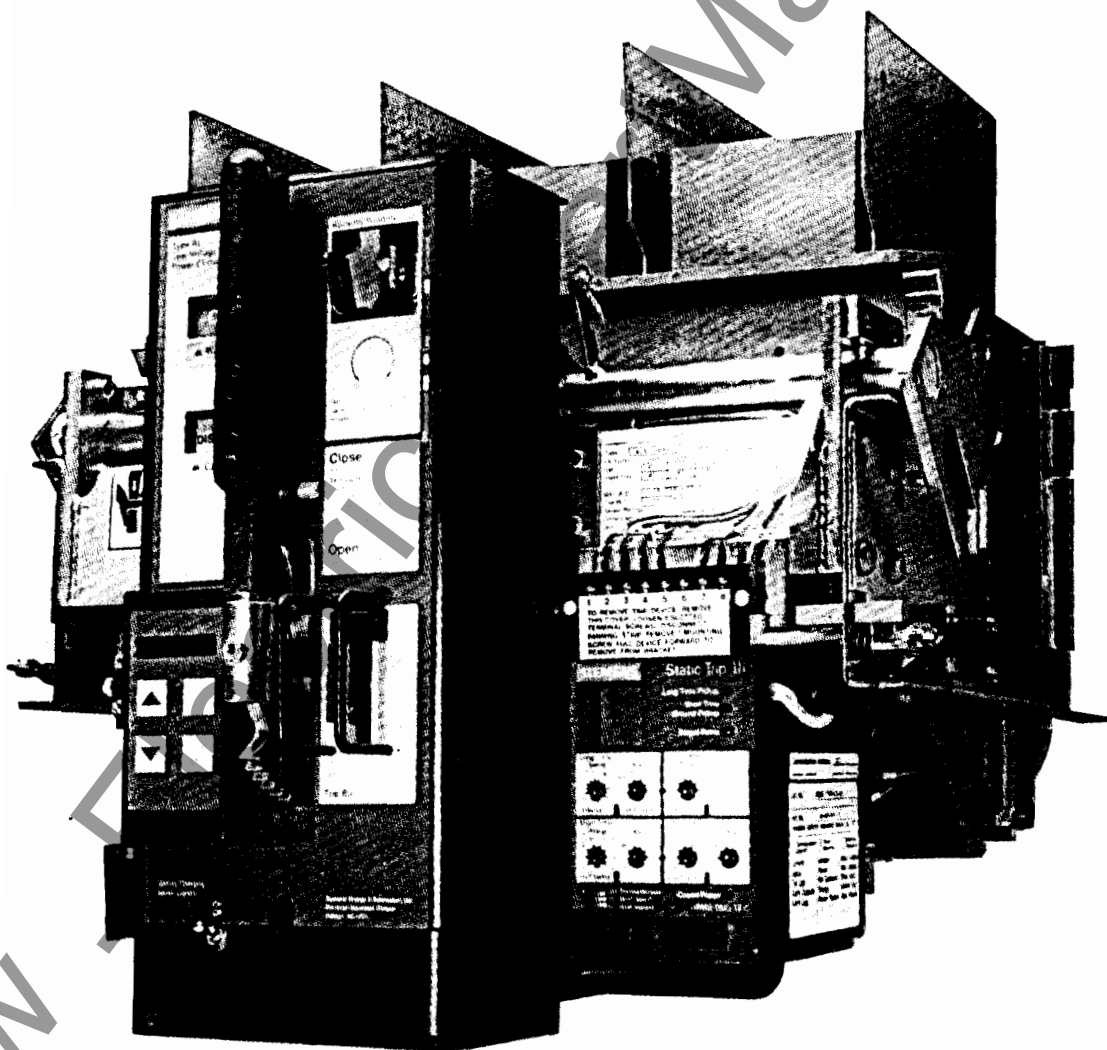


SIEMENS

Type RL Low Voltage Circuit Breakers

Information and Instruction Guide





⚠ DANGER

Hazardous voltages and high-speed moving parts.

Will cause death, serious personal injury or equipment damage.

Always de-energize and ground the equipment before maintenance. Maintenance should be performed only by qualified personnel. The use of unauthorized parts in the repair of the equipment or tampering by unqualified personnel will result in dangerous conditions which will cause severe personal injury or equipment 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 a qualified person is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

- (a) **is trained and authorized** to 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.

SUMMARY

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, listed on back of this instruction guide.

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.

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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 Amps. 3200		Serial Number R-88888A-2	
Mode of Operation:	Electrical	Manual		
Instruction Manual SG-3068-02				
	<u>Fig.</u>	<u>Item</u>	<u>Description</u>	<u>Part Number</u>
	15	6c	Apron	18-732-791-505
	23	147	Pushrod	18-657-768-036
	29	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 or sketch required part.
4. Include breaker type, rating and breaker serial number with your order.
5. Place order with your Siemens representative.

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 this option to mount.

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 the pivot pin is retained by a chain. After charging the closing springs, the handle must be manually returned to the vertical position to allow closing the breaker.

Electrically Operated Interlock

These devices amount to 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 devices are available for 48, 125 or 250 VDC as well as for 120 or 240 VAC. They are similar in construction and mount in the same location as the undervoltage trip device. The electrical 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 no adjustments for pick-up or drop-out voltages of the device. The devices are designed to be energized continuously.

Undervoltage Trip Device Option

This device automatically trips the circuit breaker on loss of voltage. Either instantaneous or time-delay operation can be supplied. A .06 inch (1.5mm) gap should be maintained between flap extension and pull link when the device is energized. The pick-up and drop-out is set so that the device picks up at a voltage of 85% or less and drops out between 30 and 60% of rated value. The devices are available for 24, 48 or 125 VDC and for 120 VAC.

Note: Pick-up and drop-out are individually adjustable. Time delay is adjustable from .04 to 3 seconds (maximum 2 seconds on 24 VDC version).

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

The Static Trip III device mounts onto a slide-type bracket on the circuit breaker. To remove 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 terminal block 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. Just pull the trip device towards the front of the circuit breaker. See "Static Trip III Information and Instruction Guide", SG-3118.

Bell Alarm Switch Option

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 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 reclosing after a fault.

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.

Fuse Carriage

3. Remove the safety barriers of the fuse carriage to allow access to the main power fuses. Disconnect the two small (No. 14 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.
4. 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 reclose the circuit breaker for the next test. Repeat the test for each of the three phases.
5. Replace the trigger fuses. Reconnect the two wires to the top of each fuse terminal, and replace the safety barriers and covers, before racking the units back to the connected position.

Maintenance

Occasional checking and cleaning of the circuit breaker and fuse carriage will promote long and trouble-free service. A periodic inspection and servicing should be included in the maintenance routine.

Refer to the Maintenance Section, **Page 10**, for recommended inspection and maintenance procedures applicable to RLF fused circuit breakers and to RFC fuse carriages.

Fuse Carriage

ment 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 reclosed 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 Chase-Shawmut Type TI-600 trigger fuses in the indicator.

Key Interlock System (See Figures 12 and 13)

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

Once the circuit breaker is open the key 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 CONNECTED positions.



Figure 12. Key Interlock Mounted in Circuit Breaker Compartment

Testing Open Fuse Trip Attachment

The open fuse trip attachment is operated by the voltage developed across the open fuse. 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.

⚠ WARNING

Hazardous voltage.
Can cause death, severe 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 is in CONNECT position.

1. Open the circuit breaker and rack it to its TEST 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.

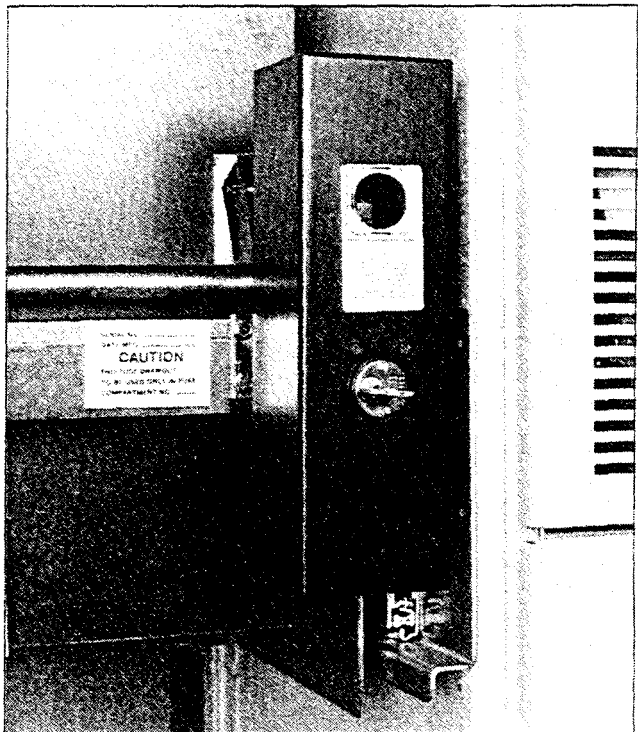


Figure 13. Fuse Carriage Key Interlock


Fuse Carriage

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 made with a key interlock that requires that they be used in specific compartments. 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 CONNECTED position. Also close compartment door prior to closing the circuit breaker when in this CONNECTED position. Once the circuit breaker is closed, keep the door closed.
7. Once the circuit breaker and fuse carriage are energized, they should not be touched, except for the exterior controls.

Installation Sequence

	⚠ DANGER
	<p>Heavy weight overhead. Can cause death, personal injury or property damage</p> <p>Always use approved lifting means to handle circuit breakers or fuse carriages. Follow instructions for use of lifting bar assembly. Avoid excessive speeds and sudden stops. Never lift a circuit breaker or fuse carriage above an area where personnel are located.</p>

1. Take the key for the FUSE CARRIAGE from its associated CIRCUIT BREAKER compartment.
2. Using the proper lifting equipment and following the instructions Step 4 (photo sequence A-D) 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 clevis engages the pins in the compartment.

Use the racking crank to rotate the racking screw in a clockwise direction until the fuse carriage reaches its CONNECTED 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 lifting equipment, insert the circuit breaker into its compartment. Push the circuit breaker until the racking clevis engages the cubicle pins. See Instructions Step 4 (photo sequence A-D) (Page 5).
6. Close and trip the circuit breaker. Refer to OPERATING PROCEDURE, Pages 6-9 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. Then refer to Operation, Pages 6-9 of this manual 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. Draw out circuit breakers are equipped with a drawout interlock to prevent movement of a closed circuit breaker into or out of the connected 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 21) 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 21.)
10. Close the compartment door. Rack the circuit breaker into its connected position. Remove the racking crank, close the racking window, and check that the open fuse trip attachment is reset. The circuit breaker can now be operated in its normal manner.
11. To remove the Circuit Breaker/Fuse Carriage reverse the above procedures.


Fuses

Only special purpose fuses per Siemens drawing number 71-142-200 can be used with the circuit breaker/fuse carriage combination. Fuses of different manufacture will not mount 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

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 attach-

	⚠ WARNING
	<p>Hazardous voltage. Can cause death, severe personal injury, electrical shock burns or property damage.</p> <p>Line voltage may be present inside trigger fuse assembly. Do not remove trigger fuse cover when circuit breaker is in CONNECT position.</p>

Fuse Carriage

Introduction

Type RFC-3200 and RFC-4000 fuse carriages for use with Type RLF-3200 and RLF-4000 circuit breakers are furnished for mounting in metal-enclosed switchgear of the drawout type. (See **Figures 10** and **11**.) 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 unfused circuit breaker has a maximum continuous current rating of 3200 amperes, and an interruption rating of 65,000 amps symmetrical at 254,508 or 635 VAC when used without an instantaneous trip. It has an interruption rating of 85,000 amperes symmetrical at 254,508 or 635 VAC when used with instantaneous trip.

The basic RL-4000 unfused circuit breaker has a continuous current rating of 4000 amperes, and an interruption rating of 85,000 amperes symmetrical at 254,508 and 635 volts when used without instantaneous trip. The interruption rating is 130,000 amperes at 254 volts, and 85,000 amperes symmetrical at 508 and 635 volts, when used with instantaneous trip.

When used in conjunction with the separately mounted fuse carriage, the circuit breaker designation becomes RLF-3200 and RLF-4000. 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 symmetri-

cal 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-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 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.

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

1. Read this Instruction Book 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.

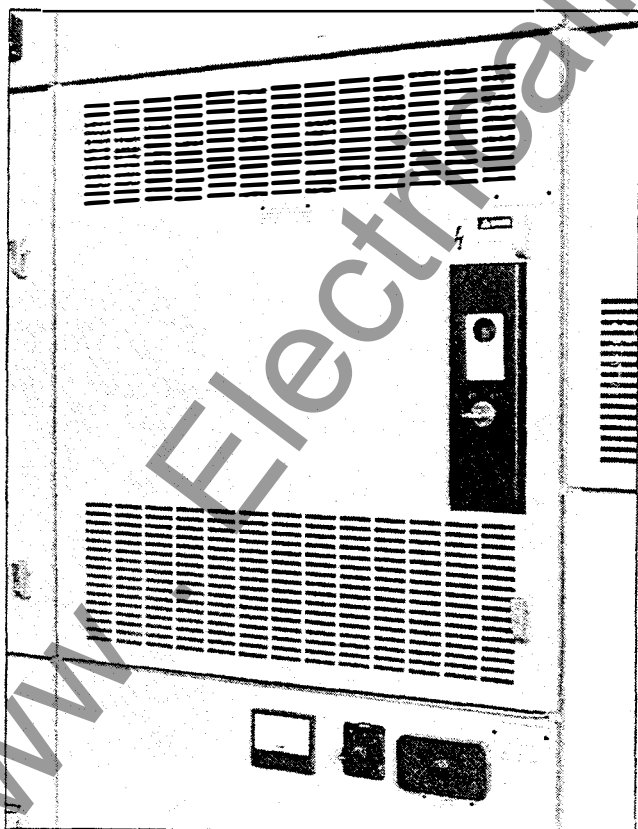


Figure 10. Fuse Carriage with Compartment Door Closed

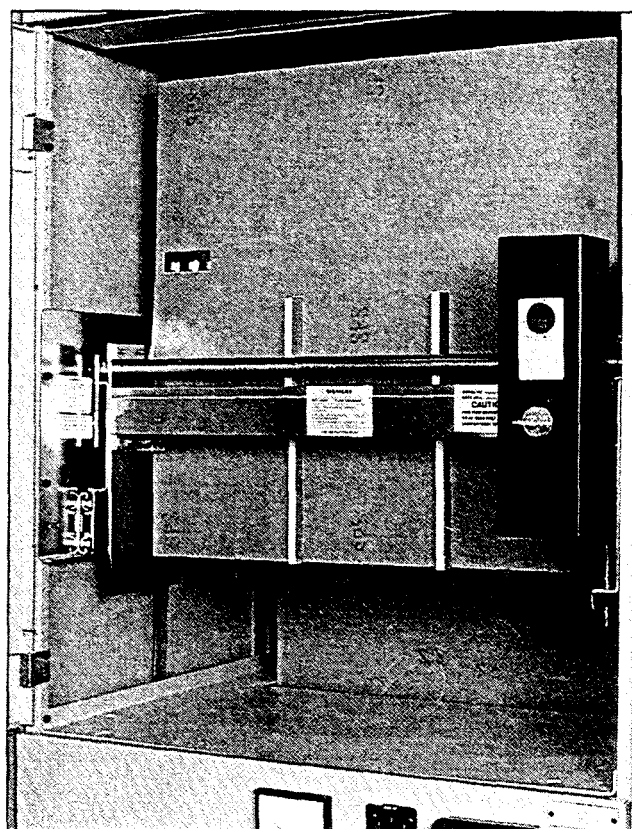


Figure 11. Fuse Carriage with Compartment Door Open

Fuse Functions

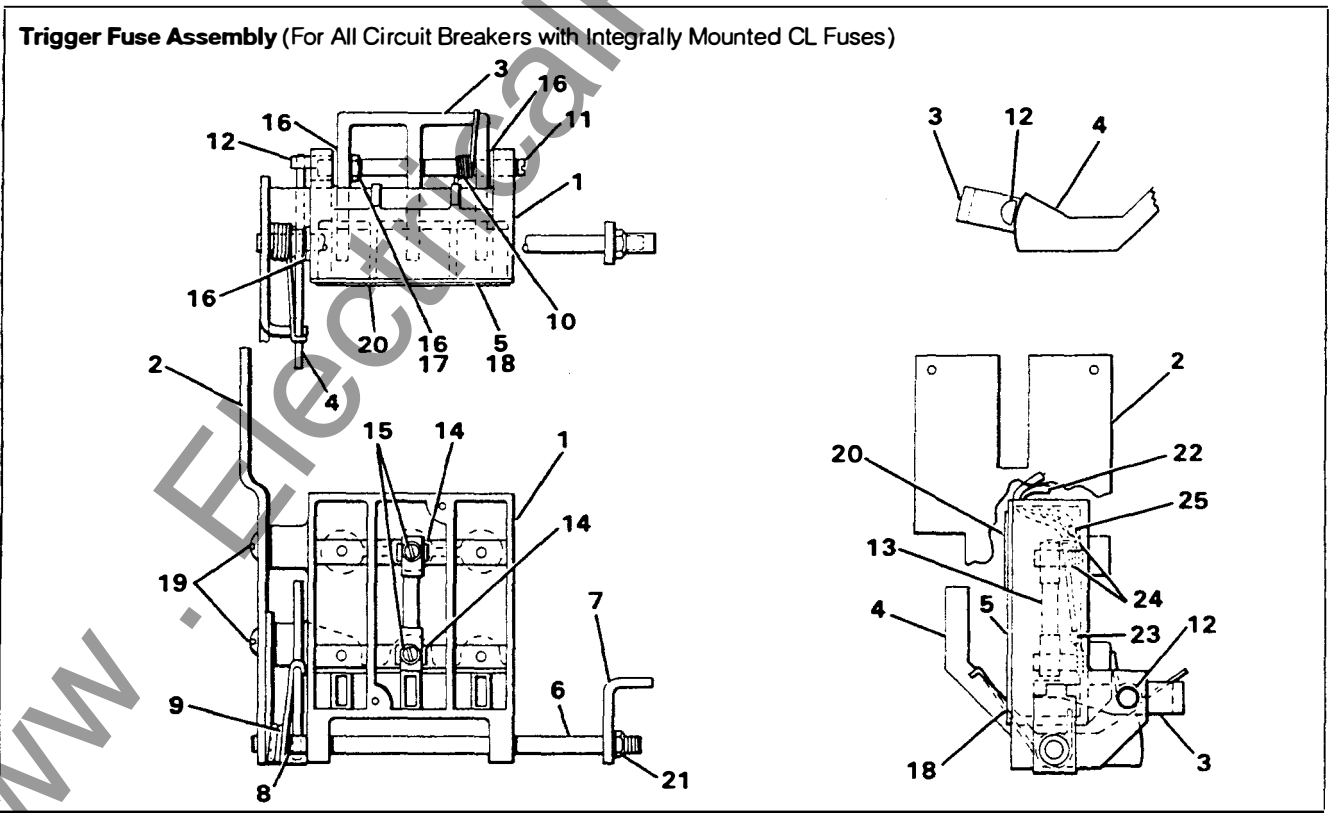
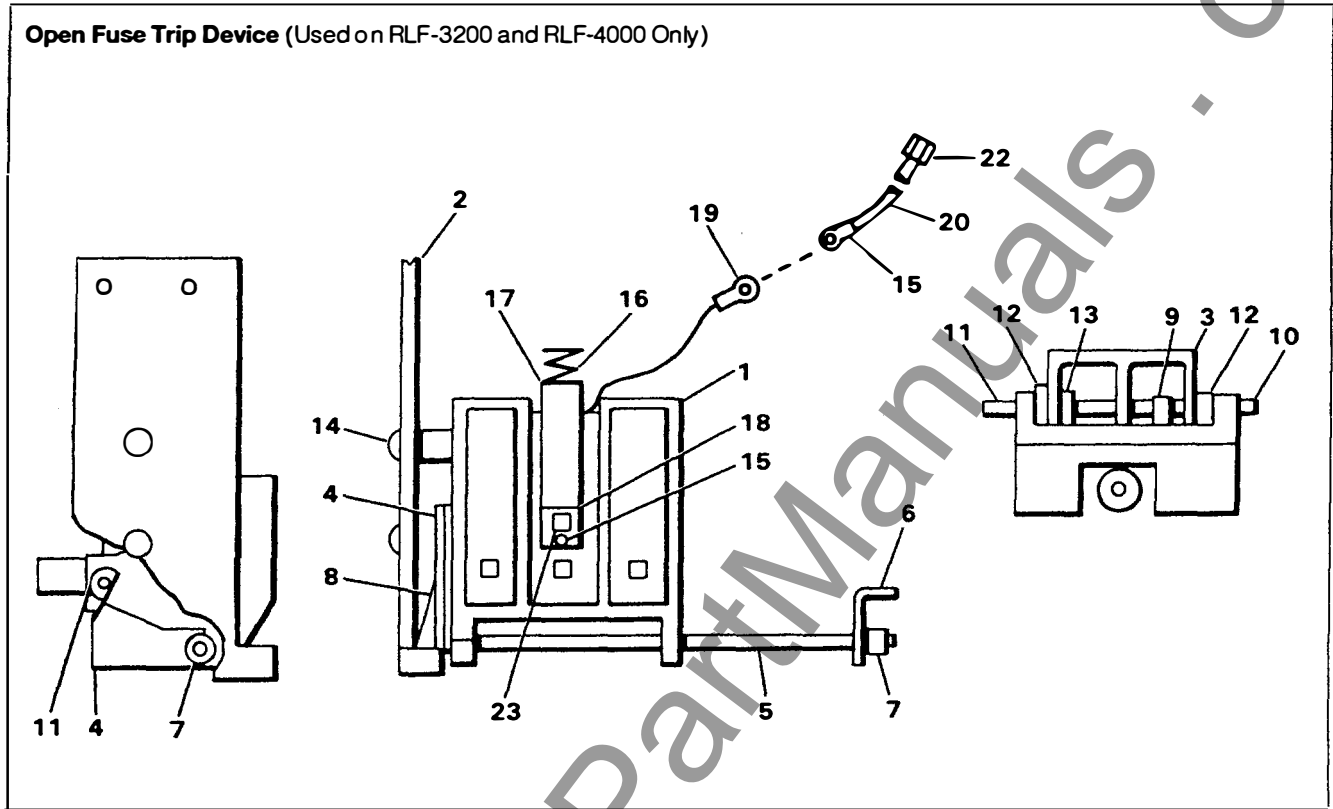


Figure 9. Open Fuse Trip Device, Trigger Fuse Assembly

Fuse Functions


Current Limiting Fuses

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

When fuse replacement is required, only use fuses per Siemens drawing 71-142-200 with 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 and RLF-4000 mount on a separate fuse drawout assembly. For complete description, see Fuse Carriage section on **Page 19**.

Open Fuse Trip Device

	⚠ WARNING
	<p>Hazardous voltage.</p> <p>Can cause death, severe personal injury, electrical shock burns or property damage.</p> <p>Line voltage may be present inside trigger fuse assembly. Do not remove trigger fuse cover when circuit breaker is in CONNECT position.</p>

The Open Fuse Trip mechanism has three functions:

1. To trip the circuit breaker mechanically when a C.L. fuse has interrupted.
2. To indicate which phase C.L. fuse has interrupted. The plunger of the trigger fuse (13), indicates visually which phase C.L. 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 C.L. fuses. When the C.L. fuse interrupts, its associated trigger fuse also opens and releases a plunger which releases a precompressed spring contained in the trigger fuse housing. On the small breakers, 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 the circuit breakers 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 insert 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 C.L. fuse before the breaker is reset.

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 Siemens contact lubricant (1) in a thin layer (approximately $\frac{1}{32}$ " thick)	
B	Sliding surfaces	Light application of Molycote 557 (2)	Wipe clean and apply Molycote 557 (2) Liberally
C	Pivot pins, rotating parts such as drive pinion, gear	Light application of Molycote Penelube (3)	Remove pins, clean, and apply Beacon P-325 (4)
D	Ground surfaces such as latches, rollers, props, etc.	Wipe clean and spray with Molycote 557 (2)	Wash clean and spray with Molycote 557 (2)
E	Faces of main and arcing contacts	Do not lubricate	Do not lubricate
F	Springs	Wipe clean and spray with Molycote 557 (2)	Wipe clean and spray with Molycote 557 (2)
G	Dry pivot points	No lubrication required	No lubrication required

- (1) Siemens contact lubricant: part number 15-171-370-002
 (2) Molycote 557 spray lubricant: part number 15-171-270-001
 (3) Molycote Penelube: part number 15-171-270-002

- (4) Beacon P-325: part number 15-337-131-001
 (5) For lubrication procedure and recommendations, refer to RECOMMENDED RL BREAKER MAINTENANCE AND LUBRICATION PROCEDURE LUBRICATION, on pages 10-11.

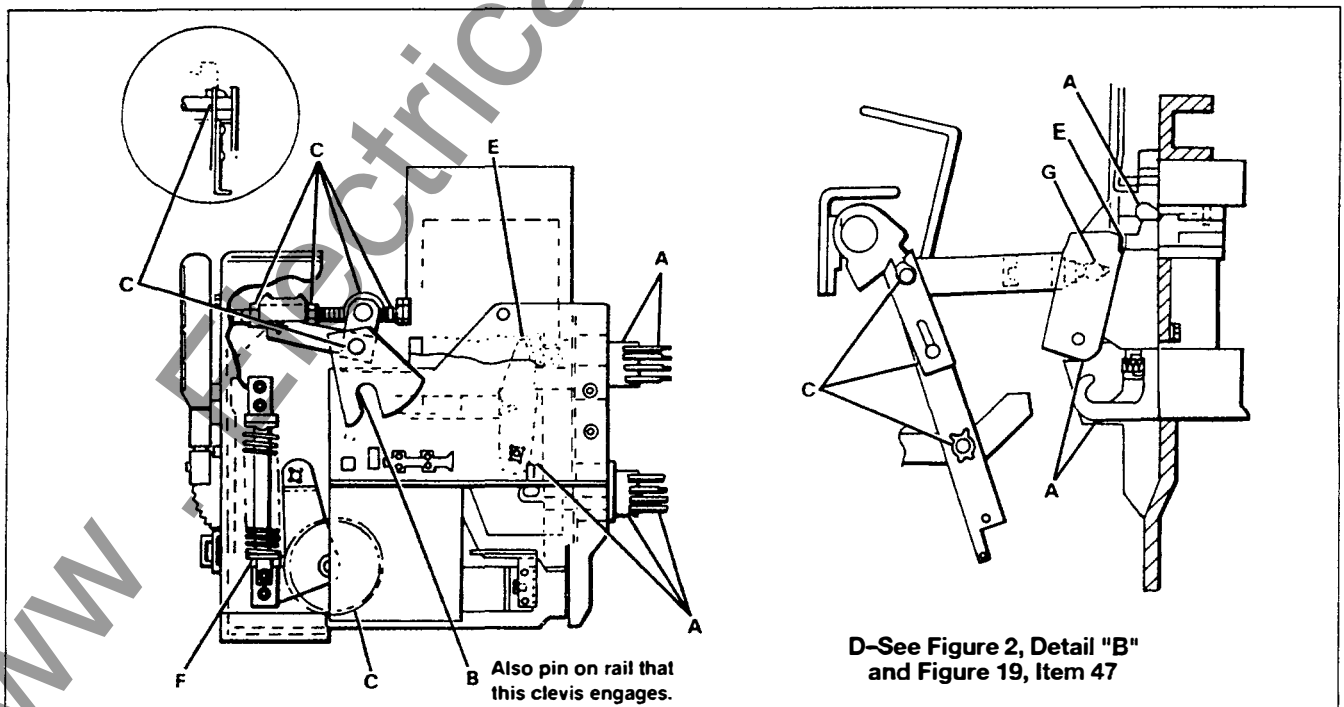


Figure 8. Lubrication Points on Breaker

Maintenance

Motor Cutoff Switches (For Electrically Operated Breakers) (See Figures 7a-7c)

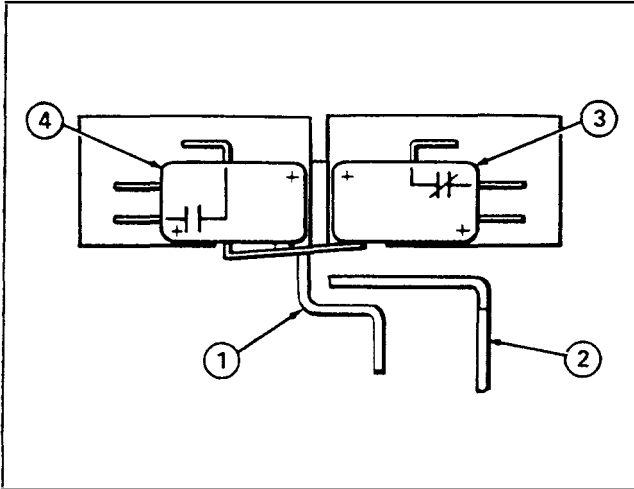


Figure 7a.

Position 1. Springs Discharged; Motor in Run Position.

(Note that Figures 7a-7c are depicted as viewed from below) In Figure 7a, note that spring position lever (1) is forward, actuating both switches. Motor/gear position (2) lever 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.

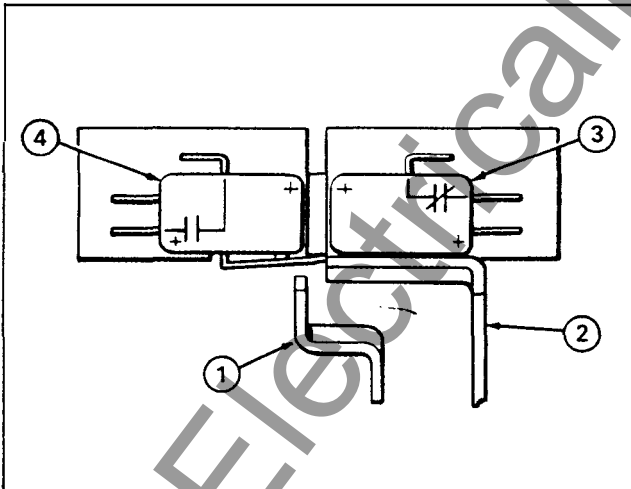


Figure 7b.

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.

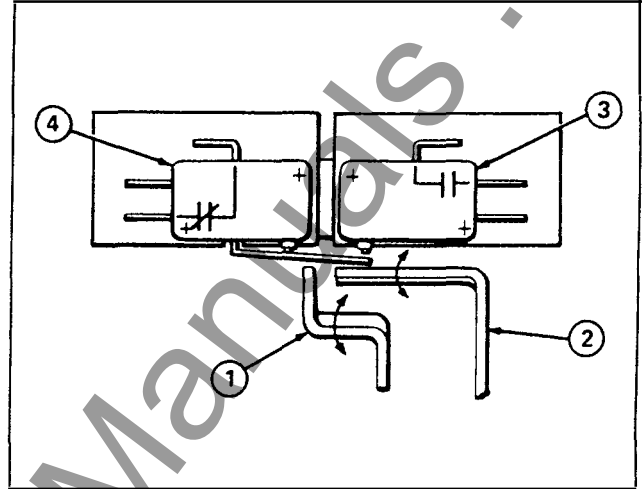


Figure 7c.

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 No. 1 position.

Note: In position 3 there is clearance between both levers and the switch actuating leaf. Clearance may be minimal (approximately 1/64) or up to 1/16 inch (0.4-1.6mm). It is important to completely remove pressure from the switch actuating leaf to be sure that the switches are free to actuate. Adjustment is made by carefully bending the levers as indicated by arrows (Items 1 and 2). Do not bend the switch actuating leaf.

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 remove the gear motor.

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.

Maintenance

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.

For Static Trip III Devices

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

When the 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.

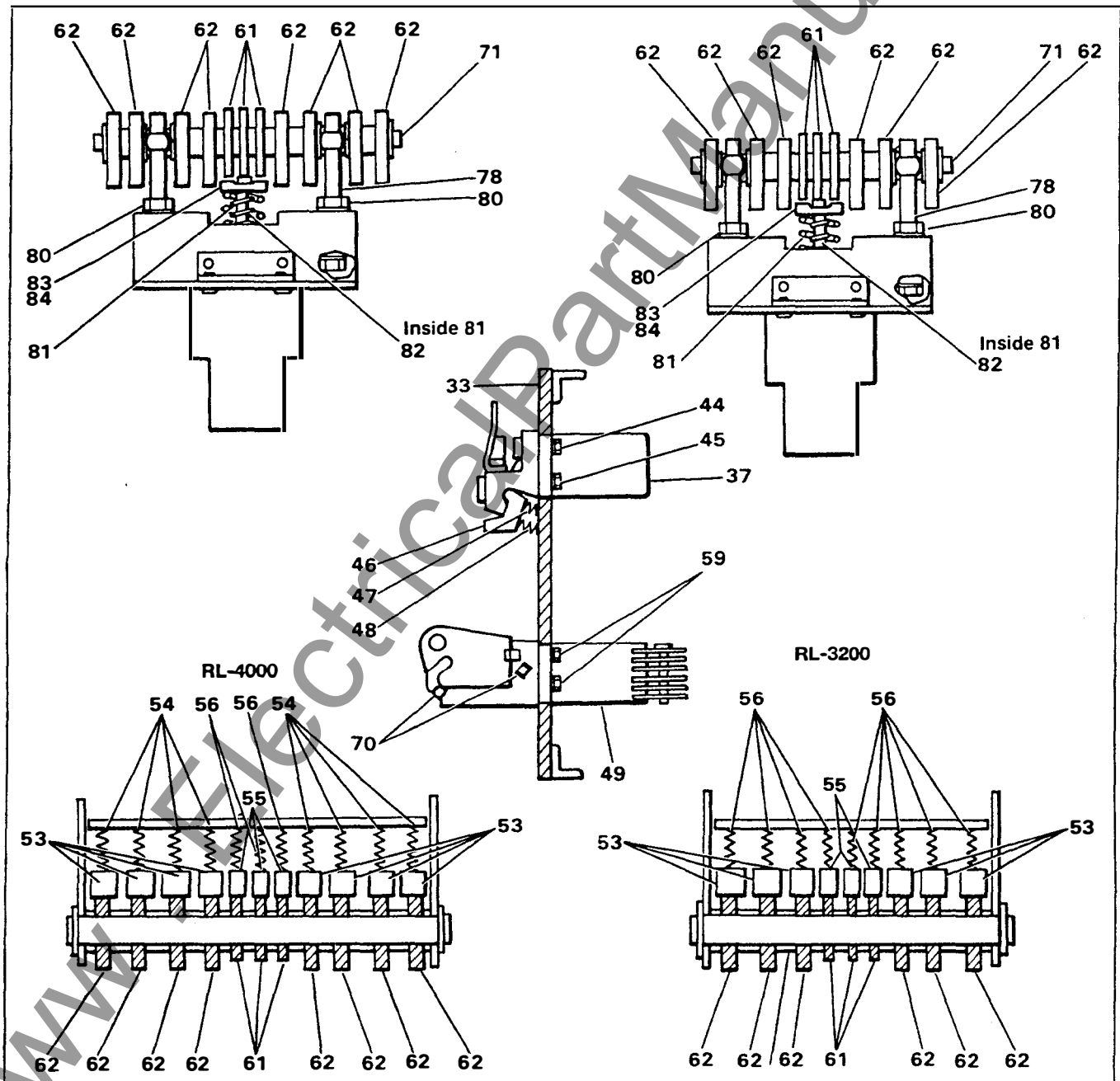


Figure 6. Contact Assembly

Maintenance

tightening the nuts against the stop washer (109), the two nuts (110) should be locked against each other.

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

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—the circuit breaker may suddenly latch fully closed and apply unexpected force to the charging handle.

Main Contact Make (See Figure 6)

Compression of the contact fingers (46) must be between .093" and .125" (2.4-3.2mm). This is the difference in the 1) measurement from the breaker base to the tip of the finger contact surface when the breaker is open, 2) the measurement in the same place when the breaker is closed. For RLE version breakers, the measurement is made .25" from bottom edge of the finger contact surface. This is checked with a normal closing operation—not maintenance closing. Adjustment is provided by positioning screws (78) after loosening nuts (80). Counterclockwise rotation of screws (78) increases compression. Care should be taken to retighten nuts (80) after adjustment. 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.

Arcing Contact Make (See Figure 6)

With the movable arcing contact (61) in any one phase touching the mating stationary contact when the circuit breaker is closed by the maintenance closing method (see Table 4), the phase-to-phase variation should not exceed .062" (1.6mm). Adjustment may be made by positioning screws (78) as in the previous paragraph. It is essential that the main contact compression be maintained within the tolerance listed in the previous paragraph. Arcing contact pressure should be between 20 and 40 pounds (9.1-18.2 kg) when checked with a pull-type spring scale at the base of the arcing contact tip insert with the circuit breaker contacts closed. Measure the pressure on each blade separately.

Contact Replacement (See Figure 6)

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 6)

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 16, Page 30), may be removed from each phase and the circuit breaker tipped to rest on the ends of connectors (37) and (49). 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 6)

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 15, Page 28). By removing pin (98 and 99 Figure 16, Page 30) the entire assembly can be lifted out.

Hinge Contact Fingers (See Figure 6)

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

Remove backpanel. Remove lower connector (49) and moving contacts by removing screws (59). The 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 aids the operation.

Movable Arcing and Main Contact (See Figure 6)

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 movable arcing contact or main contact may now be replaced. Compress spring (81, 82) to engage screws (78). The reverse procedure is followed for reinstallation. 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. It contains a coil that is energized by the output of the trip device. When energized, the coil 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 arma-

Maintenance

9. Clean any accumulation of dust or dirt from the circuit breaker. For insulating parts, use a clean cloth saturated with a non-toxic cleaner, such as denatured alcohol.
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**.)
11. Perform a maintenance closing operation 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 12**.)
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 on the bottom). Examine the operation of the circuit breaker during these operations for any evidence of difficulty, erratic operation, etc.
14. Test the tripping system, using an appropriate test set, such as the Siemens Portable Static Trip Set, model PTS-4. Refer to "Static Trip III Information and Instruction Guide", SG-3118 and "Portable Test Set Instructions", SG-3138 for information on testing. The test should in-

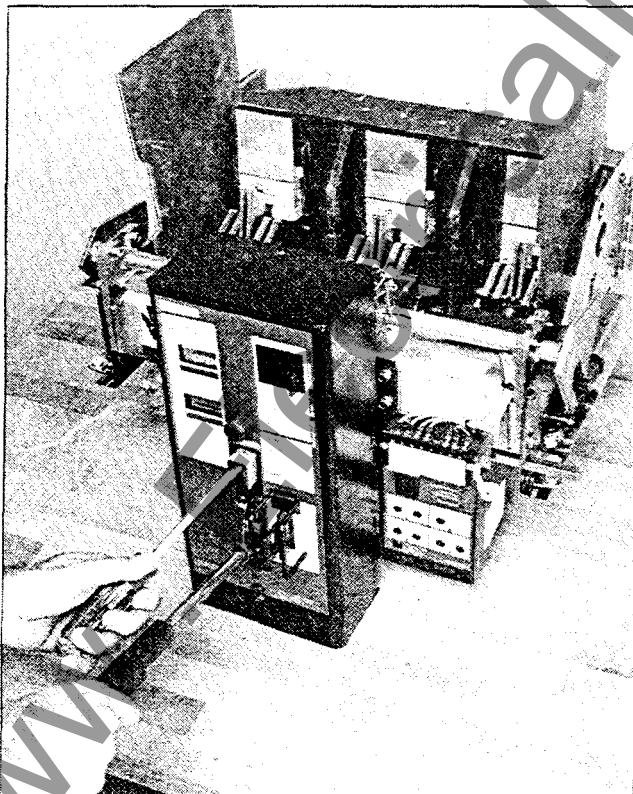


Figure 5. Maintenance Closing

Table 4. Maintenance Closing

Operation	Procedure
Closing Contacts	<ol style="list-style-type: none"> 1. Verify that racking mechanisms is in TEST position. 2. Pull charging handle DOWN ALL THE WAY (approximately 120°) 3. Place blade of screwdriver between hood and spring release latch and hold it in DOWN position. 4. Slowly return handle to vertical position. Observe contact, touch, mechanical operation, etc.
Opening Contacts	Push in manual trip rod.

clude tripping of the circuit breaker by the trip device. This confirms the functionality of the system, including the trip device and the tripping components.

15. Reinstall arc chutes. Close and open the circuit breaker to ensure that the arc chutes do not interfere with circuit breaker operation.
16. Turn the racking screw to the DISCONNECTED position, and reinstall the circuit breaker in the cubicle.
17. Log the details of the maintenance into a suitable record of circuit breaker maintenance for future use.

Maintenance Closing

Note: Holding the spring release latch down prevents the stored-energy springs from propping in the charged position. Thus, when the handle is slowly returned to the normal vertical position, the energy in the springs is slowly released against the closing handle assembly.

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 charging 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 operations is the same for both the electrically operated and the manually operated circuit breaker. Refer to **Figure 5** and **Table 4**.

Adjustments

After the circuit breaker is installed in the cubicle, and before attempting to operate, the connected position alignment must be checked. Two stop nuts are provided on the racking screw to set the connected position. These are adjusted by setting the angle of the racking clevis, as shown in **Figure 4**, and by

Maintenance

Table 3 Inspection and Maintenance Intervals

Frame Size Amperes	Inspection Interval All Type RL Breakers		Maintenance & Lubrication Interval		Overhaul Interval
	Check & Exercise Tripping System	Check & Exercise Circuit Breaker Mechanism	RL built before 6/91 (Number of operations or time, whichever occurs first)	RL built 6/91 or later (with "LM" in type designation)	All Type RL Breakers (Number of operations)
800	Annually	Annually	1750 operations/ 1 year	5 years	12500 operations
1600	Annually	Annually	500 operations/ 1 year	5 years	4000 operations
2000	Annually	Annually	500 operations/ 1 year	5 years	4000 operations
3200	Annually	Annually	250 operations/ 1 year	5 years	1500 operations
4000	Annually	Annually	250 operations/ 1 year	5 years	1500 operations

(1) Any circuit breaker which has interrupted a heavy fault current should be inspected according to the recommended procedure for maintenance and lubrication. * "LM" indicates Low Maintenance RL Breaker produced beginning June, 1991.

SIEMENS

Type	<input type="text"/>	LM	Serial No.	<input type="text"/>
kA Symm.	635V	508V	254V	Control Voltage
Inst.	<input type="text"/>	<input type="text"/>	Motor	<input type="text"/>
Short Time	<input type="text"/>	<input type="text"/>	Close	<input type="text"/>
Brkr. W/D	<input type="text"/>	<input type="text"/>	Trip	<input type="text"/>
Trip W/D	<input type="text"/>	<input type="text"/>	Fr. Size	<input type="text"/>
Sensor Ratings:	<input type="text"/>	<input type="text"/>	Freq.	<input type="text"/>
Current Sensors	<input type="text"/>	<input type="text"/>	Mfg. Date	<input type="text"/>
Grd. Sensors (when used)	<input type="text"/>	<input type="text"/>	Inst Book	SG 3068

Siemens Energy & Automation, Inc., Raleigh, NC Made in U.S.A.

- 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 SD15. 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.
- 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", SG-3138 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.
- Clean any accumulation of dust or dirt from the circuit

breaker. For insulated parts, use a clean cloth saturated with a non-toxic cleaner, such as denatured alcohol.

- Turn the racking screw to the DISCONNECTED position, and reinstall the circuit breaker in the cubicle.

Recommended RL Breaker Maintenance and Lubrication Procedure

A suggested procedure to follow during maintenance and lubrication sessions:

- De-energize the primary and control circuits.
- With the cubicle door closed, rack the circuit breaker to the DISCONNECTED position.
- Open the cubicle door, and remove the circuit breaker from the cubicle.
- 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.
- Remove arc chutes and examine arc chutes and circuit breaker contacts for burned, cracked, or broken parts. To remove arc chutes, proceed as follows:
 - Remove mounting screws for holding clips, remove bar and phase barriers.
 - Lift arc chutes vertically to clear arc runners.
- Inspect arc chutes for excessively burned arcing plates. Replace arc chutes under the following conditions:
 - Copper-plated steel plates in the arc chutes measure less than 0.06" thickness for RL-800 through RL-2000 circuit breakers.
 - Copper-plated steel plates in the arc chute measure less than 0.08" thickness for RL-3200 and RL-4000 circuit breakers.
- Wipe the contacts with a clean cloth saturated with a non-toxic cleaning fluid, such as denatured alcohol.
- Replace badly burned or pitted contacts. (See Contact Replacement, Page 13, and Lubrication Instructions, Page 17.) Do not lubricate faces of contacts.

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 II and III, 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 manual should be reviewed and retained in a location readily accessible for reference during maintenance of this equipment.

The customer 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 operation 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, sections 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, and 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.

The 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 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 annually, and the circuit breaker should be inspected and exercised annually.

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

⚠ WARNING

Failure to maintain the equipment could 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:

- Annual Inspection
- Periodic Maintenance and Lubrication

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 Purchaser's purposes, the matter should be referred to the local Siemens sales office.

⚠ DANGER

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 all 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. They should be wiped with a thin film of Diester based synthetic lubricant, such as Beacon P-325 (Exxon).

Grease 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 of the main contact fingers, arcing contact fingers and hinge contact fingers are lubricated with a coating of Siemens contact lubricant, 15-171-370-002. If dust has accumulated, disassembly may be necessary to clean and relubricate these points. See Contact Replacement, **Page 13 and Lubrication Chart, Table 5.**

Recommended Annual RL Circuit Breaker Inspection Procedure

A suggested procedure to follow during Annual Inspections:

1. De-energize the primary and control circuits.
2. With the cubicle door closed, rack the circuit breaker to the DISCONNECTED position.
3. Open the cubicle door, and remove the circuit breaker from the cubicle.

⚠ DANGER

Hazardous voltages and high-speed mechanical parts.

Will cause death, severe personal injury or property damage.

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

Operation

clear. This releases the motor cut-off 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 (CSC). When the close circuit is energized, the "Y" relay is energized and opens the "Y" 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 (CSC) 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.

Drawout Interlock

A drawout circuit breaker mechanism includes:

1. Means to rack the circuit breaker in or out of the cubicle compartment.
2. Interlocks to prevent racking a closed circuit breaker into or out of any position.
3. Interlocks to prevent closing a circuit breaker until it is racked to the TEST or CONNECTED position.
4. Interlocks 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 rail, 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. With 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 clevis does engage the pins in 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 fully 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.

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

4. To withdraw the breaker from the CONNECTED position, rotate the racking screw counterclockwise.
5. Before attempting to operate the circuit breaker, the position of the device should be checked with reference to the holes in the cubicle, to be certain that it is fully connected. See adjustments, **Page 11** for proper procedure.

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

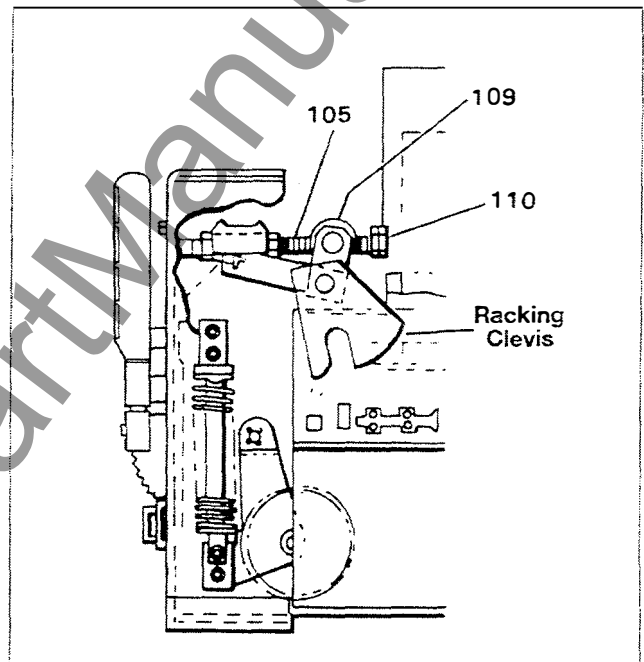


Figure 4. Detail of Typical Racking Mechanism and Drawout Interlock

Spring Discharge Interlock

When racking the circuit breaker out to the DISCONNECTED position, the closing springs will automatically discharge, at or before reaching the DISCONNECTED position. The barrel nut 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 DISCONNECTED position. For this reason, the manual charge handle must be in the vertical position during racking.

Note: The racking mechanism must be returned to the TEST position before closing springs can be charged (either in the cubicle or when removed from the cubicle).

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 normally in that position, and then rack out in the normal manner.

Operation

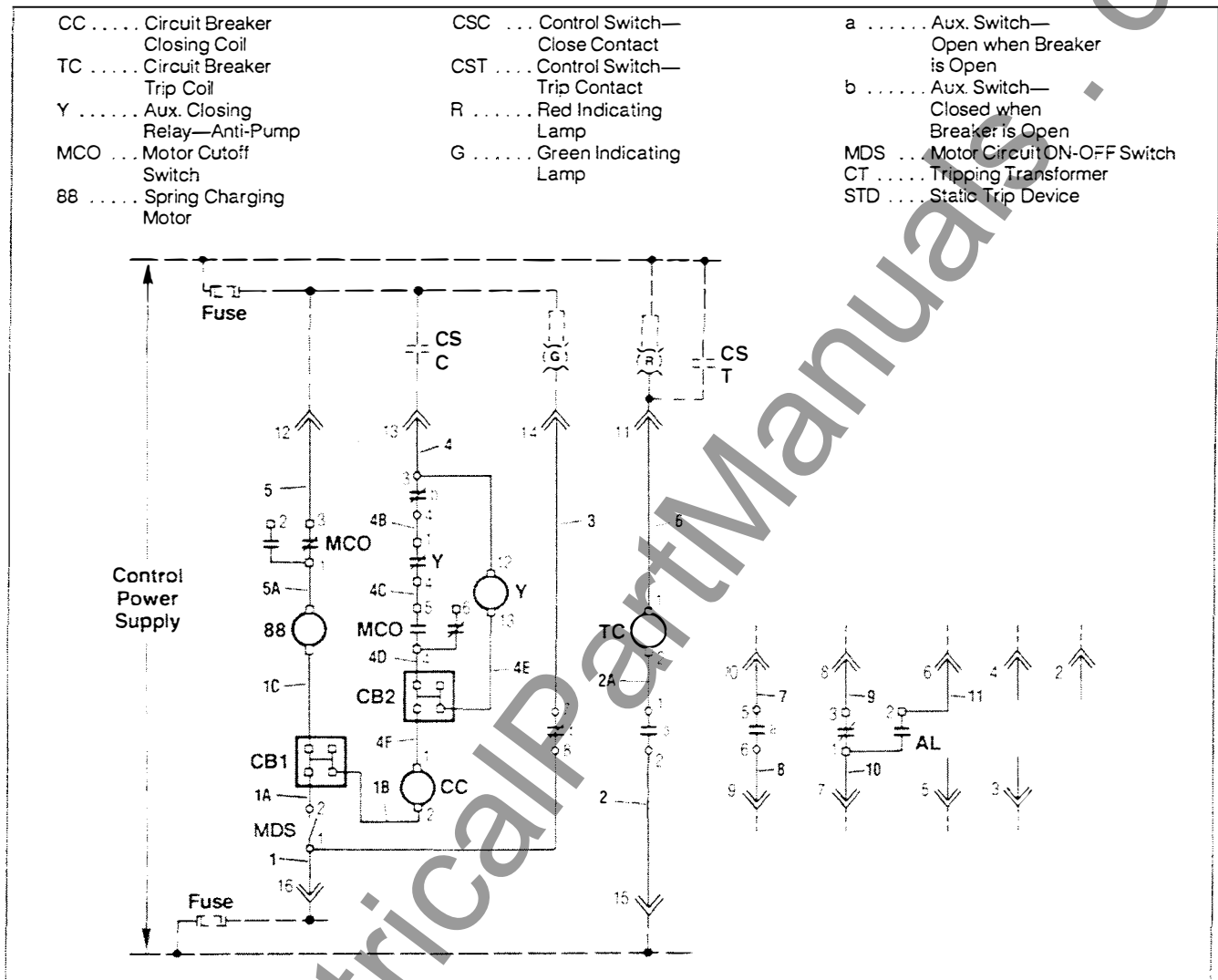


Figure 3. Typical Schematic—Electrically Operated Breakers
 Diagram Shows Breaker in Discharged and Open Position

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).

Electrically Operated Circuit Breaker

The mechanism of the electrically operated circuit breaker is the same as the manually charged 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) lifts lever (76)

Table 2. Operating Procedures Electrically Operated Circuit Breakers

Operation	Procedure
Charging Springs	Energize control circuit.
Closing	After springs are charged, actuate remote close control switch (CSC). OR Push down firmly on spring-release latch hood (50).
Tripping	Actuate remote trip control switch (CST). OR Push in manual trip rod (94).

Operation

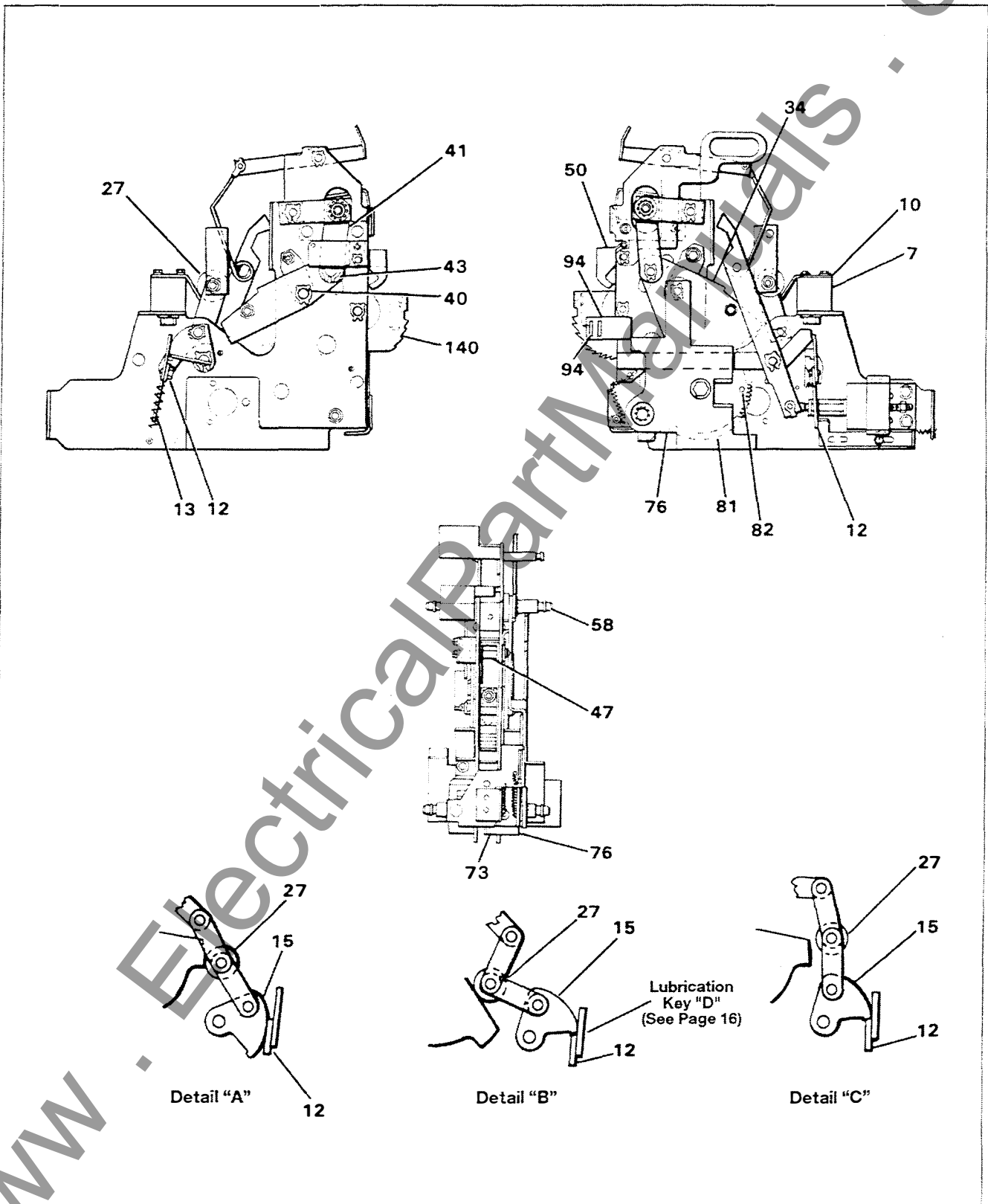


Figure 2. Circuit Breaker Operator

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 and 4000A 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, or RLF-4000. Fused circuit breakers are also 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 Guide before installing or making any changes or adjustments on the circuit breaker.
2. Stored-energy closing springs may be charged with circuit breaker contacts in either the open or closed position. Extreme care should be taken to discharge the springs before working on the circuit breaker.
3. When closing manually operated breakers out of the compartment, the racking mechanism must be returned to the test position before the closing spring 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 closing stroke 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 the shipment and handling.

7. Close the compartment door and secure door latch(s) 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 is energized, it should not be touched, except for the exterior controls.

Manually Operated 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 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 remote trip control switch (CST). (See Figure 3 .)

Movement of the charging handle downward rotates closing ratchet (140) against 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 away from the stop block (7). Then the toggle linkage is moved by 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 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).

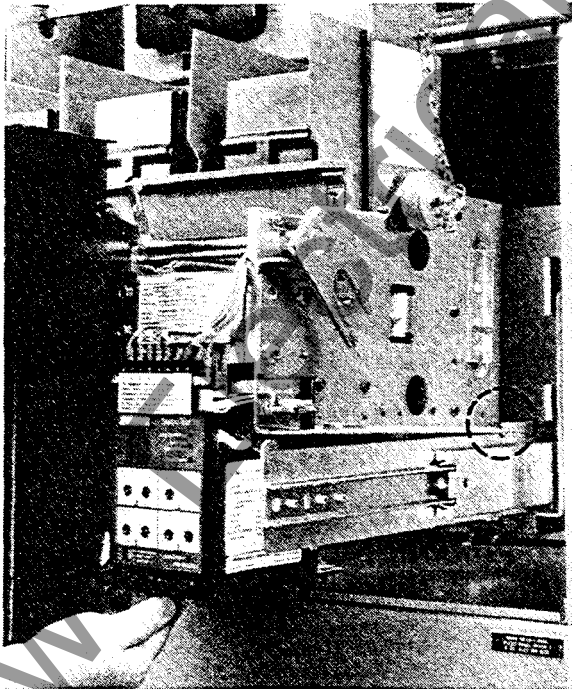
Installation



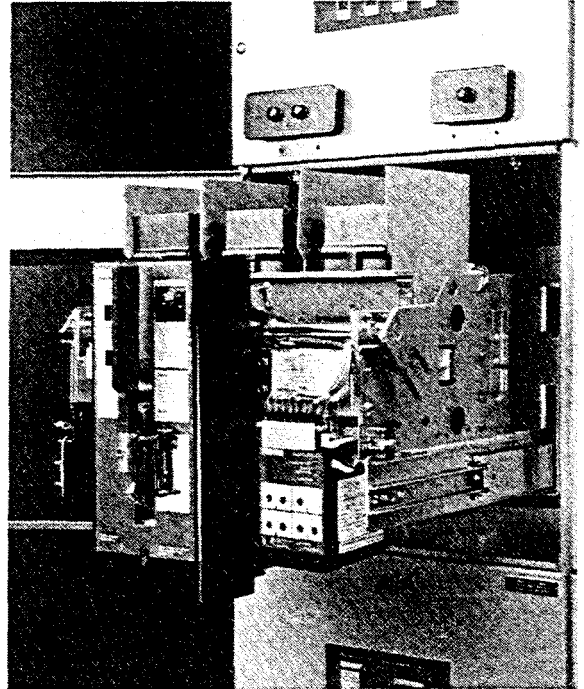
A) Attach lifting bar assembly to circuit breaker as shown above. Screw locking screws through circuit breaker side plates and lifting plates.



B) Carefully raise circuit breaker and move into position above fully extended rails.



C) Carefully begin lowering circuit breaker onto rails. **IMPORTANT:** Lift up on front of circuit breaker, tilting rear downward until side frame engages notch at the rear of the right rail.



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

Figure 1. Handling Instructions

Installation


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. Push breaker to DISCONNECTED position. Interlock bar prevents movement of breaker in 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 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 OPERATING PROCEDURE, **Pages 6-9** 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. Then refer to OPERATION, **Pages 6-9** for a detailed description

of the circuit breaker operating characteristics before placing the circuit breaker in service. Make sure circuits are not energized.

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 connected position. Circuit breaker interlock operation should be checked before it is energized. See DRAWOUT INTERLOCK, **Page 9**, and SPRING DISCHARGE INTERLOCK, **Page 9**, 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
	Heavy weight overhead. Can cause death, personal injury or property damage Always use approved lifting means to handle circuit breakers or fuse carriages. Follow instructions for use of lifting bar assembly. Avoid excessive speeds and sudden stops. Never lift a circuit breaker or fuse carriage above an area where personnel are located.

Installation

Introduction

Type RL Low Voltage AC Power Circuit Breakers may be furnished for mounting in any one of three ways: (1) 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 of 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 damages incurred in transit. If damage is disclosed, a carrier inspection must be arranged for by consignee 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 blocking bolts, 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 SR 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 items as construction dust, corrosive atmosphere, mechanical abuse and rapid temperature variations.
2. **Outdoor Storage** - Outdoor 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 switch gear 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 supplied with accessories.

	⚠ DANGER
	<p>Power circuit breakers operate at high voltages and have spring-loaded mechanical parts which operate at high speed.</p> <p>When operated improperly, this equipment will cause death, personal injury and property damage</p> <p>To avoid electrical shock, burns and entanglement in moving parts this equipment must be installed, operated and maintained only by qualified persons thoroughly familiar with the equipment, instruction manuals and drawings.</p>

Installation Sequence (and Removal)

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

1. 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, 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 17**.
3. If the circuit breaker was shipped separate from the cubicle, remove the blocking bolts, trip the circuit


Introduction and Safety

Introduction

The RL family of low voltage circuit breakers is designed to meet all the 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 the careful design and fabrication 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.

	⚠ DANGER
	<p>Power circuit breakers operate at high voltages and have spring-loaded mechanical parts which operate at high speed.</p> <p>When operated improperly, this equipment will cause death, person injury and property damage.</p> <p>To avoid electrical shock, burns and entanglement in moving parts this equipment must be installed, operated and maintained only by qualified persons thoroughly familiar with the equipment, instruction manuals and drawings.</p>

Qualified Person

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

- Training and authorization to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- 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 may be encountered by the user. These words are defined as:

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 a de-energized breaker. Always de-energize a breaker, and remove it from the switchgear before performing any tests, maintenance or repair.
2. Always perform maintenance on the breaker after the spring-charged mechanisms are discharged.
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.

Type RL Breakers

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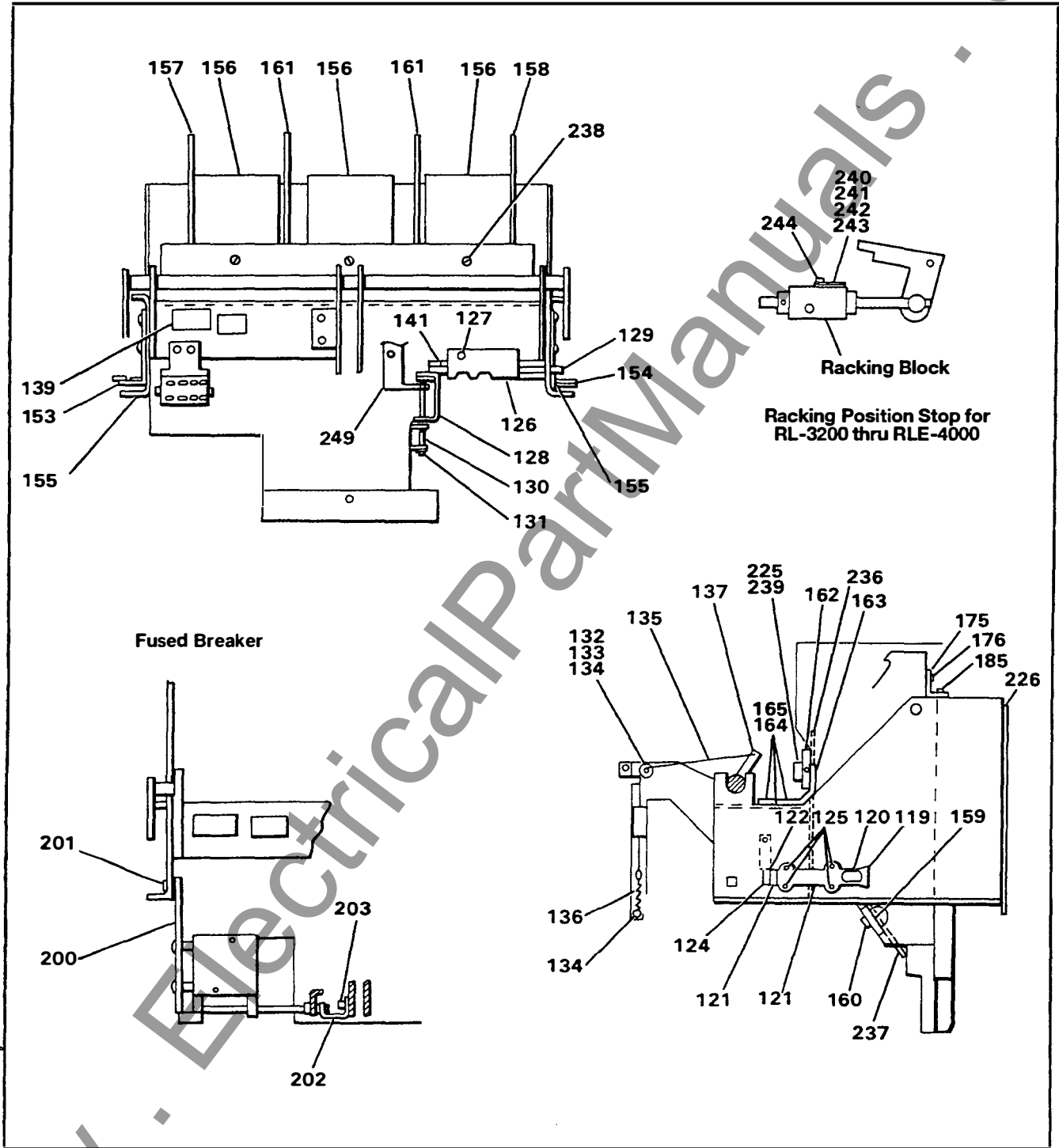


Figure 14 RL Breaker Assembly (Part 1)

Parts

Refer to **Figure 14**.

Item	Description	Part Number	Usage
74	Screw	00-611-315-434	RL-3200, RL-4000 & RLE-4000
75	Nut	15-171-063-017	RL-3200, RL-4000
119	PTO Support	18-732-790-004	
120	PTO Shaft	18-658-024-152	
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	00-615-461-371	
128	Interlock Assy.	18-658-612-572	
129	Interlock Bar	18-733-482-001	
129A	Interlock Bar	18-733-482-002	RL-3200, RL-4000 & RLE-4000
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		
157	Phase Barrier	18-398-937-001	
157A	Phase Barrier	18-398-937-003	RL-3200, RL-4000 RLE-4000 RLF-2000
157B	Phase Barrier	18-732-790-053	
158	Phase Barrier	18-398-937-002	
158A	Phase Barrier	18-398-937-004	RL-3200, RL-4000
158B	Phase Barrier	18-732-790-054	RLF-2000
159	Barrier	18-657-941-110	RL-800 to RL-1600

Item	Description	Part Number	Usage
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
160	Plastic Rivet	00-671-501-070	
161	Barrier	18-657-941-108	
161A	Barrier	18-657-962-122	RL-3200, RL-4000 & RLE-4000
161B	Barrier	18-657-937-284	RLF-2000
162	Support	18-732-790-052	RL-800, RLE-800 & 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
163	Clip	18-658-110-308	RL-800 to RLE-2000 (up to mid-1993)
163A	Knob	18-657-961-385	RL-3200, RL-4000, RLE-4000 (up to mid-1993)
163B	Lockwasher	00-655-047-240	RL-3200 to RLE-4000 (up to mid-1993) (mid-1993 and after)
163C	Chute retainer assy.	18-658-143-563	
164	Screw	15-171-399-010	
165	Lockwasher	00-655-067-100	RL-800 to RLE-2000
175	Angle	18-658-110-279	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	
200A	Open Fuse Trip	18-399-805-501	RL-3200 & RL-4000
201	Screw	15-171-399-010	Fused Versions
202	Bracket	18-657-961-338	Fused Versions
203	Screw	15-171-399-010	Fused Versions RL-3200 & RL-4000
225	Screw	00-615-471-373	Fused Versions RL-800 to RLE-2000
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	RLI-800
236B	Front Barrier	18-658-110-304	RLE-800
237	Bottom Barrier	18-658-110-177	RLE-2000
238	Screw	00-615-650-218	RLI-800, RLE-2000 RLE-800, RLE-800 RLE-2000
239	Lockwasher	00-655-067-140	
240	Shim	18-658-024-238	RL-3200 to RLE-4000
241	Shim	18-658-024-238	RL-3200 to RLE-4000
242	Shim	18-658-024-240	RL-3200 to RLE-4000
243	Shim	18-658-024-241	RL-3200 to RLE-4000
244	Screw	00-615-641-906	RL-3200 to RLE-4000
245	Pin Brace	18-658-145-005	

Parts

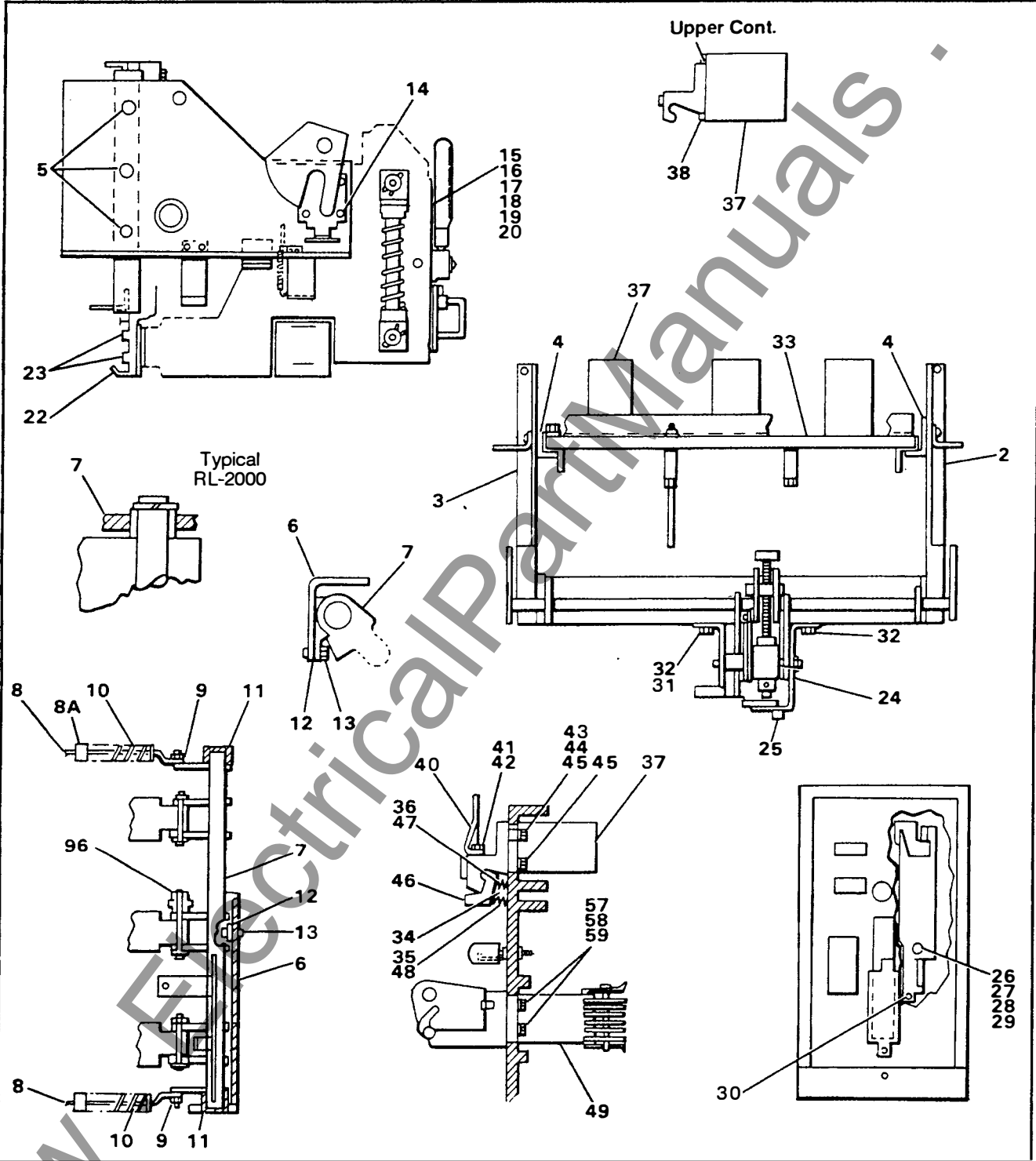


Figure 15 RL Breaker Assembly (Part 2)

Parts

Refer to **Figures 15 & 16**

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
2	RH Sideplate	18-398-289-510		37I	Upper Cont. Assy	18-732-791-528	RLF-2000 Right
3	LH Sideplate	18-398-288-002		37J	Upper Cont. Assy	18-734-434-501	RL-800, RLE-800, RLI-800 Stationary
4	Angle	18-657-937-254	RL-3200, RL-4000	37K	Upper Cont. Assy	18-734-435-501	RL-1600 Stationary
5	Screw	15-615-024-006	Drawout Only	37L	Upper Cont. Assy	18-732-791-535	RL-2000, RLE-2000 Stationary
6	Apron	18-732-791-504	RL-800, RLE-800 & RL-1600	37M	Upper Cont. Assy	18-732-791-536	RL-2000, RLE-2000 Stationary
6A	Apron	18-732-790-537	RLI-800	37N	Upper Cont. Assy	18-732-791-537	RL-2000, RLE-2000 Stationary
6B	Apron	18-732-791-521	RL-2000, RLE-2000	37O	Upper Cont. Assy	18-398-289-501	RL-3200
6C	Apron	18-732-791-505	RL-3200, RL-4000 & RLE-4000	37P	Upper Cont. Assy	18-398-289-502	RL-4000, RLE-4000
7	Shaft	18-732-791-503	RL-800, RLE-800 & RL-1600	38	Plastic Button	18-657-854-172	RL-4000, RLE-4000
7A	Shaft	18-732-790-138	RLI-800	40	Arc Runner	71-141-983-001	RL-800, RLE-800
7B	Shaft	18-732-791-508	RLE-2000, RL-2000	40A	Arc Runner	18-732-790-173	RLI-800
7C	Shaft	18-732-791-509	RL-3200	40B	Arc Runner	71-142-053-001	RL-1600
7D	Shaft	18-732-791-510	RL-4000, RLE-4000	40C	Arc Runner	18-657-939-202	RLE-2000, RL-2000
8	Spring Guide	18-732-790-008		40D	Arc Runner	18-727-730-001	RL-3200
8A	Guide	18-658-110-250	RL-800 to RLE-2000	40E	Arc Runner	18-657-840-384	RL-4000, RLE-4000
9	X Washer	00-659-055-156		40F	Arc Runner	18-732-790-175	RLE-2000
10	Spring	71-141-799-001		41	Screw	00-615-124-218	
10A	Spring	71-142-123-001	RLI-800, RL-3200 thru RLE-4000	41A	Screw	00-615-124-220	RLE-2000
11	Bearing	15-171-399-002		42	Lock Washer	00-655-017-022	
12	Bearing Block	18-657-768-050	RL-800, RL-1600	43	Brace	18-657-941-293	RL-800, RLE-800
12A	PR Stop	18-658-110-116	RLI-800	43A	Brace	18-657-941-299	RL-1600
13	Screw	00-615-663-373	RL-800, RL-1600	43B	Washer	00-651-027-170	RL-4000, RL-3200 & RLE-4000
13A	Screw	00-615-405-378	RLI-800	44	Screw	15-171-399-048	RL-800, RLI-800 & RL-1600
14	Screw	15-615-024-007		44A	Screw	15-171-399-065	RLI-800
15-20	Operator	See Figure 19		44B	Spacer	18-658-110-284	RLI-800
22	Support	18-732-790-036	RL-3200, RL-4000	44C	Lock Washer	00-655-017-030	RL-4000, RL-3200 RLE-4000
23	Screw	00-615-663-373		45	Screw	15-171-399-011	
24	Support	18-398-288-003		45A	Screw	00-611-315-426	RL-4000, RL-3200
24A	Support	18-752-300-002	Stationary	46	Contact Assy	18-727-833-501	
25	Shutter	18-744-437-501		46A	Contact Assy	18-732-790-599	RLE-800, RLE-2000, & RLE-4000 (Note 1)
26	Screw	15-171-399-025		47	Spring	71-141-173-001	
27	Pushnut	15-171-399-026		48	Spring	71-141-976-001	
28	Permanut	15-171-035-001		49	Lower Cont. Assy	18-732-789-501	RL-800, RLE-800 & RLI-800
29	Nut	00-633-059-210		49A	Lower Cont. Assy	18-732-789-502	RL-1600
30	Screw	00-615-345-214		49B	Lower Cont. Assy	18-732-791-516	RLE-2000, RL-2000 Left
31	Screw	00-615-663-373	RL-800, RLI-800 & RL-1600	49C	Lower Cont. Assy	18-732-791-517	RLE-2000, RL-2000 Center
32	Screw	15-171-399-052	RLI-800, RL-2000 to RL-4000	49D	Lower Cont. Assy	18-732-791-518	RLE-2000, RL-2000 Right
33	Back Panel	18-551-364-001	RL-800, RLE-800	49E	Lower Cont. Assy	18-734-437-501	RL-800, RLE-800, RLI-800 Stationary
33A	Back Panel	18-551-364-004	RLI-800	49F	Lower Cont. Assy	18-734-443-501	RL-1600 Stationary
33B	Back Panel	18-551-364-002	RL-1600	49G	Lower Cont. Assy	18-732-791-538	RLE-2000, RL-2000 Stationary Left
33C	Back Panel	18-551-364-003	RL-2000	49H	Lower Cont. Assy	18-732-791-539	RLE-2000, RL-2000 Stationary Center
33D	Back Panel	18-551-364-006	RLE-2000	49I	Lower Cont. Assy	18-732-791-540	RLE-2000, RL-2000 Stationary Right
33E	Back Panel	18-398-288-006	RL-3200	49J	Lower Cont. Assy	18-732-791-519	RL-3200
33F	Back Panel	18-398-288-007	RL-4000, RLE-4000	49K	Lower Cont. Assy	18-732-791-520	RL-4000, RLE-4000
34	Roll Pin	00-671-177-321	RL-3200, RL-4000 RLE-4000	57	Washer	00-651-027-170	RL-3200, RL-4000 & RLE-4000
35	Roll Pin	00-671-177-313	RL-3200, RL-4000 RLE-4000	58	Lock Washer	00-655-017-030	RL-3200, RL-4000 & RLE-4000
36	Rivet	00-671-251-085	RL-3200, RL-4000 RLE-4000	59	Screw	15-171-399-011	
37	Upper Cont. Assy	18-732-788-501	RL-800, RLI-800 & RLE-800	59A	Screw	00-611-315-426	RL-3200, RL-4000 & RLE-4000
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				

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 17). Order replacement kit 18-658-669-822.

Parts

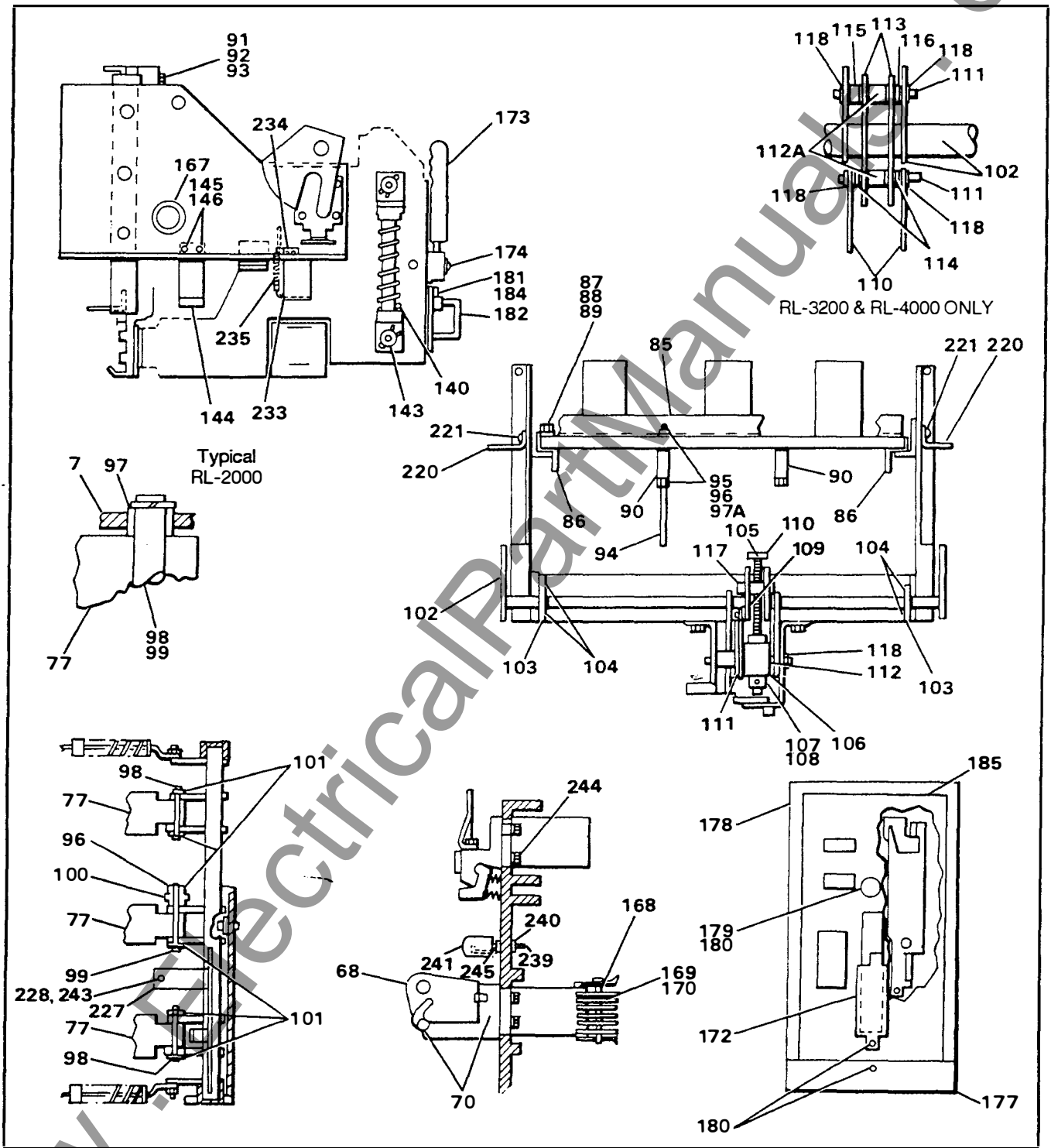


Figure 16 RL Breaker Assembly (Part 2-Continued)

Parts

Refer to **Figures 15 & 16**

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
68	Support	18-657-937-261	RL-3200 thru RLE-4000	110A	Link	18-657-942-092	RL-3200, RL-4000 & RLE-4000
68A	Support	18-657-940-150		111	Spacer	18-657-823-356	
70	Screw	00-615-663-373	RL-3200 thru RLE-4000	111A	Pin	18-747-678-006	RL-3200, RL-4000 & RLE-4000
74	Screw	00-611-315-434		112	Spacer	18-731-274-002	
75A	Nut	15-171-063-017	RL-3200 thru RLE-4000	112A	Spacer	18-724-503-004	RL-3200, RL-4000 RLE-4000
85	Angle	18-657-937-255	RL-3200, RL-4000 & RLE-4000	113	L-Link	18-657-941-297	RL-3200, RL-4000 & RLE-4000
86	Angle Plastic	18-657-941-294	RL-3200	114	Spacer	18-724-503-005	RL-2000, thru RLE-4000
86A	Angle Plastic	18-657-941-062	RL-4000, RLE-4000	115	Spacer	18-731-274-001	RL-3200, RL-4000 & RLE-4000
87	Washer	00-651-027-170	RL-3200, RL-4000 & RLE-4000	116	Spacer	18-731-274-002	RL-3200, RL-4000 & RLE-4000
88	Lock Washer	00-655-017-030	RL-3200, RL-4000 RLE-4000	117	Barrel Nut	18-657-962-344	
89	Screw	00-611-315-426	RL-3200	118	Sichsl	00-000-401-166	
89A	Screw	00-611-315-428	RL-4000, RLE-4000	140	Closing Spring	18-399-526-502	RL-800, RLE-800
90	Brace	18-657-937-256	RL-3200, RL-4000 & RLE-4000	140A	Closing Spring	18-399-526-503	RL-1600
91	Screw	00-611-315-396	RL-3200, RL-4000 & RLE-4000	140B	Closing Spring	18-398-297-504	RLI-800, RLE-2000 & RL-2000
92	Washer	00-651-027-139	RL-3200, RL-4000 & RLE-4000	140C	Closing Spring	18-726-870-501	RL-3200, RL-4000 & RLE-4000
93	Nut	15-171-063-016	RL-3200, RL-4000 & RLE-4000	143	Sichsl	00-000-401-141	
94	Stud	14-135-915-008	RL-3200, RL-4000 & RLE-4000	144	Ground Strap	18-657-916-579	Omitted on Stationary
95	Washer	00-651-027-139	RL-3200, RL-4000 & RLE-4000	145	Screw	15-171-399-010	Omitted on Stationary
96	Lock Washer	00-655-067-140	RL-3200, RL-4000 & RLE-4000	146	Nut	00-633-059-210	Omitted on Stationary
96A	Washer	00-651-007-900	RLE-2000, RL-2000	167	Grommet	15-171-890-001	
97	Bushing	18-657-765-395	RLE-2000, RL-2000	168	Primary Disc	18-734-618-502	RL-800
97A	Nut	00-631-059-104	RL-3200, RL-4000 & RLE-4000	168A	Primary Disc	18-732-790-594	RLE-800, RLI-800
98	Pin	18-747-678-006	RL-3200, RL-4000 & RLE-4000	168B	Primary Disc	18-734-618-501	RL-1600, RL-2000
98A	Pin	18-727-832-001	RL-3200, RL-4000 & RLE-4000	168C	Primary Disc	18-732-790-551	RLE-2000
99	Pin	18-747-678-011	RL-3200, RL-4000 & RLE-4000	168D	Primary Disc	18-733-481-501	RL-3200
99A	Pin	18-727-832-002	RL-3200, RL-4000 & RLE-4000	168E	Primary Disc	18-733-481-502	RL-4000, RLE-4000
100	Spacer	18-657-942-300	RL-3200, RL-4000 & RLE-4000	169	Screw	00-615-114-373	RL-3200, RL-4000 & RLE-4000
100A	Spacer	18-727-838-002	RL-3200, RL-4000 & RLE-4000	170	Lock Washer	00-655-017-026	RL-3200, RL-4000 & RLE-4000
101	Sichsl	00-000-401-166	RL-3200, RL-4000 & RLE-4000	172	Cover Filler	18-658-133-032	E.O. Models Only
101A	X Washer	15-171-399-035	RL-3200, RL-4000 & RLE-4000	173	Man. Chg. Handle	18-398-288-066	Manual Chg. Only
102	Rack Shaft	18-732-791-506	RL-800 thru RL-1600	173A	Man. Chg. Handle	18-398-288-067	Manual Chg. Only
102A	Rack Shaft	18-732-791-522	RLE-2000, RL-2000	174	Set Screw	18-658-110-173	Manual Chg. Only
102B	Racking Shaft	18-732-791-507	RL-3200, RLE-4000 & RL-4000	177	Bottom Cover	18-736-830-501	
103	Retainer	15-171-399-012	RL-800 thru RL-1600	177A	Bottom Cover	18-736-830-502	RL-3200, RL-4000
103A	Retainer	18-657-822-197	RL-2000 thru RLE-4000	178	Cover	18-394-426-080	
104	Screw	00-615-663-373	RL-3200, RL-4000 & RLE-4000	178A	Cover	18-394-426-079	RL-4000, RL-3200
105	Racking Screw	18-735-641-059	RL-3200, RL-4000 & RLE-4000	179	Bumper	15-171-399-007	
105A	Racking Screw	18-735-641-060	RL-3200, RL-4000 & RLE-4000	180	Screw	15-171-399-010	
106	Block	18-658-110-361	RL-3200, RL-4000 & RLE-4000	181	Clip	18-658-133-031	
106A	Block	18-658-024-237	RL-3200, RL-4000 & RLE-4000	182	Guard	18-748-962-001	
107	Collar	18-658-110-024	RL-3200, RL-4000 & RLE-4000	184	Screw	00-615-641-910	
108	Driv-Pin	18-658-110-036	RL-3200, RL-4000 & RLE-4000	185	Label	18-487-118-001	
109	Washer	00-651-007-902	RL-3200, RL-4000 & RLE-4000	185A	Label	18-487-117-001	Breaker Display Unit
109A	Washer	00-651-007-214	RL-3200, RL-4000 & RLE-4000	185B	Label	18-487-908-001	
110	Nut	00-631-177-108		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

Parts

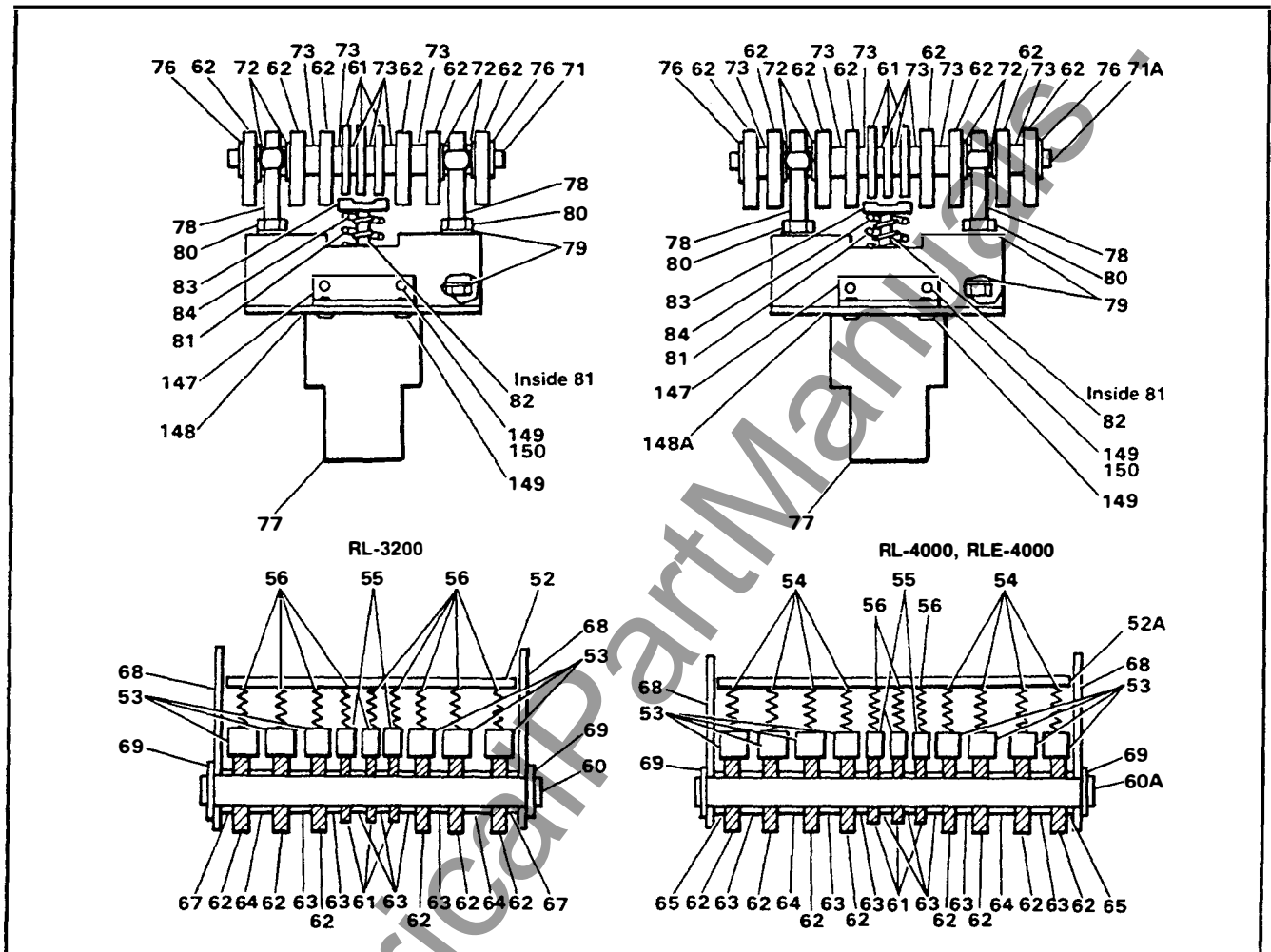


Figure 17 Contacts RL-3200 and RL-4000

Refer to **Figure 17**

Item	Description	Part Number	Usage
52	Spring Seat	18-657-822-171	RL-3200
52A	Spring Seat	18-657-854-166	RL-4000, RLE-4000
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
61	Arcing Contact	18-727-729-502	
62	Main Contact	18-727-729-503	
62A	Main Contact	18-732-790-598	All RLE
63	Spacer	18-747-421-004	
64	Spacer	18-747-421-008	
65	Spacer	18-747-421-005	RL-4000, RLE-4000
67	Washer	00-651-027-357	RL-3200
68	Support	18-657-940-150	
69	Sichsl	00-000-401-141	
71	Pin	18-658-143-029	RL-3200
71A	Pin	18-658-143-030	RL-4000, RLE-4000

Item	Description	Part Number	Usage
72	Washer	18-657-941-295	
73	Spacer (.18)	18-747-421-001	
76	Sichsl	00-000-401-141	
77	Pushrod	18-398-288-008	
78	Screw (Spec.)	18-657-937-268	
79	Washer	00-651-007-910	
79A	Washer	00-651-027-170	RL-4000, RLE-4000
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 Sups.	18-657-963-214	
148	Barrier	18-734-619-002	RL-3200
148A	Barrier	18-734-619-003	RL-4000, RLE-4000
149	Screw	15-171-074-010	
150	Lock Washer	00-655-067-060	

Parts

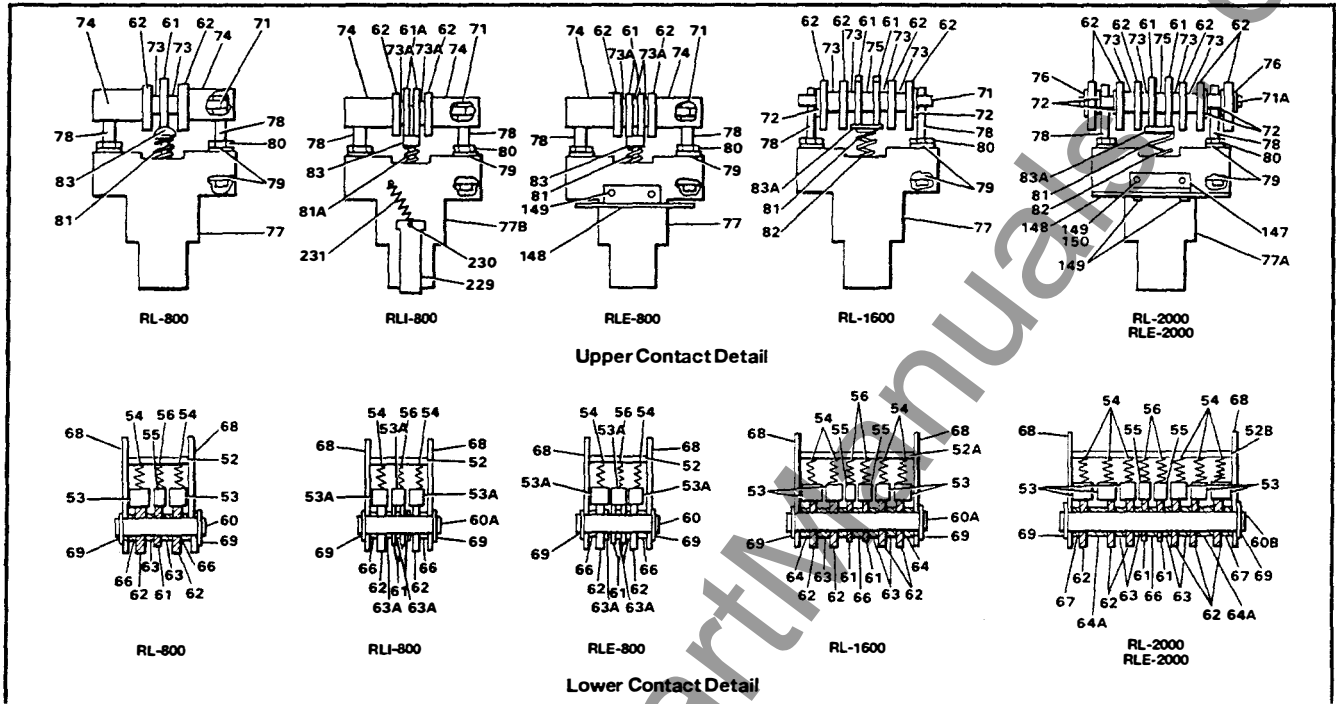


Figure 18 Contacts RL-800 to RL-2000

Refer to Figure 18

Item	Description	Part Number	Usage
52	Spring Seat	18-657-938-303	RL-800, RLE-800 & RLI-800
52A	Spring Seat	18-657-938-304	RL-1600
52B	Spring Seat	18-657-938-305	RLE-2000, RL-2000
53	Contact .531	18-727-825-002	
53A	Contact	18-727-825-005	RLE-800, 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-800, RLE-800, RLI-800
60A	Pin	18-750-059-001	RL-1600
60B	Pin	18-750-059-006	RLE-2000, RL-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	RLE-800, RLE-2000 (NOTE 1)
63	Spacer	18-747-421-004	
63A	Washer	00-651-017-357	RLI-800, RLE-800
64	Spacer	18-747-421-007	RL-1600
64A	Spacer	18-747-421-008	RLE-2000
66	Spacer	18-747-421-006	RLE-2000
67	Washer	00-651-027-357	RL-2000, RLE-2000
68	Support	18-657-937-261	RLE-2000
69	Sichsl	00-000-401-141	
71	Pin	18-657-922-147	RL-800 to RL-1600
71A	Pin	18-658-143-028	RLE-2000, RL-2000
72	Washer	18-657-941-295	RL-1600, RL-2000
73	Spacer (.18)	18-747-421-001	
73A	Washer	00-651-017-288	RLI-800, RLE-800

Item	Description	Part Number	Usage
74	Pin Cover Spacer	18-657-765-368	RL-800, RLI-800, RLE-800
75	Spacer	18-747-421-003	RLE-2000, RL-2000
76	Sichsl	00-000-401-141	RL-1600
77	Pushrod	18-398-288-009	RL-800, RL-1600
77A	Pushrod	18-657-954-580	RLE-2000, RL-2000 & RLE-800
77B	Pushrod	18-398-288-054	RLI-800
78	Screw (Spec.)	18-657-937-268	
79	Washer	00-651-007-910	
80	Nut	00-631-143-205	
81	Spring	71-142-123-001	
81A	Spring	18-658-110-147	RLI-800
82	Spring	71-142-139-001	RL-1600, RL-2000
83	Spring Seat	18-657-940-290	RL-800, RLE-800
83A	Spring Seat	18-657-939-170	RL-1600 to RLE-2000
83B	Spring Seat	18-658-583-522	RLI-800
147	Barrier Sups.	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	
150	Lock Washer	00-655-067-060	
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 15). Order replacement kit 18-658-669-822.

Parts

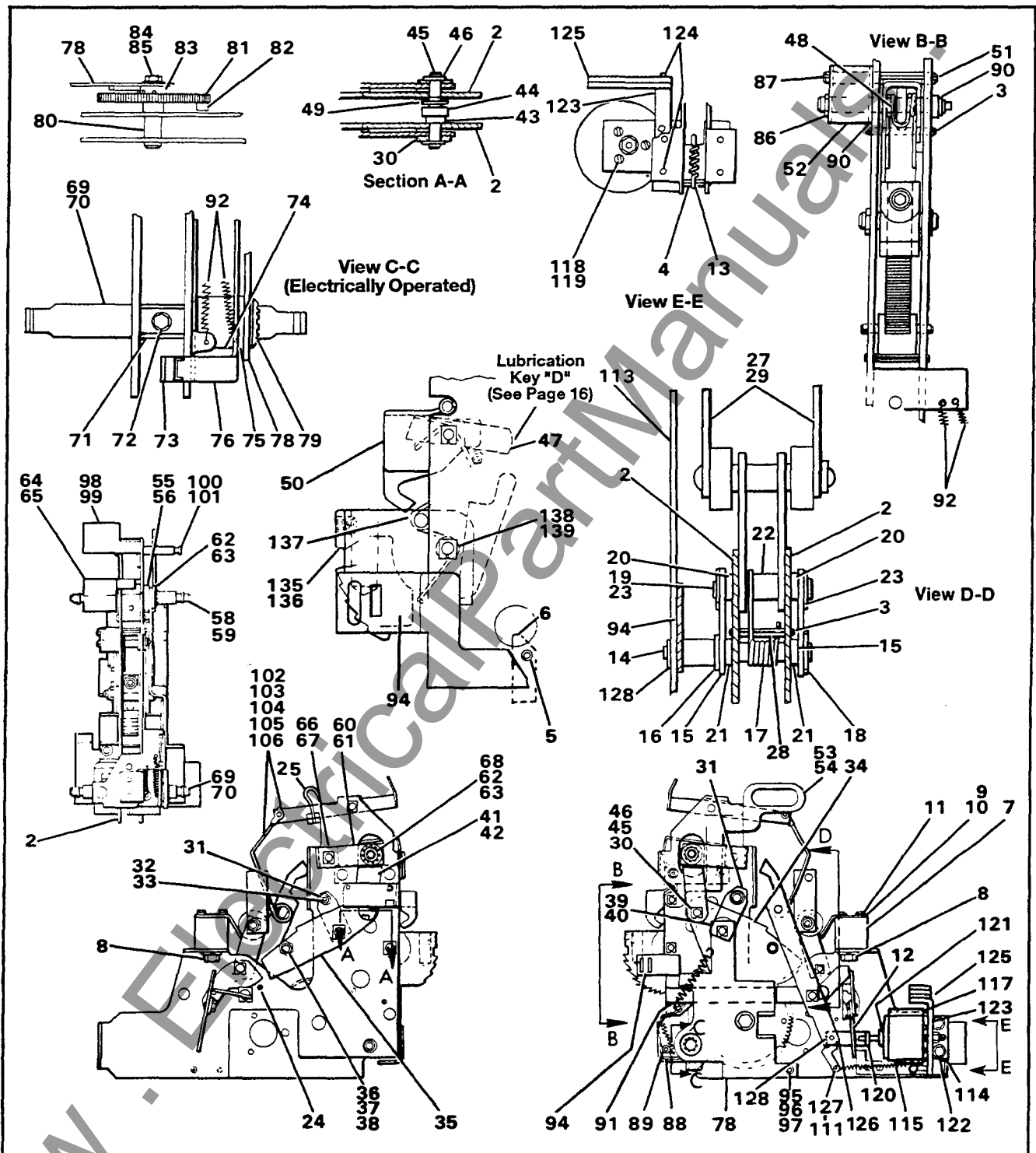


Figure 19. Operator

18-473-704-401-818

Parts

The following item numbers refer to **Figure 19** and are common parts used on all models except as noted.

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
2	Frame	18-469-506-501		65	Decal	18-657-800-116	
3	Rollpin	00-671-176-195		66	Pin	18-747-678-009	
4	Rollpin	00-671-176-195		67	Sichsl	00-000-401-166	
5	Rollpin	00-671-176-257		68	Bearing	18-658-110-320	Omit RL-3200 & 4000
6	Pawl	18-658-024-123		69	Spring Hanger	18-658-110-292	RL-800 to RL-2000
7	Stop Block	18-657-768-039		70	Spring Hanger	18-658-110-293	RL-3200 to 4000
8	Screw	15-171-259-004		71	Clip	18-657-768-014	
9	Back-Up	18-657-765-130		72	Screw	15-171-074-010	
10	Spring	18-657-768-038		73	Switch Lever	18-657-768-037	Elec. Charge Only
11	Screw	15-171-074-010		74	Bearing Spacer	18-657-768-031	
12	Trip Flap Assy.	18-727-727-504		75	Spacer	18-747-421-010	
13	Spring	72-140-324-001		76	Switch Lever	18-657-768-032	Elec. Charge Only
14	Shoulder Pin	18-658-110-296		78	Gear Brace	18-732-790-191	
15	Latch	18-658-110-325		79	Retainer	00-673-285-063	
16	Washer	00-651-007-900		80	Gear Pin	18-657-768-371	Elec. Charge Only
17	Spring	18-657-768-033		81	Gear	18-724-505-501	Elec. Charge Only
18	Sichsl	00-000-401-166		82	Cam Follower	18-657-768-026	Elec. Charge Only
19	Pin	18-747-678-004		83	Spacer	18-658-024-151	Elec. Charge Only
20	Spacer	18-657-823-356		84	Screw	00-611-315-461	Elec. Charge Only
21	Bushing	18-658-110-342		85	Lock Washer	00-655-017-032	Elec. Charge Only
22	Spacer	18-658-110-344		86	Sichsl	00-000-401-166	
23	Sichsl	00-000-401-166		87	Rollpin	00-671-176-327	
24	Rollpin	15-171-233-008		88	Bracket	18-732-790-007	
25	Spring	18-658-024-197	RL-3200, RL-4000	89	Screw	15-171-074-010	
26	Washer	00-651-007-214		90	Washer	71-152-809-002	
27	Toggle Link Assy.	18-732-790-565	RL-800 - RL-2000	91	Spring	15-837-455-002	
28	Tubing-heat shrink	18-658-143-095		92	Spring	00-837-455-026	Elec. Charge Only
29	Toggle Link Assy.	18-732-791-555	RL-3200 - RL-4000	94	Trip Bar	18-732-790-194	
30	Bearing	18-658-110-330		95	Screw	00-611-315-384	
31	Spacer Link	18-657-768-372		96	Spacer	18-733-309-001	
32	Screw	00-615-114-428		97	Nut	15-171-063-016	
33	Nut	15-171-063-017		98	Flag	18-728-500-005	
34	Cam Wind & Close	18-724-492-001		99	Decal	71-141-817-001	
35	Cam Close	18-724-493-001		100	Pin	18-747-678-015	
36	Spacer	18-657-768-053		101	Sichsl	00-000-401-166	
37	Screw	00-611-315-476		102	Retainer Ringer	00-673-173-018	
38	Nut	15-171-063-018		103	Rod End Clip	15-171-399-029	RL-800 to RL-2000
39	Pin	18-747-678-005		104	Rod End Clip	15-171-399-003	RL-3200 to RL-4000
40	Sichsl	00-000-401-166		105	Close Flag Link	18-733-435-001	RL-800 to RL-2000
41	Link	18-658-110-321	RL-800 thru RL-2000	106	Close Flag Link	18-657-822-353	RL-3200 to RL-4000
42	Link	18-657-961-340	RL-3200 thru RL-4000	111	S Hook	18-658-110-305	800A Only
43	Spacer	18-658-110-327		113	Reset Lever	18-734-620-502	
44	Bearing	15-171-399-061	RL-800 thru RL-2000	114	Actuator Bracket	18-657-768-022	
45	Pin	18-747-678-008		115	Actuator	18-809-575-507	
46	Sichsl	00-000-401-166		116	Washer	00-651-007-909	Non-Auto Only
47	Latch Assembly	18-657-765-564		117	Shield	18-657-937-287	Omit on 800A
48	Spring	18-657-939-020		118	Screw	00-615-513-220	
49	Washer	00-651-007-214		119	Lock Washer	00-655-067-100	
50	Close Hood Assy.	18-657-943-560		120	Reset Assembly	18-732-791-545	
51	Pin	18-658-110-295		121	Washer	72-140-000-001	
52	Close Lever	18-657-768-020		122	Screw	00-615-663-373	
53	Spring Interlock	18-732-790-045	RL-800 - RL-2000	123	Shield Support	18-657-939-200	Omit on 800A
54	Spring Interlock	18-657-852-575	RL-3200 - RL-4000	124	Screw	15-171-399-025	Omit on 800A
55	Bumper	18-658-143-031	RL-800 - RL-2000	125	Shield	18-657-940-182	Omit on 800A
56	Bumper	18-657-854-169	RL-3200 - RL-4000	126	Sichsl	00-000-401-158	
57	Bearing	00-813-109-037	RL-3200 - RLE-4000	127	Spring	71-113-503-001	
58	Spring Hanger	18-658-110-292	RL-800 - RL-2000	128	X Washer	00-659-055-187	
59	Spring Hanger	18-658-110-294	RL-3200 - RL-4000	135	Charge Cam	18-732-791-501	
60	Guide Link	18-658-110-322	RL-800 - RL-2000	136	Charge Link	18-732-791-544	
61	Guide Link	18-657-854-171	RL-3200 to RL-4000	137	Spring	18-657-937-288	
62	Retainer	00-673-285-063	RL-800 to RL-2000	138	Pin	18-747-678-001	
63	Retainer	15-171-399-057	RL-3200 to RL-4000	139	Sichsl	00-000-401-166	
64	Flag	18-724-498-001					

Parts

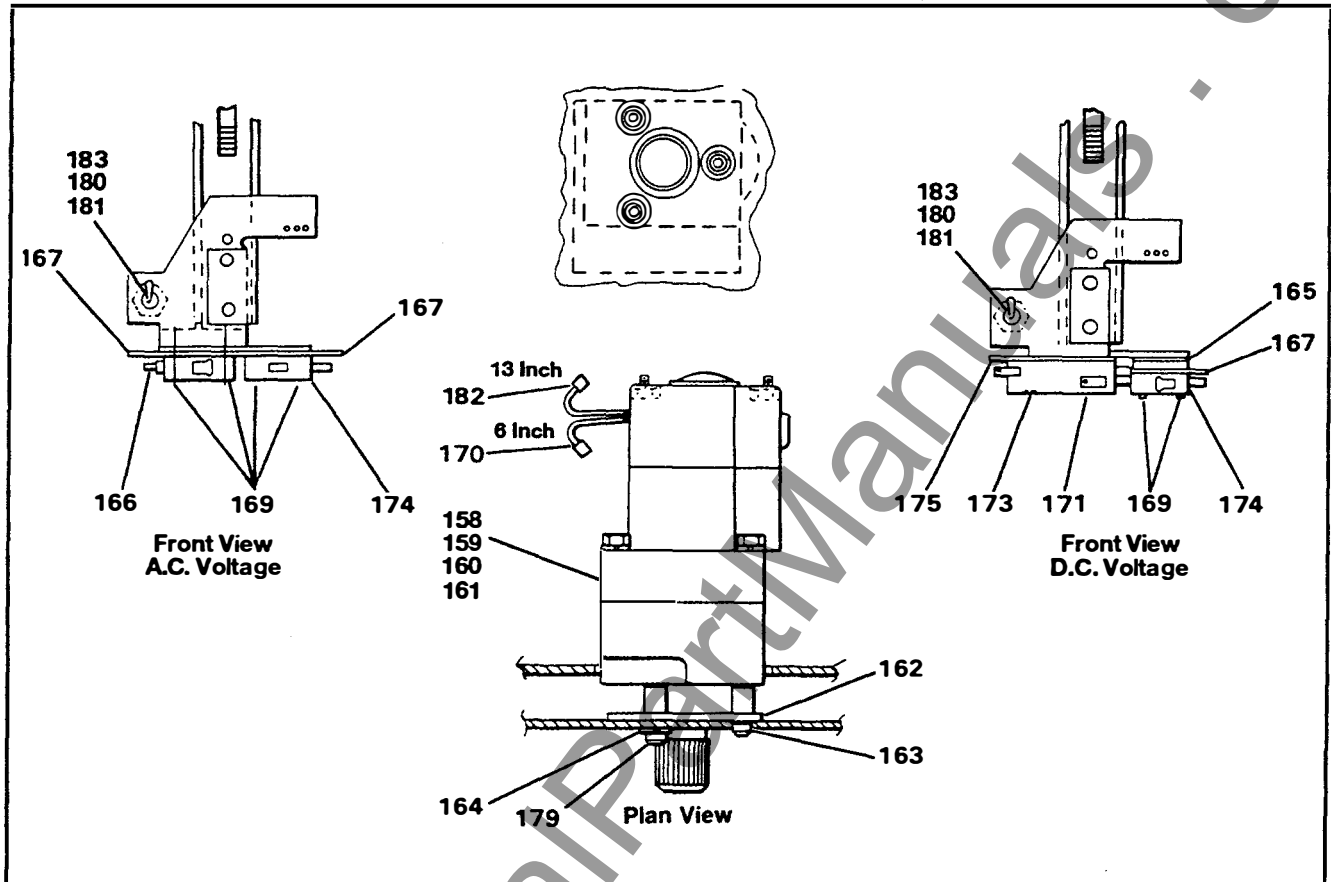


Figure 20. Motor Group

The following item numbers refer to **Figure 20**, and are common parts used on all models. (Ref 18-474-541-825/18-484-748-822)

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
158	Motor 24 VDC	71-340-297-006		167	Insulator	18-657-783-362	
159	Motor 48 VDC	71-340-297-005		169	Screw	15-171-399-008	
160	Motor 120 VAC and 125 VDC	71-340-297-001		170	Terminal, Faston	15-172-099-005	
161	Motor 240 VAC and 250 VDC	71-340-297-002		171	Switch (DC)	15-171-323-003	
162	Spacer	18-657-768-030		173	Screw	15-171-399-041	
163	Screw	00-615-245-218	1 Req. per Motor	174	Switch (AC & DC)	15-171-186-010	
164	Lock Washer	00-655-017-022		175	Insulator	18-657-800-327	
165	Sw. Spacer	18-657-941-061		179	Screw	00-615-124-220	2 Req. per Motor
168	Switch (AC)	15-171-399-013		180	Toggle Switch	00-871-523-008	
				181	Non-Turn Ring	15-171-399-047	
				182	Terminal	15-172-099-023	
				183	Screw	18-658-110-031	

Parts

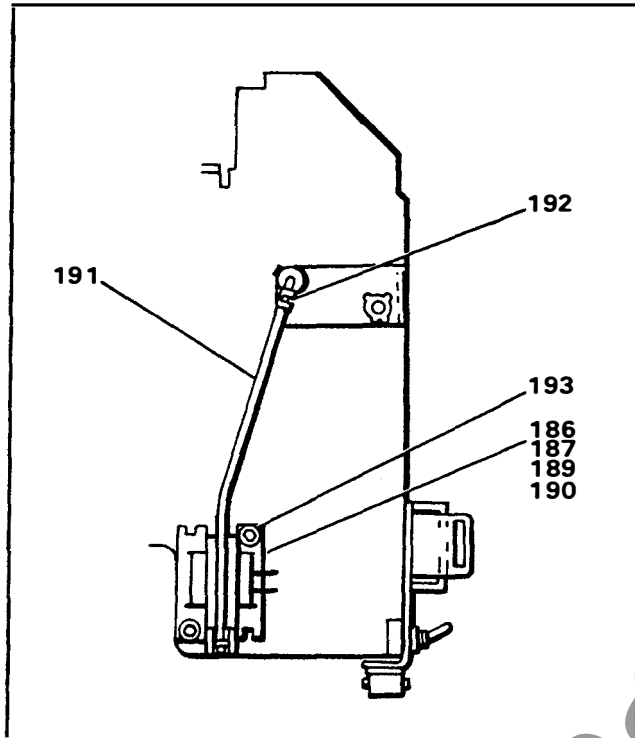


Figure 21. Close Solenoid Group

The following item numbers refer to **Figure 21**, and are common parts used on all models.

Item	Description	Part Number	Usage
186	Solenoid 24VDC	18-724-513-006	
187	Solenoid 48 VDC and 120 VAC	18-724-513-001	
189	Solenoid 240 VAC and 125 VDC	18-724-513-002	
190	Solenoid 250 VDC	18-724-513-004	
191	Close Linkage	18-724-511-001	
192	Clip	15-171-399-003	
193	Screw	15-171-399-010	

The following item numbers refer to **Figure 22A**, and are common parts used on all models with old style "Y" relay.

Item	Description	Part Number	Usage
201	Relay "Y" 48 VDC	15-171-399-027	
202	Relay "Y" 120 VAC	15-171-399-014	
203	Relay "Y" 240 VAC	15-171-399-015	
204	Relay "Y" 125 VDC	15-171-399-016	
205	Relay "Y" 250 VDC	15-171-399-017	Some applications require 2 of this relay
206	Bracket	18-657-961-290	
207	Nut	00-633-059-108	
208	Screw	15-171-094-010	

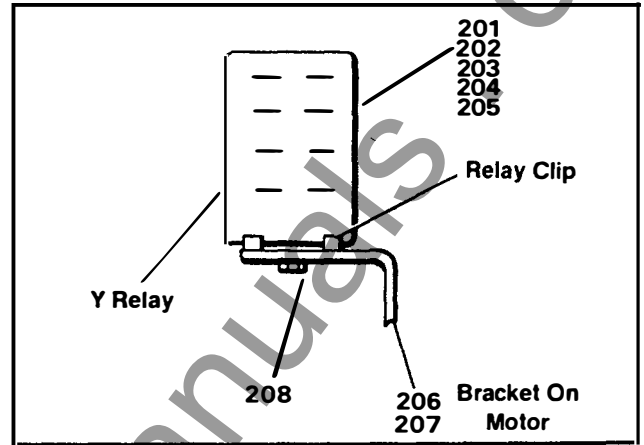


Figure 22A. Anti-Pump "Y" Relay (Old Style)

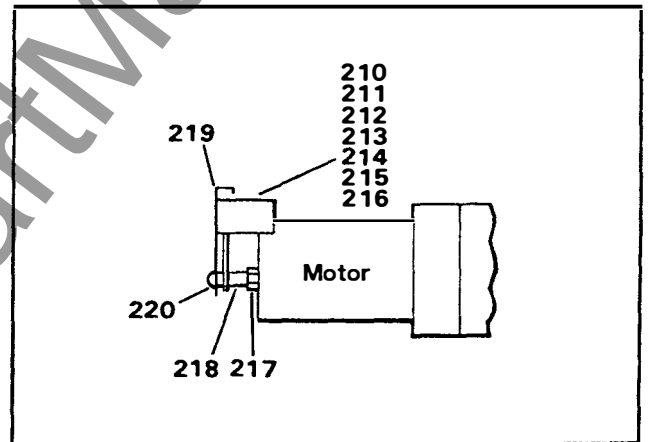


Figure 22B. Anti-Pump "Y" Relay (New Style)

The following item numbers refer to **Figure 22B**, and are common parts used on all models with new style "Y" relay.

Item	Description	Part Number	Usage
210	Relay "Y" 24VDC	18-746-073-501	
211	Relay "Y" 48VDC	18-746-073-502	
212	Relay "Y" 120VAC/125VDC	18-746-073-503	
213	Relay "Y" 240VAC/250VDC	18-746-073-504	
214	Relay "Y" 24VDC	18-749-238-501	Remote Close
215	Relay "Y" 48VDC	18-749-238-502	Remote Close
216	Relay "Y" 120VAC/125VDC	18-749-238-503	Remote Close
217	Nut	00-633-059-108	
218	Spacer	15-172-624-001	
219	Cover	18-732-790-210	
220	Screw	00-615-641-903	

Parts

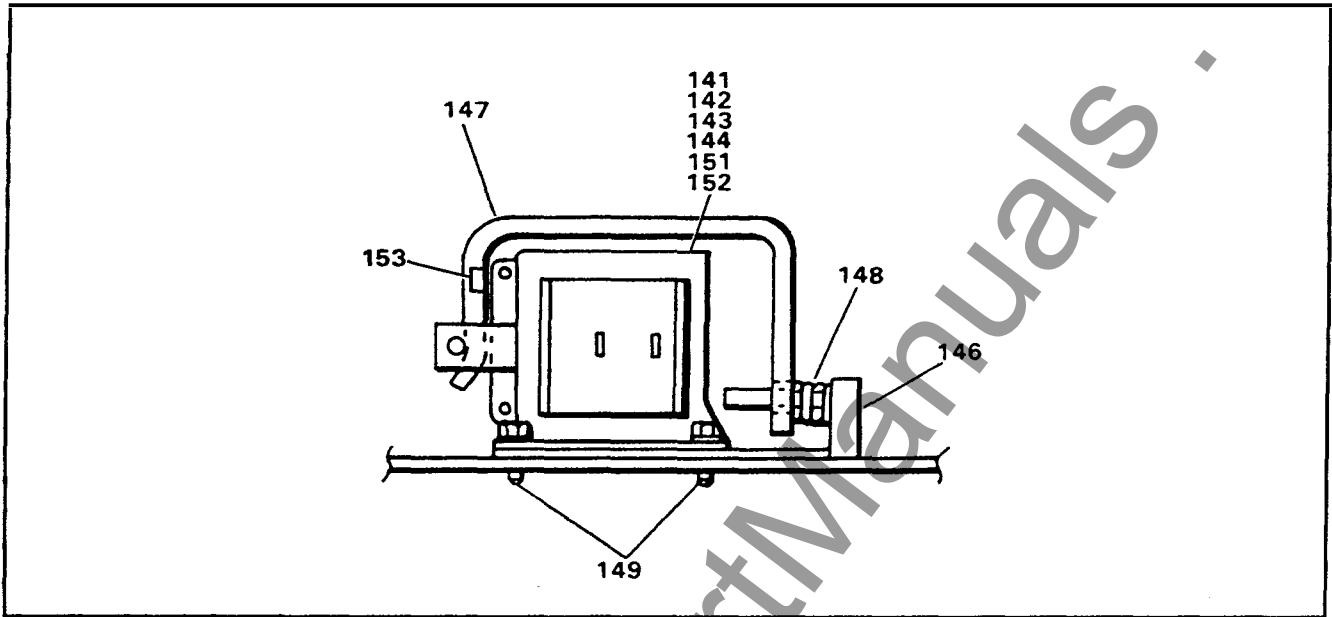


Figure 23.. Shunt Trip Group

The following item numbers refer to **Figure 23**, and are common parts used on all models.

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
141	Solenoid 48VDC and 120VAC	18-724-513-001		147	Pushrod	18-657-768-036	
142	Solenoid 240VAC and 125 VDC	18-724-513-002		148	Spring	14-128-784-001	
143	Solenoid 24VDC	18-724-513-006		149	Screw	15-171-399-010	
144	Solenoid 250VDC	18-724-513-004		151	Solenoid 28VDC	18-724-513-007	
146	Bracket	18-657-781-264		152	Solenoid 32VDC	18-724-513-008	
				153	Clip	18-658-110-309	

Parts

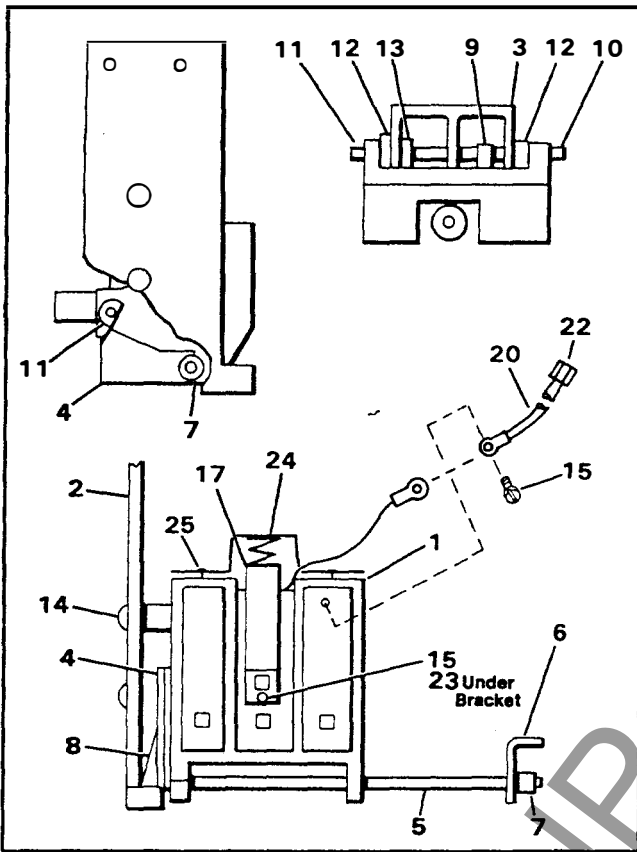


Figure 24. Blown Fuse Trip Assembly 18-399-805-501

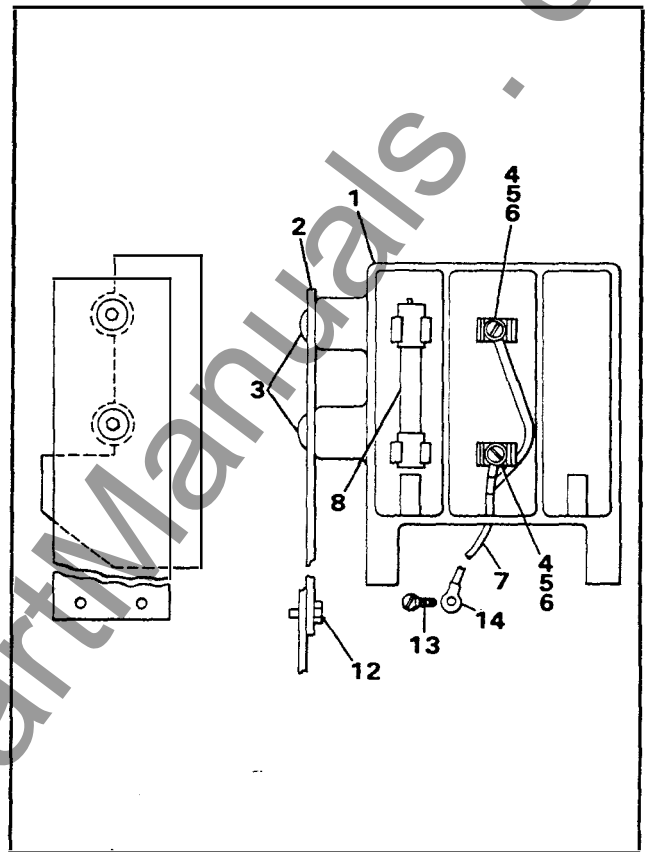


Figure 25. Open Fuse Indicator

The following items refer to **Figure 24**. Applies to RLF-3200 and RLF-4000 fused models.

Item	Description	Part Number	Usage
1	Housing	18-734-445-001	
2	Base	18-657-961-284	
3	Lever	18-734-444-001	
4	Latch Plate	18-657-961-285	
5	Shaft	18-657-961-281	
6	Arm	18-657-961-288	
7	Spacer Nut	18-657-961-280	
8	Spring	18-657-961-279	
9	Spring	18-657-961-278	
10	Shaft	18-657-961-286	
11	Latch	18-657-961-283	
12	Washer	00-651-007-146	
13	Nut	00-631-143-204	
14	Screw	15-615-024-006	
15	Screw	00-615-641-904	
17	Solenoid Assy.	18-658-583-569	
20	Wire	00-557-286-003	
21	Terminal	15-172-099-003	
22	Terminal	15-172-099-007	
23	Washer	00-651-027-072	
24	Wire Shield	18-658-143-100	
25	Screw	00-615-605-120	

The following items refer to **Figures 25**, and are common to all fuse carriages:

Item	Description	Part Number	Usage
1	Fuse Housing	18-399-759-001	
2	Plate	18-657-961-276	
3	Screw	15-615-024-006	
4	Fuse Clip	18-732-790-159	
5	Sems Screw	00-615-641-904	
6	Terminal	15-172-099-003	
7	Wire No. 18 (SIS)	00-557-286-003	
8	Actuator Fuse	72-140-317-001	
12	Screws .25-20 (.62)	00-615-663-373	
13	#10-32 x .38 Sems	00-611-445-216	
14	Terminal No. 10 Ring	15-172-099-003	

Parts

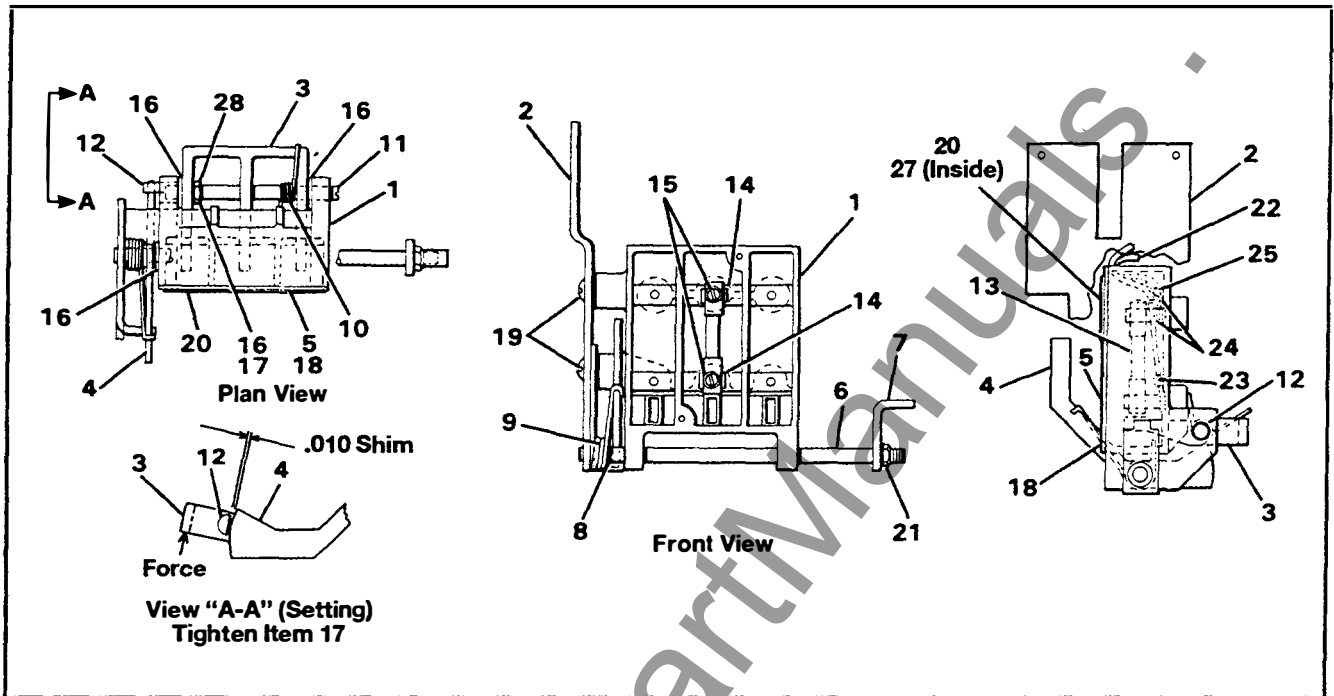


Figure 26. Trigger Fuse
Assembly 18-399-796-501

The following items refer to **Figure 26**, Applies to RLF-800, RLF-1600 and RLF-2000.

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
1	Housing	18-399-759-001		17	.25-28 Hex Nut	00-631-143-204	
2	Base	18-657-961-284		18	#6-32 x .25 Screw	00-615-511-120	
3	Lever	18-734-444-001		19	.25-20 x .50 Screw	15-615-024-006	
4	Latch Plate	18-657-961-285		20	Caution Label	15-171-185-002	
5	Cover	18-657-961-287		21	.25-28 Stopnut	00-633-025-216	
6	Shaft	18-657-961-289		22	Wire #18	00-557-286-003	
7	Arm	18-657-961-288		23	Terminal	15-172-099-003	
8	Spacer Nut	18-657-961-280		24	Faston Tab	15-171-949-049	
9	Torsion Spring	18-657-961-279		25	Faston Terminal	15-172-099-007	
10	Torsion Spring	18-657-961-278		26	Terminal	15-172-099-017	
11	Shaft	18-657-961-286		27	Label	18-658-024-196	
12	Latch	18-657-961-283		28	Lock Washer	00-655-067-140	
13	Actuator Fuse	72-140-317-001					
14	Fuse Clip	18-732-790-159					
15	#8-32 x .25 Screw	00-615-641-904					
16	Washer	00-651-007-146					

Parts

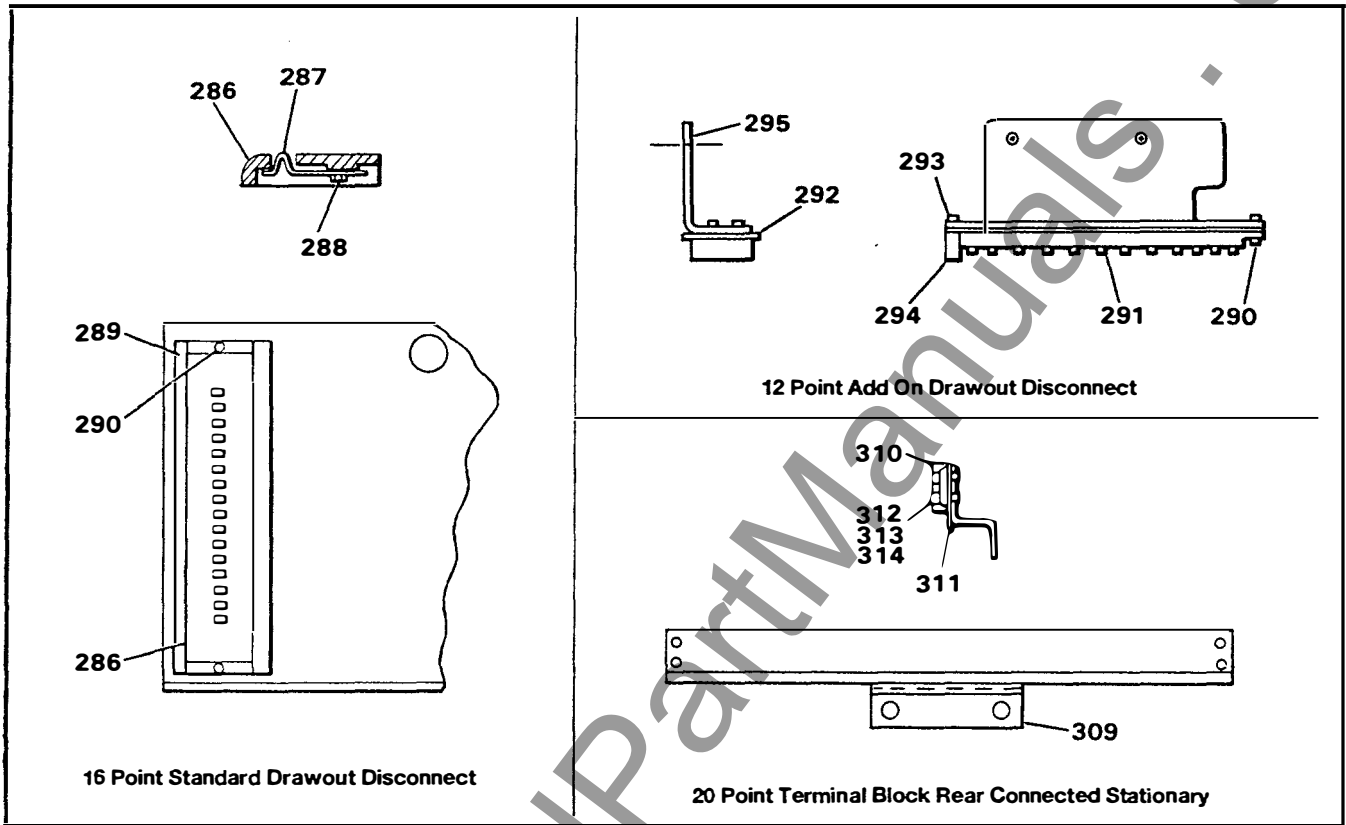


Figure 27. Drawout Secondary Disconnect Group

The following item numbers refer to **Figure 27**, and are common parts used on all models.

16 Point Drawout 18-398-790-501

Item	Description	Part Number	Usage
286	Block	18-398-288-004	Assembly 18-398-790-501
287	Contact	18-657-937-266	
288	Rivet	18-658-110-026	
289	Insulator	18-657-937-270	
290	Screw	15-171-399-010	

12 Point Add On Drawout 18-398-288-811 to 2000A 18-398-288-812 3200 to 4000

Item	Description	Part Number	Usage
287	Contact	18-657-937-266	} In Item 291
288	Rivet	18-658-110-026	
290	Screw	15-171-399-010	
291	Block Assembly	18-732-790-572	
292	Insulator	18-658-110-331	
293	Screw	15-171-074-010	RL-800/2000 RL-3200/4000
294	Clip	18-658-110-271	
295	Support	18-732-790-176	
295A	Support	18-732-790-177	

20 Point Stationary 18-732-791-556

Item	Description	Part Number	Usage
309	Bracket	18-732-790-043	Stationary RL-800S thru RL-2000S
310	Block	15-171-051-009	Stationary RL-800S thru RL-2000S
311	Marking Strip	15-857-036-002	Stationary RL-800S thru RL-2000S
312	Screw	00-615-471-178	Stationary RL-800S thru RL-2000S
313	Lock Washer	00-655-047-080	Stationary RL-800S thru RL-2000S
314	Washer	00-651-027-072	Stationary RL-800S thru RL-2000S

16 Point Stationary Front Conn. 18-752-300-501

Item	Description	Part Number	Usage
317	Bracket	18-658-143-060	Stationary
318	Terminal Block	15-171-051-013	Stationary
319	Screw	00-615-581-174	Stationary
320	Screw	00-615-663-373	Stationary
321	Screw	15-171-074-012	Stationary

Parts

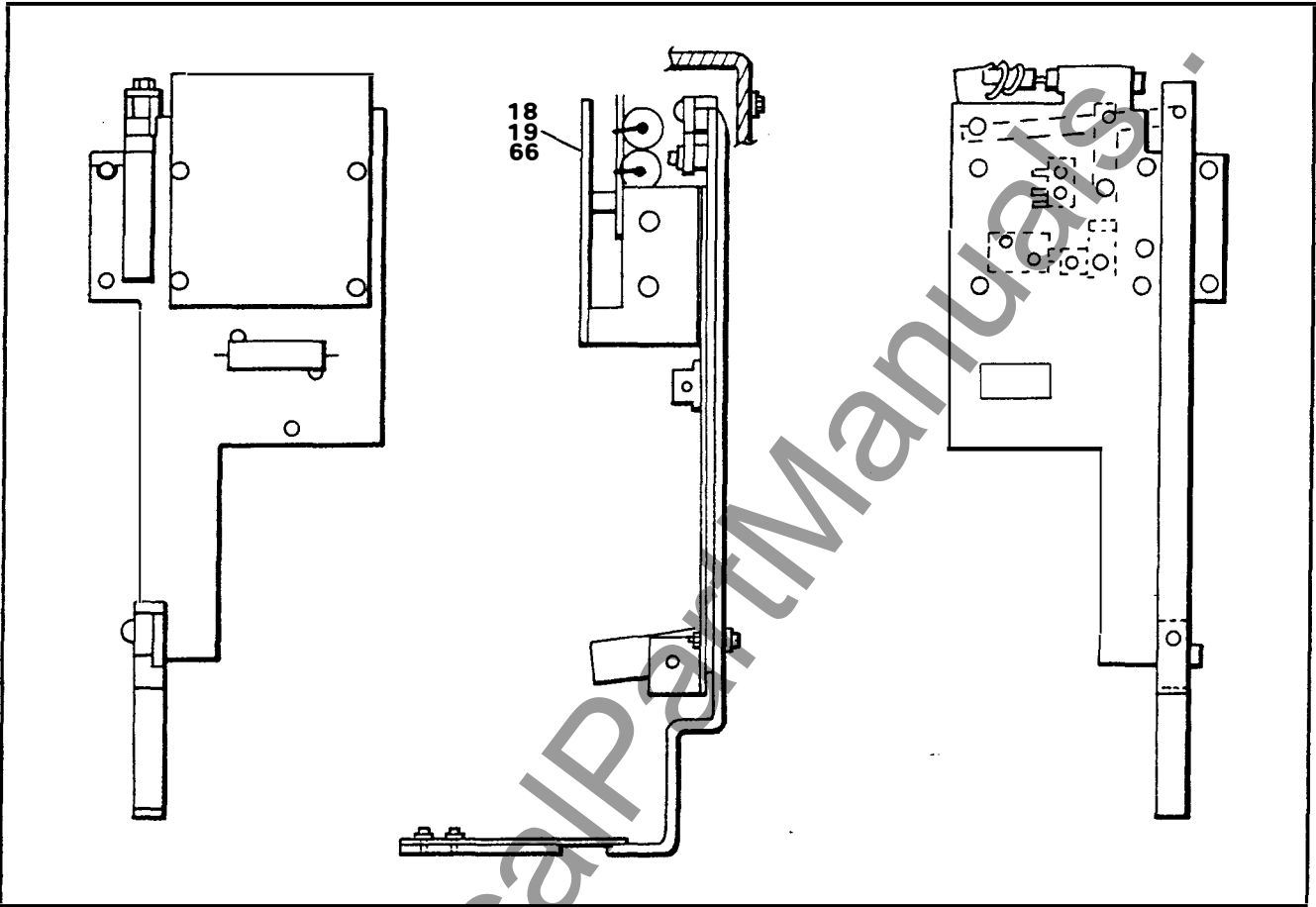


Figure 28. Undervoltage Trip

Complete Undervoltage Device
18-474-540-(Plus MK No. from Table)

MK No.	V ₁ Dropout Voltage	V ₂ Pickup Voltage	V ₃ Rated Voltage	Time Delay
501	60 VAC	100 VAC	120 VAC	3 Sec.
502	24 VDC	40 VDC	48 VDC	3 Sec.
503	62 VDC	105 VDC	125 VDC	3 Sec.
504	60 VAC	100 VAC	120 VAC	0
505	24 VDC	48 VDC	48 VDC	0
506	62 VDC	125 VDC	125 VDC	0
507	12 VDC	20 VDC	24 VDC	2 Sec.
508	12 VDC	20 VDC	24 VDC	0

The following item numbers refer to **Figure 28**

Item	Description	Part Number	Usage
18	UV Circuit Board ..	18-802-170-501	125V
19	UV Circuit Board ..	18-802-170-502	48V
66	UV Circuit Board ...	18-802-170-503	24V

Parts

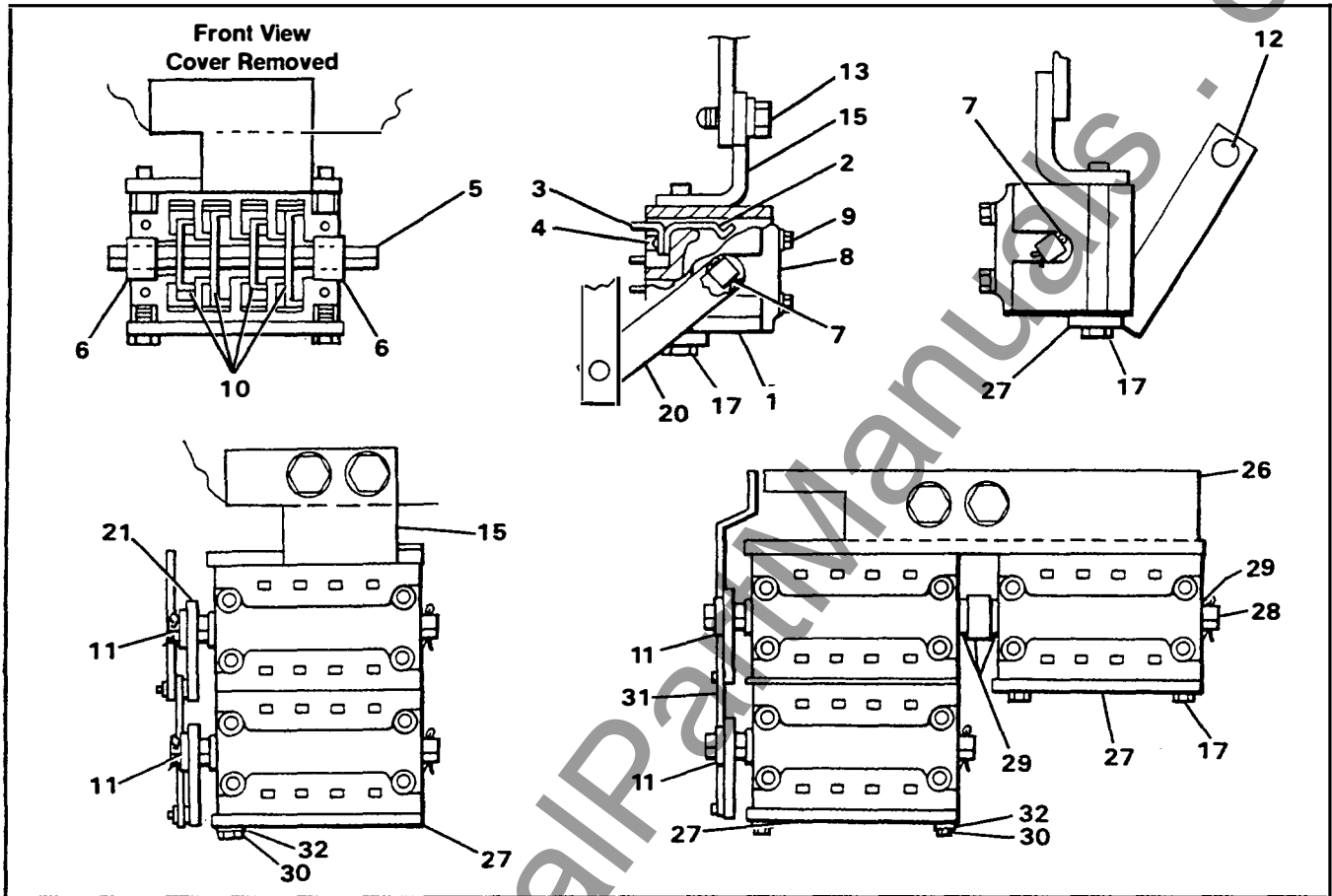


Figure 29. Auxiliary Switch Group

The following item numbers refer to Figure 29, and are common parts used on all models.

Item	Description	Part Number	Usage
1	Case	71-240-524-001	
2	Contact	71-141-994-001	
3	Terminal	15-171-949-049	
4	Screw	00-615-641-904	
5	Shaft	18-729-789-001	
6	Bearing	71-141-995-001	
7	Cotter Pin	00-671-195-049	
8	Cover	71-141-952-001	
9	Screw	15-171-074-001	
10	Rotor	18-657-961-381	
11	Retainer	15-171-399-055	
12	X Washer	00-659-055-156	

Single Switch Assembly 18-398-788-501
 Dual Switch Assembly 18-398-788-506
 Triple Switch Assembly 18-817-175-500
 Contacts are adjustable. Undervoltage Trip not available with Triple Switch Version.

Item	Description	Part Number	Usage
13	Screw	00-615-663-373	
15	Bracket	18-658-143-036	Single and Dual
17	Screw	15-171-399-045	Single and Triple
20	Arm	18-732-791-562	Single
21	Aux Arm-2 stage	18-752-300-513	Dual
26	Bracket	18-732-790-178	Triple
27	Retainer	18-658-110-275	Triple
28	Shaft	18-658-110-290	Triple
29	Bearing	18-658-110-274	Triple
30	Screw	00-611-315-398	Triple and Dual
31	Arm	18-732-790-570	Triple
32	Lock Washer	00-655-067-140	Triple and Dual

Parts

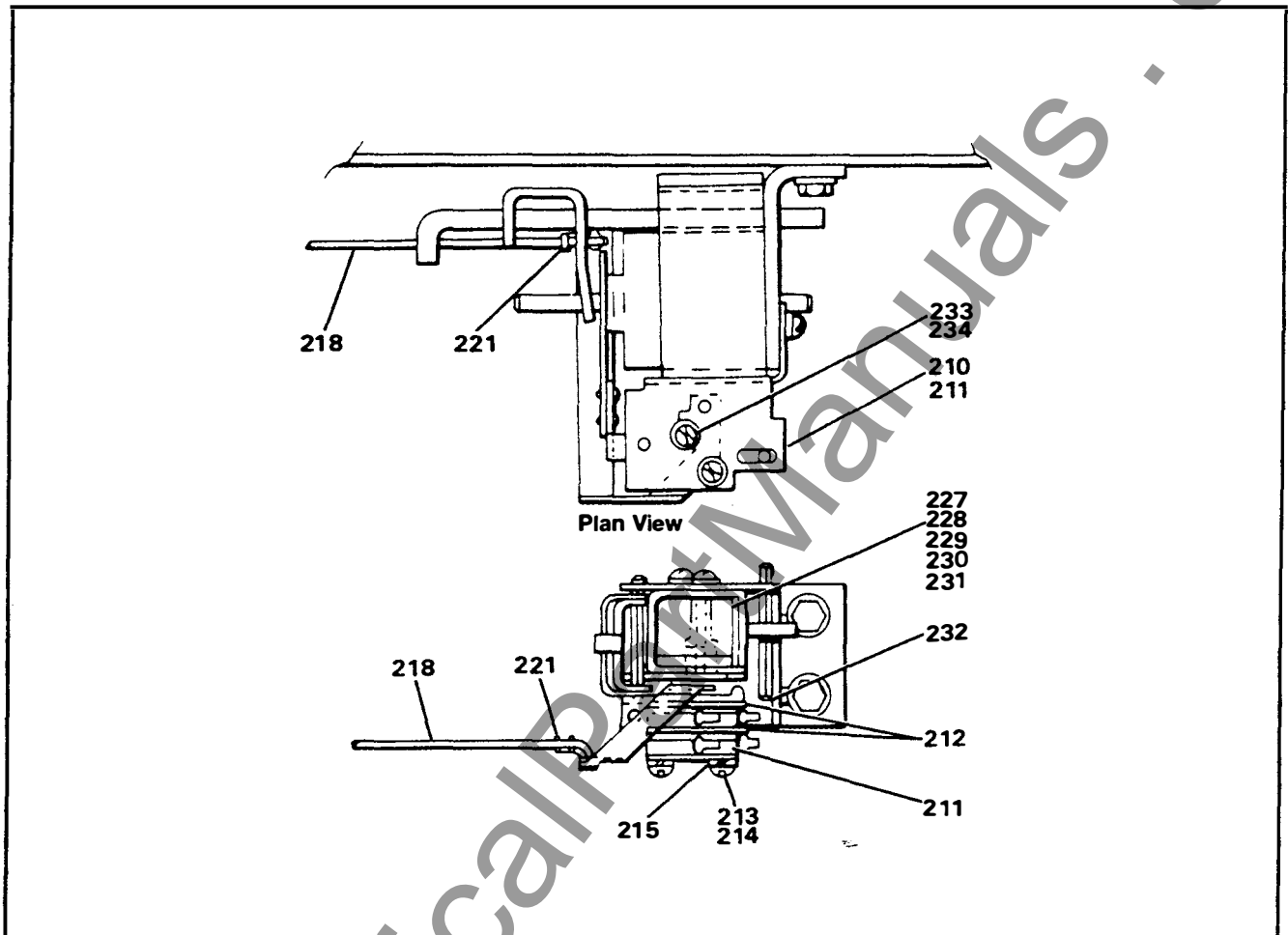


Figure 30. Optional Bell Alarm Switch Group

The following item numbers refer to **Figure 30**, and are common parts used on all models.

Item	Description	Part Number	Usage
210	Bracket Assy.	18-392-075-504	
211	Bracket Assy.	18-805-296-502	Four Switch
212	Switch	15-171-186-010	
213	Insulator	18-657-783-362	
214	Screw	15-171-399-008	Single Switch
215	Screw	00-615-471-082	
218	Lock Washer	00-855-047-040	
221	Manual Reset Rod . .	18-658-024-006	
223	Clip	15-171-399-003	
224	Label	18-658-125-298	Mounts on Breaker Cover
227	Solenoid 24VDC Int. . .	18-721-497-006	Elec. Reset Option

Single Switch Assembly	18-392-075-505
Dual Switch Assembly	18-392-075-506
Four Switch Assembly	18-805-296-501

Electrical Reset not Available for Four Switch Model.

Item	Description	Part Number	Usage
227	Solenoid 48VDC Int . . .	18-721-497-005	Elec. Reset Option
228	Solenoid 120VAC Int . .	18-721-497-001	Elec. Reset Option
229	Solenoid 240VAC Int . .	18-721-497-003	Elec. Reset Option
230	Solenoid 125VDC Int . .	18-721-497-002	Elec. Reset Option
231	Solenoid 250VDC Int . .	18-721-497-004	Elec. Reset Option
232	Rollpin	15-171-233-006	Elec. Reset Option
233	Screw	00-615-471-120	Elec. Reset Option
234	Lock Washer	00-655-047-060	Elec. Reset Option

Parts

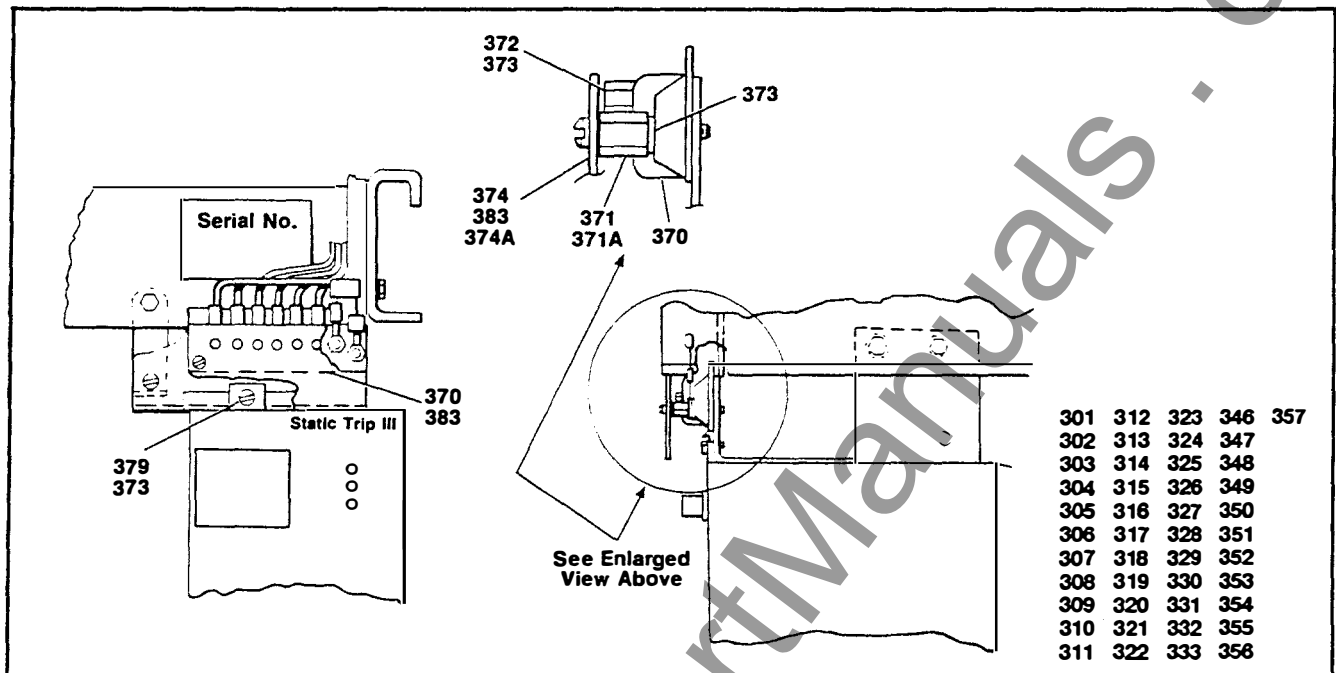


Figure 31. Static Trip Group

The following item numbers refer to **Figure 31**, and are common parts used on all models.

Item	Description	Part Number	Usage
Trip Device Type		Order Part No.	
301	RMS-TI	18-483-905-501	18-751-349-501
302	RMS-TSZ	18-483-905-502	18-751-349-502
303	RMS-TSIZ	18-483-905-503	18-751-349-503
304	RMS-TI-T	18-483-905-504	18-751-349-504
305	RMS-TS-TZ	18-483-905-505	18-751-349-505
306	RMS-TSI-TZ	18-483-905-506	18-751-349-506
307	RMS-TIG-TZ	18-483-905-507	18-751-349-507
308	RMS-TSG-TZ	18-483-905-508	18-751-349-508
309	RMS-TSIG-TZ	18-483-905-509	18-751-349-509
310	RMS-TI-TC	18-483-905-510	18-751-349-510
311	RMS-TS-TZC	18-483-905-511	18-751-349-511
312	RMS-TSI-TZC	18-483-905-512	18-751-349-512
313	RMS-TIG-TZC	18-483-905-513	18-751-349-513
314	RMS-TSG-TZC	18-483-905-514	18-751-349-514
315	RMS-TSIG-TZC	18-483-905-515	18-751-349-515
316	RMS-TI-TCN	18-483-905-516	18-751-349-516
317	RMS-TS-TZ-CN	18-483-905-517	18-751-349-517
318	RMS-TSI-TZ-CN	18-483-905-518	18-751-349-518
319	RMS-TIG-TZ-CN	18-483-905-519	18-751-349-519
320	RMS-TSG-TZ-CN	18-483-905-520	18-751-349-520
321	RMS-TSIG-TZ-CN	18-483-905-521	18-751-349-521
322	RMS-TI-T-CP	18-483-905-522	18-751-349-522
323	RMS-TS-TZ-CP	18-483-905-523	18-751-349-523
324	RMS-TSI-TZ-CP	18-483-905-524	18-751-349-524
325	RMS-TIG-TZ-CP	18-483-905-525	18-751-349-525
326	RMS-TSG-TZ-CP	18-483-905-526	18-751-349-526
327	RMS-TSIG-TZ-CP	18-483-905-527	18-751-349-527

Item	Description	Part Number	Usage
Trip Device Type		Order Part No.	
328	RMS-TI-T-CNP	18-483-905-528	18-751-349-528
329	RMS-TS-TZ-CNP	18-483-905-529	18-751-349-529
330	RMS-TSI-TZ-CNP	18-483-905-530	18-751-349-530
331	RMS-TIG-TZ-CNP	18-483-905-531	18-751-349-531
332	RMS-TSG-TZ-CNP	18-483-905-532	18-751-349-532
333	RMS-TSIG-TZ-CNP	18-483-905-533	18-751-349-533
346	RMS-TI-T-CPX	18-483-905-546	18-751-349-546
347	RMS-TS-TZ-CPX	18-483-905-547	18-751-349-547
348	RMS-TSI-TZ-CPX	18-483-905-548	18-751-349-548
349	RMS-TIG-TZ-CPX	18-483-905-549	18-751-349-549
350	RMS-TSG-TZ-CPX	18-483-905-550	18-751-349-550
351	RMS-TSIG-TZ-CPX	18-483-905-551	18-751-349-551
352	RMS-TI-T-CNPX	18-483-905-552	18-751-349-552
353	RMS-TS-TZ-CNPX	18-483-905-553	18-751-349-553
354	RMS-TSI-TZ-CNPX	18-483-905-554	18-751-349-554
355	RMS-TIG-TZ-CNPX	18-483-905-555	18-751-349-555
356	RMS-TSG-TZ-CNPX	18-483-905-556	18-751-349-556
357	RMS-TSIG-TZ-CNPX	18-483-905-557	18-751-349-557
370	Terminal Block	15-171-051-010	
371	Standoff Screw	18-657-465-036	
371A	Standoff Screw	18-658-143-026	Neutral Metering
372	Terminal Screw	18-657-465-035	
373	Lock Washer	00-655-047-060	
374	Cover	18-658-100-045	
374A	Cover	18-658-143-027	Neutral Metering
379	Screw	00-615-641-901	
383	Label	18-658-100-046	
384	Insulation	00-413-615-182	Actuator Leads

Parts

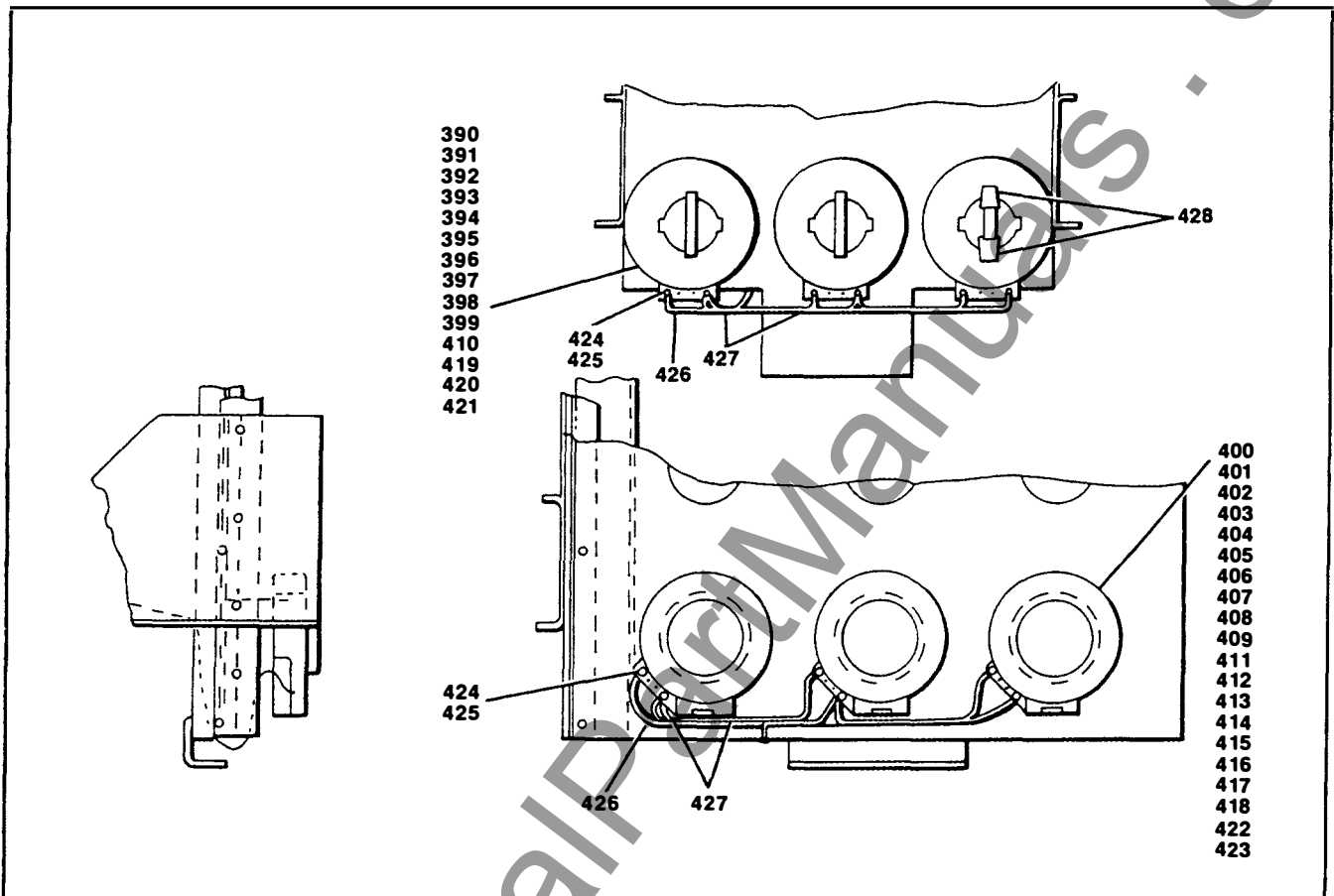


Figure 32. Tripping Transformer Group

The following items refer to **Figure 32**, RL Breakers with Static Trip III Trip Device. For further information on Static Trip III Trip Device, refer to "Static Trip III Information and Instruction Guide", SG-3118.

Single Winding Transformer

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
390	Trip Transformer 80A	61-300-053-527	to RL-2000	400	Trip Transformer 1200A	61-300-053-510	RL-3200
391	Trip Transformer 150A	61-300-053-501	to RLE-2000	401	Trip Transformer 1600A	61-300-053-511	RL-3200
392	Trip Transformer 200A	61-300-053-502	to RLE-2000	402	Trip Transformer 2000A	61-300-053-512	RL-3200
393	Trip Transformer 300A	61-300-053-503	to RLE-2000	403	Trip Transformer 2400A	61-300-053-525	RL-3200
394	Trip Transformer 400A	61-300-053-504	to RLE-2000	404	Trip Transformer 3000A	61-300-053-526	RL-3200
395	Trip Transformer 600A	61-300-053-505	to RLE-2000	405	Trip Transformer 3200A	61-300-053-513	RL-3200
396	Trip Transformer 800A	61-300-053-506	to RLE-2000	406	Trip Transformer 1600A	61-300-053-514	RL-4000-RLE-4000
397	Trip Transformer 1200A	61-300-053-507	RL-1600 to RLE-2000	407	Trip Transformer 2000A	61-300-053-515	RL-4000-RLE-4000
398	Trip Transformer 1600A	61-300-053-508	RL-1600 to RLE-2000	408	Trip Transformer 3200A	61-300-053-516	RL-4000-RLE-4000
399	Trip Transformer 2000A	61-300-053-509	RL-2000 to RLE-2000	409	Trip Transformer 4000A	61-300-053-517	RL-4000-RLE-4000

Parts

Dual Winding—Separate 2000A Ground Winding

Item	Description	Part Number	Usage
410	Trip Transformer 2000A	61-300-059-509	RL-2000-RLE-2000
411	Trip Transformer 1200A	61-300-059-501	RL-3200
412	Trip Transformer 1600A	61-300-059-502	RL-3200
413	Trip Transformer 2000A	61-300-059-503	RL-3200
414	Trip Transformer 3200A	61-300-059-504	RL-3200
415	Trip Transformer 1600A	61-300-059-505	RL-4000, RLE-4000
416	Trip Transformer 2000A	61-300-059-506	RL-4000, RLE-4000
417	Trip Transformer 3200A	61-300-059-507	RL-4000, RLE-4000
418	Trip Transformer 4000A	61-300-059-508	RL-4000, RLE-4000

Hardware Common to All Versions

Item	Description	Part Number	Usage
424	Terminal	15-172-099-003	
425	Screw 10-32	00-615-649-216	
426	Wire #18	00-557-286-003	
427	Tyrap	00-857-271-230	
428	Spacer	18-658-024-052	RL-800, RLI-800, RLE-800
429	Screw 6-32	00-615-641-901	Dual Winding Ground

Dual Winding Tapped Configuration (See Figure 33)

Item	Description	Part Number	Usage
419	Trip Transformer	61-300-065-501	RL-, RLE-, RLI-800
Taps for 200A, 400A, 600A and 800A			
420	Trip Transformer	61-300-065-502	RL-1600, RL-2000
Taps for 400A, 800A, 1200A and 1600A			
421	Trip Transformer	61-300-065-503	RL-2000-RLE-2000
Taps for 500A, 1000A, 1500A and 2000A			
422	Trip Transformer	61-300-065-504	RL-3200
Taps for 800A, 1600A, 2400A and 3200A			
423	Trip Transformer	61-300-065-505	RL-4000, RLE-4000
Taps for 1000A, 2000A, 3000A and 4000A			

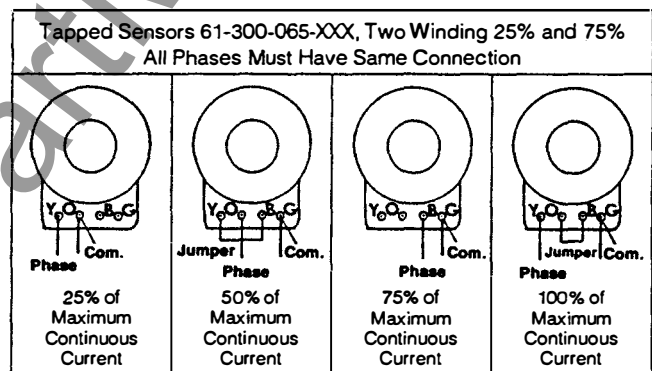


Figure 33: Tapped Sensor Connections

Parts

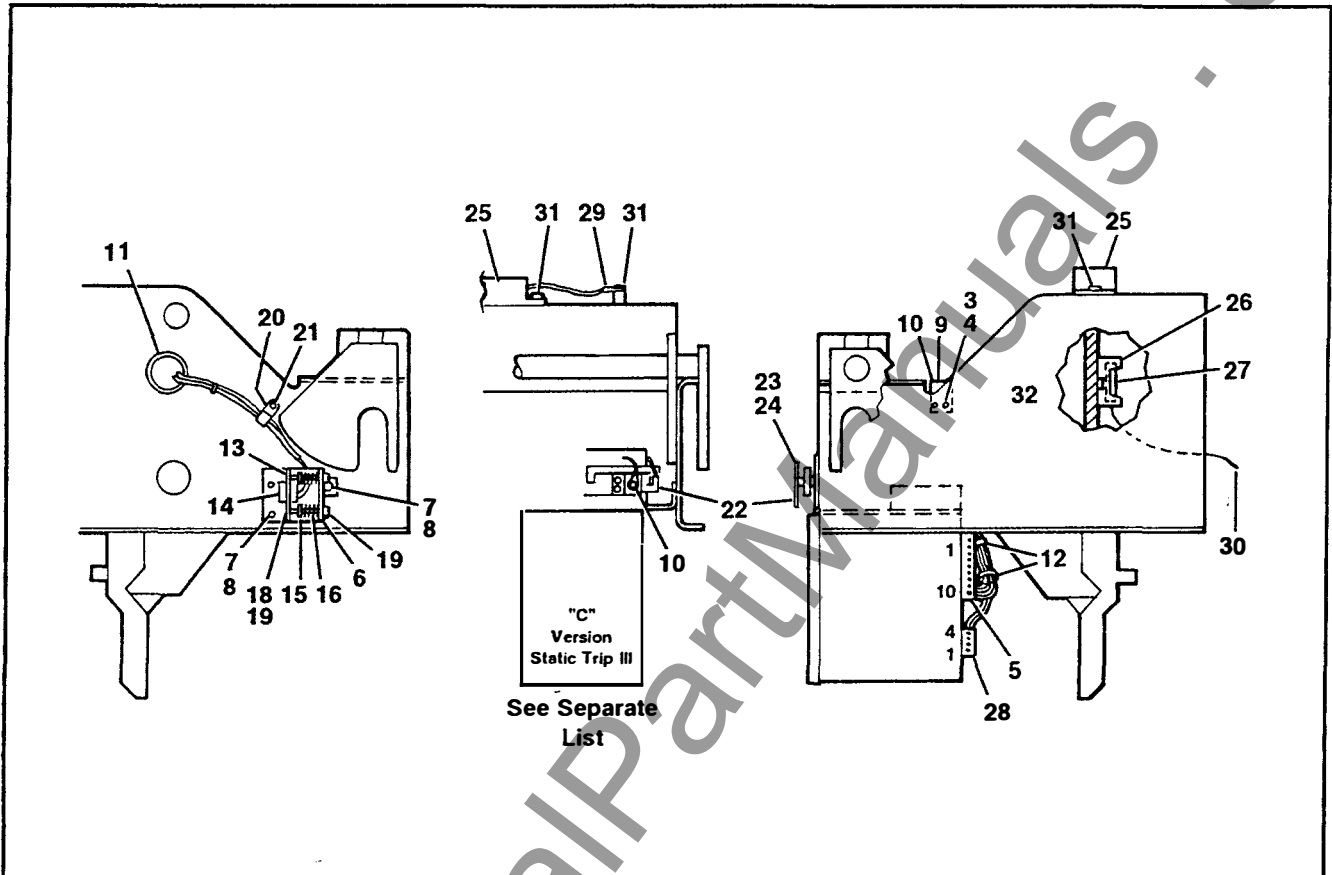


Figure 34. Communications Options

The following item numbers refer to **Figure 34**, and are common parts used on all models. (Ref. 18-398-289-551/-565)

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
1	Switch	00-000-466-771		18	Screw	00-615-471-072	
2	Insulator	18-658-110-126		19	Lock Washer	00-655-017-014	
3	Screw	00-615-471-130		20	Cable Hanger	00-857-275-006	
4	Nut	00-633-043-106		21	Screw	00-615-581-174	
5	Plug 10 Pt.	18-658-110-150		22	Term. Conn.	18-732-790-592	Neutral Metering
6	Plug Bracket	18-732-790-142		23	Cover	18-658-143-027	Neutral Metering
7	Screw	15-171-399-010		24	Standoff	18-658-143-026	Neutral Metering
8	Nut	00-633-059-210		25	PT Module	18-817-157-501	
9	Terminal	15-172-099-007		26	Fuse Block	15-172-704-001	
10	Terminal	15-172-099-001		27	Fuse	15-172-704-002	
11	Grommet Mtg.	15-171-890-001		28	Plug 4 Pin	15-172-638-248	
12	Tyrap	00-857-271-230		29	Terminal	15-172-099-004	
13	Guide Plate	18-658-110-152		30	Terminal	15-172-099-022	
14	Sub-D 15 Pin	15-172-245-015		31	Screw #10	15-171-399-010	
15	Pin Guide	18-658-110-151		32	Screw #6	00-615-641-903	
16	Spring	71-141-173-001					
17	Nut	00-633-059-210					

Parts

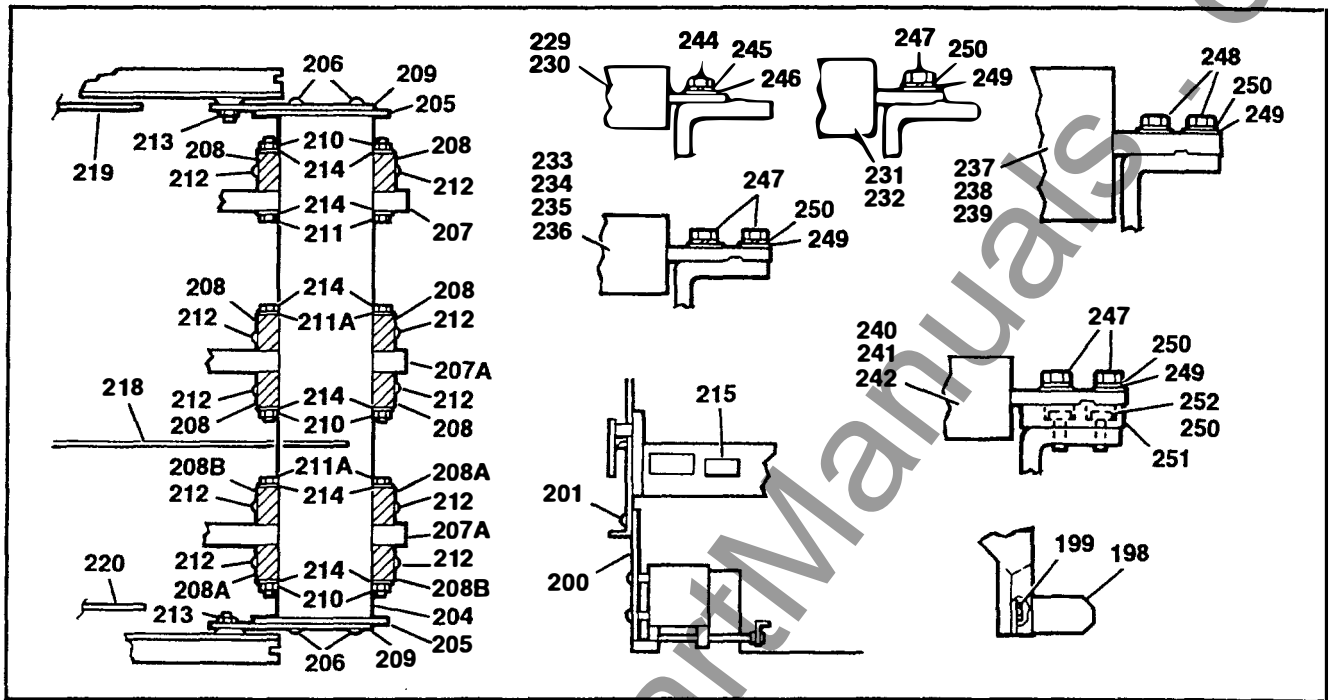


Figure 35. Integally Fused Breakers

The following items refer to **Figure 35**. Used on RLF-800 thru RLF-2000 Breakers.

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
198	Bracket	18-657-937-283		229	Fuse 250A	71-142-200-001	
199	Screw	15-171-399-011		230	Fuse 400A	71-142-200-002	
200	Open Fuse Trip	18-399-796-501	See figure 26	231	Fuse 600A	71-142-200-003	
201	Screw	15-171-399-010		232	Fuse 800A	71-142-200-004	
204	Insulator	18-732-790-025		233	Fuse 1000A	71-142-200-013	
205	Insulator	18-657-947-202		234	Fuse 1200A	71-142-200-005	
206	Screw	15-615-024-004		235	Fuse 1600A	71-142-200-006	
207	Connector	18-657-942-090	RLF-800	236	Fuse 2000A	71-142-200-007	
207A	Connector	18-657-942-091		237	Fuse 2500A	71-142-200-008	
208	Bracket	18-398-288-010		238	Fuse 3000A	71-142-200-009	
208A	Bracket	18-399-523-001	RLF-2000	239	Fuse 4000A	71-142-200-010	
208B	Bracket	18-399-523-002	RLF-2000	240	Fuse 1600A	71-142-200-015	} Welder Fuses
209	Bracket	18-732-790-026		241	Fuse 2000A	71-142-200-016	
210	Nut	15-171-063-016		242	Fuse 2500A	71-142-200-019	
211	Screw	00-615-114-388	RLF-800	244	Screw	00-611-315-421	
211A	Screw	00-615-114-395		245	Lock Washer	00-655-017-030	
212	Screw	15-171-399-011		246	Washer	00-615-007-900	
213	Nut	00-631-059-104		247	Screw	00-611-315-546	
214	Washer	00-651-007-146		248	Screw	00-611-315-548	
215	Label	18-657-765-208		249	Washer	00-651-007-285	
218	Barrier	18-657-937-284	RLF-2000	250	Lock Washer	00-655-017-036	
219	Barrier	18-732-790-053	RLF-2000	251	Adapter	18-732-791-586	
220	Barrier	18-732-790-054	RLF-2000	252	Screw	00-615-114-542	

Breaker Type	Maximum Fuse
RLF-800	1600A
RLF-1600	3000A
RLF-2000	4000A

Parts

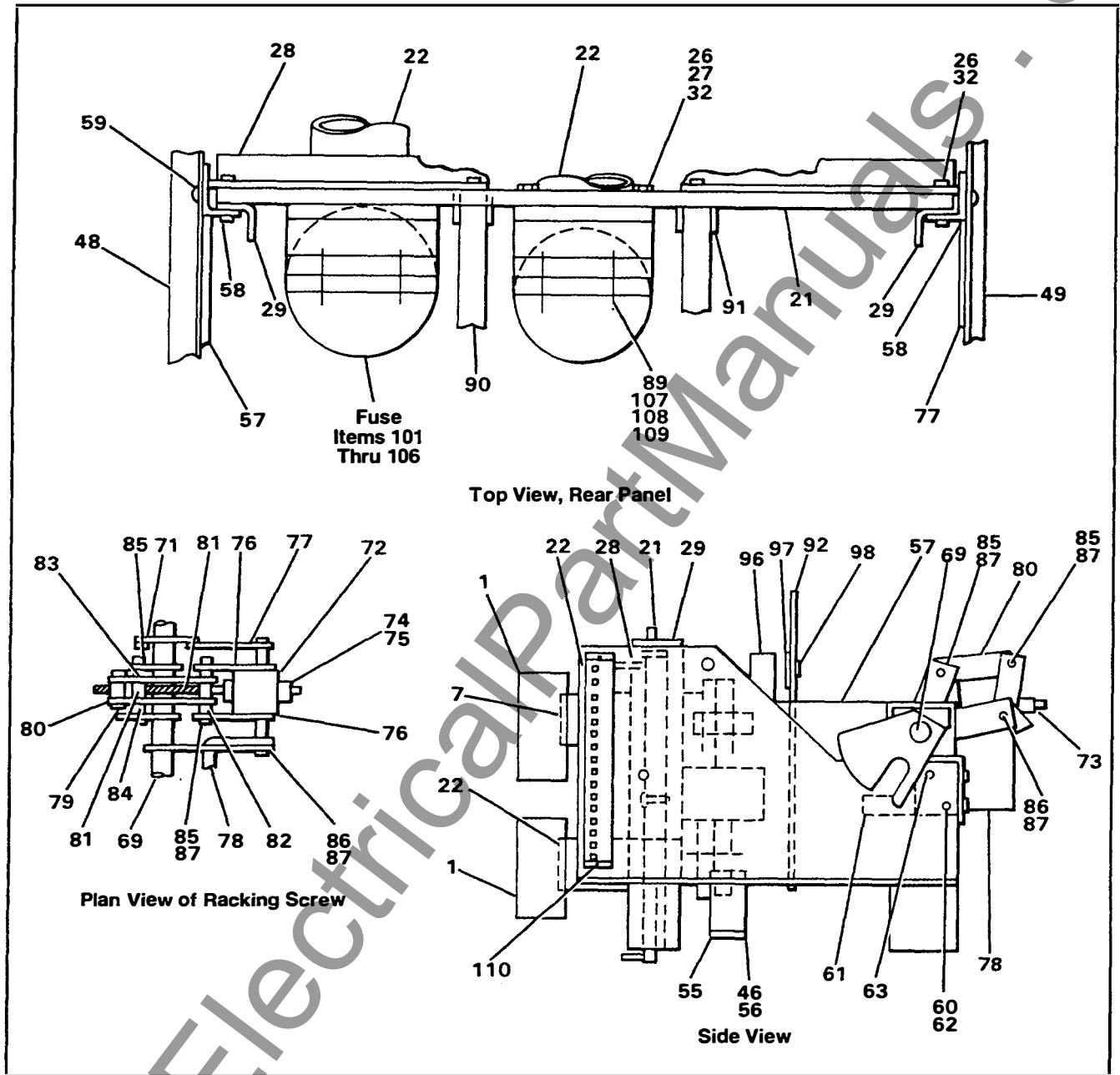


Figure 36. Fuse Carriage Outline

Parts

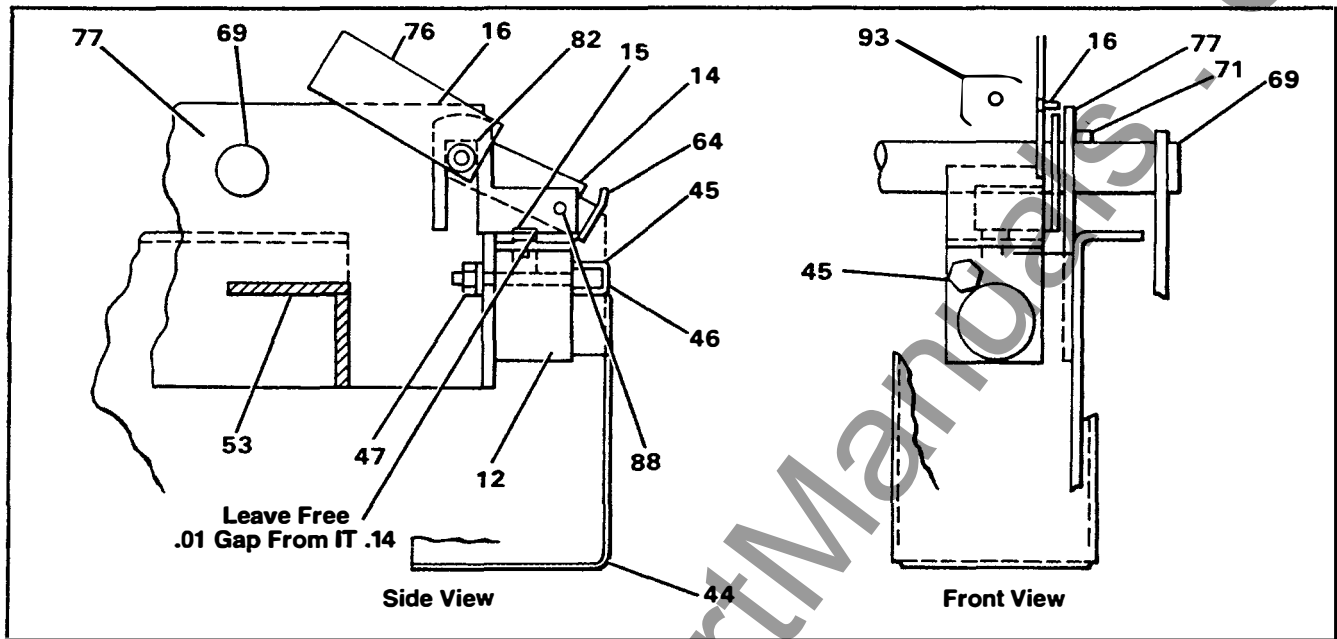


Figure 37 Key Interlock Mounting

The following items refer to **Figures 36 & 37**, and are common to RFC-3200A and RFC-4000A fuse carriages (except as noted):
(Ref. 18-474-533-506/-803/-401)

Item	Description	Part Number	Usage	Item	Description	Part Number	Usage
1	Primary Contact	18-733-481-501	RFC 3200A	71	Retainer	18-657-822-197	
1A	Primary Contact	18-733-481-502	RFC 4000A	72	Racking Block	18-657-823-359	
7	Screw	00-613-114-373		73	Racking Screw	18-735-641-060	
12	Key Interlock	00-675-535-311		74	Collar	18-658-110-024	
14	Interlock	18-657-765-372		75	Roll Pin	18-658-110-036	
15	.25-20 x .5 Hex. Soc. Hd. Screw	15-171-738-008		76	Link	18-657-961-200	
16	Rivet (.188 x .50)	18-657-824-128		77	Rack Shaft Support	18-733-744-001	
21	Base Plate	18-399-521-001	RFC 3200A	78	Screw Brace	18-657-942-197	
21A	Base Plate	18-398-939-001	RFC 4000A	79	Barrel Nut	18-657-962-344	
22	Contact Assy.	18-399-274-502	RFC 3200A	80	Link	18-657-941-297	
22A	Contact Assy.	18-399-274-501	RFC 4000A	81	Spacer (.5)	18-724-503-004	
26	Lk. Washer .312	00-655-017-030		82	Spacer (.310)	18-724-503-005	
27	Washer .312	00-651-027-170		83	Spacer (.19)	18-731-274-002	
28	Angle	18-657-937-255		84	Spacer (.46)	18-731-274-001	
29	Angle Glastic	18-657-941-062		85	Pin .375 x (1.94)	18-724-501-012	
32	Cap Screw	00-611-315-426		86	Pin .376 x (2.75)	18-724-501-013	
44	Cover	18-744-871-001		87	X Washer	00-659-055-250	
45	Spec Screw	18-657-855-247		88	Screw	15-171-074-101	
46	Screw No. 10 (.5)	15-171-399-010		90	Brace	18-657-942-196	
47	Nut (.375-16)	15-171-063-018		91	Roll Pin .188 x 1.25	00-671-176-319	
48	Side Plate RH	18-398-289-510		92	Barrier	18-733-821-002	RFC 3200A
49	Side Plate LH	18-398-288-002		92A	Barrier	18-733-821-001	RFC 4000A
53	Apron Assy.	18-733-745-501		93	Label (Racking)	18-657-765-385	
54	Screw .25-20 (.62)	00-615-663-373		95	Open Fuse Sensor	See Fig. 38	
55	Ground Bar	18-657-916-579		96	Open Fuse Indicator	See Fig. 25	
56	Nut	00-633-059-210		97	Cover	18-657-961-277	
57	Rack Shaft Support	18-733-744-002		98	Screw, Self Tap.No.6	00-615-605-120	
58	Angle	18-657-937-254		101	Fuse 200A	71-142-000-007	
59	Screw	15-615-024-006		102	Fuse 2500A	71-142-000-008	
60	Screw	00-615-015-468		103	Fuse 3000A	71-742-000-009	
61	Bracket	18-657-942-199		104	Fuse 4000A	71-142-000-010	
62	Nut	15-171-063-018		105	Fuse 5000A	71-142-000-011	
63	Screw	15-615-024-007		106	Fuse 6000A	71-142-000-012	
64	Shutter	18-657-765-373		107	Screw 2000A only	00-611-315-548	
69	Rack Shaft Assy.	18-733-820-501		108	Screw, All Others	00-611-315-550	
				109	Rd. Washer	00-651-007-300	
				110	Secdy. Disconnect	18-398-790-501	

Parts

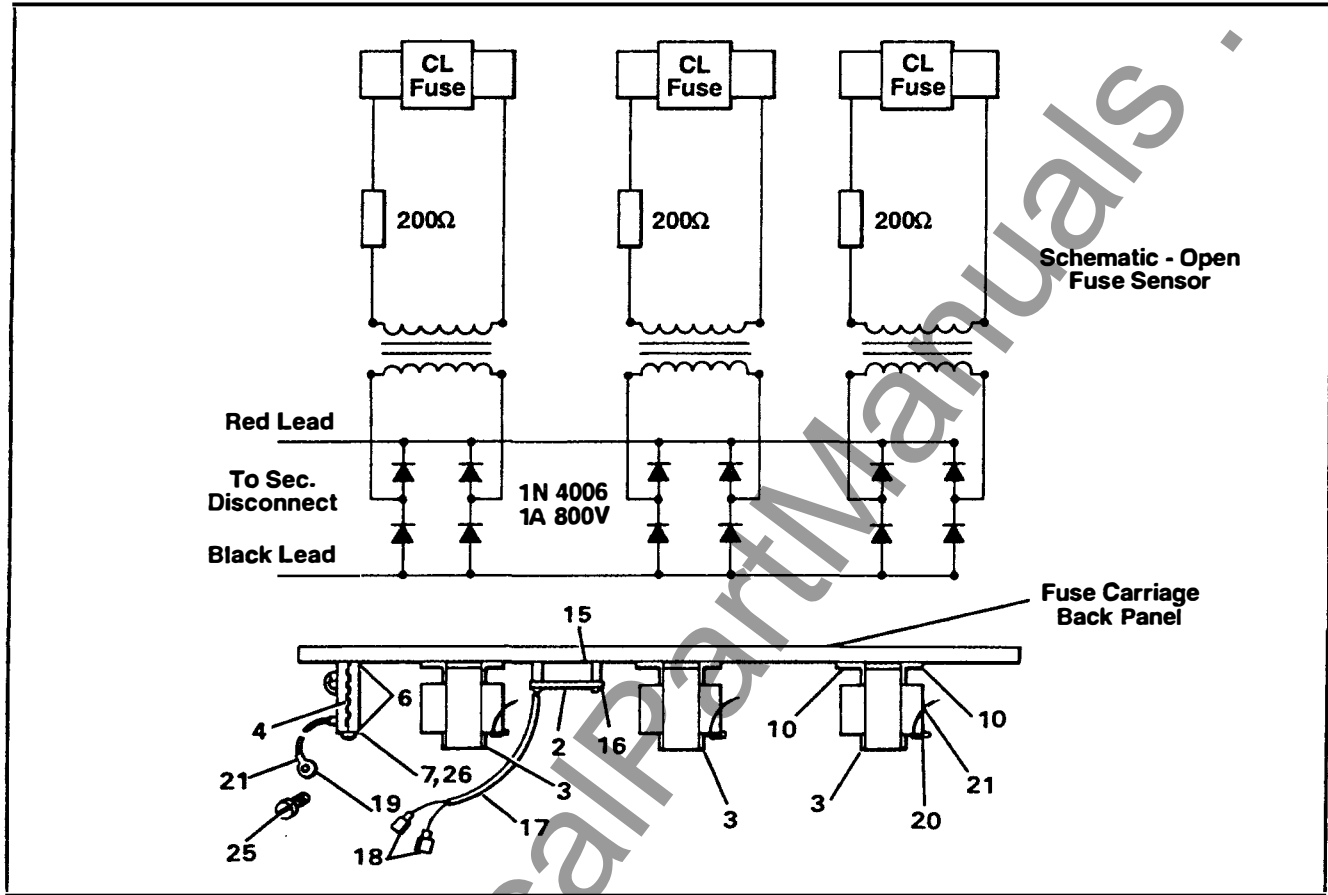


Figure 38. Open Fuse Sensor

The following items refer to **Figures 38**, and are common to all fuse carriages:

Item	Description	Part Number	Usage
2	Circuit Board Assy.	18-730-037-502	
3	Transformer	18-657-855-365	
4	Resistor (200 OHM 25W)	00-875-401-201	
6	Washer (Centering)	14-105-442-001	
7	Screw #10 x 2.75	00-615-635-237	
10	Screw #10 x .5	00-615-644-218	
15	Spacer	15-171-772-001	
16	Screw #6 x .62	00-615-648-126	

Item	Description	Part Number	Usage
17	Insulation	00-413-615-182	
18	Terminal	15-171-099-007	
19	Terminal #10 Ring	15-172-099-003	
20	Terminal #6 Ring	15-172-099-001	
21	#18 SIS Wire	00-557-286-003	
23	Tyrap	00-857-271-230	
24	Tyrap Mtg. Plate	00-857-271-750	
25	#10-32 x .38 Sems	00-611-445-216	
26	Lock Washer, #10	00-655-067-100	

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