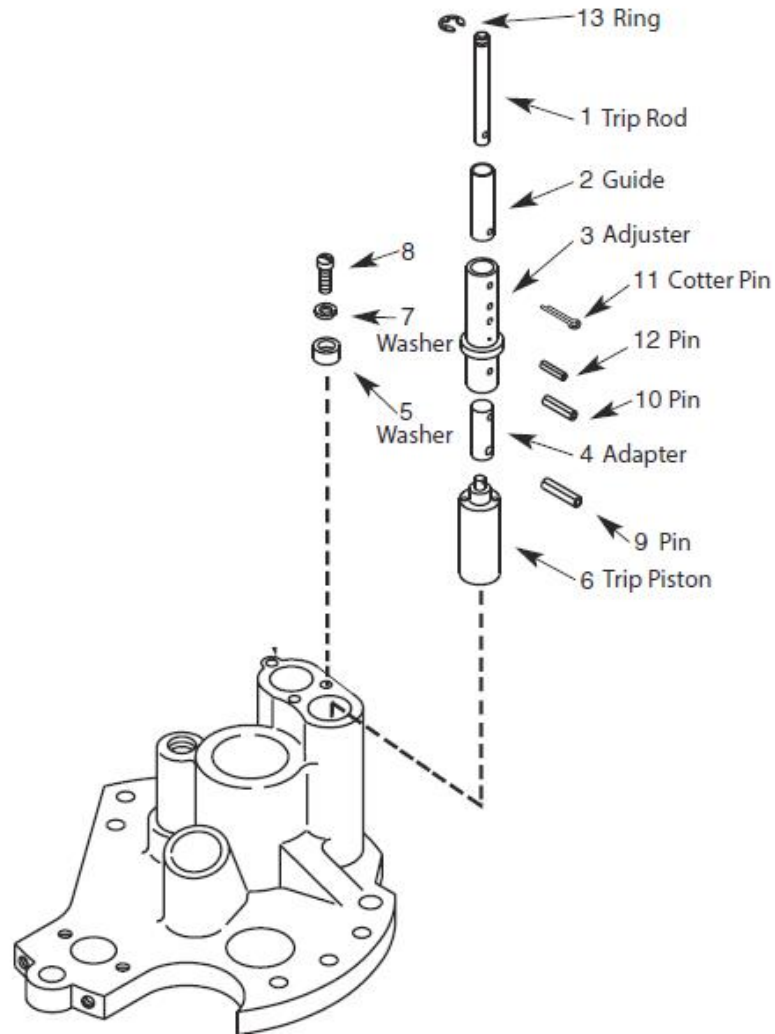


KA715L1, KA715L2, and KA715L3 Types L, E, and 4E Sequence Selector Kit Installation Instructions



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Contents

DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY	ii
SAFETY FOR LIFE	iv
SAFETY INFORMATION	iv
Safety instructions	iv
INTRODUCTION	1
Read this manual first	1
Additional information	1
Acceptance and initial inspection	1
Handling and storage	1
Quality standards	1
PRODUCT INFORMATION	1
Kit description	1
Kit parts	2
INSTALLATION	3
ADJUSTMENTS	5
Pump piston shell	5
Trip linkage	6
TESTING	6
Pump piston test	6
Trip point test	7
Insulation level withstand tests	8
Contact operation test	8



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.

G122.2

Introduction

This document provides installation and adjustment instructions for KA715L1, KA715L2, and KA715L3 Sequence Selector assemblies for use with Type L, E, and 4E reclosers, as follows:

- Type L reclosers below Serial No. 208750
- Type E reclosers from Serial No. 52000 to 72640
- Type 4E reclosers below Serial No. 16149

Table 1 provides a description of each Sequence Selector kit to aid in ordering the correct item.

Table 1. Ordering information

Kit	Description
KA715L1	Used to select 1F1D, 1F2D, 1F3D, 2F0D, 2F1D, 2F2D, 3F0D or 4F0D. Cannot be used to select 3F1D sequence.
KA715L2	Used to select 2F0D, 2F1D, 2F2D, 3F1D or 3F0D without special solenoid frame. Cannot be used to set 1F1D, 1F2D, 1F3D sequence.
KA715L3	Used to select 0F2D, 0F3D, or 0F4D sequence

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 provide directions for meeting every possible contingency during installation or operation. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your Eaton representative.

Acceptance and initial inspection

Sequence selector kits are in good condition at the factory and when accepted by the carrier for shipment.

Upon receipt, inspect the shipping container for signs of damage. Unpack the sequence selector kit and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Handling and storage

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

Quality standards

ISO 9001 Certified Quality Management System

Product information

Kit description

The service kit for the Sequence Selector allows customers to vary the fast and delayed sequences of operation to lockout. Operating sequences can be all fast, all delayed, or a combination of both.

The height (H) of the trip piston (see Figure 1) allows different timing sequences, as specified in Table 2.

Refer to Table 3 on page 2 to determine the correct kit to obtain the desired timing sequence. Table 3 also identifies other service parts that may be required.

Indexing the adapter within the trip adjuster determines the total number of operations, while indexing the trip rod guide within the trip adjuster determines the number of fast operations.

Recloser operating sequences are used with standard delay curves to assure coordination with other reclosers or protective devices.

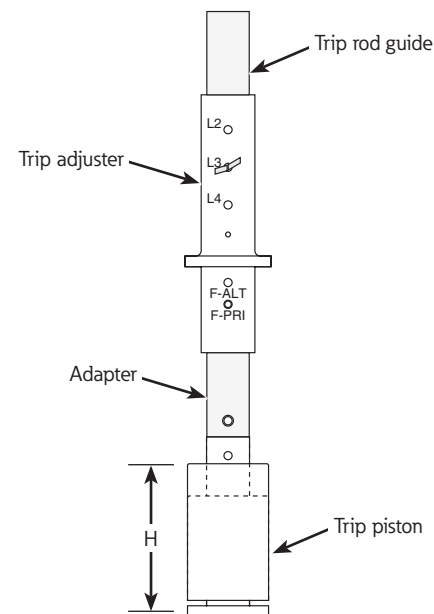


Figure 1. Sequence Selector assembly

Table 2. Trip piston details

Kit	Trip Piston	Height (H), inches
KA715L1	LA-23A-1	1-27/32
KA715L2	LA-23A-3	1-13/32
KA715L3	LA-23A-1	1-27/32

KA715L1, KA715L2, and KA715L3 Types L, E, and 4E Sequence Selector Kit

Table 3. Kit application

Desired sequence	Sequence Kit Part No.	Additional Required Parts
3F0D, 4F0D	KA715L-1	Solenoid frame: <ul style="list-style-type: none"> • LA-127-3 for recloser type L • EA-179-3 for recloser type E • 4EA-108-3 for recloser type 4E
2F0D, 2F1D, 2F2D	KA715L-1 or KA715L-2	None required
1F1D, 1F2D, 1F3D	KA715L-1	None required
3F0D, 3F1D	KA715L-2	None required
0F2D, 0F3D, 0F4D	KA715L-3	Slide Valve Assembly LA-155 (L, E, and 4E) Slide Valve Stops L-105 and L-106 (L, E, and 4E)
1F0D	None required	Timing sequence can only be obtained using a non-reclosing handle.
0F1D	None required	Timing sequence can only be obtained using a non-reclosing handle and the slide valve assembly/slide valve stops above for "all delay" sequence.

Kit parts

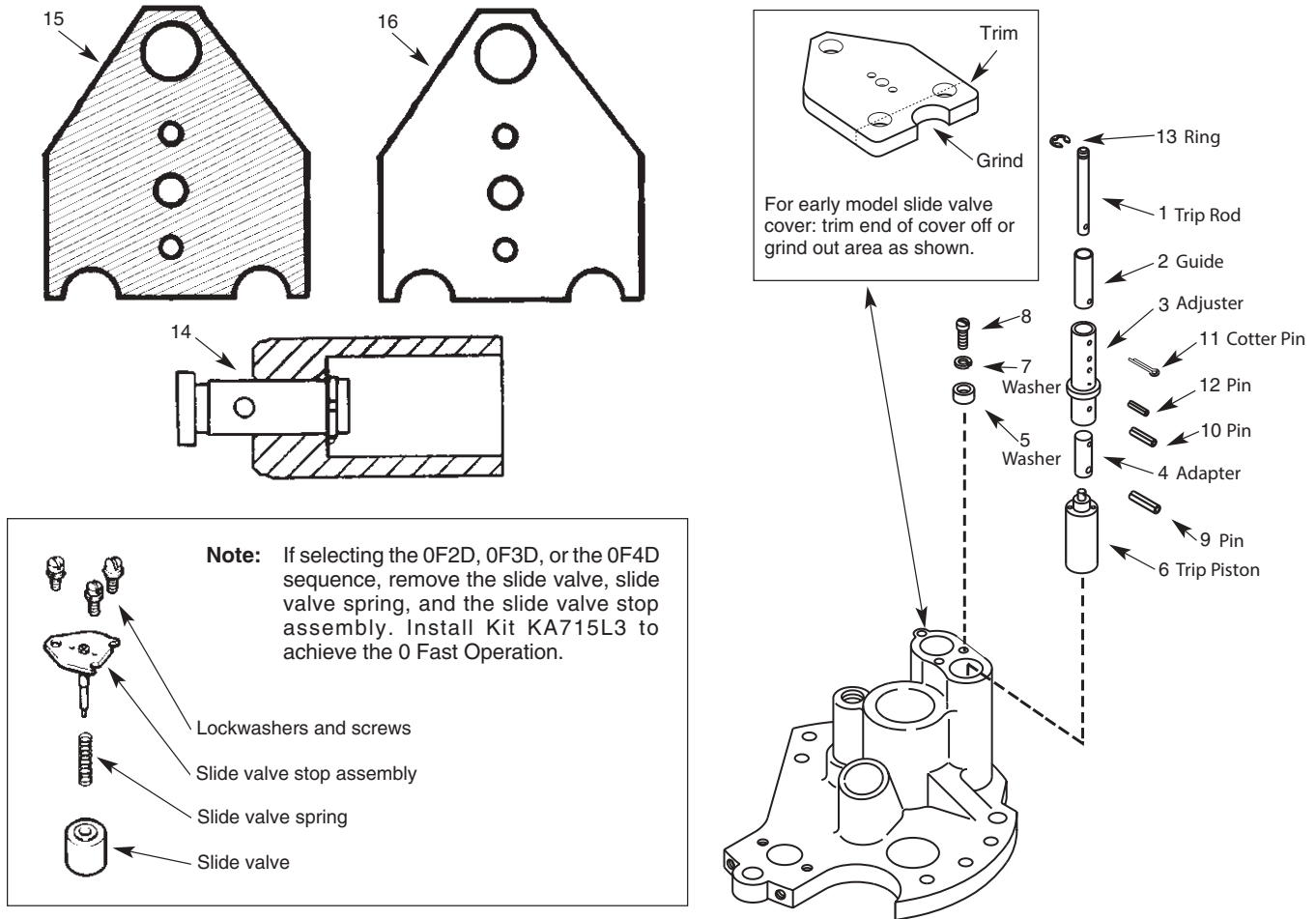


Figure 2. Sequence selector kit parts

Table 4. Sequence selector kit parts

Item # in Figure 2	Part Number*	Description	Quantity		
			KA715L1	KA715L2	KA715L3
1	L-387A	Trip Rod	1	1	1
2	L-388A	Trip Rod Guide, 2-1/16" Long	1	1	1
3	L-389A	Trip Adjuster	1	1	1
4	L-390A	Adapter, 1-3/4" Long	1	1	1
5	L-391A	Trip Adjuster Stop (spacer)	1	1	1
6	L23A-1	Trip Piston Assembly	1	—	1
	L23A-3	Trip Piston Assembly	—	1	—
7	KA-2030-1	Lockwasher, High Collar	1	1	1
8	L-376A	Screw, Flange Head	1	1	1
9	9708-15-093050A	Roll Pin, 3/32 x 1/2" Long	1	1	1
10	9708-15-093062A	Roll Pin, 3/32 x 5/8" Long	1	1	1
11	9708-15-062062A	Roll Pin, 1/16 x 5/8" Long	1	1	1
12	9705-25-093100A	Cotter Pin, 3/32 x 1" Long	1	1	1
13	9710-01-187000A	Retaining Ring	1	1	1
14	LA155	Valve Assembly	—	—	1
15	L-106	Fiber Slide Valve Pad	—	—	1
16	L-105	Metal Slide Valve Stop	—	—	1

* Part numbers are for identification purposes only. Individual parts cannot be purchased.

Installation

Note: 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. Disassemble the hydraulic mechanism following procedures found in Service Information MN280055EN, *Types V4L, V4E Maintenance Instructions*.

Note: Discard the existing trip rod. Use the shorter trip rod (3-5/8") provided with the kit for proper operation.

3. Install the adapter on the trip piston assembly (see Figure 3). Secure with a roll pin (3/32" x 1/2").

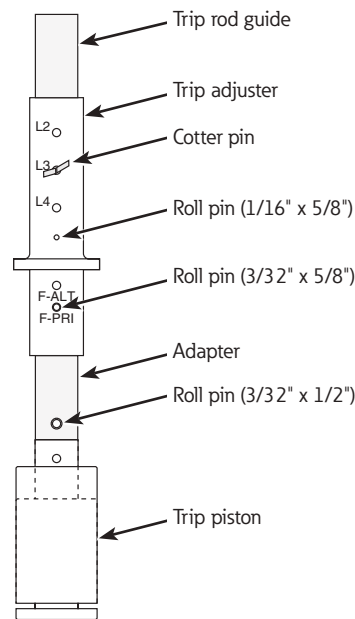


Figure 3. Trip rod assembly

KA715L1, KA715L2, and KA715L3 Types L, E, and 4E Sequence Selector Kit

4. Install the roll pin (1/16" x 5/8") into the small bottom hole of the trip adjuster.
5. Install the trip adjuster over the adapter; then install a roll pin (3/32" x 5/8") in either the "F-ALT" or "F-PRI" adjuster hole. (See Table 5.)

Table 5. Lockout sequences

Possible Sequences	Kit	Adjuster Hole	Lockout Hole
0F1D*	Use non-reclose handle		
0F2D*	3	Either	L2
0F3D*	3	Either	L3
0F4D*	3	Either	L4
1F0D	Use non-reclose handle		
1F1D	1	F-ALT	L2
1F2D	1	F-ALT	L3
1F3D	1	F-ALT	L4
2F0D	1	F-PRI	L2
2F0D	2	F-ALT	L2
2F1D	1	F-PRI	L3
2F1D	2	F-ALT	L4
2F2D	1	F-PRI	L4
2F2D	2	F-ALT	L4
3F0D*	1	Either	L3
3F0D	2	F-PRI	L3
3F1D	2	F-PRI	L4
4F0D*	1	Either	L4

* Refer to Table 3 for additional service parts required.

6. Install the trip rod guide inside the trip adjuster and secure with a cotter pin in either L2, L3, or L4 holes to choose the total number of operations (refer to Table 5).
7. Referring to Figure 2 and Figure 4, reassemble the trip piston assembly as follows:
 - a. Remove the outside screw (Figure 2, item 1) (away from the trip plunger) and lockwasher.
 - b. Position the lockwasher and trip-adjustment stop onto the new screw (see Figure 2, items 5, 7, and 8).

Note: The trip-adjuster stop can only be installed one way onto the screw and lockwasher.
 - c. Install the trip piston assembly into the solenoid frame.
 - d. Install the screw, lockwasher, and trip-adjustment stop into the hole.
8. Install the new trip rod (Figure 2, item 1) into the recloser mechanism and secure with a retaining ring (Figure 2, item 13).

9. Rotate the solenoid frame over and reinstall the ball seat. Make sure the ball seat is properly seated. Make sure the new trip rod is seated within the trip rod guide.
10. Grasp the trip piston assembly and raise to the highest position. Release the piston and allow it to reset downward. Make sure the piston assembly does not interfere with the slide valve cover or any other mechanism part.

Note: For early model slide valve covers, a portion of the cover can be trimmed or ground away to prevent interference with the new trip piston assembly (refer to the inset illustration in Figure 2).

11. Perform the adjustment procedures in "Pump piston shell" on page 5 and "Trip linkage" on page 6.
12. Refer to Service Information MN280055EN, *Types V4L, V4E Maintenance Instructions*, for procedures to reassemble the solenoid frame and recloser.

IMPORTANT

If the timing sequence has been changed by the assembly of the kit parts, be sure to attach a new data plate to the recloser to identify the correct sequence of operation.

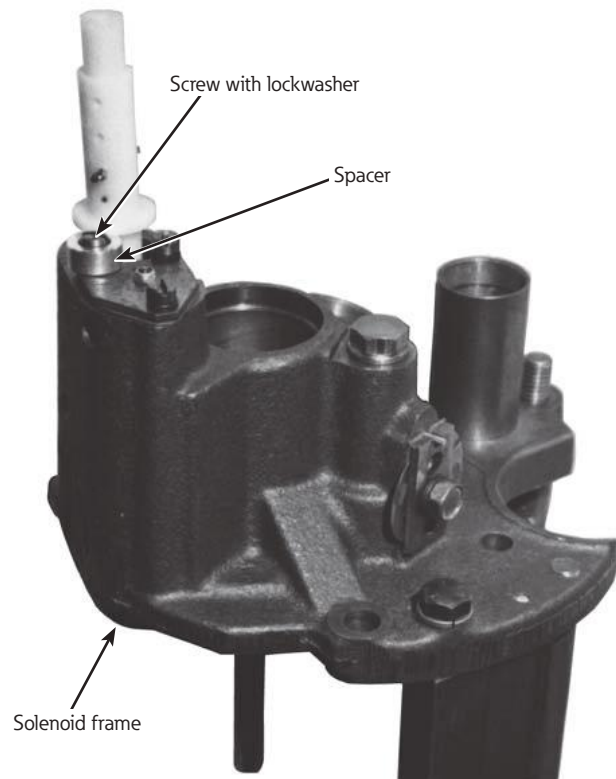


Figure 4. Trip spacer

Adjustments

After the service parts have been replaced, or after the operating sequence has been changed, it is necessary to verify the operation of the recloser.

The pump piston shell and the trip linkage can be set initially by operating the recloser mechanism out of oil. To verify the adjustments, use a suitable tester to apply the required test currents.

The fine-tuning procedure begins with adjustment of the pump piston shell (to produce the proper number of fast operations), and concludes with adjustment of the trip linkage (to produce the proper number of operations to lockout).

Pump piston shell

After installing the service parts, you must adjust the position of the pump piston shell on the pump piston (see Figure 5).

- Turning the pump piston shell *counterclockwise* off the piston increases the effective length of the piston, causing the ports in the cylinder wall to be covered earlier during the downward stroke of the pump. As a result, more oil will be pushed into the trip piston cylinder and the trip piston will raise higher in the cylinder (reducing the number of fast operations).
- Turning the pump piston shell *clockwise* onto the pump piston decreases the effective length of the piston, causing the ports to remain open longer during the downward stroke of the pump. As a result, less oil will be pushed into trip piston cylinder and the trip piston will raise lower in the cylinder (increasing the number of fast operations).

Note: If the existing pump piston shell is to be reused, you must drill out the stake punch that secures the pump piston shell to the pump piston (see Figure 6). Do not restake the pump piston until both the Pump Piston Adjustment and the Trip Linkage Adjustment are performed.

1. Set the pump piston initially according to the following guide (see Figure 5):
 - When the recloser is adjusted for a "B" timing curve, approximately 1/4 of the pump cylinder port should be covered by the piston shell.
 - When set for a "C" curve, approximately 1/2 of the ports should be covered.
 - When set for a "D" curve, approximately 3/8 of the ports should be covered.
2. Perform the Trip Point Adjustment before staking the pump piston.

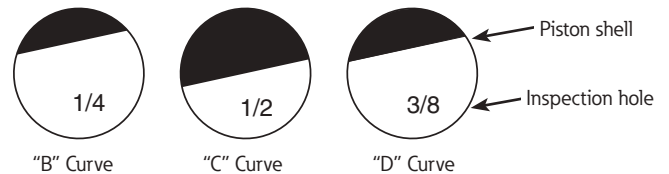
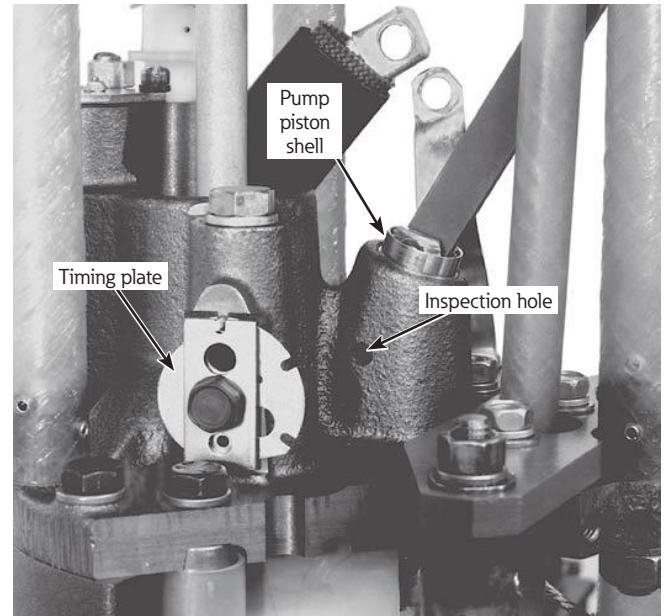


Figure 5. Pump piston shell adjustment

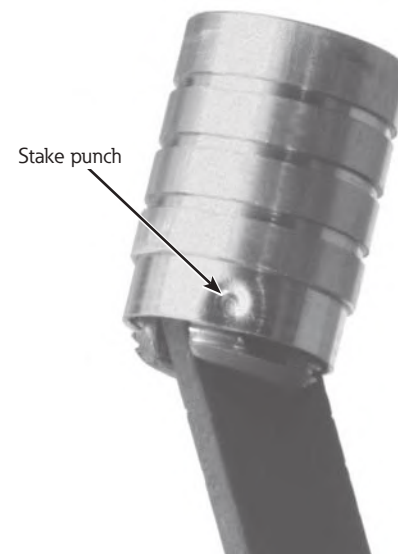


Figure 6. Pump piston shell

Trip linkage

After adjusting the pump piston for the correct number of fast operations, adjust the trip linkage so the recloser will operate the correct number of times to lockout.

Initial adjustment is performed by operating the solenoid out of oil.

Note: With the solenoid assembly removed from the tank, the recloser should be prevented from fast open to prevent damage to the mechanism.

1. Firmly rest your thumb in the groove under the eyelet of the yellow manual operating handle to prevent fast opening when the latch releases.

IMPORTANT

Do not apply too much upward pressure with your thumb. The yellow manual operating handle will raise up from its locked position when too much pressure is applied.

2. With your thumb in position as described in step 1, manually close the recloser.
3. Referring to Figure 7, grasp the trip piston assembly and lift it until the recloser trips; then observe the roll pin that secures the trip piston to the trip piston adjuster assembly. Note the location of the roll pin relative to the trip-adjuster stop (i.e., the spacer), as shown in Figure 7.

- **If the sequence is set for 0, 2, or 3 fast operations**, the recloser should trip to lockout when the roll pin is even with the bottom of the trip adjuster stop.
- **If the sequence is set for 1 fast operation**, the recloser should trip to lockout when the roll pin is about even with the top of the trip adjuster stop.

4. Make any necessary adjustments:

- **If the recloser trips too soon**, the roll pin is below the desired height; in that case, turn the self-locking nuts counterclockwise (downward, or off the recloser). (See Figure 7 and Figure 8.)
- **If the recloser trips too late**, the roll pin is above the desired height; in that case, turn the self-locking nuts clockwise (upward, or onto the recloser).

Note: Be sure to maintain free play between the trip linkage mechanism and the two self-locking nuts. Any time the assembly becomes too tight, loosen one nut one-half turn to maintain the proper amount of free play. If free play is in question, make sure the adjustment is correct, tighten the bottom nut against the trip linkage mechanism, and then back the nut off 1-1/2 turns.

5. Retank the recloser; then test the operation of the pump piston and trip point adjustment using a low voltage tester. (See "Testing" on page 6.)

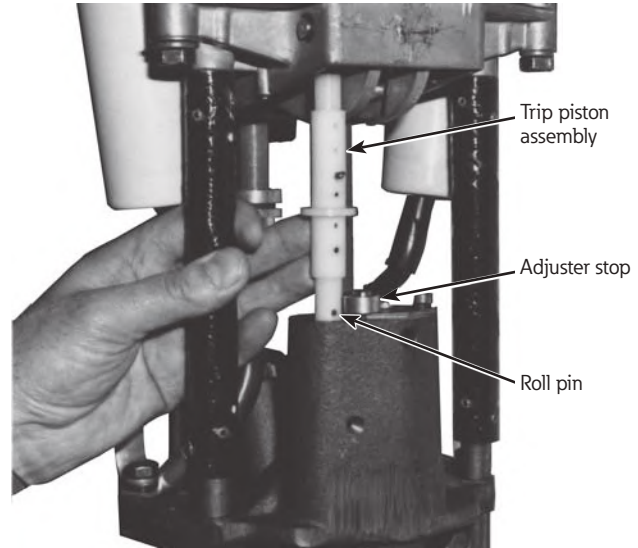


Figure 7. Trip linkage adjustment

Testing

Pump piston test

Adjustment of the pump piston shell must be done with a suitable tester. Refer to Reference Data R280-90-2, *Low Voltage A-C Testing of Hydraulic Reclosers*, for additional information. The tester should be adjusted to provide at least four times the minimum trip current of the recloser being tested.

Use the following procedure to test the piston shell adjustment:

Note: Test Type E reclosers above Serial No. 52000 to the same voltages as the Type L recloser identified in Reference Data R280-90-2.

1. Move the yellow manual operating handle to the CLOSED position and wait at least three minutes for the trip piston to fully reset.
2. Operate the tester (per manufacturer's directions) to apply the required current through the recloser. Note the sequence and number of operations.

Note: During fast operations, the recloser contact will open almost immediately after test current is applied. During delayed operations, a noticeable delay will be observed before the recloser operates. When lockout occurs, the yellow manual operation handle will drop down. The trip times recorded for all fast operations should be almost identical.

3. The number of fast and delayed operations should match the data plate specifications and the settings selected by the assembly of the service kit parts. If the sequence does not match, check to see if the recloser is correctly configured. If the configuration is correct, the problem may be either a mis-adjusted pump piston or an oil leak.

Note: If the recloser operates too many or too few times to lock out, you will have to adjust the trip linkage to achieve the correct number of operations to lock out. You might have to re-adjust the piston shell and trip linkage several times to obtain the proper sequence and time characteristics.

- a. Inspect the upper coil gasket and replace it if it looks damaged or worn. Repeat the test.
- b. Make any necessary adjustments:
 - **If the recloser is performing too many fast operations**, turn the piston shell counterclockwise slightly (off the pump piston), as shown in Figure 5. Repeat the test.
 - **If the recloser is performing too few fast operations**, turn the piston shell clockwise slightly (onto the pump piston), as shown in Figure 5. Repeat the test.
- c. Continue to test and adjust the pump piston shell until the proper number of fast trip operations are being performed.

Note: If the adjustment of the pump piston shell will not provide proper operation, the piston shell may be worn. Replace the shell and repeat the test and the adjustment procedure.

4. Stake the piston shell to prevent movement after the adjustment is correct (refer to Figure 6).
5. If the total number of operations is not correct, test the trip point adjustment.

Trip point test

After the pump piston has been adjusted to perform the correct number of fast operations, the trip linkage must be adjusted so the recloser will operate the correct number of times to lockout.

1. Move the yellow manual operating handle to the closed position and wait at least three minutes for the trip piston to fully reset.
2. Operate the tester (per manufacturer's directions) to apply the required current through the recloser, and note the number of operations to lockout.
3. The number of operations to lockout should match the data plate specifications and the settings selected by the assembly of the service kit parts. If the number of operations to lockout does not match the expected result, then:
 - a. Check to see if the recloser is configured properly; if not, make any necessary corrections and retest.
 - b. If the configuration is correct, adjust the trip linkage as appropriate (refer to Figure 8):
 - **If the recloser is performing too many operations before lockout**, turn the self-locking nuts off the trip linkage slightly (i.e., toward the head casting). Repeat the test.
 - **If the recloser is performing too few operations before lockout**, turn the self-locking nuts onto the trip linkage slightly (i.e., away from head casting and onto the pump piston). Repeat the test.
4. Perform the insulation level withstand test (page 8) and the contact operation test (page 8).
5. Return the recloser to operation after all the adjustments are correct.

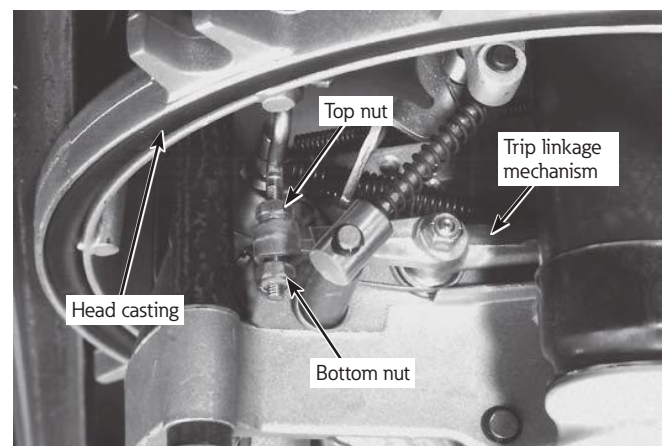


Figure 8. Trip point adjustment

KA715L1, KA715L2, and KA715L3 Types L, E, and 4E Sequence Selector Kit

Insulation level withstand tests

The high-potential withstand tests provide information on the dielectric condition of the recloser and the integrity of the vacuum interrupter.

Perform the high-potential withstand tests in a suitable test cage at 75% of the rated low-frequency withstand voltage (V4L 37.5 kV ac-rms, V4E 45 kV ac-rms).

Service Information MN280062EN or MN280051EN shows the dry, one-minute, 60-Hz withstand voltage rating for each recloser. **Test the recloser at the applicable voltage for 60 seconds in both the closed-contact and open-contact configurations.** (See "Closed-contact test" and "Open-contact test," below.)

CAUTION

Radiation. At voltages up to the specified test voltages, the radiation emitted by the vacuum interrupter is negligible. However, above these voltages, radiation injurious to personnel can be emitted. See Service Information MN280051EN, Vacuum Interrupter Withstand Test Voltage Ratings Information, for further information.

CAUTION

Equipment damage. Never operate a vacuum recloser with a DC test source. The vacuum interrupters will be severely damaged if a DC arc interruption is attempted.

Closed-contact test

1. Manually close the main contacts.
2. Ground the recloser tank and head.
3. Apply the test voltage to one bushing.

Open-contact test

1. Open the main contacts.
2. Ground the recloser tank, head and one bushing.
3. Apply the test voltage to the opposite bushing.
4. Reverse connections and apply the test voltage.

Failure indicators

The recloser has failed the test if any one of the following occurs:

- Breaker opens on high potential tester.
- External arcing is seen (from bushing terminal to head or terminal to terminal).
- A sharp "popping" noise is heard (indicating an internal failure).

Troubleshooting a failed test result

- If the recloser fails the closed-contact test, the cause may be a diminished electrical clearance, low oil dielectric strength, or failed insulation. Inspect the recloser to identify and correct the problem; then repeat the test.
- Failure in either open-contact test may be caused by a deterioration of the vacuum interrupter. Replace the interrupter assembly and repeat the test.

Contact operation test

The following test verifies that the recloser contacts/mechanism are operating properly.

With the recloser tanked:

1. Manually operate the recloser to lockout.
2. Slowly raise the operating handle to the closed position.
Note: Operate at a uniform rate which will allow the handle to swing through its complete arc in a period of approximately 5 to 15 seconds.
3. As soon as the contacts close, restrain the downward movement of the handle. Slowly allow the handle to return to the open position. This movement should take approximately 5 to 15 seconds and the contact should open.

Contacts should freely close and open while the mechanism is being slowly operated. If the contacts fail to freely open or close, inspect the recloser and repair or replace parts as required to achieve proper operation.

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