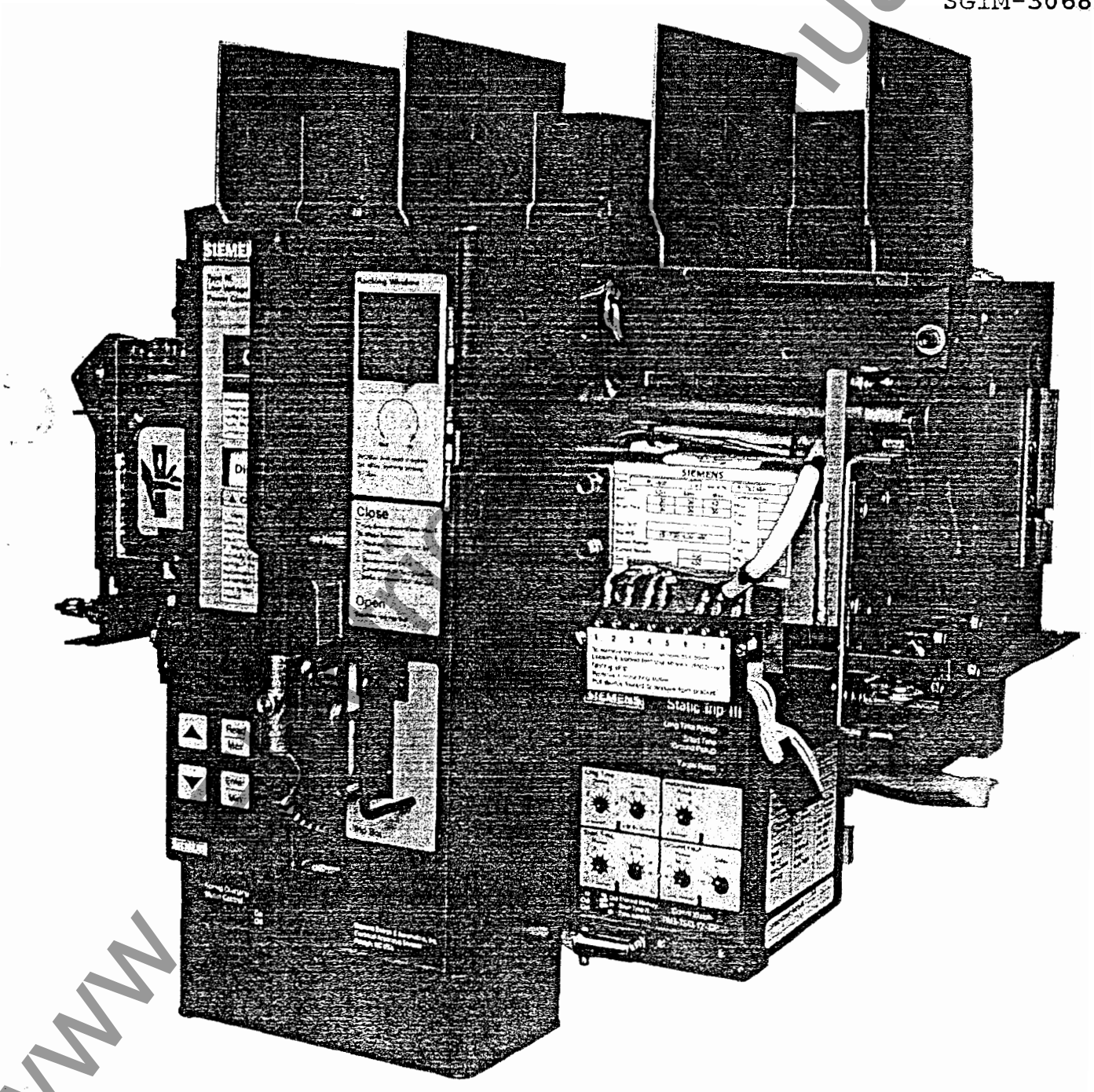
SIEMENS

Also RLE Breaker and parts

Type RL Low Voltage Circuit Breakers

Instructions
Installation
Operation
Maintenance

SGIM-3068E



⚠ DANGER

Hazardous voltages and high-speed moving parts.

Will cause death, serious personal injury or equipment or property damage.

Always de-energize and ground the equipment before maintenance. Read and understand this instruction manual before installing, operating, or maintaining the equipment. Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment, altering of the design, or tampering by unqualified personnel will result in dangerous conditions which will cause death or serious personal injury or equipment or property damage. Follow all safety instructions contained herein.

IMPORTANT

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Siemens reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

QUALIFIED PERSON

For the purpose of this manual and product labels a qualified person is one who is familiar with the installation, construction, operation, or maintenance of the equipment and the hazards involved. In addition, this person has the following qualifications:

(a) **is trained and authorized** to energize, de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.

(b) **is trained** in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

(c) **is trained** in rendering first aid.

GENERAL

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local sales office.

The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens Energy & Automation, Inc. The warranty contained in the contract between the parties is the sole warranty of Siemens Energy & Automation, Inc. Any statements contained herein do not create new warranties or modify the existing warranty.

Type RL Low Voltage Power Circuit Breakers

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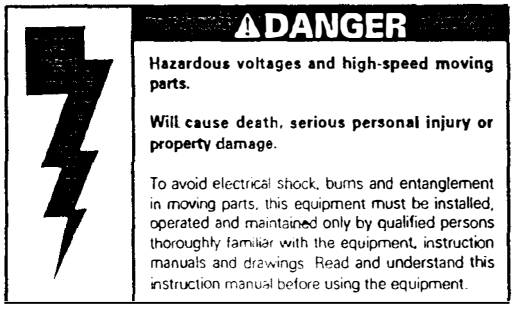
Introduction
The RL family of low voltage AC power circuit breakers is designed to meet all applicable ANSI, NEMA and IEEE standards. Successful application and operation of this equipment depends as much upon proper installation and maintenance by the user as it does upon careful design and manufacture by Siemens.

The purpose of this Instruction Manual is to assist the user in developing safe and efficient procedures for the installation, maintenance and use of the equipment.

Contact the nearest Siemens representative if any additional Information is desired.



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* Training in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses, face shields, flash clothing, etc.. in accordance with established safety procedures.

* Training in rendering first aid.

Signal Words
The signal words **"Danger", "Warning"** and **"Caution"** used in this manual indicate the degree of hazard that maybe encountered by the user. These words are defined as follows:

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.

Dangerous Procedures
In addition to other procedures described in this manual as dangerous, user personnel must adhere to the following:

1. **Always work on de-energized equipment. Always de-energize a breaker, and remove it from the switchgear before performing any tests, maintenance or repair.**

2. **Always discharge energy from closing and opening (tripping) springs before performing maintenance on circuit breakers.**

3. **Always let an interlock device or safety mechanism perform its function without forcing or defeating the device.**

Field Service Operation
Siemens can provide competent, well-trained Field Service Representatives to provide technical guidance and advisory assistance for the installation, overhaul, repair and maintenance of Siemens equipment, processes and systems. Contact regional service centers, sales offices or the factory for details, or telephone Siemens Field Service at 1-800-241-4453.

Installation

Introduction

Type RL Low Voltage AC Power Circuit Breakers may be furnished for mounting in any one of three ways:

1. In switchboards or in metal enclosed switchgear of the Drawout type.
2. In individual metal enclosures (Drawout type).
3. For stationary mounting in the user's own enclosure or switchboard.

All RL circuit breakers are completely assembled, tested, and calibrated at the factory in a vertical position and must be so installed to operate properly. The user's primary connections must be adequately braced against the effects of short circuit currents to prevent overstressing the circuit breaker terminals.

Receiving and Inspection for Damage

IMPORTANT: Do not accept the statement from any driver that. The damaged equipment was not properly packaged by shipper.

Do not sign Bill of Lading without notation of visible damage if observed. Our equipment packaging meets the rigid requirements established by the trucking industry. You must obtain carrier inspection within 15 days of receipt on damaged equipment.

Immediately upon receipt of this equipment, carefully remove all packing braces. Examine parts and check them against the packing list and note any damage incurred in transit. If damage is disclosed, the consignee must arrange for a carrier inspection within 15 days of receipt of equipment. If equipment is shipped F.O.B. Destination, the consignee must obtain the original of the carrier inspection report and notify Siemens immediately.

Two shipping methods are used with RL circuit breakers:

1. Individually skidded with protective covering.
2. Within a cubicle

Note all caution tags, remove any blocking, and open circuit breaker contacts before installation.

Storage

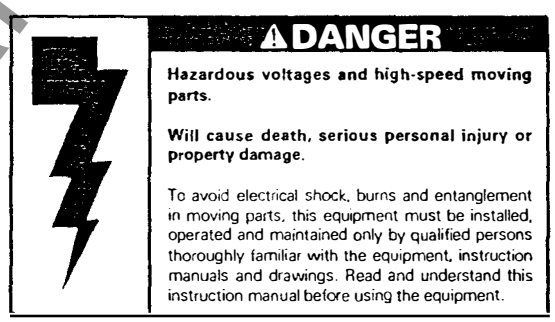
Whenever possible, install circuit breakers in their assigned switchgear compartments for storage. Follow instructions contained in the instruction manual for types R and SB Low Voltage Metal-Enclosed Switchgear, SG-3088. When the circuit breaker is stored separately, place the circuit breaker on a sturdy pallet. Secure the circuit breaker to the pallet, and cover with polyethylene film at least 10 mils thick. Also observe the following:

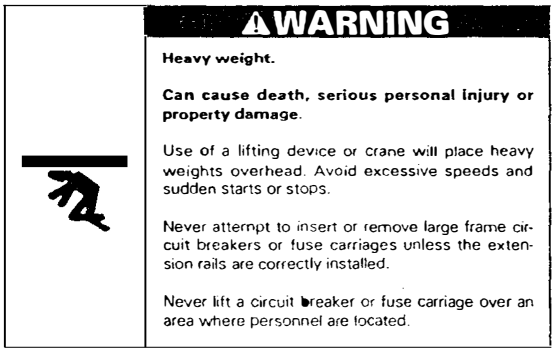
1. **Indoor Storage** - Whenever possible, store the circuit breaker indoors. The storage environment must be clean, dry and free of such conditions as construction dust, corrosive atmosphere, mechanical abuse and rapid temperature variations.
2. **Outdoor Storage** - OUTDOORS STORAGE IS NOT RECOMMENDED. When no other option is available, the circuit breaker must be completely covered and protected from rain, snow, dirt and all other contaminants.
3. **Space Heating** - Space heating must be used for *both indoor and outdoor* storage to prevent condensation and corrosion. Space heaters of approximately 100 watts per breaker are recommended. If the circuit breakers are stored inside their assigned switchgear compartments, and the switchgear is equipped with space heaters, the switchgear space heaters should be energized

General

The RL Low Voltage AC Power Circuit Breaker is completely adjusted, tested and inspected before shipment. However, a careful check should be made to be certain that shipment or storage has not resulted in damage or change of adjustment. Circuit breakers and their enclosures should be installed in a clean, dry, well-ventilated area in which the atmosphere is free from destructive acid or alkali fumes. For stationary breakers and custom enclosures, the factory should be consulted for minimum clearances and required ventilation openings.

Before installing, make certain that the circuit breaker contacts are in the open position and that the closing springs are discharged. Be sure to lubricate primary and secondary disconnect fingers with Siemens electrical contact lubricant, part no. 15-171-370-002, or Mobilgrease 28, part no. 15-172-791-214.





IMPORTANT: Be certain that you check points 1a through 1f below before placing circuit breaker in compartment.

Installation (and Removal) Sequence

I. Determine the correct switchgear compartment for each circuit breaker by checking the One-Line Diagram and Schematic Diagram furnished with the drawings. These drawings show the following for each circuit breaker compartment:
   a. Circuit breaker Type (RL-800, RL-1600 etc.)
   b. Trip "XFMR" or "SENSOR" rating
   c. Static Trip Type (RMS-TS-TZ, RMS-TIG-TZ etc.)
   d. Type of operator (Manual Operator-MO or Electrical Operator-EO)
   e. Circuit Breaker wiring information.
   f. Special accessories (Undervoltage Trip, etc.)

2. On fused breakers, make sure trigger fuse linkage is reset. Breaker will remain trip free as long as this linkage is tripped. Refer to 'Open Fuse Trip Device' on **Page 20.**

3. If the circuit breaker was shipped separate from the cubicle, remove any blocking, trip the circuit breaker and move the racking mechanism to the DISCONNECTED position.

4. To prepare circuit breaker for insertion into the cubicle, follow steps A-D of **Figure 1** on **Page 5.**

5. Hold the trip bar in, open the racking window, push breaker to the DISCONNECT position. Then close the racking window. The position interlock prevents movement of the breaker in the cell, unless trip bar is depressed.

6. While holding the trip bar in, open the racking window and insert the racking crank.

7. Use crank to rack breaker into the TEST position of the cell.

8. Check door iris for free movement while closing door,

9. **To remove circuit breaker, reverse the above procedures.**

10. After the circuit breaker is placed in the compartment, rack it to the TEST position.

11. Open the compartment door. Close and trip the circuit breaker. Refer to 'Operation', **Pages 6-10** for manually and electrically operated breakers.

During the closing operation, observe that the contacts move freely without interference or rubbing between movable arcing contacts and parts of the arc chutes. Refer to 'Operation', **Pages 6-10** for a detailed description of the circuit breaker operating characteristics before placing the circuit breaker in service. Make sure power circuits are not energized, before testing.

12. Trip units and accessory devices should receive a thorough check before placing the circuit breaker in service. This check makes certain that adjustments are proper and parts are not damaged. Refer to 'Static Trip III Information and Instruction Guide', SG-3118.

13. Drawout circuit breakers are equipped with an interlock to prevent movement of a closed circuit breaker into or out of the CONNECT position. Circuit breaker interlock operation should be checked before it is energized. See 'Drawout Interlock', **Page 9,** and 'Spring Discharge Interlock', **Page 10,** for a description of these interlocks.

14. After completing the installation inspection, check the control wiring (if any) and test the insulation.

15. Close the compartment door. Rack the circuit breaker into the CONNECTED position. Refer to 'Racking Mechanism', **Page 9.** Remove the racking crank and close the racking window.

16. The circuit breaker can now be closed to energize the circuit.

⚠ DANGER

Hazardous voltages and high-speed moving parts.

Will cause death, serious personal injury, and property damage.

Always de-energize and ground the equipment before maintenance.

Read instruction manuals, observe safety instructions, and limit use to qualified personnel.

⚠ WARNING

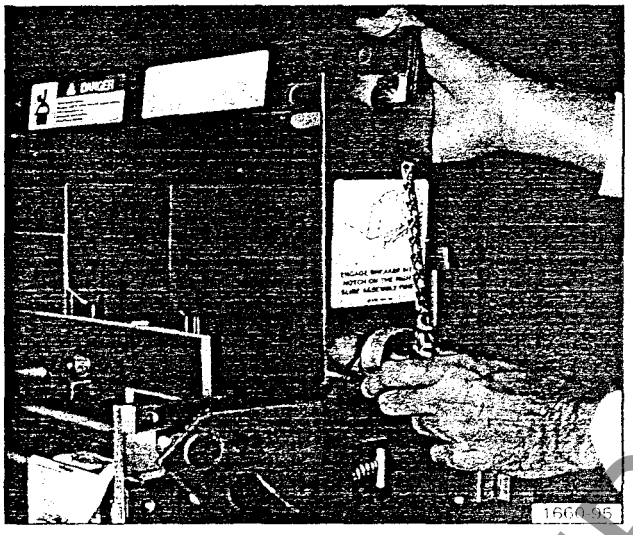
Heavy weight.

Can cause **death, serious** personal injury or **property damage.**

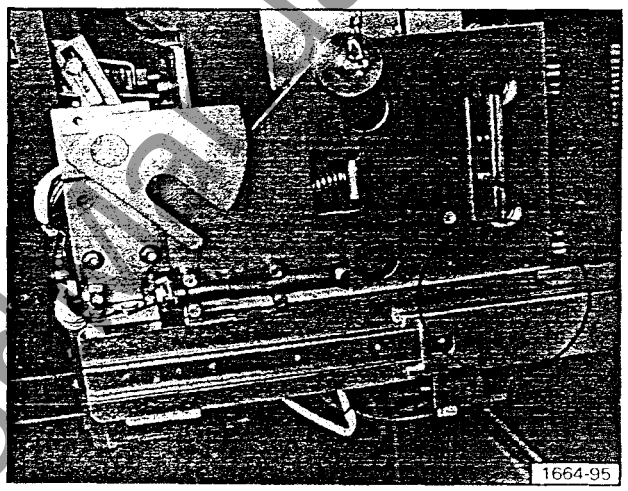
Use of a lifting device or crane will place heavy weights overhead. Avoid excessive speeds and sudden starts or stops.

Never attempt to insert or remove large frame circuit breakers or fuse carriages unless the extension rails are correctly installed.

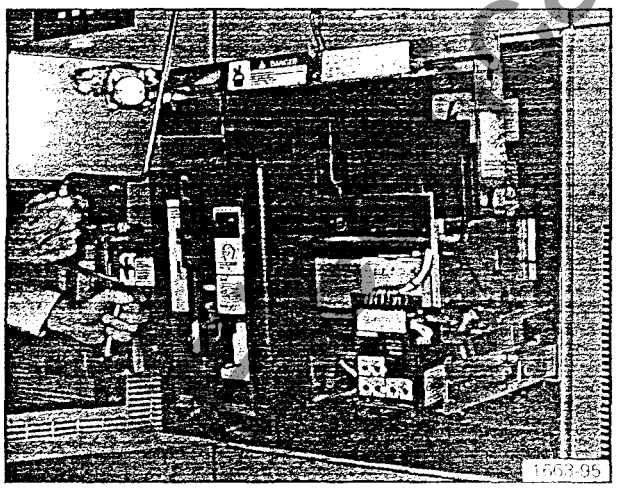
Never lift a circuit breaker or fuse carriage over an area where personnel are located.



A) Attach lifting bar assembly to circuit breaker as shown above. Fasten locking screws through circuit breaker side plates and lifting plates.



C) Lower breaker onto rails. Important! The rear of the breaker must be tilted downward so that the breaker engages the notch at the rear of the right hand rail (shown in circle).



B) Attach crane hook and insert crank into hoist mechanism eye Raise breaker above compartment, and fully extend rails

D) Continue lowering until circuit breaker rests securely on the rails. Remove the lifting yoke The circuit breaker is now ready for inserting into the cell.

Figure 1. Use of Lifting Bar Assembly to Handle Circuit Breakers or Fuse Carriages.

Operation

Description

The continuous current and interrupting ratings of the circuit breakers are as shown on the circuit breaker rating label.

The circuit breakers are also available with integrally mounted current limiting fuses through 2000A frame size, and with separately mounted fuses for 3200A, 4000A and 5000A frame size. For 800A, 1600A and 2000A frame sizes the basic circuit breakers are the same with or without fuses. The fuses mount on a bracket that is bolted to the side plates and upper studs on the back of the circuit breaker. Due to this difference, fused circuit breakers are not interchangeable with unfused circuit breakers. The current limiting fuses increase the interruption rating to that of the fuses. Fused circuit breakers are identified as RLF-800, RLF-1600, RLF-2000, RLF-3200, RLF-4000 or RLF-5000. Fused circuit breakers are equipped with an open fuse trip device to open the circuit breaker if one or more current limiting fuses open.

Note: Fused circuit breakers. Are not physically interchangeable with unfused breakers.

Unfused circuit breakers can also be supplied for stationary mounting in which the racking components are omitted and brackets are provided for mounting to a stationary frame

All RL circuit breakers use the same basic closing mechanism or Operator. The closing springs used vary between sizes. Two configurations of the operator are available for charging the closing springs, manually charged or electrically charged. For electrical operators, a maintenance handle accessory can be used to charge the springs manually for maintenance or in an emergency. Optionally, a built-in manual spring charging handle can be provided.

The manual and electrical operators are identical except for the means of supplying energy to the closing springs. A double-toggle, trip-free mechanism is used. This means that the breaker contacts are free to open at any time if required, regardless of the position of the mechanism

Precautions to be observed in Operation

1. Read this Instruction Manual before installing or making any changes or adjustments on the circuit breaker.

2. Stored-energy closing springs may be charged when the circuit breaker contacts are either open or closed. **EXTREME CARE SHOULD BE TAKEN TO DISCHARGE THE SPRINGS BEFORE WORKING ON THE CIRCUIT BREAKER.**

3. When closing a breaker out of the compartment, the racking mechanism must be returned to the TEST position before the closing springs can be charged.

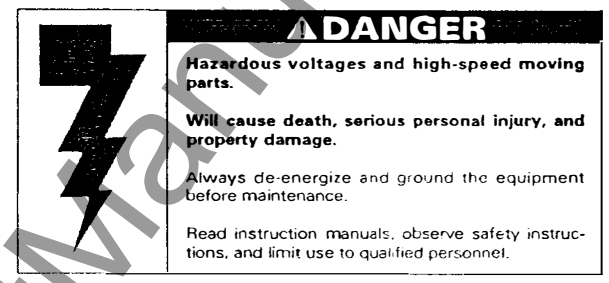
4. When charging manually operated breakers, always hold the handle firmly until it is returned to the normal vertical position. A ratchet insures that the spring charging operation must be completed once started.

5. Check current ratings, circuit breaker wiring information, circuit breaker type and trip device type, against the One-Line Diagram to assure that circuit breakers are located in the proper compartments within the Switchgear.

6. Check the alignment of the Secondary Disconnect fingers. This ensures against misalignment due to possible distortion of fingers during shipment and handling

7. Close the compartment door and secure door latch or latches prior to racking the circuit breaker to or from the CONNECTED position. Also close and latch the door prior to closing the circuit breaker when in the CONNECTED position. Once the circuit breaker is closed, keep the door closed.

8. **ONCE THE CIRCUIT BREAKER OR FUSE CARRIAGE IS ENERGIZED, DO NOT OPEN THE COMPARTMENT DOORS. PERFORM ANY REQUIRED OPERATIONS WITH EXTERNAL CONTROLS, WITH THE DOORS CLOSED AND SECURELY LATCHED.**



Manually Operated Circuit Breakers

The breaker has a center-mounted frame, so many of the latches and links are arranged in pairs. For descriptive purposes, they will be referred to as single items. Refer to **Figure 2** and **Table 1**. Detail "A" shows the position of the trip latch and toggle linkage when the circuit breaker is open and the closing springs are discharged.

Table 1. Operating Procedure for Manually Operated Circuit Breakers

Operation	Procedure
Charging Springs	Pull charging handle down all the way (approximately 120°) and return it to normal vertical position. (Engagement of pawl with ratchet teeth prevents handle reversal until the downward stroke is completed.)
Closing	Push down firmly on spring-release latch hood (50) after handle is returned to normal vertical position.
Tripping	Push in manual trip rod (94) OR If shunt trip is provided, operate external Control switch (CS/T) to trip or open Breaker. (See **Figure 3.**)

Movement of the charging handle downward rotates closing ratchet (140) lifting roller (43), thus pivoting closing cam (34) clockwise about pin (40). This extends the closing springs through link (41) and spring hanger (58). Rotation of cam (34) allows roller (27) in toggle linkage to be moved into position shown in **Detail B**. Kickoff spring (10) moves rollers (27) away from the stop block (7). Then, the toggle linkage is moved by a torsion spring until latch (15) clears trip flap (12). Spring (13) causes trip flap (12) to reset under latch (15). Trip flap (12) should normally stop against the front surface of latch (15).

When the closing springs are fully charged, roller (43) engages latch (47). Closing ratchet (140) engages a pawl in such a manner that the charging cam must complete the charging stroke before it can return to its normal position.

With the charging handle in its normal upright position, the circuit breaker can be closed. By pressing firmly on hood (50), latch (47) will disengage roller (43). Then, closing springs cause closing cam (34) to rotate against the toggle link rollers (27), moving the toggle into its upright position, as shown in **detail C**. The closing cycle can be interrupted at any point by operation of one of the tripping means. This will cause rotation of trip flap (12) to a position that releases latch (15), allowing toggle linkage to collapse to the position shown in **detail A**.

To manually open the circuit breaker, press in manual trip rod (94). This bar engages the top of trip flap (12), to disengage the latch (15).

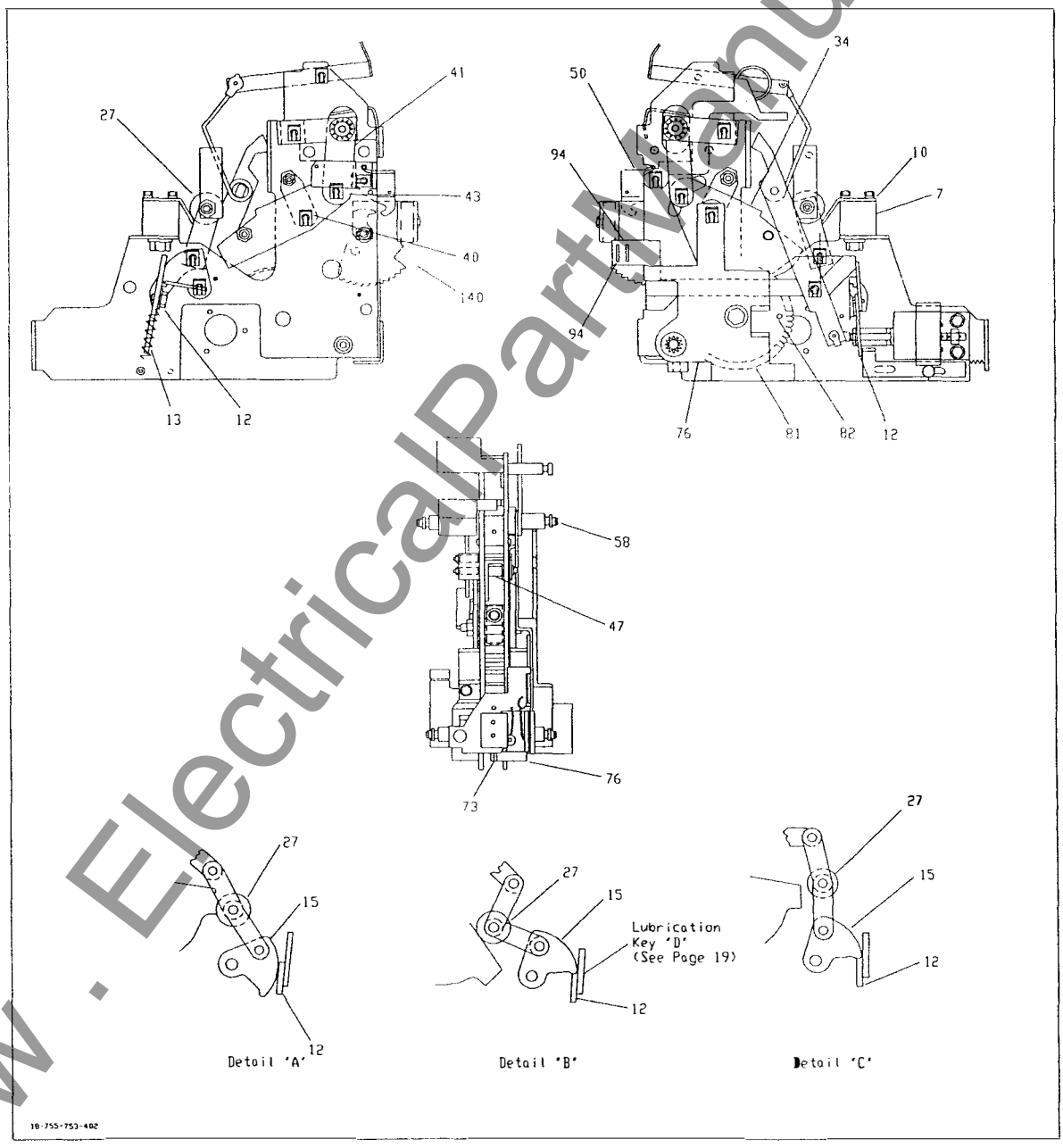


FIGURE 2. Circuit Breaker Operator.

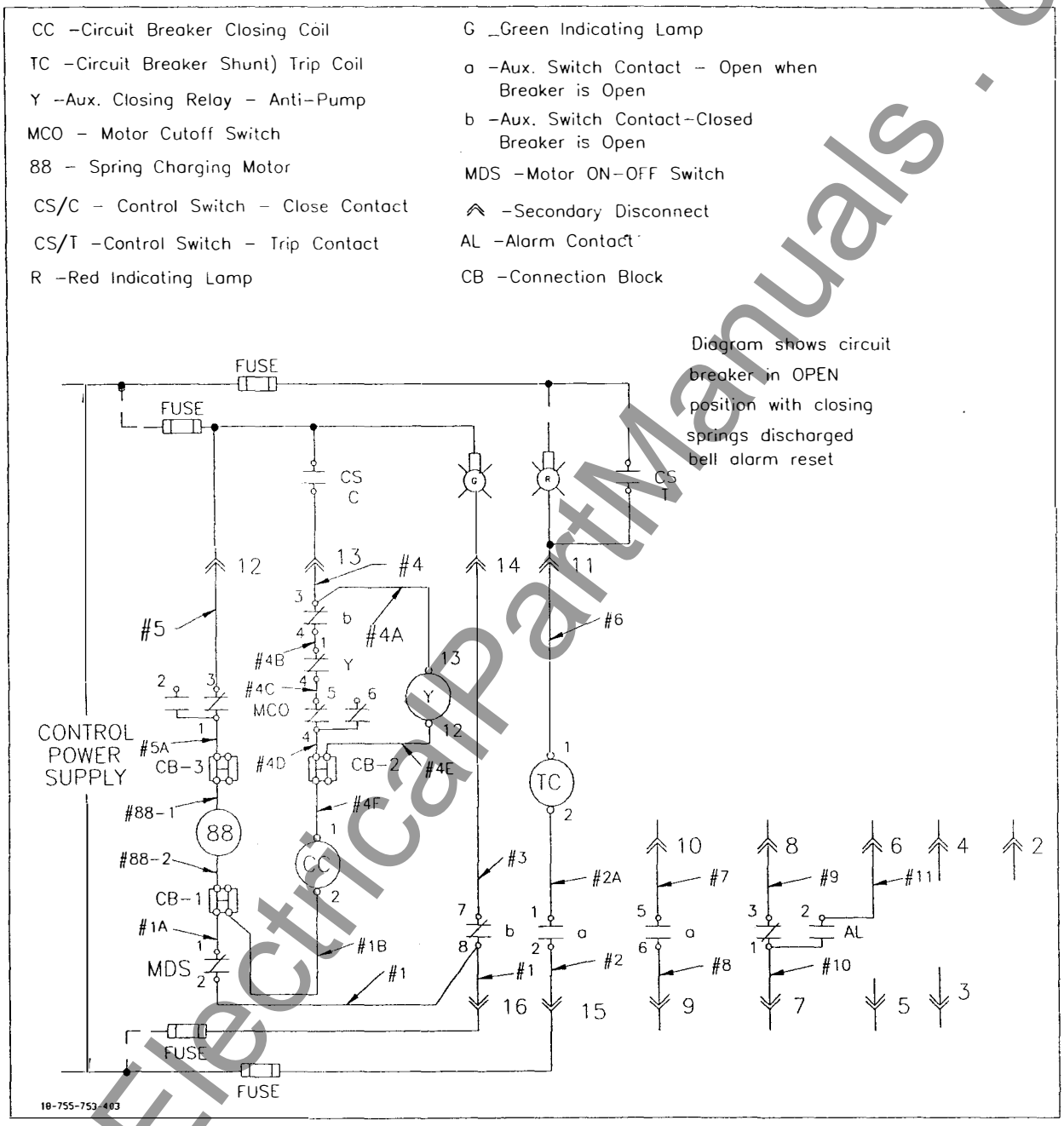


FIGURE 3. Typical Schematic of Electrically Operated Circuit Breakers.

Page issue 01

Electrically Operated Circuit Breakers

The mechanism of the electrically operated circuit breaker is the same as the manually operated circuit breaker, except that the manual-charging handle is replaced by a motor and gear system. Refer to **Figure 2 and Table 2.** Power available to the control circuit will start the automatic charging cycle. The motor gear-box pinion rotates gear (81) counterclockwise. Cam follower (82) engages an arm of wind and close cam (34), which rotates the cams in the same manner as for the manually charged circuit breaker. When the wind and close cam (34) reaches its charged position, the back of the cam engages switch lever (73), rotating the lever away from the switch operator. Gear switch lever (76) will still be holding the switch in the operate position and the motor will continue to run until the roll pins on the side of gear (81) lift lever (76) clear. This releases the motor cutoff switch (MCO). When the MCO switch opens, the motor stops, and the closing coil circuit is set up through one side of the MCO switch.

The circuit breaker can now be closed by depressing the latch hood (50) or by energizing the closing coil (CC) through the external close control switch (CS/C). When the close circuit is energized, the anti-pump (Y) relay is energized and opens the Y
relay contact in the closing circuit. This prevents "pumping" or repeated attempts to close the circuit breaker if a tripping signal or fault is present. This would happen if the closing switch (CS/C) is bypassed by a short circuit, or if it is defective.

A combination manually and electrically operated circuit breaker is also available. This includes both the motor-gear charging system as well as the manual charge handle.

Note: Manual charging handle must be in vertical position during electrical charging. Failure to follow this instruction will cause the mechanism to jam, damaging the motor and the mechanism.

Table 2. Operating Procedure for Electrically Operated Circuit Breakers

Operation	Procedure
Charging Springs	Energize control circuit.
Closing	After the springs are charged, Actuate the external close control switch (CS/C), OR Push down firmly on spring-release latch-hood (50) (After spring charging handle (if present) is returned to normal vertical position.)
Tripping	Actuate external Control Switch (CS/T) to Trip or Open Breaker, OR, Push in manual trip rod (94).

Drawout Interlock

A draw-out circuit breaker mechanism includes:

1. Means to rack the circuit breaker in or out of the compartment.

2. Interlock to prevent racking a closed circuit breaker into or out of any position.

3. Interlock to prevent closing a circuit breaker while it is racked to any position between the TEST and CONNECT position.

4. Interlock to prevent withdrawing a circuit breaker from the cubicle while the closing springs are charged.

Racking **Mechanism**

Refer to **Figure 4.** With the circuit breaker resting on the cubicle rails, the following sequence should be used to rack the circuit breaker into the cubicle.

1. Push trip bar in, open racking window and insert racking crank.

Note: Racking window cannot be opened unless manual trip bar is pressed in. While the trip bar is pressed in, the circuit breaker is TRIP FREE and cannot be closed.

2. Using the racking crank, rotate the racking screw (105) counterclockwise until the racking shaft is in the DISCONNECTED position. The racking clevis can now engage the racking pins in the cubicle. The circuit breaker should now be pushed along the rail into the DISCONNECTED position. Double check that the racking clevises engage the pins on both sides of the cubicle.

3. Clockwise rotation of the racking screw will rack the breaker into the TEST position. At the TEST position, the racking window can be closed, allowing the trip bar to reset and the circuit breaker can be operated. Further racking will place the circuit breaker between the TEST and CONNECTED positions. Between positions, the interlock bar will not engage the position holes of the cubicle. The breaker will be held TRIP FREE and cannot be closed.

4. In the CONNECTED position, the interlock bar will engage the cubicle hole, releasing the trip bar to reset and allowing circuit breaker to be closed. This prevents closing a circuit breaker that is not in the CONNECTED or TEST position.

5. To withdraw the breaker from the CONNECTED position, the procedure is the same only the racking screw is rotated in the counterclockwise direction. When racking the breaker out to the DISCONNECTED position, the closing springs will automatically discharge, at or before reaching the DISCONNECTED position.

IMPORTANT: To avoid damage to the racking mechanism, when in the CONNECTED position, do not forcefully rotate the racking crank clockwise.

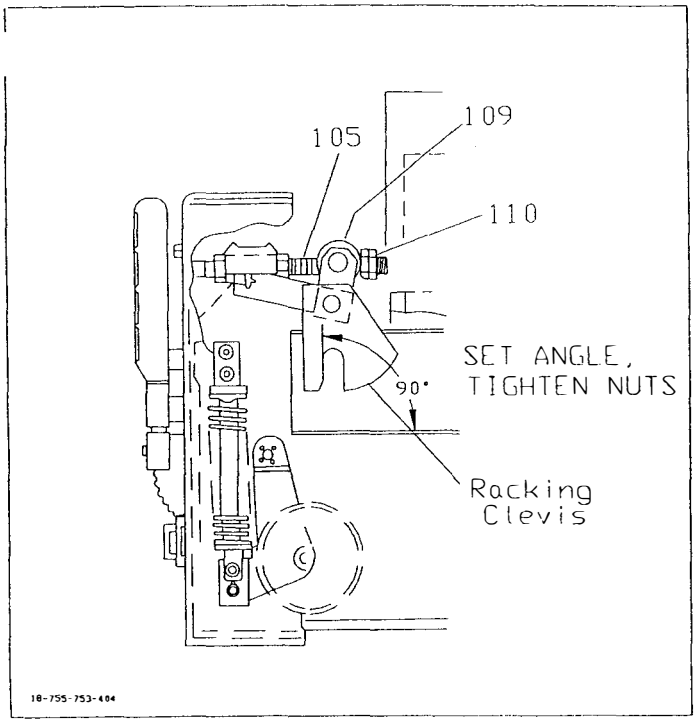


Figure 4. Detail of Typical Racking Mechanism. RL-800 to RL-2000.

Spring Discharge Interlock

When racking the circuit breaker out to the DISCONNECT position, the closing springs will automatically discharge, at or before reaching the DISCONNECT position. The barrel nut (109) engages the spring interlock. This, in turn, is connected to the manual close hood which releases the closing springs.

IMPORTANT: On manually charged breakers, the close hood is interlocked to the manual charge cam, and must be clear before racking the circuit breaker to the DISCONNECT position. This requires the manual charge handle to be in the vertical position during racking.

Note: The racking mechanism must be returned to the TEST position before charging the closing springs (either in the cubicle

⚠ WARNING

or when removed from the cubicle). Failure to comply with this requirement may damage the mechanism, manual charging will deform the closing hood. Electrical charging will result in unexpected breaker closure and/or continuous trip free operations.

The spring discharge interlock produces TRIP FREE operation in which all of the stored energy of the springs is dissipated in the mechanism. It is preferable to turn the motor power off in the TEST position, close and trip the circuit breaker manually in that position, and then rack out in the normal manner.

Maintenance

General

For the safety of maintenance personnel as well as others who might be exposed to hazards associated with maintenance activities, the safety related work practices of NFPA 70E, parts 11 and 111, should always be followed when working on electrical equipment. Maintenance personnel should be trained in the safety practices, procedures and requirements that pertain to their respective job assignments. This Instruction Manual should be reviewed and retained in a location readily accessible for reference during maintenance of this equipment.

The user must establish a periodic maintenance program to ensure trouble-free and safe operation. The frequency of inspection, periodic cleaning and preventive maintenance schedule will depend upon the operating conditions. NFPA Publication 70B, 'Electrical Equipment Maintenance' may be used as a guide to establish such a program. **A preventive maintenance program is not intended to cover reconditioning or major repair, but should be designed to reveal, if possible, the need for such actions in time to prevent malfunctions during operation.**

Service Conditions and Maintenance Intervals

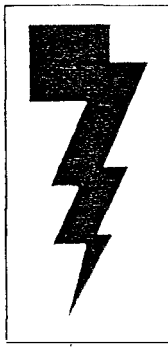
'Usual' and 'Unusual' service conditions for Low Voltage Metal-Enclosed Switchgear are defined in ANSI C37.20.1, clauses 3 and 7.1. Generally, 'usual service conditions' are defined as an environment in which the equipment is not exposed to excessive dust, acid fumes, damaging chemicals, salt air, rapid or frequent changes in temperature, vibration, high humidity, or extremes of temperature.

This definition is subject to a variety of interpretations. Because of this, you are best served by adjusting maintenance and lubrication intervals based on your experience with the actual service environment.

e frequency of required maintenance depends on the nature of the service conditions; the more severe the conditions, the more frequently that maintenance is needed. **Table 3** gives service and lubrication intervals for type RL (LM version circuit breakers applied under ANSI 'Usual Service Conditions'. This table indicates that RL circuit breakers (with 'LM' in the type designation on the rating label) have a five (5) year maintenance interval.

Regardless of the length of the maintenance (lubrication) interval, the tripping system should be checked and exercised periodically. The circuit breaker should be inspected and exercised periodically.

Always inspect a circuit breaker that has interrupted a heavy fault current.



⚠ DANGER

Hazardous voltages and high-speed moving parts.

Will cause death, serious personal injury, and property damage.

Always de-energize and ground the equipment before maintenance.

Read instruction manuals, observe safety instructions, and limit use to qualified personnel.

⚠ WARNING

Failure to properly maintain the equipment can result in death, serious injury or product failure, and can prevent successful functioning of connected apparatus.

The instructions contained herein should be carefully reviewed, understood, and followed.

The following maintenance procedures must be performed regularly:

- Recommended annual RL circuit breaker inspection procedure
- Recommended RL breaker maintenance and lubrication procedure.

The above list does not represent an exhaustive survey of maintenance steps necessary to ensure safe operation of the equipment. Particular applications may require further procedures. Should further information be desired or should particular problems arise which are not covered sufficiently for the user's purposes, the matter should be referred to the local Siemens sales office.

The use of unauthorized parts in the repair of the equipment, or tampering by unqualified personnel will result in dangerous conditions which can cause death, serious injury or equipment damage. Follow safety instructions contained herein.

Lubrication

Lubrication should be a part of the servicing procedure. Old grease should be removed from bearing pins and other non-current carrying rotating or sliding surfaces. A thin film of lubricant should be applied in accordance with the 'Lubrication Chart', **Table 5, Page 16.**

Apply lubricants with care to avoid getting grease on insulating members, since it may affect the dielectric strength. Faces of arcing contacts and faces of main contacts should not be lubricated. The rubbing surfaces (i.e., those surfaces without brazed on contact tips) of the main contact fingers, arcing contact fingers, and hinge contact fingers should be lubricated with a coating of Siemens lubricant, part no. **15-172-791-214.** Or 15-171-370-002 . user to determine choice based on existing lubricant in the Cubicle or Adapter. If dust or dirt has accumulated, disassembly may be necessary to clean and re-lubricate these points. See 'Contact Replacement', **Page 17** and 'Lubrication Chart', **Table 5, Page 16.**

Recommended Periodic RL (LM Version) Circuit Breaker Inspection Procedure A suggested procedure to follow during Periodic Inspections:

1 . **De-energize the primary and control circuits.**

2. With the cubicle door closed, rack the circuit breaker to the DISCONNECT position.

3. Open the cubicle door, and remove the circuit breaker from the cubicle.

4. Rotate the racking screw to the TEST position (approximately 3 turns) to clear the spring discharge interlock, before attempting to charge closing springs. Exercise the circuit breaker through several close-open cycles. For electrically operated circuit breakers, operate the circuit breaker electrically. (Refer to the specific wiring information for your circuit breaker to determine where control voltage signals should be applied. Usually, spring charging power is connected between secondary disconnects SD12 and SD16, closing control power between SD13 and SD16, and tripping power between SD11 and SD16. Secondary disconnects are arranged with SD1 on top, and SD16 on the bottom). Examine the operation of the circuit breaker during these operations for any evidence of difficulty, erratic operation, etc.

5. Test the tripping system, using an appropriate test set, such as the Siemens Portable Static Trip Test Set, model PTS-4. Refer to 'Static Trip III Information and Instruction Guide', SG-3118, and 'Portable Test Set Instructions', SG3138, for information on testing. The test should include tripping of the circuit breaker by the trip device. This confirms the functionality of the system, including the trip device and the tripping components.

6. Clean any accumulation of dust or dirt from the circuit breaker. For insulated parts, use a clean lint-free cloth. A non-toxic cleaner, such as denatured or isopropyl alcohol may be used.

7. Turn the racking screw to the DISCONNECT position, and reinstall the circuit breaker in the cubicle.

Table 3. Inspection and Maintenance Intervals (see **Note 1)**

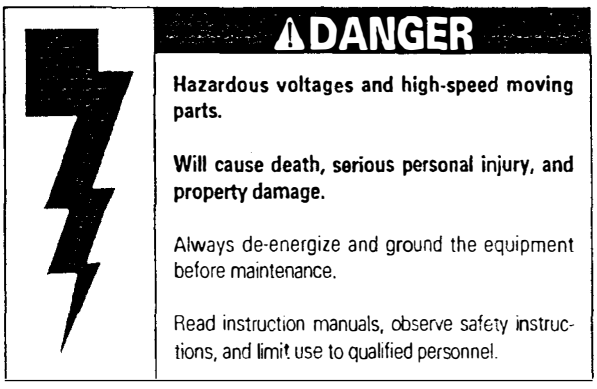
Frame Size	Inspection Interval All Type RL Breakers	Maintenance & Lubrication Interval	Overhaul Interval
	Check & Exercise Tripping System & Circuit Breaker Mechanism	RL breakers (with " L M " in type designation - see **Note 2**)	Type RL breakers (Number of Operations)
800A	12-18 Months	5 years	12500 operations
1600A	12-18 Months	5 years	4000 operations
2000A	12-18 Months	5 years	4000 operations
3200A	12-18 Months	5 years	1500 operations
4000A	12-18 Months	5 years	1500 operations
5000A	12-18 Months	5 years	1500 operations

Throughout this manual, references to RL-800 etc (unfused) also apply to RLF-800 (fused) versions.

Notes:

1 . Any circuit breaker which has interrupted a heavy fault current should be inspected according to the recommended procedure for maintenance and lubrication.

2. "LM" indicates Low Maintenance RL Breaker produced beginning June, 1991



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Recommended RL (LM Version) Breaker Maintenance and Lubrication Procedure

A suggested procedure to follow during maintenance and lubrication sessions:

1 . De-energize the primary and control circuits.

2. With the cubicle door closed, rack the circuit breaker to the DISCONNECT position.

3. Open the cubicle door, and remove the circuit breaker from the cubicle.

4. Rotate the racking screw to the TEST position (approximately 3 turns) to clear the spring discharge interlock. This is necessary before the closing springs can be charged, and also makes removal of the arc chutes easier.

5. Remove arc chutes and examine arc chutes and circuit breaker contacts for burned, cracked, or broken parts.

To remove arc chutes, proceed as follows:

a. Remove retaining nuts that hold the support bar. remove the support bar and phase barriers.

b. Lift arc chutes vertically to clear arc runners.

6. Inspect arc chutes, replace if arc plates are excessively burned.

7. Wipe the contacts with a clean lint-free cloth and a non-corrosive contact cleaner solvent, denatured or isopropyl alcohol.

8. Replace badly burned or pitted contacts. (See 'Contact Replacement', Page 17, and 'Lubrication Chart', Table 5). Do not lubricate faces of contacts.

9. Clean any accumulation of dust or dirt from the circuit breaker. For insulating parts, use a clean lint-free cloth. a non-toxic cleaner, such as denatured or isopropyl alcohol may be used.

10. Bearing pins and other sliding or rotating surfaces should be cleaned and then coated with a light film of grease. (See 'Lubrication Chart', Table 5. Page 16)

11. Perform a maintenance closing operation (see Page 14 and Table 4) to check latch and linkage movement. (Be sure to rotate the racking screw to the TEST position to clear the spring discharge interlock before attempting to charge closing springs).

12. Check circuit breaker adjustments. (See 'Adjustments', Page 14)

13. Exercise the circuit breaker through several close-open cycles. For electrically operated circuit breakers, operate the circuit breaker electrically. (Refer to the specific wiring information for your circuit breaker to determine where control voltage signals should be applied. Usually, spring charging power is connected between secondary disconnects SD12 and SD16, closing control power between SD13 and SD16, and tripping power between SD11 and SD16. Secondary disconnects are arranged with SD1 on top, and SD16 on the bottom). Examine the operation of the circuit breaker during these operations for any evidence of difficulty, erratic operation, etc.

14. Reinstall arc chutes. Close and open the circuit breaker to ensure that the arc chutes do not interfere with circuit breaker operation.

15. Test the tripping system, using an appropriate test set, primary current or secondary injection, such as the Siemens Portable Static Trip Set, model PTS4. Refer to 'Static Trip III Information and Instruction Guide', SG-3118, and 'Portable Test Set Instructions', SG3138, for information on testing. The test should include tripping of the circuit breaker by the trip device. This confirms the functionality of the system, including the trip device and the tripping components.

16. An optional megger test may be run on the main contact circuit (500-1000VDC, (100 Megohms Min)), to be sure that all connections are free of undesired grounds. A megger test also may be run on the control circuit including the spring charging motor (250-500VDC, (25 Megohms Min.)). both limits are at 20 degrees C.

17. A dielectric test, if possible, may be run on the main contact (power) circuit for one minute at the appropriate test voltage. (Voltage transformers, control power transformers, surge arresters, and surge capacitors must be disconnected during this test.)

Note: Do not perform dielectric tests on the Static Trip III tripping system. Refer to 'Static Trip III Information and Instruction Guide', SG-3118.

Rated voltage of circuit	Test voltage
480 or 600 volts	75% of 2200 = 1650 VAC
208 or 240 volts	75% of 1500 = 1125 VAC
Secondary & control circuits	75% of 1500 = 1125 VAC

Note: Certain control devices, such as motors and motor circuits, should be tested at 675 VAC. Electronic devices should be tested at the voltages specified in the instruction manual for the electronic device.

For routine testing it is considered to be acceptable to limit the test voltage to 675 VAC on all the attached control circuits when a motor is involved. To avoid having to disconnect the motor leads.

Dielectric tests are also recommended when new units are added to an existing installation, or after major field modifications. The equipment should be put in good condition prior to the field test. It is not to be expected that equipment shall be subjected to these tests after it has been stored for long periods of time or has accumulated a large amount of dust, moisture, or other contaminants without being first restored to good condition.

⚠CAUTION

Excessive test voltages may result in damage to equipment.

Do not perform dielectric tests at test voltages exceeding the ratings of the tested equipment.

18. Turn the racking screw to the DISCONNECT position, and reinstall the circuit breaker in the cubicle.

19. Log the details of the maintenance into a suitable record of circuit breaker maintenance for future use.

Table 4. Maintenance Closing

Operation	Procedure
Closing Contacts	1. Verify that racking mechanism is in TEST position. 2. Pull charging handle DOWN ALL THE WAY (approximately 120°). Do not allow charging handle to return toward the vertical position - keep the handle all the way down. 3. Maintain firm grip and heavy pressure on charging handle to counteract force of charged closing springs! Place blade of screwdriver between hood and spring release latch, and hold the latch in the DOWN position. 4. Slowly return charging handle to vertical position. Once charging handle starts to move, screwdriver may be removed. Observe contact touch, mechanical operation, etc.
Opening Contacts	Push in manual trip rod.

Figure 5. Maintenance Closing

⚠CAUTION

High-speed moving parts.

May cause personal injury.

When performing maintenance close operation, maintain a firm grip on the manual charging handle during the closing stroke to counteract the large force in the closing springs. If a firm grip (and heavy pressure) is not maintained, the circuit breaker may close suddenly, which will return the charging handle to the vertical position with considerable force.

IMPORTANT: The procedure in Table 4 should be used for maintenance closing only. The circuit breaker must be on a table with the arc chutes removed during any maintenance close operation. Maintain a firm grip on the manual charging handle during the closing stroke to counteract the large force in the closing springs. If a firm grip (and heavy pressure) is not maintained, the circuit breaker may close suddenly, which will return the charging handle to the vertical position with considerable force.

Note: Holding the spring release latch down prevents the stored-energy springs from propping in the charged position. Thus, when the handle is returned to the normal vertical position, the energy in the springs is released against the closing handle assembly. A firm grip must be maintained on the charging handle to counteract the energy stored in the charged closing springs. As the handle is slowly released to the normal vertical position, the main contacts are slowly moved to the closed position.

During inspection prior to installation, and for routine maintenance inspections, the circuit breaker contacts may be closed slowly to check clearances, contact adjustments, and movement of links and latches.

Electrically operated breakers normally do not have a manual charging handle, but it is available as a maintenance item. When the hole in the maintenance closing handle assembly is aligned with the holes in the operating mechanism frame, the pin which is attached to the cam is inserted. This pin holds the assembly in place and acts as a pivot point for the cam. After insertion of the maintenance closing handle assembly on the electrically operated breaker, the actual maintenance closing operation is the same for both the electrically operated and the manually operated circuit breaker. Refer to **Figure 5 and Table 4.**

Adjustments

On the small frame breakers two stop nuts are provided on the racking screw to set the connected position. Initially these are adjusted by setting the racking clevis angle to 90 degrees, as shown in **Figure 4,** and by tightening the nuts against the stop washer (109). The two nuts (110) are then locked against each other. When the circuit breaker is installed in a cubicle the actual connected position should be checked, using the interlock rod and its mating hole in the cubicle before attempting to operate the breaker.

The adjustment on the large frame breakers is made by shims mounted on the top of the racking block. Removing shims allows the racking mechanism to move the breaker farther into the cubicle.

Adjustments, continued

During maintenance inspections, the following items should be checked to ensure that the original settings are maintained:

Trip Latch Engagement

(Refer to Figure 2) Toggle latch (15) should engage the full width of trip latch (12) when the breaker is closed in normal manner. To adjust the tension on spring (13) can be increased by bending the spring tab on trip flap towards the front of the breaker. Too much tension will interfere with the capability of the tripping actuator to move the trip flap, so over-bending should be avoided.

Main Contact Make (See Figure 8)

Compression of the contact fingers (46) must be between .093" and .125" (2.4-3.2mm). This is the difference between:

1. The measurement from the breaker base to the bottom edge of the finger contact surface when the breaker is open, and

2. The measurement in the same place when the breaker is closed.

For convenience, a GO/NO-GO feeler gauge (part no. 18-658-143-214) can be used to measure the gap between the contact finger (46) and the extruded portion of the upper contact assembly (37). This measurement is made with the breaker closed. The outside contacts (46) on each pole must be checked and adjusted, such that the GO end of the gauge can be inserted into the gap all the way to the front surface of the contact finger's vertical portion. The NO-GO end should not be able to be fully inserted. **Figure 6** shows the GO/NO-GO gauge and the manner in which it is inserted between the contact fingers (46) and the upper contact assembly (37). **Figure 6a** shows use of the GO/NO-GO gauge on an RL circuit breaker.

Adjustment is provided by positioning screws (78) after loosening nuts (80). Counterclockwise rotation of screws (78) increases compression. Carefully tighten nuts (80) do not over-tighten, damage to the pushrods may result.

If it is desired to check contact pressure, a push-type spring scale can be used to compress contact fingers (46) with breaker open. Contact pressure should be between 20 and 30 pounds (9.1-13.6 kg) on each finger.

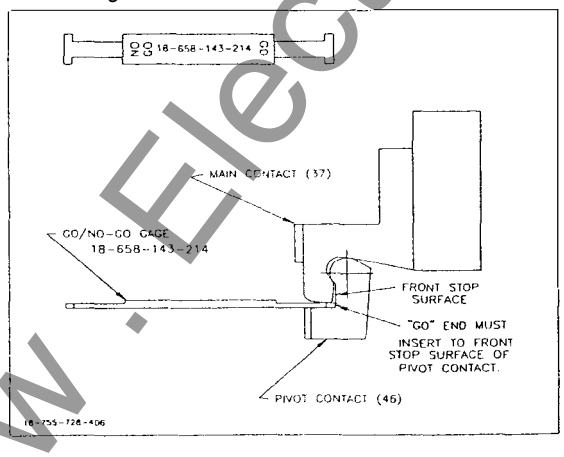

Figure 6. Use of the GO/NO-GO Gauge to Check Main Contact Make (Compression)

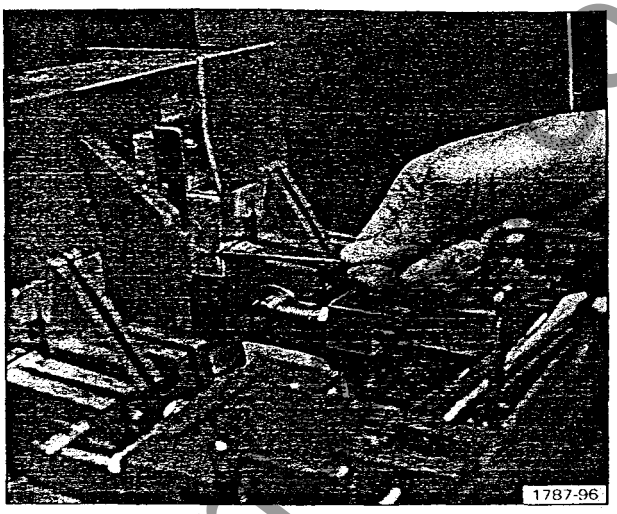

Figure 6a. Check of Main Contact Make (Compression) using GO/NO-GO Gauge

Position Indicator Adjustment (See Figure 7)

The Position Indicator is adjusted by rotating the racking shaft to the CONNECTED position. Then loosening the screw (2) enough to allow sliding the fiber cable (1) to increase or decrease the size of the loop. Adjust to align the top of the bobber with the C●NNECTED mark on the cover. Tighten the screw to retain the cable.

Note that the indicated positions are not independently adjustable, so exact alignment with TEST or DISCONNECT may not result. As an example, If the TEST position is considered to be more important the cable can be adjusted at that position, and the error showing in the CONNECTED and DISCONNECT positions.

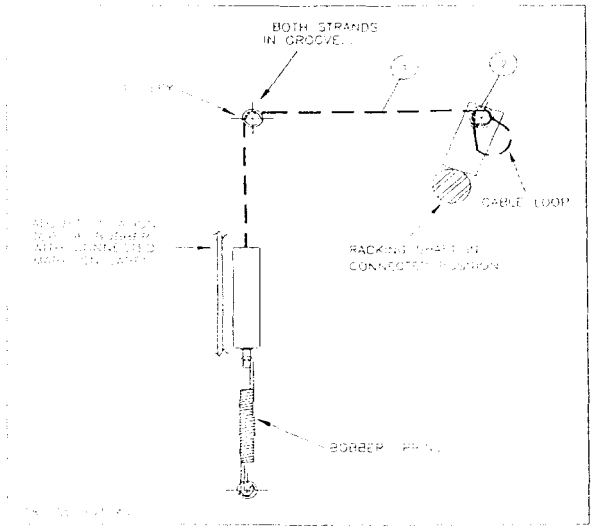

Figure 7. Position indicator

Lubrication

Table 5. Lubrication Chart

Lubrication Key	Parts Description	Maintenance & Lubrication	Overhaul
A	Contact bar hinge assembly Primary disconnect fingers, grounding contact Secondary disconnect fingers Rubbing surfaces of main and arcing contacts	Wipe clean and apply a film of Mobilgrease 28, Siemens lubricant (1) or: Siemens contact lubricant (2) in a thin layer (approximately 1/32" thick)	
B	Sliding surfaces	Light application of Mobilgrease 28 (1)	Wipe clean and apply Mobilgrease 28 (1)
C	Pivot pins, rotating parts such as drive pinion, gear, etc.	Light application of Mobilgrease 28 (1)	Remove pins, clean, and apply Mobilgrease 28 (1)
D	Ground surfaces such as latches, rollers, props, etc.	Light application of Mobilgrease 28 (1)	Wash clean and apply Mobilgrease 28 (1)
E	Faces of main and arcing contacts	Do not lubricate	Do not lubricate
F	Springs, wear and rubbing points	Wipe clean and apply Mobilgrease 28 (1)	Wipe clean and apply Mobilgrease 28 (1)
G	Dry pivot points	No lubrication required	Wipe clean and apply Mobilgrease 28 (1)

(1) Mobilgrease ® 28; Siemens: part number 15-172-791-214
(2) Siemens contact lubricant: part number 15-171-370-002
(3) Points where contact is made with stationary equipment, the user should chose lubricant to best match the existing conditions.
(4) for lubrication procedure and recommendations, refer to 'Recommended RL (version LM) Breaker Maintenance and Lubrication Procedure', on **Page 13.**

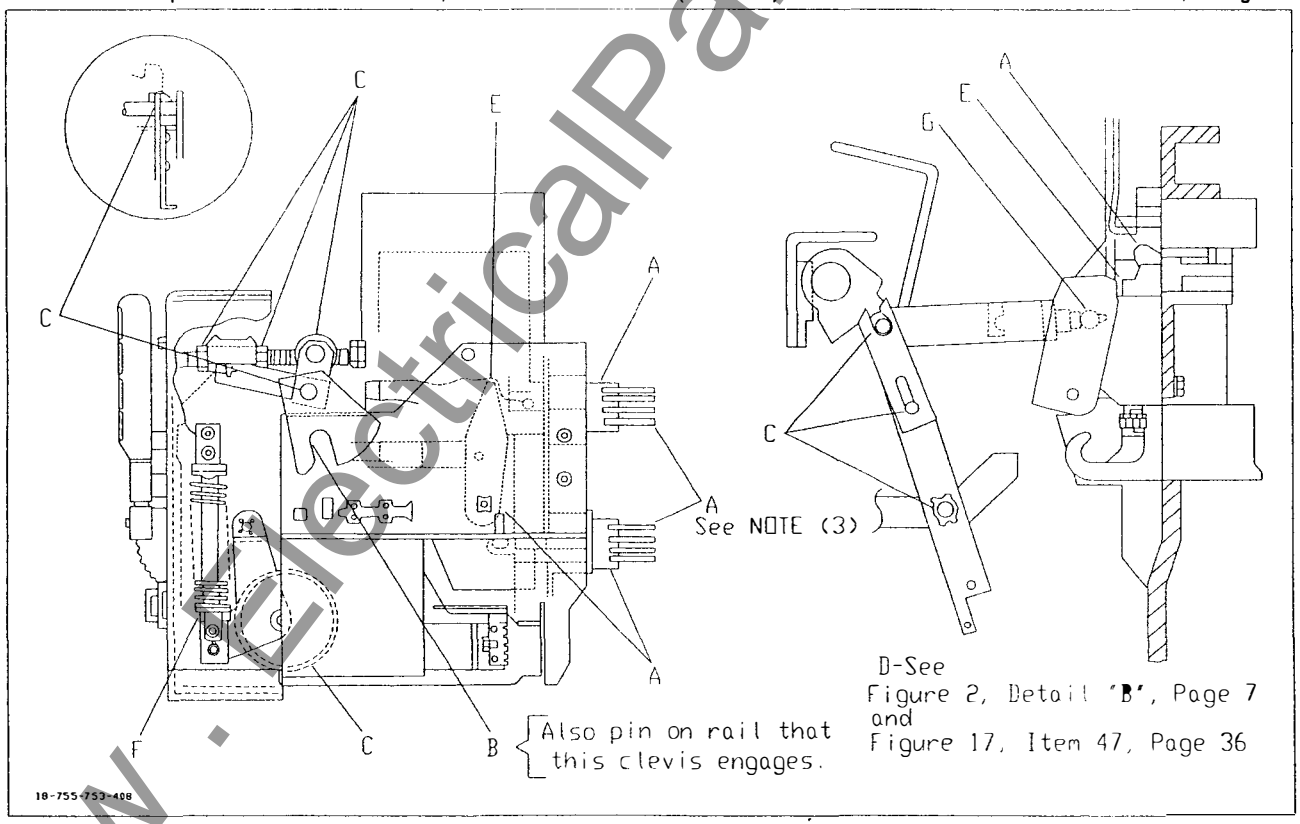

Figure 8. Lubrication Points on Circuit Breaker

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Contact Replacement (See Figure 9) The contact structure consists of main current carrying contacts and arcing contacts arranged so that initial contact make and final contact break is by means of the arcing contacts. The actual contact surfaces are clad with an alloy facing which greatly reduces mechanical wear and arc erosion,

When inspection of the alloy facing indicates that the contacts should be replaced, it should be noted that hinge contact fingers (53, 55), main contact fingers (46), and arcing contacts (61) are spring loaded. Therefore, care must be used in removal and installation of any of the contacts.

Main Contact Fingers (See **Figure 9)**

With the circuit breaker contacts open and the stored energy springs discharged, the main contact fingers (46) may be removed by loosening screws (44, 45) enough to relieve the compression on springs (47, 48). There are two springs behind each finger. It is important that they be positioned properly upon reinstallation. If difficulty is experienced in correctly positioning these springs, the upper and lower primary disconnects (168 **Figure 18),** may be removed from each phase and the circuit breaker tipped to rest on the ends of the Sideplates (2) and (3). After the contact fingers are replaced, connector (37) should be positioned in the center of the slot in the molded base to assure correct alignment of the primary disconnect fingers.

Stationary Arcing Contact (See **Figure 9)**

The stationary arcing contact is a part of a connector (37) and may be replaced by proceeding as above. In this case, screws (44, 45) must be removed. However, to provide clearance for removal of connector the backpanel (33) may have to be loosened by removing screws (58, 59 and 23, **Figure 17).** By removing pin (98 and 99 **Figure 18),** the entire assembly can be lifted out.

Hinge Contact Fingers (See **Figure 9)**

Hinge contact fingers (53, 55) may be removed as follows:

Remove backpanel. Remove lower connector (49) and moving contacts by removing screws (59). On all RL Breakers springs (54, 56) are unloaded by rotating the moving contacts toward a horizontal position relative to the stationary contact (49). Remove screws (70) to remove moving contacts. Slide fingers (53, 55) sideways to remove. Replace fingers by compressing spring (56, 54) in position and inserting the fingers from the side. Holding connector (49) in a vise, and using a tool such as 18-657-143-279 aids the operation.

Movable Arcing and Main Contact (See Figure 9)
Either movable arcing contact (61), or main contact (62), or both, may be removed and replaced as follows:

IMPORTANT: Extreme care should be taken to hold the assembly firmly to retain spring seat (83, 84) and spring (81, 82) upon removal of the screws (78).

Remove lower connectors and moving contacts as described in the preceding section. The complete movable contact assembly may now be brought to the bench. The location of spacers should be noted. Loosen nuts (80) and remove screws (78) from pin (71),

alternate several turns each side to prevent binding. (The reverse procedure is followed for reinstallation.)

The movable arcing contacts or main contacts may now be replaced. Compress spring (81, 82) to engage screws (78). Care should be taken to replace spacers correctly. Check alignment and adjustment of contacts upon reassembly.

Tripping Actuator Operation and Replacement

When the overcurrent trip device senses a circuit condition that requires the circuit breaker to open, it produces an output that is fed to the tripping actuator. This device then causes the circuit breaker contacts to open and isolate the circuit.

Mounted on the circuit breaker, the tripping actuator is held in a charged position by a permanent magnet. When the overcurrent trip device issues a trip signal, the coil of the tripping actuator is energized, which causes the magnetic flux to shift to a new path, releasing the stored energy of a spring located inside the tripping actuator. The spring provides the energy to trip the breaker, moving the trip-flap clear of the toggle latch.

If the spring-loaded armature does not reset during trip operation, spacer washers may be added to obtain positive reset of the armature. If adding spacers does not cause the armature to be reset, the tripping actuator should be replaced (if breaker mechanism is not at fault).

Note: Do not attempt to disassemble the tripping actuator as this may destroy the magnetic field set up by the permanent magnet and will render the actuator latch inoperative until magnetized

When replacing a tripping actuator, the coil leads must be connected to the terminal block of the trip device in the correct polarity relationship.

The black lead of the coil must be connected to terminal 6, the red lead of the coil connected to terminal 7, and the blue lead of the coil to terminal 8 of the static trip device.

Static Trip III Overcurrent Devices

When the Static Trip device or tripping actuator has been replaced, the circuit breaker should be tested to ensure proper operation of all components. Refer to 'Static Trip III Information and Instruction Guide', SG-3118, and 'Portable Test Set Instructions', SG-3138, for the information on testing the static tripping system on a circuit breaker.

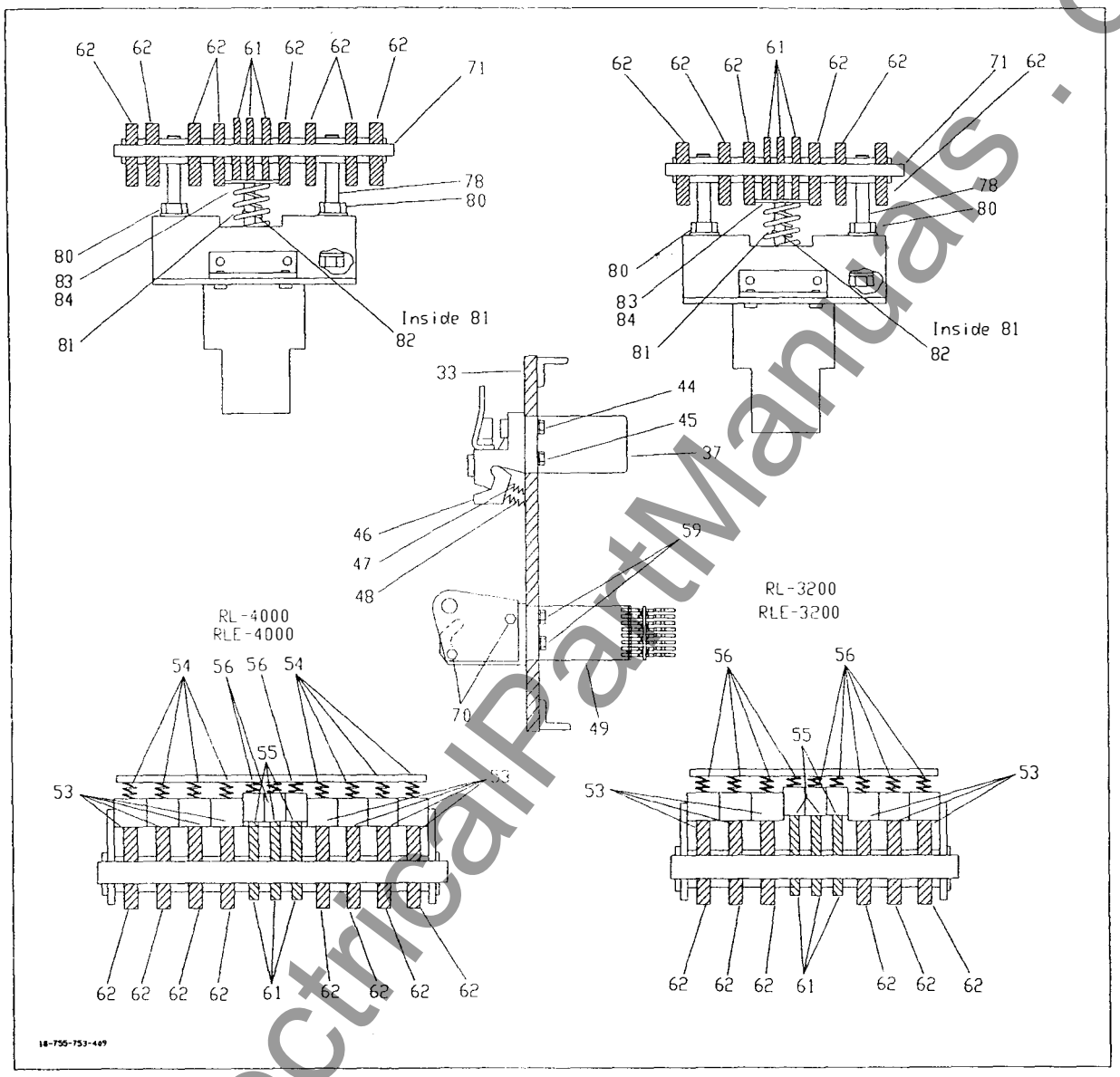

Figure 9. Typical Contact Assemblies

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.or Cutoff Switches (for Electrically Operated Circuit Breakers)

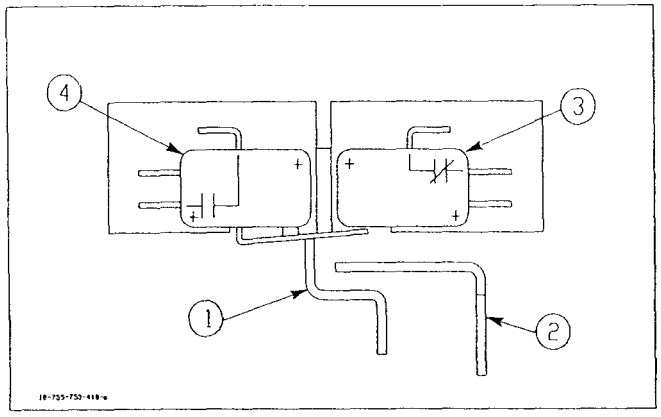


Figure 10a. Position 1. Springs discharged; motor in run position.

Position 1. Springs Discharged & Motor in Run Position.
(Note that **Figures 10a-10c are** depicted as viewed from below)

In **Figure 10a,** note that spring position lever (1) is forward, actuating both switches. Motor/gear position lever (2) is retracted. Motor cutoff switch (3) is closed. Application of power at this time will cause the motor to start, thereby charging the closing springs.

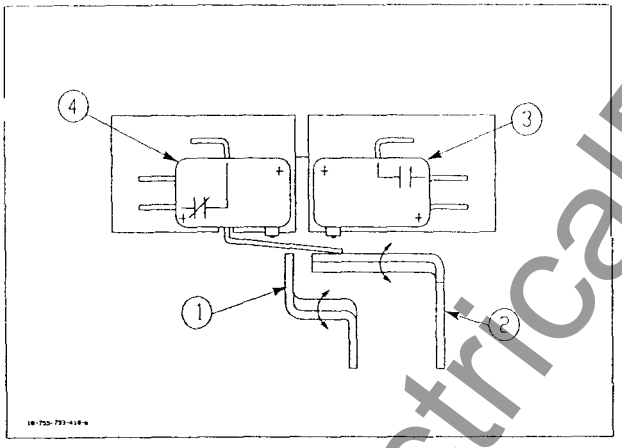


Figure 10b. Position 2. Springs charging', motor not yet cutoff.

Position 2. Springs Charging; Motor Not Yet Cutoff.

While the springs are charging the motor/gear position lever (2) moves forward, applying pressure to the switch actuating leaf. The spring position lever (1) retracts as the springs reach full charge. The motor cutoff switch (3) is closed and the motor is running.

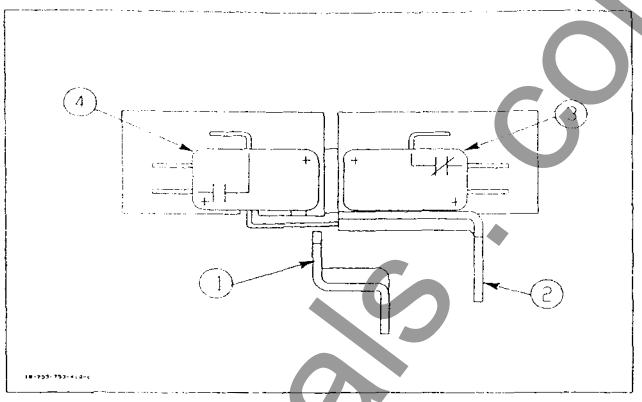


Figure 10c. Position 3. Springs charged; motor stopped.

Position 3. Springs Charged; Motor Stopped.

The springs have reached charged position. The motor/gear lever (2) has been retracted by roll pins on the large gear as the cam follower (82, **Figure 2**) on the large spur gear has disengaged from the wind and close cam (34, **Figure 2).** The motor cutoff switch (3) has opened, stopping the motor and the closing coil switch (4) has closed. Upon application of power to the closing circuit, the breaker will close. Switches then return to position **1 (Figure 10a).**

Note: In position 3, there is clearance between both levers and the switch actuating leaf. Clearance may be minimal (approximately 1/64" to 1/16") (0.4-1.6mm) or more. It is important to completely remove pressure from the switch actuating leaf to be sure that the switches are free to actuate. Note: due to pre-travel of the DC version of switch (4), the gap is measured between the actuating point of the DC switch (4) and the levers. Verify that both switches have actuated at the specified gap. The clearance is measured when both levers are provided with maximum natural lift (closing cams in charged position and the spur gear cam follower rotated to its bottom position). Adjustment is made by carefully bending the end of the levers as indicated by arrows (items 1 and 2). Do not bend the switch actuating leaf, unless absolutely necessary.

IMPORTANT: If the motor cutoff switch (3) does not open, the motor will continue to run and the cam follower (82, Figure 2) will re-engage wind and close cam (34, Figure 2) jamming the entire mechanism, possibly stripping gears in the gear motor, blowing the control fuse, or damaging the motor. To free a jammed mechanism, it is necessary to either remove the gear motor, or, alternatively, to rotate gear by using a ratchet wrench with 13/16 inch 12 point socket to rotate the motor pinion just enough to free the jam.

The springs will discharge and the breaker closes when the gear motor pinion is disengaged from the gear.

Use the manual charging mechanism or the maintenance closing device to prevent this from happening. Move the manual handle towards the charge position, applying force to the closing springs, and allow the ratchet on charging cam to support load while the motor is removed. This prevents the closing springs from discharging when the motor is removed.

Fuse Functions

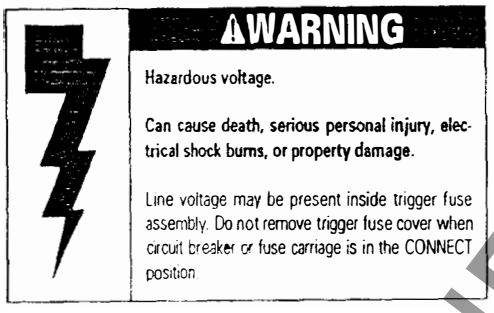
Current Limiting Fuses

Current limiting (CL) fuses are used to increase the interrupting capacity beyond that of the breaker alone, or to limit the fault "let-thru" current downstream of the fuse. The CL fuses used with the RL series of circuit breakers are **special purpose** fuses having NEMA Class "J" or Class "L" characteristics with an interrupting capacity of 200,000 Amperes RMS Symmetrical.

When fuse replacement is required, use only fuses as shown on Siemens drawing 71-142-200, having the same ratings as supplied with the circuit breaker. Different fuses may not properly mount on the breaker and may have different protective characteristics.

The current limiting fuses for the larger frame sizes (RLF-3200, RLF-4000 and RLF-5000) mount on a separate fuse Drawout assembly. For complete description, see 'Fuse Carriage', beginning on **Page 22.**

Open Fuse Trip Device



The Open Fuse Trip mechanism has three functions:

1. To trip the circuit breaker mechanically when a CL fuse has interrupted

2. To indicate which phase CL fuse has interrupted. The plunger of the trigger fuse (13), indicates visually which phase CL fuse has interrupted.

3. To retain the breaker in the trip free position until the trigger fuse is replaced.

Each trigger fuse is wired in parallel with one of the CL fuses. When the CL fuse interrupts, its associated trigger fuse also opens, releasing a plunger and precompressed spring contained in the trigger fuse housing. **See Figure 11.** On the integrally fused breakers (RLF-800 through RLF-2000), this plunger operates arm (3) which moves the latch (12), releasing the spring-loaded lever (4). This rotates circuit breaker trip flap link (7). This trips the circuit breaker and holds the circuit breaker in the mechanical trip-free position.

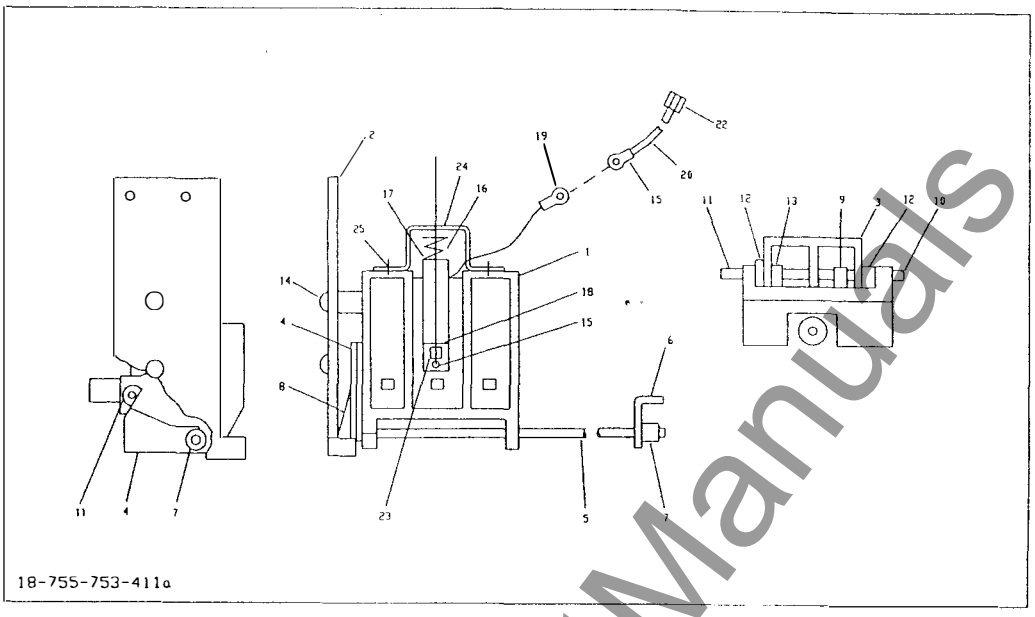
On large frame size circuit breakers (RLF-3200 through RLF-5000) supplied with a separate fuse carriage, the trigger fuses are mounted on the fuse carriage, and are used for visual identification of the faulted phase. Tripping of the breaker is accomplished through a power supply connected across the main fuses of the fuse carriage. The voltage from this supply is applied through the secondary control wiring to the coil of a solenoid mounted open fuse trip device on the circuit breaker. The plunger of the solenoid operates arm (3). The balance of the operation is the same as for the trigger fuse operated device.

The circuit breaker will remain trip free (cannot be closed) until the trigger fuse has been replaced and the associated trip mechanism reset lever (4) has been manually reset (pushed up).

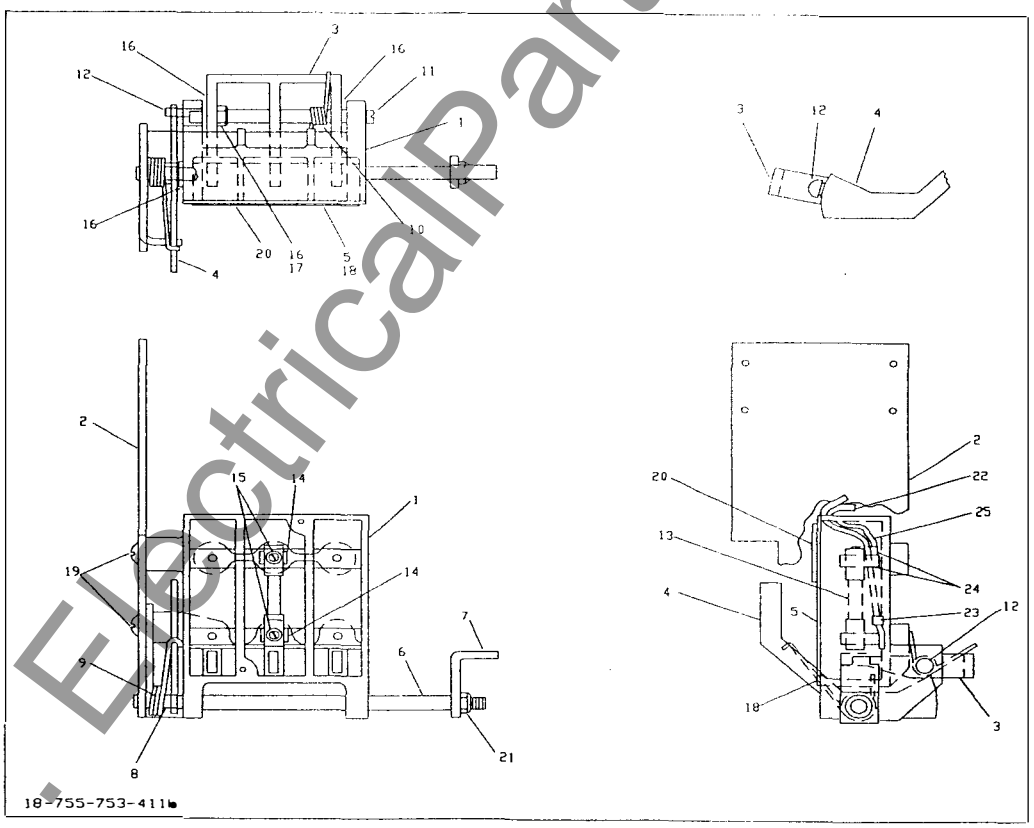
To remove the trigger fuse, remove screws (15), remove plastic cover (5), then the trigger fuse.

To install the trigger fuse, reverse the above procedure.

NOTE: The trigger fuse (13) must be inserted with the plunger facing arm (6). The gap dimension of 0.03" (0.8mm) maximum must be maintained for each fuse. Be sure to replace both the trigger fuse and its corresponding CL fuse before the breaker is reset.



Open Fuse Trip Device (RLF-3000 through RLF-5000)



Trigger Fuse Assembly (RLF-800 through RLF-2000)

Figure 11. Open Fuse Trip Device Views and Trigger Fuse Assembly Views

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Fuse Carriage

Introduction

Type RFC-3200 through RFC-5000 fuse carriages for use with Type RLF-3200 through RLF-5000 circuit breakers are furnished for mounting in metal-enclosed switchgear of the Drawout type. (See Figures **12** and **13).** All fuse carriages are completely assembled, tested, and calibrated at the factory in a vertical position, and must be so installed to operate properly.

Description

The basic RL-3200, RL-4000 and RL-5000 unfused circuit breakers have continuous current ratings equal to their frame size (3200A, 4000A or 5000A) or tripping transformer rating (whichever is lower), and interrupting ratings as shown in the descriptive bulletin.

When used in conjunction with the separately mounted type RFC fuse carriage, the circuit breaker designations become RLF-3200, RLF-4000 and RLF-5000. The fused breakers have an attachment that operates to open the circuit breaker when one or more of the current limiting fuses opens. The interruption rating of the combination of fuses and circuit breaker is increased to the interrupting rating of the fuses - 200,000 amperes symmetrical at 600 volts or less.

The continuous current rating may be restricted by the fuse size used. When equipped with 6000 amperes fuses, the RLF-5000 combination is rated at 5000 amperes continuous. RLF-4000 combination is rated at 4000 amperes continuous The RLF-3200 combination is rated at 3200 amperes continuous when equipped with 5000-ampere fuses. The circuit breaker continuous ratings are reduced when smaller rated fuses are used. (Refer to the catalog for application information.)

The type RFC fuse carriages are provided with open-fuse sensors connected to the open-fuse trip attachment, which is mounted on the circuit breaker. This device opens the circuit breaker when one or more of the current-limiting fuses open.

Note: Tripping depends on voltage being developed across the open fuse by the power source. NO TRIPPING WILL OCCUR IF THE POWER CIRCUIT IS DE-ENERGIZED.

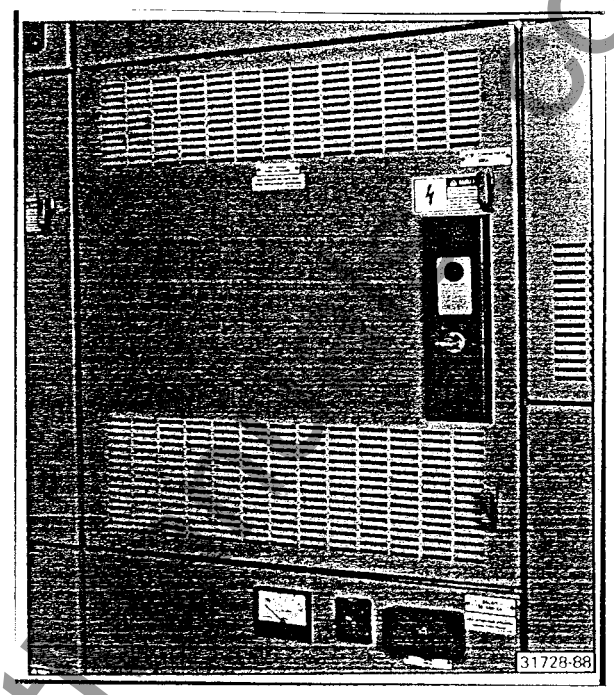

Figure 12.Fuse Carriage Compartment with Door Closed

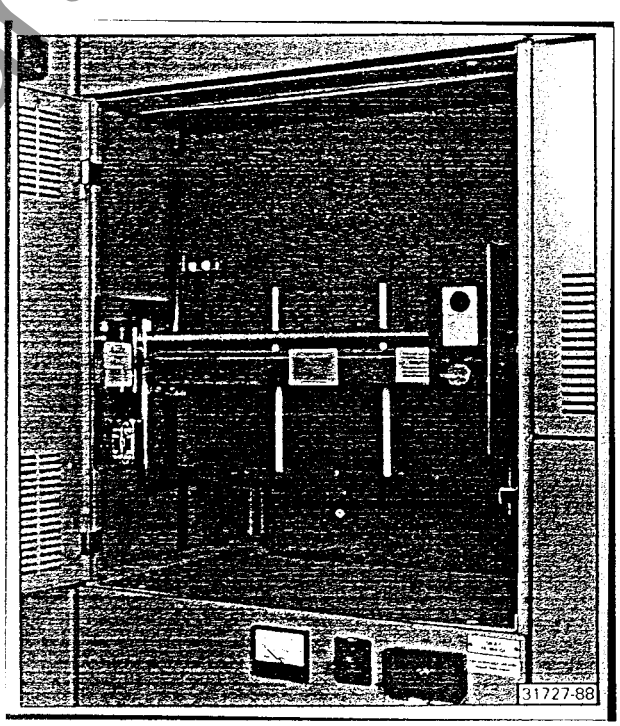

Figure 13. Fuse Carriage in Compartment with Door Open

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Fuse Carriage

Precautions to be observed in the Operation of RLF Circuit Breakers with RFC Fuse Carriages:

1. Read this Instruction Manual before installing or making any changes or adjustments.

2. As the closing springs on stored-energy breakers may be charged in either the circuit breaker open or closed position, extreme care should be taken to discharge all springs before working on the circuit breaker.

3. When charging springs of manually operated circuit breakers, always grasp charging handle firmly until it is returned to the normal vertical position.

4. Check current ratings, wiring information, circuit breaker type and static trip type against the one line diagram to assure that circuit breakers and fuses are located in the proper compartments within the switchgear.

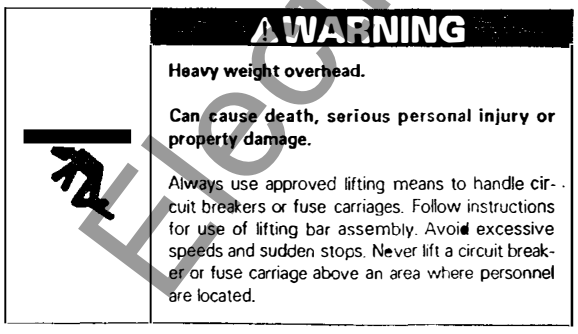
Note: The separately mounted fuse carriage is equipped with a key interlock that requires that the fuse carriage be used in a specific compartment. Refer to nameplate on fuse carriage for compartment number.

5. Check the alignment of the secondary disconnect fingers to ensure against misalignment due to possible distortion of fingers during shipment and handling.

6. Close the compartment door and secure the latches prior to racking to or from the CONNECT position. Also close compartment door prior to closing the circuit breaker when in the CONNECT position. Once the circuit breaker is closed, keep the door closed.

7. Once the circuit breaker or fuse carriage is energized, do not open the compartment doors. Perform any required operations with external controls, with the doors closed and securely latched.

Installation Sequence



1. Take the key for the **FUSE CARRIAGE** from its associated CIRCUIT BREAKER compartment.

2. Using the proper lifting equipment and following the instructions (Steps A-D, on **Figure** 1 on **Page 5)** for circuit breaker installation, insert the FUSE CARRIAGE into its proper compartment. Observe labeling. Unlock the racking mechanism using the key from the circuit breaker compartment. Check that the racking clevises engage the pins on both sides of the compartment.

Use the racking crank to rotate the racking screw in **a** clockwise direction until the fuse carriage reaches its CONNECT position.

3. Close the fuse carriage compartment door.

4. Operate the key interlock on the fuse carriage, which allows the key to be removed. Use the key to operate the key interlock in the associated CIRCUIT BREAKER cell.

5. Using the proper lifting equipment insert the circuit breaker into its compartment. See 'Installation' (Steps A-D, Figure 1 on **Page** 50, and steps 5-10 of the 'Installation (and removal) Sequence' on **Page 4.**

6. During the closing operation, observe that the contacts move freely without interference or rubbing between movable arcing contacts and parts of the arc chutes. Then refer to 'Operation', **Pages** 6-10 for a detailed description of the circuit breaker operating characteristics before putting the circuit breaker in service.

7. Trip units and accessory devices should receive **a** thorough check prior to placing the circuit breaker in service to be certain that adjustments are correct and parts are not **damaged.** Refer to 'Static Trip III Information and Instruction Guide', SG-3118.

8. Drawout circuit breakers are equipped with a drawout interlock to prevent movement of a closed circuit breaker into or out of the CONNECT position. See 'Drawout Interlock', **Page** 9 for a description of the interlock. Its operation should be checked before the circuit breaker is energized. The fuse carriages are interlocked with a key and lock system to assure that the circuit breaker is OPEN (see 'Key Interlock System', **Page** 23) before the fuse carriage can be racked in or out.

9. Upon completion of the installation inspection, the circuit breaker is ready to be energized after the control wiring, if any, is checked and the insulation tested. (Also see 'Testing Open Fuse Trip Attachment', **Page** 23).

10. Before racking the circuit breaker into the CONNECT position, check that the open fuse trip attachment is reset properly. If the attachment is correctly reset, close the compartment door, and rack the circuit breaker into the CONNECT position. Remove the racking crank and close the racking window. The circuit breaker can now be operated in its normal manner.

11. To remove the Circuit Breaker/Fuse Carriage, reverse the above procedures.

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Fuse Carriage

Fuses

Only special purpose fuses in accordance with Siemens drawing number 71-142-200 can be used with the circuit breaker/fuse carriage combination. Fuses which do not conform to this specification will not mount properly on the fuse carriage terminals.

Only fuses of the same current rating should be used for replacement of any open fuses.

Trigger Fuses and Open Fuse Trip Attachment

⚠WARNING

Hazardous voltage.

Can cause death, serious personal injury, electrical shock burns, or property damage.

Line voltage may be present inside trigger fuse assembly. Do not remove trigger fuse cover when circuit breaker or fuse carriage is in the CONNECT position.

The fuse carriage has provisions for mounting three trigger fuses that are connected in parallel with the main power fuses. They are used to indicate which of the power fuses opened under a system fault. Operation of the open-fuse trip attachment is indicated by movement of its reset handle to a horizontal position

The breaker-mounted open-fuse trip attachment holds the circuit breaker in its tripped position, and the circuit breaker cannot be re-closed until the open-fuse trip attachment is reset manually. The trigger fuses should also be replaced when replacing the main power fuses if open phase indication is desired. The system will function normally if the trigger fuses are not replaced. However, phase indication will not be provided.

Use only Ferraz-Shawmut Type TI-600 trigger fuses in the indicator, Siemens Part 72-140-317-001.

Key Interlock System

Each fuse carriage is equipped with an integral key-operated interlock for installation in a specific compartment. Interlocks prevent racking the fuse carriage in or out of the CONNECT position if its associated circuit breaker is not in its locked open position.

Once the circuit breaker is open and racked to its disconnected position, with the breaker trip bar depressed the key in the circuit breaker compartment can be rotated, lowering the locking bar to prevent closing the circuit breaker. The key can then be removed from the circuit breaker lock and transferred to the lock on the fuse carriage. The fuse carriage lock operates the slide interlock cover over the racking screw of the fuse carriage. Once the racking screw is exposed, the fuse carriage can be racked in or out using the racking handle. The key is retained in the lock when the fuse carriage is between the TEST and CONNECT positions.

Figure 14. Key Interlock Located in Circuit Breaker Compartment.

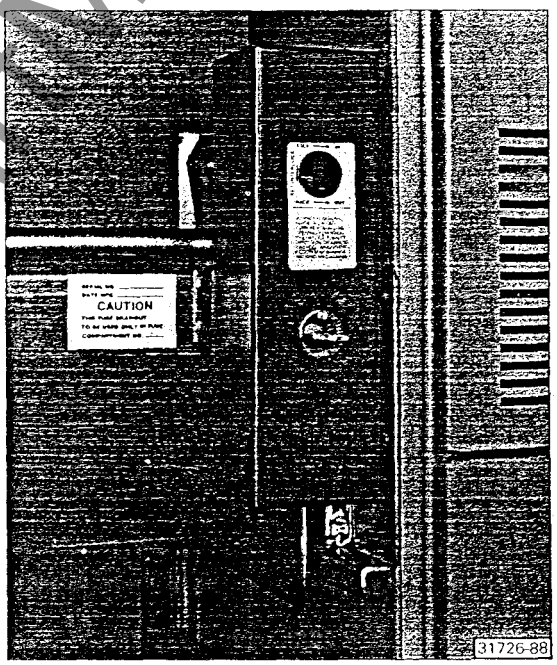

Figure 15. Fuse Carriage Key Interlock.

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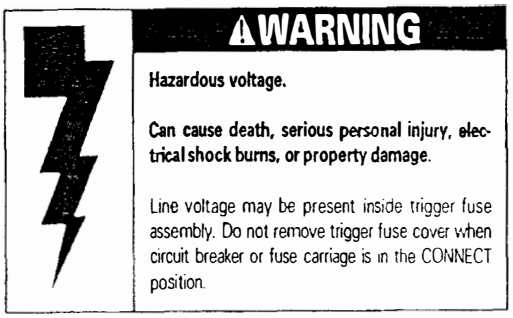
Testing Open Fuse Trip Attachment

The voltage developed across the open fuse operates the Open Fuse Trip Attachment. This voltage is applied to a transformer and rectifier combination. The output of the rectifier is connected to the coil of the trip attachment on the circuit breaker through the secondary disconnects of the two devices. For testing, voltage is applied to the input of the transformers. To do this, the fuses must be open, or the transformer disconnected from the fuse. Otherwise, the fuse will short out the test source. For safety, the following procedure is recommended.



1. Open the circuit breaker and rack it to its DISCONNECT position. Open the circuit breaker compartment door, remove the key from the interlock.

2. Use the key to unlock the fuse carriage racking mechanism. Rack the fuse carriage to its TEST position. At this point, the main disconnects are clear of the power circuit, while the secondary disconnects are still engaged. The key can now be rotated and removed from the fuse carriage racking mechanism lock.

3. Return key to the lock in the circuit breaker compartment. Unlock, and rack circuit breaker to its TEST position.

4. Remove the safety barriers of the fuse carriage to allow access to the main power fuses. Disconnect the two small (No. 18 AWG) wires from the top terminals of the power fuses. Connect the two small wires of each phase together. Keep them insulated from the top of the fuse. Remove the trigger fuse cover and remove the trigger fuses.

5. Close the circuit breaker. Apply voltage to the terminals in the trigger fuse block, preferably from a variable transformer with a voltmeter, although 120 VAC can be used. The voltage is applied between the terminals where the trigger fuses were mounted, one phase at a time. The circuit breaker must trip at 120 VAC or less. Remove the voltage, reset the open fuse trip device on the circuit breaker and re-close the circuit breaker for the next test. Repeat the test for each of the three phases.

6. Replace the trigger fuses. Reconnect the two wires to the top of each power fuse terminal, and replace the safety barriers and covers, before racking the units back to the CONNECT position.

Maintenance

Occasional checking and cleaning of the circuit breaker and fuse carriage, including the cubicle disconnect terminal studs, will promote long and trouble-free service. Periodic inspection and servicing should be included in the maintenance routine.

Refer to 'Maintenance', **Pages 11-16**, and 'Lubrication Chart', **Table 5**, for recommended inspection and maintenance and lubrication instructions applicable to RLF fused circuit breakers and to RFC fuse carriages.

Optional Devices

Operation Counter
This option consists of a mechanically operated counter with a bracket that mounts at the bottom of the breaker mounted auxiliary switch. The counter arm connects through a spring to the switch-operating arm. The counter is non-resettable. The breaker must have an auxiliary switch for installation of this option.

Maintenance Closing Device
This device is a manual charging handle assembly arranged for use as a maintenance tool. The charge link is spring loaded and retained to make insertion into the breaker frame less difficult and a chain retains the pivot pin. After charging the closing springs, the handle must be manually returned to and held in the vertical position to allow closing the breaker.

Electrically Operated Interlock
This device is an additional solenoid that must be energized before the breaker can be closed. When the device is de-energized, the breaker is held TRIP FREE so that it cannot be closed either electrically or manually. The device is a derivative of the Undervoltage trip device and mounts in the same location as the Undervoltage trip device. The electrically operated interlock has a mechanical link from the device to the main shaft of the breaker to hold the device in the picked-up position when the breaker is closed. Once closed, the device can be de-energized without tripping the breaker. There are adjustments for pickup and dropout voltages of the device. (See chart in **Figure 27** for selectable values). The device is designed to be energized continuously.

Undervoltage Trip Device
This device automatically trips the circuit breaker on loss of voltage. The device has time delay settings of instantaneous, and 1, 2, or 3 seconds. The rated input voltage, pickup voltage, and dropout voltage are selectable using DIP switches, as shown in the chart in **Figure 31.**

A 0.06" (1.5mm) gap should be maintained between flap extension and pull link when the device is energized (See **Figure 31).**

The device includes an LED indicator. When the device is energized and operating normally, the LED flashes. If the voltage drops below the dropout voltage, the LED will be on continuously to indicate an impending trip. If the input voltage exceeds the rated voltage by approximately 15% (DC) or 5% (AC), the LED will be on continuously to indicate excessive voltage input.

The device includes an internal fuse. This fuse is not designed to protect the device, but rather, is intended to avoid damage to the user's control power supply in the event of failure of the Undervoltage device. If the fuse is blown, damage to the Undervoltage device is likely, and the device should be replaced.

Latch Check Switch
This option is a small switch mounted on a bracket. The switch operator is adjusted so the switch is operated by, and indicates the position of, the breaker trip flap. The latch check switch may be used in conjunction with the electrical interlock or Undervoltage devices to delay the application of voltage to the close coil until the Undervoltage or Interlock device has picked up.

Static Trip III Overcurrent Device
The Static Trip III device mounts onto a slide-type bracket on the circuit breaker. To remove the trip device, the terminal block cover located above it should be removed, exposing the terminal block screws. The lower row of screws can be loosened with a screwdriver allowing the cord set fanning strip to be removed from the terminal block. Removal of the fanning strip exposes a mounting screw. This screw can be removed, allowing the trip device to be removed from the circuit breaker. To remove the trip device, pull the trip device towards the front of the circuit breaker. See 'Static Trip III Information and Instruction Guide', SG-3118.

Bell Alarm Switch
This unit functions to operate a switch. A single-pole double-throw, or a double-pole double-throw switch is available. The switch operator is connected to, and is operated by the tripping actuator. The switch operator remains tripped even when the actuator is reset by the circuit breaker. The switch operator must be reset either manually or by an additional optional electrical reset solenoid.

The contacts of the bell alarm switch can be connected in series with the circuit breaker closing coil, to provide a lockout feature to prevent re-closing after an overcurrent tripping operation.

Bell Alarm Relay
This unit functions to provide a momentary closure and opening of isolated contacts. The Static Trip device supplies the relay coil in parallel with the tripping actuator. The contacts return to the normal de-energized position after short time-delay (0.2-0.5 Second).

Mechanical Lockout
This option consists of a manual reset for the tripping actuator, with the normal automatic reset disabled. The breaker is held trip free following an overcurrent trip, until manually reset.

Parts

Table of Contents

How to Use Your Parts Ordering Guide

1. Locate part or parts to be replaced in one of the figures in this manual.
2. Identify each part by item number, description, and part number. Give figure number in which part is shown.
3. Include breaker type, rating, and breaker serial number with your order.
4. Place order with your Siemens representative.
5. When ordering relays or other electrical parts, include control voltage (see recommended spare parts list for part numbers).

Ordering Example

Type RL-3200 Rated Continuous 3200A Serial Number R-99999A-2
Mode of Operation: Electrical

Instruction Manual SG-3068E

Figure	Item	Description	Part Number
17	6C	Apron	18-732-791-505
25	147	Pushrod	18-657-768-036
32	6	Bearing	71-141-995-001

IF REQUIRED PARTS ARE NOT IDENTIFIED IN THIS MANUAL -

1. Make a copy of the figure in which the part would appear.
2. Indicate with arrows or other markings location of part.
3. Describe required part and enclose sketch or photograph of part.
4. Include breaker type, rating, and breaker serial number with your order.
5. Place order with your Siemens representative.

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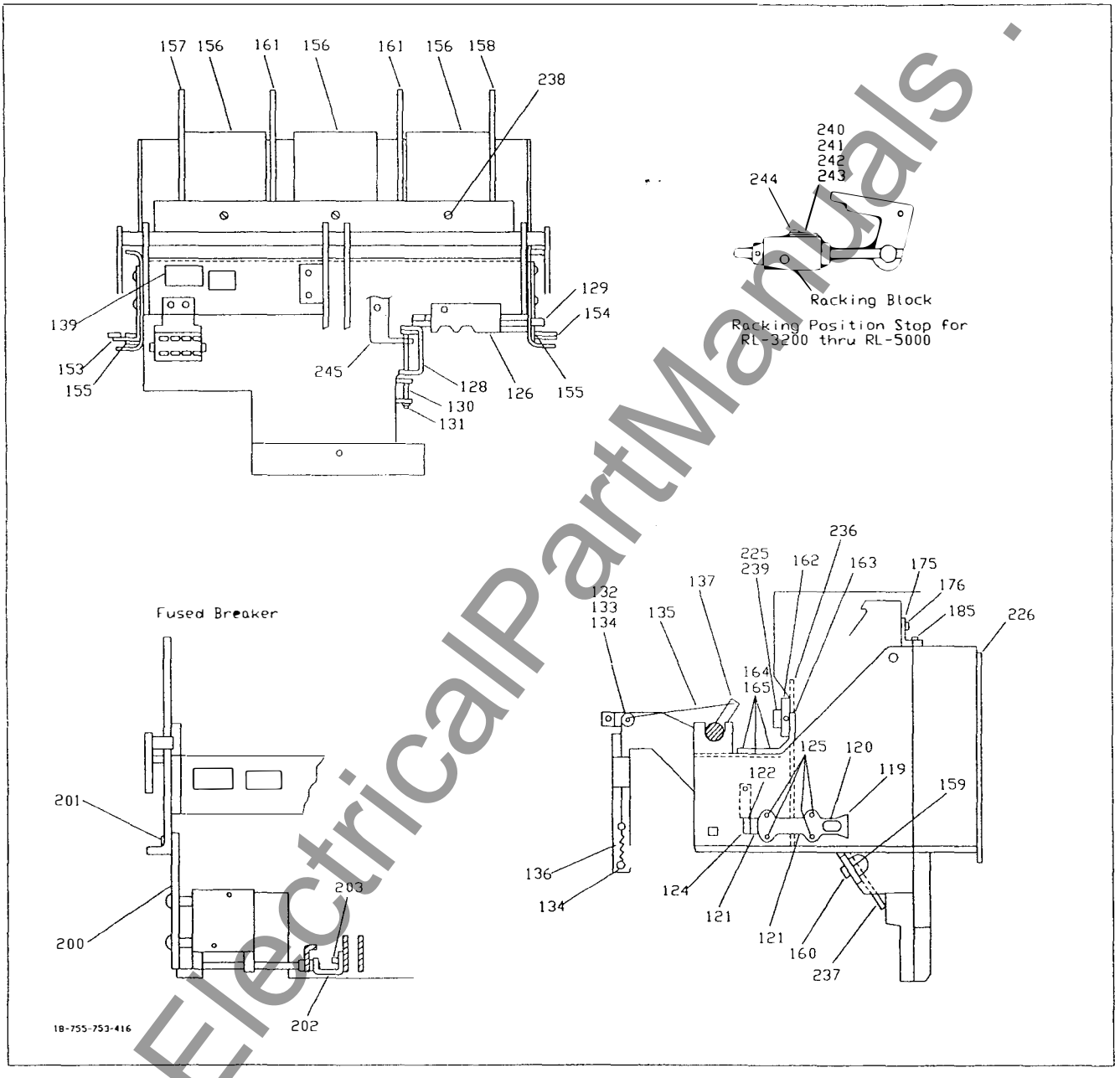

Figure 16. RL Breaker Assembly (Part 1)

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er to **Figure 16.**

Item	Description	Part Number	Usage
119	PTO Support	18-732-790-004	
120	PTO Shaft	18-661-600-515	
121	Bearing	18-658-110-274	
122	PTO Arm Assy	18-733-500-518	
124	Cotter Pin	00-671-195-117	
125	Screw	15-171-399-049	
126	Bracket	18-398-936-003	
127	Screw	00-611-461-371	
128	Interlock assy	18-658-612-572	
129	Interlock Bar	18-733-482-001	
129A	Interlock Bar	18-733-482-002	RL-3200 thru RLE-4000
129B	Interlock Bar	18-733-482-005	RL-5000
130	Pin	18-658-110-329	
131	Sichsl	00-000-401-166	
132	Pulley Half 1	18-658-143-018	
133	Pulley Half 2	18-658-143-019	
134	Screw	15-171-399-008	
135	Cable Assy	18-732-791-806	
136	Spring	71-142-049-001	
137	Screw	15-171-074-010	
139	Label	18-658-024-193	
141	X Washer	00-659-055-156	
153	Detent Assy LH	18-732-791-551	
154	Detent Assy RH	18-732-791-550	
155	Spring	18-657-434-169	
156	Arc Chute	18-728-500-591	RL-800, RLE-800
156A	Arc Chute	18-732-792-501	RL-1600
156B	Arc Chute	18-398-789-503	RLE-2000, RL-2000
156C	Arc Chute	18-398-789-501	RL-3200
156D	Arc Chute	18-398-789-502	RL-4000, RLE-4000
156E	Arc Chute	18-732-790-557	RLI-800
156F	Arc Chute	18-398-289-581	RL-5000
57	Phase Barrier	18-398-937-001	
57A	Phase Barrier	18-398-937-003	RL-3200 thru RL-5000
157B	Phase Barrier	18-732-790-053	RLF-2000
158	Phase Barrier	18-398-937-002	
158A	Phase Barrier	18-398-937-004	RL-3200 thru RL-5000
158B	Phase Barrier	18-732-790-054	RLF-2000
159	Barrier	18-657-941-110	RL-800 to RL-1600
159A	Barrier	18-657-941-109	RLE-2000, RL-2000
159B	Barrier	18-657-962-124	RL-3200
159C	Barrier	18-657-962-123	RL-4000, RLE-4000
159D	Barrier	18-658-143-254	RL-5000
160	Plastic Rivet	00-671-501-070	
161	Barrier	18-657-941-108	
161A	Barrier	18-657-962-122	RL-3200 thru RLE-4000
161B	Barrier	18-657-937-284	RLF-2000
162	Support	18-732-790-052	RL-800 thru RLI-800
162A	Support	18-732-790-055	RL-1600
162C	Support	18-732-790-056	RLE-2000, RL-2000
162D	Support	18-734-617-002	RL-3200
162E	Support	18-734-617-001	RL-4000, RLE-4000
162F	Support	18-734-617-003	RL-5000
163	Chute retainer assy	18-658-143-563	(mid-1993 and after)
164	Screw	15-171-399-010	
165	Lockwasher	00-655-067-100	RL-800 thru RLE-2000
175	Angle	18-668-110-279	RLI-800, RLE-2000
176	Screw	00-615-650-218	RLI-800, RLE-2000
185	Screw	15-171-399-052	RLI-800, RLE-2000
200	Open Fuse Trip	18-399-796-501	RLF-800 thru RLF-2000
200A	Open Fuse Trip	18-399-805-501	RLF-3200 thru RLF-4000
200B	Open Fuse Trip	18-399-805-502	RLF-5000
201	Screw	15-171-399-010	All RLF
202	Bracket	18-657-961-338	RLF-3200 thru RLF-5000
224	Screw	00-615-471-373	RL-800 thru RLE-2000
224A	Knob	18-657-961-385	RL-3200 thru RL-5000
225	Lockwasher	00-655-067-140	RL-800 thru RLE-2000
225A	Lockwasher	00-655-047-240	RL-3200 thru RLE-4000
203	Screw	15-171-399-010	RLF-3200 thru RLF-5000
226	Stud Brace	18-732-790-130	RLE-800, RLI-800
226A	Stud Brace	18-732-790-180	RLE-2000
236	Front Barrier	18-732-790-160	RLI-800
236A	Front Barrier	18-658-110-178	RLE-800
236B	Front Barrier	18-658-110-304	RLE-2000
236C	Front Barrier	18-752-300-121	RL-5000
237	Bottom Barrier	18-658-110-177	RLE-800, RLE-2000
237A	Bottom Barrier	18-658-143-384	RL-5000
238	Screw	00-615-650-218	RLI-800, RLE-800 RLE-2000
239	Lockwasher	00-655-067-100	
240	Shim	18-658-024-238	RL-3200 thru RL-5000
241	Shim	18-658-024-238	RL-3200 thru RL-5000
242	Shim	18-658-024-240	RL-3200 thru RL-5000
243	Shim	18-658-024-241	RL-3200 thru RL-5000
244	Screw	00-615-641-906	RL-3200 thru RL-5000
245	Pin Brace	18-658-145-005	

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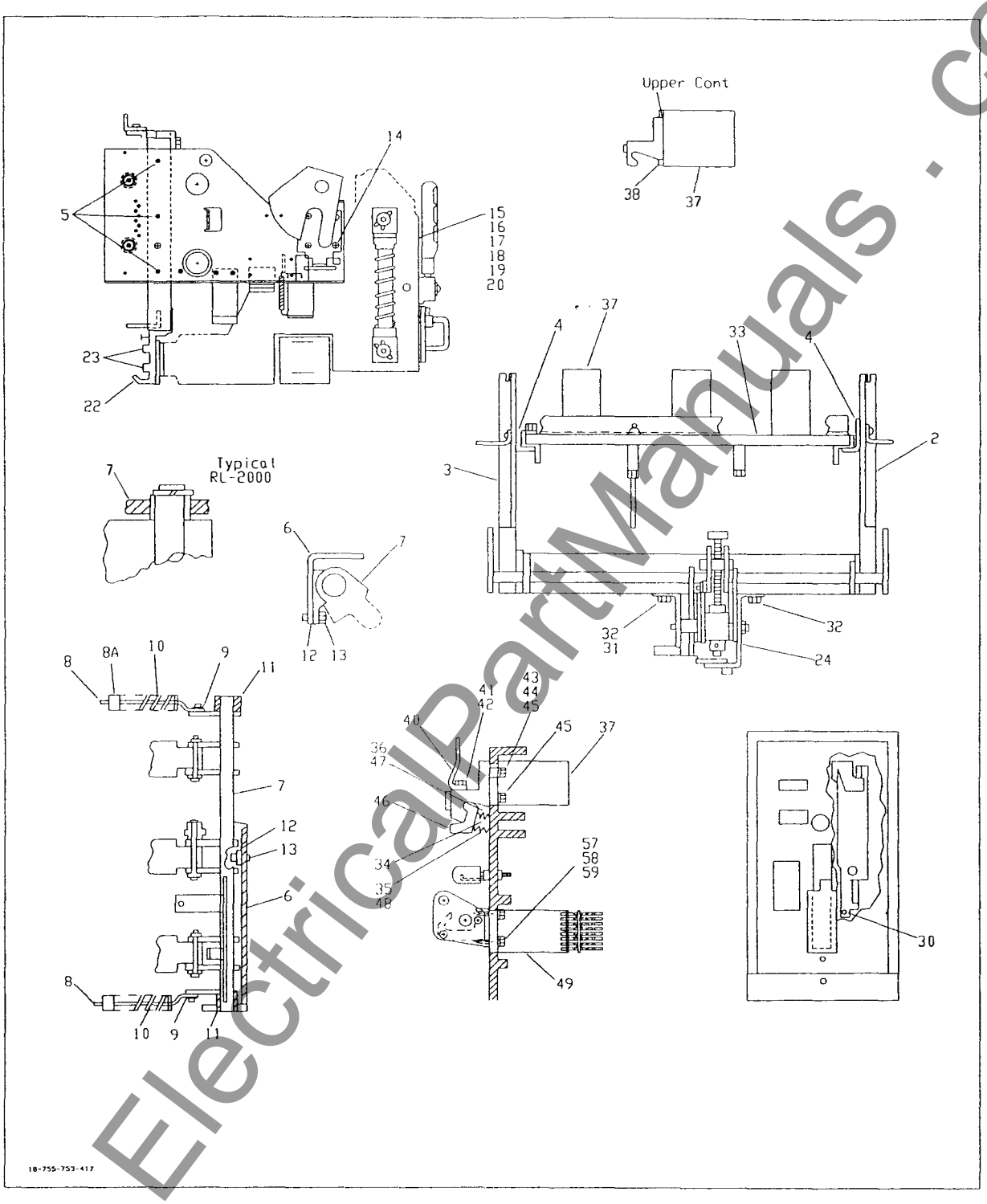

Figure 17. RL Breaker Assembly (Part 2)

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Refer to Figures 17 and 18

Item	Description	Part Number	Usage
2	RH Sideplate	18-398-289-510	
3	LH Sideplate	18-398-288-002	
4	Angle	18-657-937-254	RL-3200, RL-4000
5	Screw	15-615-024-006	Drawout Only
6	Apron	18-732-791-504	RL-800, RLE-800 & RL-1600
6A	Apron	18-732-790-537	RLI-800
6B	Apron	18-732-791-521	RL-2000, RLE-2000
6C	Apron	18-732-791-505	RL-3200 thru RLE-4000
6D	Apron	18-752-300-553	RL-5000
7	Shaft	18-732-791-503	RL-800, RLE-800 & RL-1600
7A	Shaft	18-732-790-138	RLI-800
7B	Shaft	18-732-791-608	RLE-2000, RL-2000
7C	Shaft	18-732-791-509	RL-3200
7D	Shaft	18-732-791-510	RL-4000, RLE-4000
7E	Shaft	18-752-300-554	RL-5000
8	Spring Guide	18-732-790-008	
8A	Guide	18-658-110-250	RL-800 thru RLE-2000
9	X Washer	00-659-055-156	
10	Spring	71-141-799-001	
10A	Spring	71-142-123-001	RLI-800, RL-3200 thru RL-5000
11	Bearing	15-171-399-002	
12	Bearing Block	18-657-768-050	RL-800, RL-1600
12A	PR Stop	18-658-110-116	RLI-800
13	Screw	00-615-663-373	RL-800, RL-1600
13A	Screw	00-615-405-378	RLI-800
14	Screw	15-615-024-007	
15-20	Operator	See Figure 21	
22	Support	18-732-790-036	RL-3200 thru RL-5000
23	Screw	00-615-663-373	
24	Support	18-752-300-514	Drawout
24A	Support	18-752-300-002	Stationary
25	Shutter Assy	18-752-300-514	Drawout
25A	Shutter Assy	18-752-300-565	Stationary
30	Screw	00-615-345-214	
31	Screw	00-615-663-373	RL-800, RLI-800 & RL-1600
32	Screw	15-171-399-052	RLI-800, RL-2000 thru RL-4000
33	Backpanel	18-551-364-001	RL-800, RLE-800
33A	Backpanel	18-551-364-004	RLI-800
33B	Backpanel	18-551-364-002	RL-1600
33C	Backpanel	18-551-364-003	RL-2000
33D	Backpanel	18-551-364-006	RLE-2000
33E	Backpanel	18-398-288-006	RL-3200
33F	Backpanel	18-398-288-007	RL-4000, RLE-4000
33G	Backpanel	18-398-288-114	RL-5000
34	Roll Pin	00-671-177-321	RL-3200 thru RLE-4000
35	Roll Pin	00-671-177-313	RL-3200 thru RLE-4000
36	Rivet	00-671-251-085	RL-3200 thru RLE-4000
37	Upper Cont Assy.	18-732-788-501	RL-800, RLI-800 & RLE-800
37A	Upper Cont Assy.	18-732-788-502	RL-1600
37B	Upper Cont Assy.	18-732-791-511	RLE-2000, RL-2000 Left
37C	Upper Cont Assy	18-732-791-512	RLE-2000, RL-2000 Center
37D	Upper Cont Assy	18-732-791-513	RLE-2000, RL-2000 Right
37E	Upper Cont Assy	18-733-742-501	RLF-800
37F	Upper Cont Assy	18-733-742-502	RLF-1600
37G	Upper Cont Assy	18-732-791-526	RLF-2000 Left
37H	Upper Cont Assy	18-732-791-527	RLF-2000 Center
371	Upper Cont Assy	18-732-791-528	RLF-2000 Right
37J	Upper Cont Assy.	18-734-434-501	RL-800, RLE-800, RLI-800 Stationary
37K	Upper Cont Assy.	18-734-436-501	RL-1600 Stationary
37L	Upper Cont Assy	18-732-791-535	RL-2000, RLE-2000 Stationary Left
37M	Upper Cont Assy.	18-732-791-536	RL-2000, RLE-2000 Stationary Center
37N	Upper Cont Assy.	18-732-791-537	RL-2000, RLE-2000 Stationary Right
370	Upper Cont Assy	18-398-289-501	RL-3200
37P	Upper Cont Assy	18-398-289-502	RL-4000, RLE-4000
37Q	Upper Cont Assy	18-398-289-580	RL-5000
38	Plastic Button	18-657-854-172	RL-4000, RLE-4000
40	Arc Runner	71-141-983-001	RL-800, RLE-800
40A	Arc Runner	18-732-790-173	RLI-800
40B	Arc Runner	71-142-053-001	RL-1600
40C	Arc Runner	18-657-939-202	RLE-2000, RL-2000
40D	Arc Runner	18-727-730-001	RL-3200
40E	Arc Runner	18-657-840-384	RL-4000, RLE-4000
40F	Arc Runner	18-732-790-175	RLE-2000
40G	Arc Runner	18-658-143-246	RL-5000
41	Screw	00-615-124-218	
41A	Screw	00-615-124-220	RLE-2000
42	Lockwasher	00-655-017-022	
43	Brace	18-657-941-293	RL-800, RLE-800
43A	Brace	18-657-941-299	RL-1600
43B	Washer	00-651-027-170	RL-3200 thru RLE-4000
44	Screw	15-171-399-048	RL-800, RLI-800 & RL-1600
44A	Screw	15-171-399-065	RLI-800
44B	Spacer	18-658-110-284	RLI-800
44C	Lockwasher	00-655-017-030	RL-3200 thru RLE-4000
45	Screw	15-171-399-011	
45A	Screw	00-611-315-426	RL-4000, RL-3200
46	Contact Assy	18-727-833-501	
46A	Contact Assy	18-732-790-599	All RLE (Note 1), RL-5000
47	Spring	71-141-173-001	
48	Spring	71-141-976-001	
49	Lower Cont Assy	18-732-789-501	RL-800, RLE-800 & RLI-800
49A	Lower Cont Assy	18-732-789-502	RL-1600
49B	Lower Cont Assy	18-732-791-516	RLE-2000, RL-2000 Left
49C	Lower Cont Assy	18-732-791-517	RLE-2000, RL-2000 Center
49D	Lower Cont Assy	18-732-791-518	RLE-2000, RL-2000 Right
49E	Lower Cont Assy	18-734-437-501	RL-800, RLE-800, RLI-800 Stationary
49F	Lower Cont Assy	18-734-443-501	RL-1600 Stationary
49G	Lower Cont Assy	18-732-791-538	RLE-2000, RL-2000 Stationary Left
49H	Lower Cont Assy,	18-732-791-539	RLE-2000, RL-2000 Stationary Center
49I	Lower Cont Assy	18-732-791-540	RLE-2000, RL-2000 Stationary Right
49J	Lower Cont Assy.	18-732-791-519	RL-3200
49K	Lower Cont Assy.	18-732-791-520	RL-4000, RLE-4000
49L	Lower Cont Assy	18-752-300-555	RL-5000
52	Spring Seat	18-658-143-247	RL-5000
57	Washer	00-651-027-170	RL-3200 thru RLE-4000
58	Lockwasher	00-655-017-030	RL-3200 thru RLE-4000
59	Screw	15-171-399-011	
59A	Screw	00-611-315-426	RL-3200 thru RLE-4000

Note 1: For RLE-800 manufactured prior to April, 1992, if replacing contact 46A, replace all contacts 46A for the affected phase, along with main contacts (62A, **Figure 20**). Order replacement kit 18-658-669-822.

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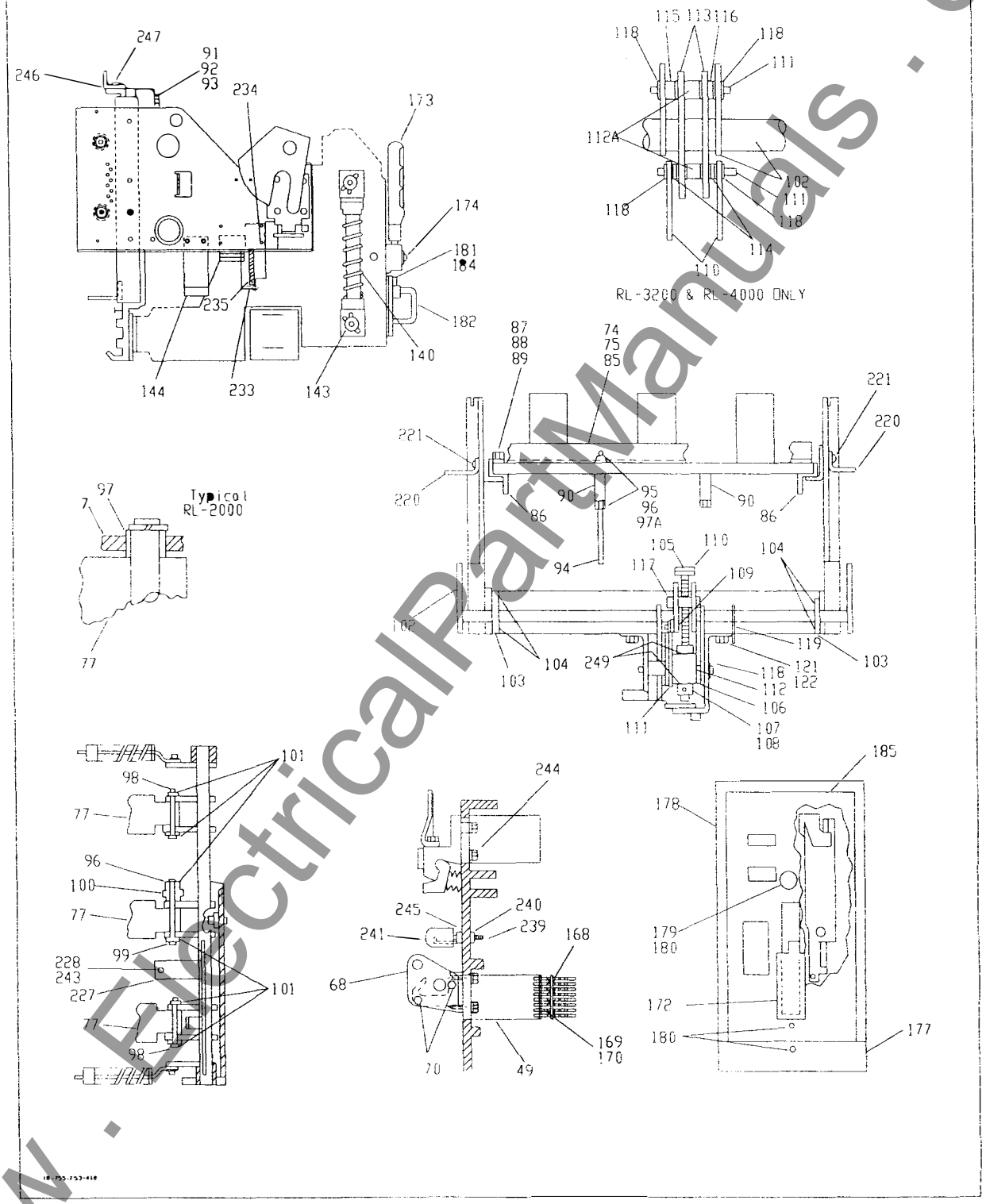

Figure 18. RL Breaker Assembly (Part 2-continued)

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:r to Figures 17 and 18

Item	Description	Part Number	Usage
68	Support	18-657-937-261	
68A	Support	18-657-940-150	RL-3200 thru RL-5000
70	Screw	00-615-663-373	
74	Screw	00-611-315-434	RL-3200 thru RL-5000
75	Nut	15-171-063-017	RL-3200 thru RL-5000
77	Pushrod	See **Figures 19-20**	
85	Angle	18-657-937-255	RL-3200 thru RL-5000
86	Angle Plastic	18-657-941-294	RL-3200
86A	Angle Plastic	18-657-941-062	RL-4000 thru RL-5000
87	Washer	00-651-027-170	RL-3200 thru RL-5000
88	Lockwasher	00-655-017-030	RL-3200 thru RL-5000
89	Screw	00-611-315-426	RL-3200
89A	Screw	00-611-315-428	RL-4000 thru RL-5000
90	Brace	18-657-937-256	RL-3200 thru RL-5000
91	Screw	00-611-315-396	RL-3200 thru RL-5000
92	Washer	00-651-027-139	RL-3200 thru RL-5000
93	Nut	15-171-063-016	RL-3200 thru RL-5000
94	Stud	14-135-915-008	RL-3200 thru RL-5000
95	Washer	00-651-027-139	RL-3200 thru RL-5000
96	Lockwasher	00-655-067-140	RL-3200 thru RL-5000
96A	Washer	00-651-007-900	RLE-2000, RL-2000
97	Bushing	18-657-765-395	RLE-2000, RL-2000
97A	Nut	00-631-059-104	RL-3200 thru RL-5000
98	Pin	18-747-678-006	
98A	Pin	18-727-832-001	RL-3200 thru RL-5000
99	Pin	18-747-678-011	
99A	Pin	18-727-832-002	RL-3200 thru RL-5000
100	Spacer	18-657-942-300	
100A	Spacer	18-727-838-002	RL-3200 thru RL-5000
101	Sichsl	00-000-401-166	
101A	X Washer	15-171-399-035	RL-3200 thru RL-5000
102	Racking Shaft	18-732-791-506	RL-800 thru RL-1600
102A	Racking Shaft	18-732-791-522	RLE-2000, RL-2000
02B	Racking Shaft	18-732-791-507	RL-3200 thru RLE-4000
J2C	Racking Shaft	18-732-300-556	RL-5000
103	Retainer	15-171-399-012	RL-800 thru RL-1600
103A	Retainer	18-657-822-197	RL-2000 thru RL-5000
104	Screw	00-615-663-373	
105	Racking Screw	18-735-641-059	
105A	Racking Screw	18-735-641-060	RL-3200 thru RL-5000
105B	Racking Screw ASM.	18-755-753-538	RLE-2000
106	Block	18-657-823-359	
106A	Block	18-658-024-237	RL-3200 thru RL-5000
107	Collar	18-658-110-024	
108	Drive Pin	18-658-110-036	
109	Washer	00-651-007-902	
109A	Washer	00-651-007-214	RL-3200 thru RL-5000
110	Nut	00-631-177-108	
110A	Link	18-657-942-092	RL-3200 thru RL-5000
111	Spacer	18-657-823-356	
111A	Pin	18-747-678-006	RL-3200 thru RL-5000
112	Spacer	18-731-274-002	
112A	Spacer	18-724-503-004	RL-3200 thru RL-5000
113	L-Link	18-657-941-297	RL-3200 thru RL-5000
114	Spacer	18-724-503-005	RL-2000 thru RL-5000
115	Spacer	18-731-274-001	RL-3200 thru RL-5000
116	Spacer	18-731-274-002	RL-3200 thru RL-5000
117	Barrel Nut	18-657-962-344	
118	Sichsl	00-000-401-166	
119	Support	18-752-300-141	RL-4000 thru RL-5000
121	Screw	00-615-114-373	RL-4000 thru RL-5000
122	Lockwasher	00-655-017-026	RL-4000 thru RL-5000

Item	Description	Part Number	Usage
140	Closing Spring	18-399-526-502	RL-800, RLE-800
140A	Closing Spring	18-399-526-503	RL-1600
140B	Closing Spring	18-398-297-504	RLI-800, RLE-2000 & RL-2000
140C	Closing Spring	18-726-870-501	RL-3200 thru RL-5000
143	Sichsl	00-000-401-141	
144	Ground Strap	18-657-916-579	Omitted on Stationary
145	Screw	15-171-399-010	Omitted on Stationary
146	Nut	00-633-059-210	Omitted on Stationary
167	Grommet	15-171-890-001	
168	Primary Disc	18-734-618-502	RL-800
168A	Primary Disc	18-732-790-594	RLE-800, RLI-800
168B	Primary Disc	18-734-618-501	RL-1600, RL-2000
168C	Primary Disc	18-732-790-551	RLE-2000
168D	Primary Disc	18-733-481-501	RL-3200
168E	Primary Disc	18-733-481-502	RL-4000, RLE-4000
168F	Primary Disc	18-752-300-596	RL-5000
169	Screw	00-615-114-373	RL-3200 thru RL-5000
170	Lockwasher	00-655-017-026	RL-3200 thru RL-5000
172	Cover Filler	18-658-133-032	EO versions only
173	Man. Chg. Handle	18-398-288-066	Manual charge only RL-800 thru RLE-2000
173A	Man. Chg. Handle	18-398-288-067	Manual charge only RL-3200 thru RL-5000
174	Set Screw	00-617-031-367	Manual charge only
177	Bottom Cover	18-736-830-501	RL-800 thru RLE-2000
177A	Bottom Cover	18-736-830-502	RL-3200 thru RL-5000
178	Cover	18-394-426-080	RL-800 thru RLE-2000
178A	Cover	18-394-426-079	RL-3200 thru RL-5000
179	Bumper	15-171-399-007	
180	Screw	15-171-399-010	
181	Clip	18-658-133-031	
182	Guard	18-748-962-001	
184	Screw	00-611-471-120	
185	Label	18-487-118-001	
185A	Label	18-487-117-001	Breaker Display Unit
185B	Label	18-487-908-001	
220	Bracket	18-734-436-001	Stationary
221	Screw	15-615-024-005	Stationary
227	Trip Shaft	18-732-790-528	RLI-800
228	Trip Wire	18-658-110-174	RLI-800
233	Spring Anchor	18-658-110-145	RLI-800
234	Screw	15-171-399-010	RLI-800
235	Spring	71-113-504-001	RLI-800
239	Stud	18-658-110-283	RLI-800
240	Nut	15-171-063-016	RLI-800
241	Spring Cover	18-398-288-061	RLI-800
243	Stop Nut	00-633-043-106	RLI-800
245	Spring	15-171-431-001	RLI-800
246	Angle	18-658-143-364	RL-5000
247	Screw	18-658-143-223	RL-5000
249	Washer	18-657-941-295	

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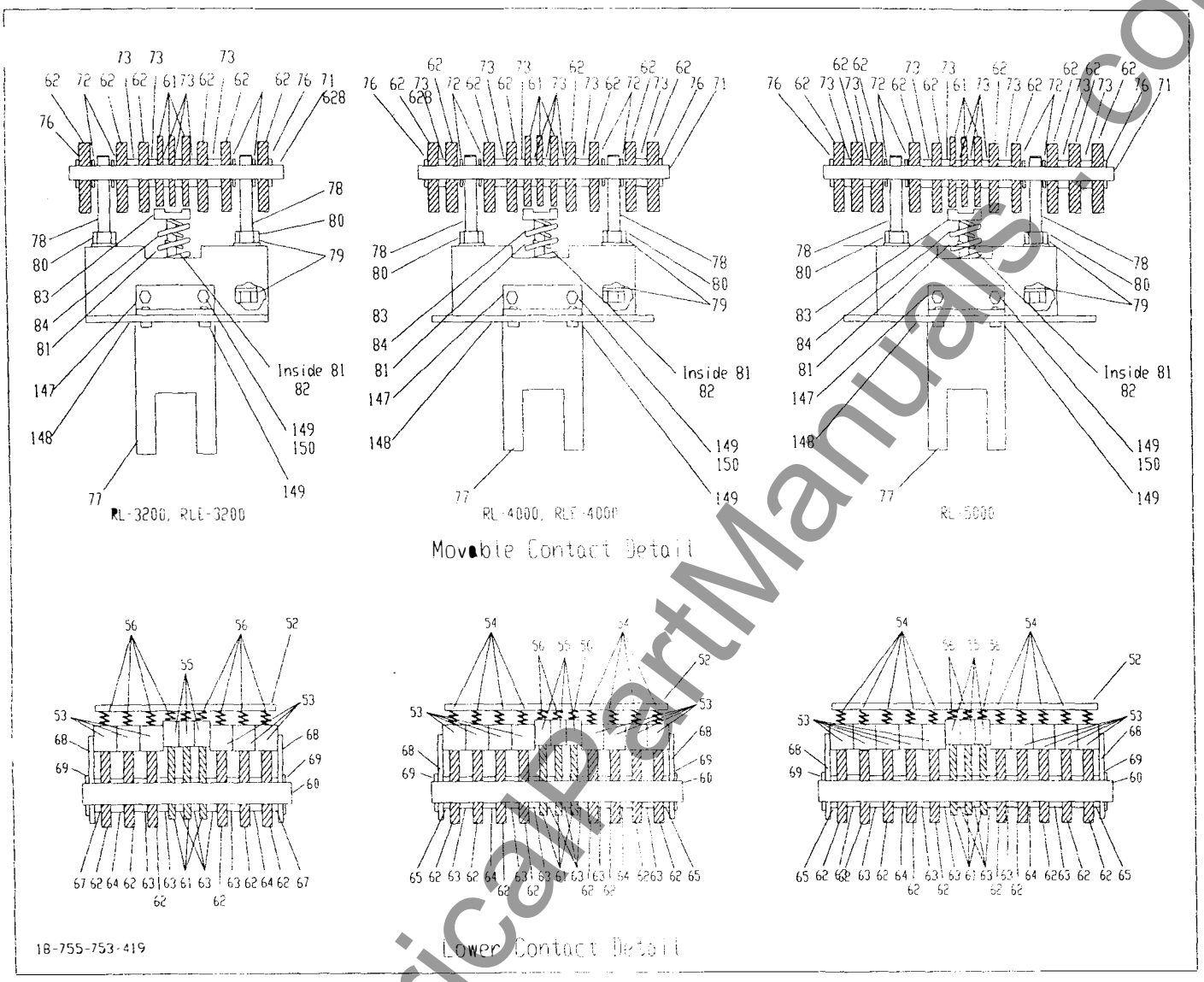

Figure 19. Contacts RL-3200 Through RL-5000

Refer to Figure 19

Item	Description	Part Number	Usage
52	Spring Seat	18-657-822-171	RL-3200
52A	Spring Seat	18-657-654-166	RL-4000, RLE-4000
52B	Spring Seat	18-658-143-247	RL-5000
53	Contact .531	18-727-825-002	
54	Spring	71-141-173-001	
55	Contact .38	18-727-825-001	
56	Spring	71-141-976-001	
60	Pin	18-750-059-002	RL-3200
60A	Pin	18-750-059-003	RL-4000, RLE-4000
60B	Pin	18-750-059-007	RL-5000
61	Arcing Contact	18-727-729-502	
62	Main Contact	18-727-729-503	
62A	Main Contact	18-732-790-598	All RLE, RL-5000
63	Spacer	18-755-707-004	
64	Spacer	18-755-707-008	
65	Spacer	18-747-707-005	RL-4000, RLE-4000
65A	Spacer	18-755-707-006	RL-5000
67	Washer	00-651-027-357	RL-3200
68	Support	18-657-940-150	
69	Sichsl	00-000-401-141	
1	Pin	18-657-937-279	RL-3200
71 A	Pin	18-657-937-280	RL-4000, RLE-4000
71 B	Pin	18-658-143-253	RL-5000
72	Washer	18-657-941-295	
73	Spacer	18-755-707-001	
75	Nut	15-171-063-017	
76	X Washer	00-659-055-250	
77	Pushrod	18-398-288-008	
78	Screw (Spec.)	18-657-937-268	
79	Washer	00-651-027-170	
80	Nut	00-631-143-205	
81	Spring	18-657-823-358	
82	Spring	71-141-799-001	
83	Spring Seat	18-657-822-184	
84	Spring Seat	18-657-822-196	
147	Barrier Sup	18-657-963-214	
148	Barrier	18-734-619-002	RL-3200
148A	Barrier	18-734-619-003	RL-4000, RLE-4000
148B	Barrier	18-734-619-004	RL-5000
149	Screw	15-171-074-010	
150	Lockwasher	00-655-067-060	

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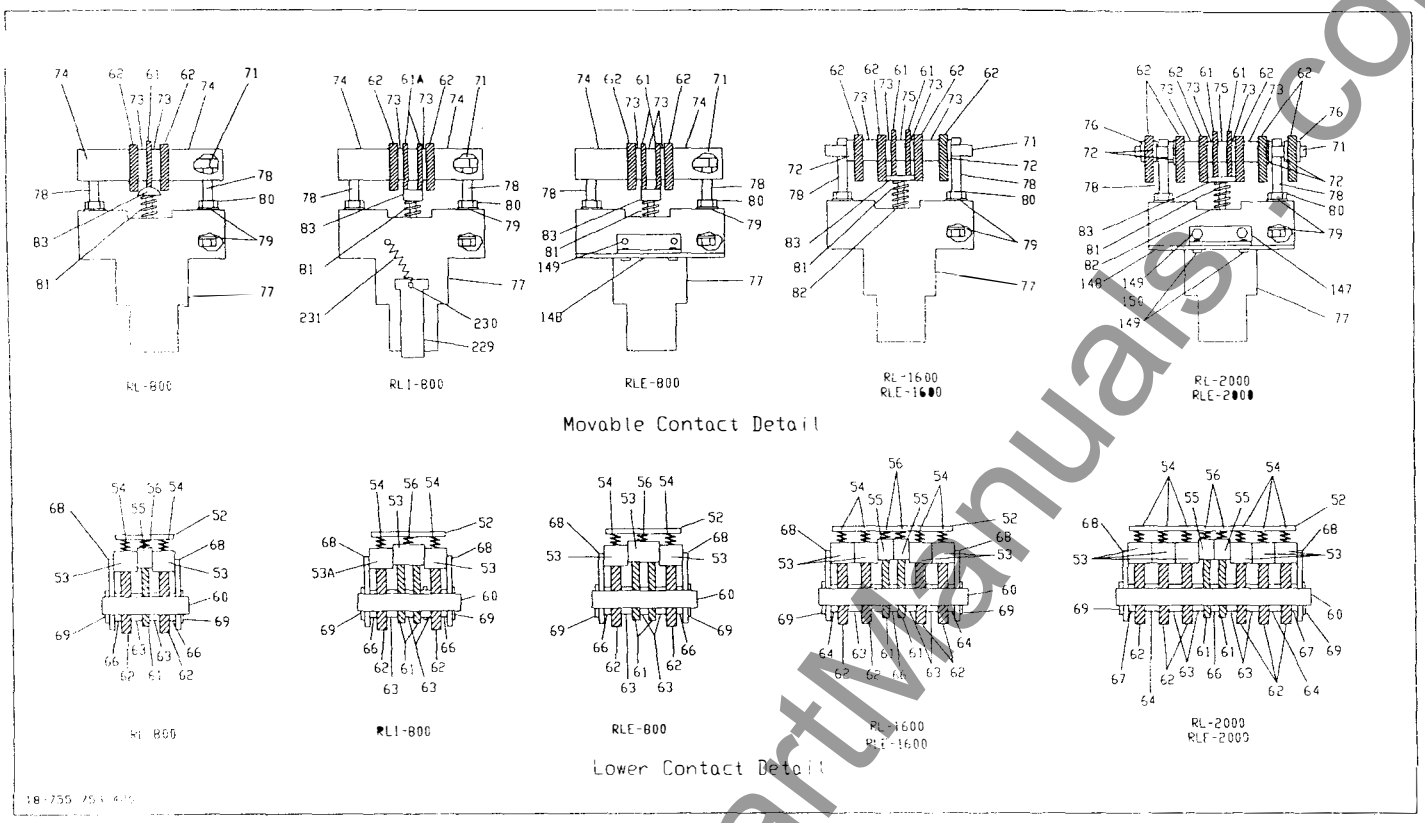

Figure 20. Contacts RL-800 thru RLE-2000

Refer to **Figure 20**

Item	Description	Part Number	Usage
52	Spring Seat	18-657-938-303	RL, RLE & RLI-800
52A	Spring Seat	18-657-938-304	RL-1600
52B	Spring Seat	18-657-938-305	RLE, RLE-2000
53	Contact .531	18-727-825-002	
53A	Contact	18-727-825-005	RLE & RLI-800
54	Spring	71-141-173-001	
55	Contact .38	18-727-825-001	
56	Spring	71-141-976-001	
60	Pin	18-750-059-005	RL, RLE & RLI-800
60A	Pin	18-750-059-001	RL & RLE-1600
60B	Pin	18-750-059-006	RL & RLE-2000
61	Arcing Contact	18-727-729-502	
61A	Arcing Contact	18-727-729-505	RLI-800
62	Main Contact	18-727-729-503	
62A	Main Contact	18-732-790-598	All RLE
63	Spacer	18-755-707-004	
63A	Washer	00-651-017-357	RLI & RLE-800
64	Spacer	18-755-707-007	RL & RLE-1600
64A	Spacer	18-755-707-008	RL & RLE-2000
66	Spacer	18-755-707-006	
67	Washer	00-651-027-357	RL & RLE-2000
68	Support	18-657-937-261	
69	Sichsl	00-000-401-141	
71	Pin	18-657-922-147	RL-800 thru RL-1600
71A	Pin	18-657-937-278	RLE-2000, RL-2000
72	Washer	18-657-941-295	RL-1600 thru RLE-2000
73	Spacer	18-755-707-001	RL-800 & RL-1600 thru RLE-2000
73A	Washer	00-651-027-286	RLI & RLE-800
74	Pin Cover Spacer	18-657-765-368	RL, RLI & RLE-800
75	Spacer	18-755-707-003	RL-1600 thru RLE-2000

Item	Description	Part Number	Usage
76	Sichsl	00-000-401-141	RL-2000
76A	X-Washer	00-659-055-250	RLE-2000
77	Pushrod	18-398-288-056	**(Note 2)**
77A	Pushrod	18-398-288-054	RLI-800 **(Note 2)**
78	Screw (Spec.)	18-657-937-268	
79	Washer	00-651-007-910	
80	Nut	00-631-143-205	
81	Spring	18-658-110-147	**(Note 2)**
82	Spring	18-657-903-282	RL-1600, RLE-1600 RL-2000 **(Note 2)**
82A	Spring	71-141-799-001	RLE-2000 **(Note 2)**
83	Spring Seat	18-658-145-239	RL-800, RLE-800 **(Note 2)**
83A	Spring Seat	18-657-939-170	RL-1600 to RLE-2000 (Note 2)
83B	Spring Seat	18-658-583-522	RLI-800 **(Note 2)**
84	Washer	00-651-027-170	
147	Barrier Support	18-657-963-214	RL-2000, RLE-2000
148	Barrier	18-734-619-001	RL-2000, RLE-2000
148A	Barrier	18-658-110-120	RLE-800 Left
148B	Barrier	18-658-110-121	RLE-800 Center
148C	Barrier	18-658-110-122	RLE-800 Right
148D	Barrier	18-658-110-285	RLI-800
149	Screw	15-171-074-010	RLE-800, RL-2000 RLE-2000
150	Lockwasher	00-655-067-060	RLE-800, RL-2000 RLE-2000
229	Latch Box	18-732-790-529	RLI-800
230	Cotter Pin	00-671-195-197	RLI-800
231	Spring	18-658-110-175	RLI-800

Note 1: For RLE-800 manufactured prior to April, 1992, if replacing main contact 62A, replace all contacts 62A for the affected phase, along with contacts 46A **(Figure 17)**. Order replacement kit 18-658-669-822.

Note 2: Items 77, 81, 82, and 83 must be replaced together.

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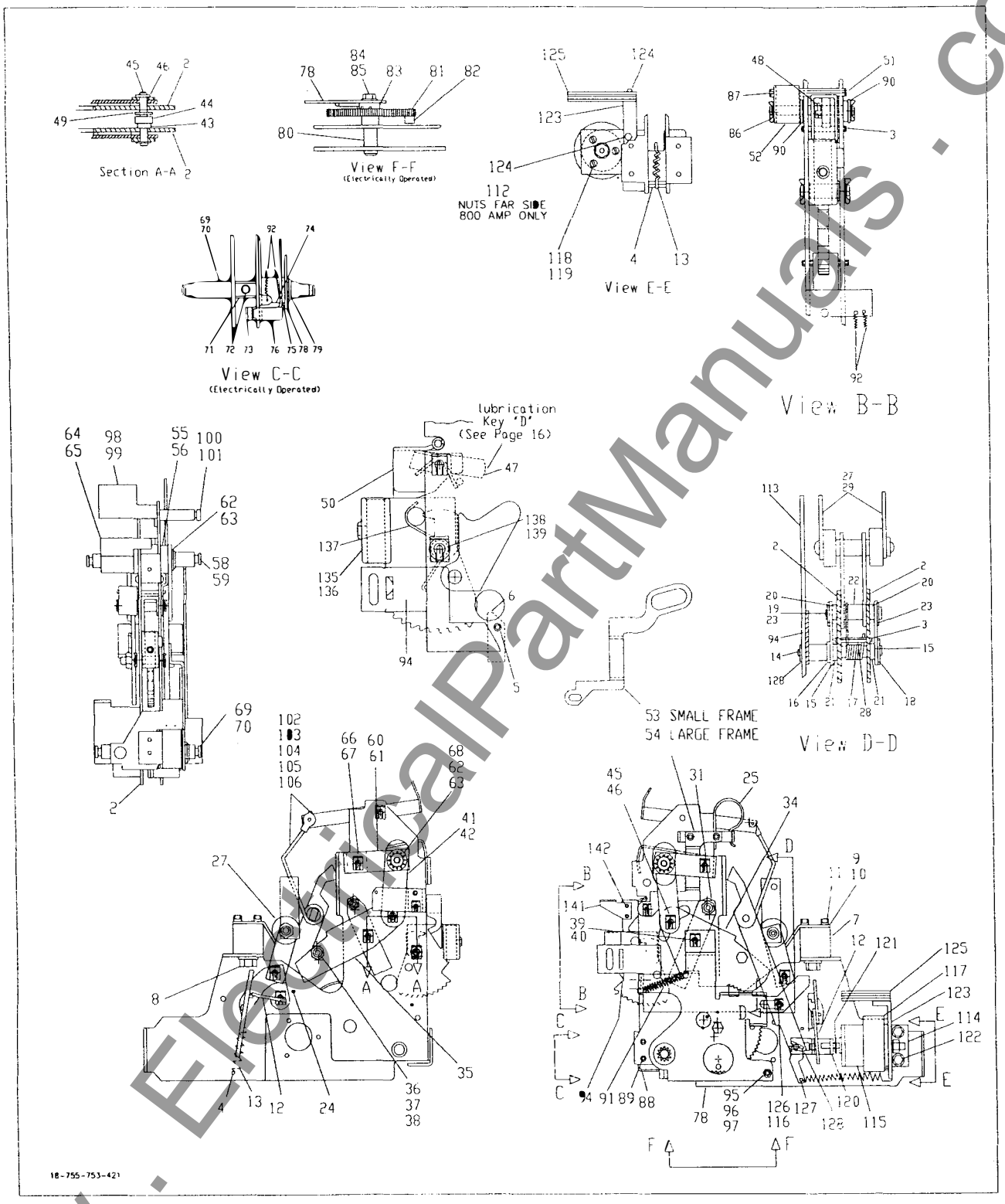

Figure 21. Operator

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