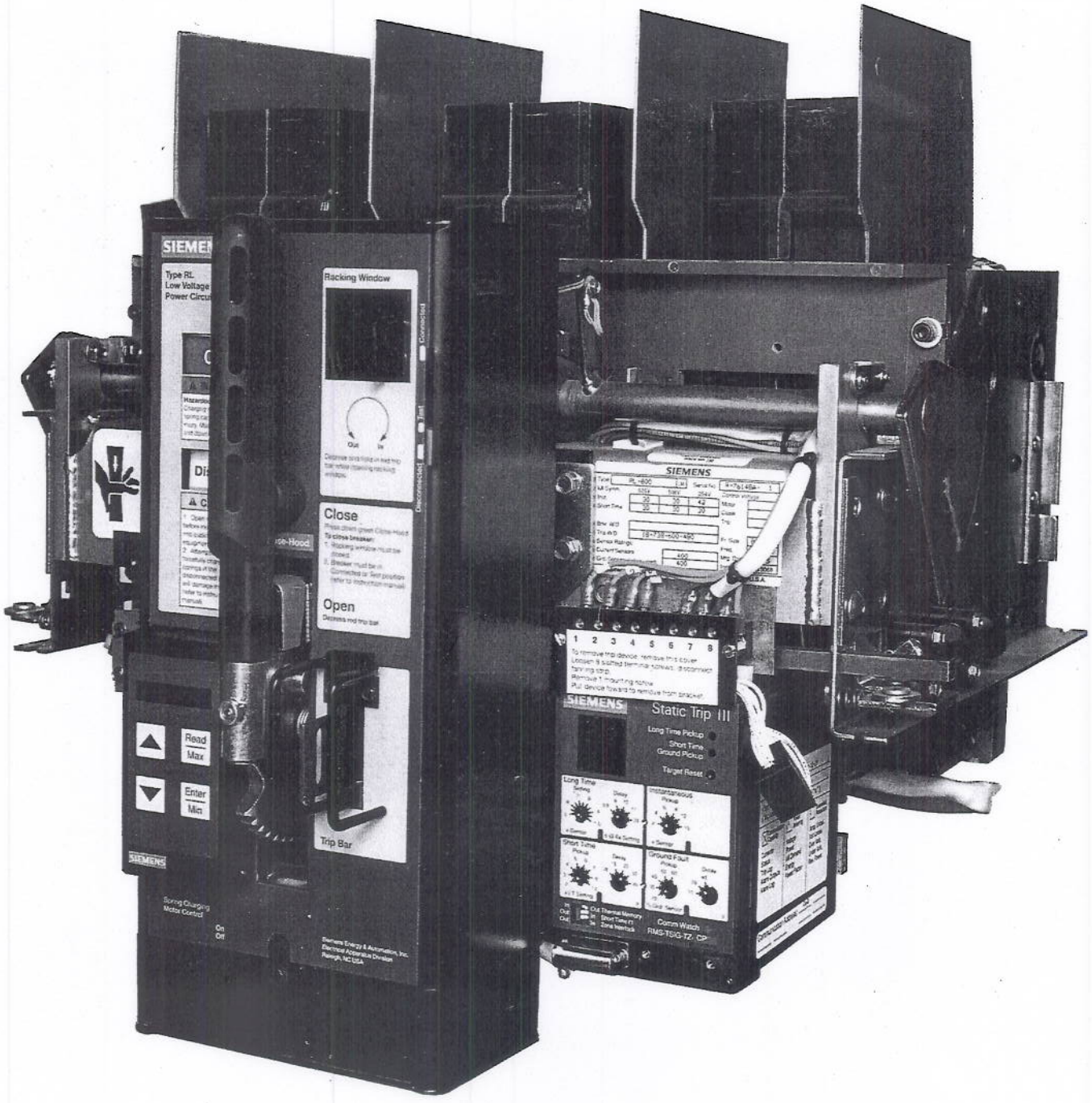
SIEMENS

Type RL Low Voltage Circuit Breakers

Instructions
Installation
Operation
Maintenance
SGIM-3068D



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.

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

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

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

Note: Manual charging handle must be in vertical position during electrical charging.

Table 2. Operating Procedure for Electrically Operated Circuit Breakers

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

Drawout Interlock
A drawout circuit breaker mechanism includes:

1. Means to rack the circuit breaker in or out of the compartment.
2. Interlock to prevent racking a closed circuit breaker into or out of any position.
3 Interlock to prevent closing a circuit breaker until it is racked to the TEST or CONNECT position.
4. Interlock to prevent withdrawing a circuit breaker from the cubicle while the closing springs are charged.

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

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

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

2. Using the racking crank, rotate the racking screw (105) counterclockwise until the racking shaft is in the DISCONNECT 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 DISCONNECT position. Double check that the racking clevises engage the pins on both sides of the cubicle.

3. Clockwise rotation of the racking screw will rack the breaker into the TEST position. At the TEST position, the racking window can be closed, allowing the trip bar to reset and the circuit breaker can be operated. Further racking will place the circuit breaker between the TEST and CONNECT 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 CONNECT 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 CONNECT or TEST position.

4. To withdraw the breaker from the CONNECT 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 14** for proper procedure.

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

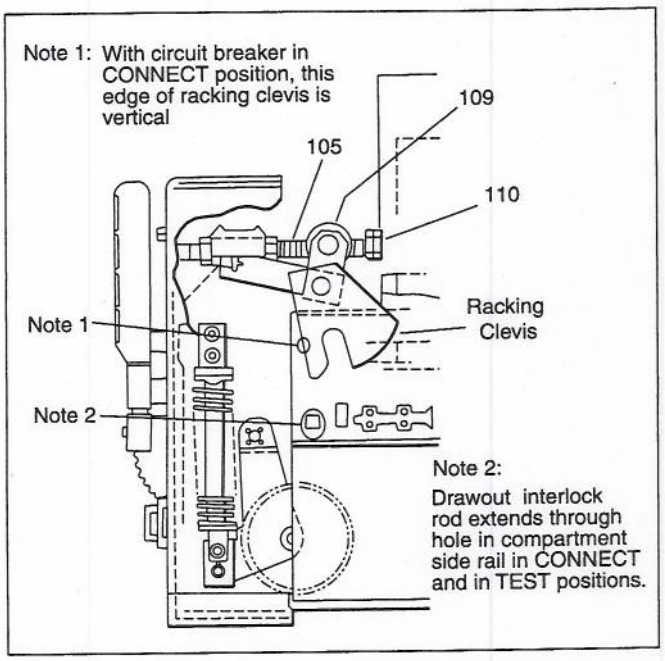


Figure 4. Detail of Typical Racking Mechanism

Spring Discharge Interlock

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

IMPORTANT: On manually charged breakers, the close hood is interlocked to the manual charge cam, and must be clear before racking the circuit breaker to the DISCONNECT position. 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 manually in that position, and then rack out in the normal manner.

Maintenance

General
For the safety of maintenance personnel as well as others who might be exposed to hazards associated with maintenance activities, the safety related work practices of NFPA 70E, parts 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 Instruction Manual should be reviewed and retained in a location readily accessible for reference during maintenance of this equipment.

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

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

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

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.

⚠DANGER

Hazardous voltages and high-speed moving parts.

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

Always de-energize and ground the equipment before maintenance.

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

⚠WARNING

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

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

The following maintenance procedures must be performed regularly:
- Recommended annual RL circuit breaker inspection procedure
- Recommended RL breaker maintenance and lubrication procedure.

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

The use of unauthorized parts in the repair of the equipment, or tampering by unqualified personnel will result in dangerous conditions which can cause death, serious injury or equipment damage. Follow 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. A thin film of lubricant should be applied in accordance with the 'Lubrication Chart', **Table 5**.

Apply lubricants with care to avoid getting grease on insulating members, since it may affect the dielectric strength. Faces of arcing contacts and faces of main contacts should not be lubricated. The rubbing surfaces (i.e., those surfaces without brazed-on contact tips) of the main contact fingers, arcing contact fingers, and hinge contact fingers should be lubricated with a coating of Siemens electrical contact lubricant, part no. 15-171-370-002. If dust or dirt has accumulated, disassembly may be necessary to clean and relubricate these points. See 'Contact Replacement', **Page 15** 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 DISCONNECT position.
3. Open the cubicle door, and remove the circuit breaker from the cubicle.
4. Rotate the racking screw to the TEST position (approximately 3 turns) to clear the spring discharge interlock, before attempting to charge closing springs. Exercise the circuit breaker through several close-open cycles. For electrically operated circuit breakers, operate the circuit breaker electrically. (Refer to the specific wiring information for your circuit breaker to determine where control voltage signals should be applied. Usually, spring charging power is connected between secondary disconnects SD12 and SD16, closing control power between SD13 and SD16, and tripping power between SD11 and 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.
5. Test the tripping system, using an appropriate test set, such as the Siemens Portable Static Trip Test Set, model PTS-4. Refer to 'Static Trip III Information and Instruction Guide', SG-3118, and 'Portable Test Set Instructions', 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.
6. 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.
7. Turn the racking screw to the DISCONNECT 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:

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

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

Frame Size Amperes	Inspection Interval All Type RL Breakers	Maintenance & Lubrication Interval		Overhaul Interval
	Check & Exercise Tripping System Check & Exercise Circuit Breaker Mechanism	RL Breakers built before 6/91 (Number of operations, or time, whichever occurs first)	RL breakers built 6/91 or later (with "LM" in type designation- See **Note 2**)	All Type RL breakers (Number of Operations)
800	Annually	1750 operations/1 year	5 years	12500 operations
1600	Annually	500 operations/1 year	5 years	4000 operations
2000	Annually	500 operations/1 year	5 years	4000 operations
3200	Annually	250 operations/1 year	5 years	1500 operations
4000	Annually	250 operations/1 year	5 years	1500 operations
5000	Annually	250 operations/1 year	5 years	1500 operations

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

⚠ DANGER

Hazardous voltages and high-speed moving parts.

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

Always de-energize and ground the equipment before maintenance.

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

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

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

   To remove arc chutes, proceed as follows:

   a. Remove mounting screws for holding clips, remove support and phase barriers.

   b. Lift arc chutes vertically to clear arc runners.

6. Inspect arc chutes for excessively burned arcing plates. Replace arc chutes under the following conditions:

   a. Copper-plated steel plates in the arc chutes measure less than 0.06" thickness for RL-800 through RLE-2000 circuit breakers.

   b. Copper-plated steel plates in the arc chutes measure less than 0.08" thickness for RL-3200 through RL-5000 circuit breakers.

7. Wipe the contacts with a clean cloth saturated with a non-toxic cleaning fluid, such as denatured alcohol.

8. Replace badly burned or pitted contacts. (See 'Contact Replacement', **Page 15**, and 'Lubrication Chart', **Table 5**.) Do not lubricate faces of contacts.

9. Clean any accumulation of dust or dirt from the circuit breaker. For insulating parts, use a clean 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 (see **Page 14** and **Table 4**) to check latch and linkage movement. (Be sure to rotate the racking screw to the TEST position to clear the spring discharge interlock before attempting to charge closing springs).

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

13. Exercise the circuit breaker through several close-open cycles. For electrically operated circuit breakers, operate the circuit breaker electrically. (Refer to the specific wiring information for your circuit breaker to determine where control voltage signals should be applied. Usually, spring charging power is connected between secondary disconnects SD12 and SD16, closing control power between SD13 and SD16, and tripping power between SD11 and 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.

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 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.

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

16. A megger test should be made on the high voltage circuit to be sure that all connections are free of undesired grounds. A megger test is also advisable on the control circuit.

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

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

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

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

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

⚠CAUTION

Excessive test voltages may result in damage to equipment.

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

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

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

Figure 5. Maintenance Closing

Maintenance Closing

⚠CAUTION

High-speed moving parts.

May cause personal injury.

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

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

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

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

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

Table 4. Maintenance Closing

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

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

Main Contact Make (See **Figure 8**)
Compression of the contact fingers (46) must be between .093" and .125" (2.4-3.2mm). This is the difference between:

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

For RLE version breakers, the measurement is made .25" from the bottom edge of the finger contact surface.

For convenience, a GO/NO-GO feeler gauge (part no. 18-658-143-214) can be used to measure the gap between the contact finger (46) and the extruded portion of the upper contact assembly (37). This measurement is made with the breaker closed. The outside contacts (46) on each pole must be checked and adjusted, such that the GO end of the gauge can be inserted into the gap all the way to the front surface of the contact finger's vertical portion. The NO-GO end should not be able to be fully inserted. **Figure 6** shows the GO/NO-GO gauge and the manner in which it is inserted between the contact fingers (46) and the upper contact assembly (37). **Figure 7** shows use of the GO/NO-GO gauge on an RL circuit breaker.

Adjustment is provided by positioning screws (78) after loosening nuts (80). Counterclockwise rotation of screws (78) increases compression. Carefully torque nuts (80) to 30-60 inch-pounds 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 Adjustment of the arcing contacts is dependent on the adjustment of the main contact make (compression) as discussed 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.

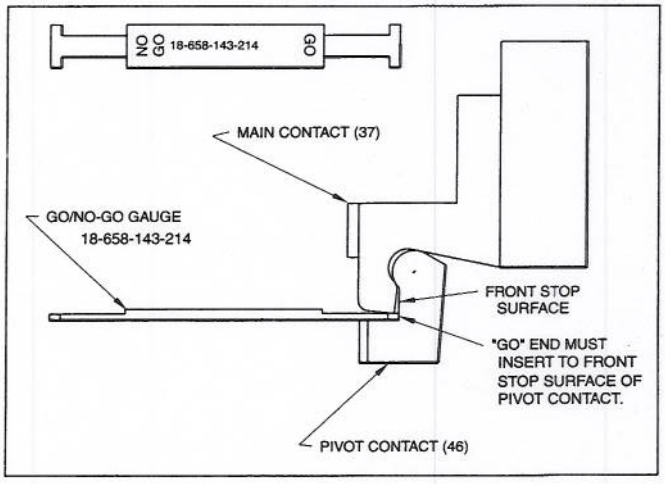


Figure 6. Use of the GO/NO-GO Gauge to Check Main Contact Make (Compression)

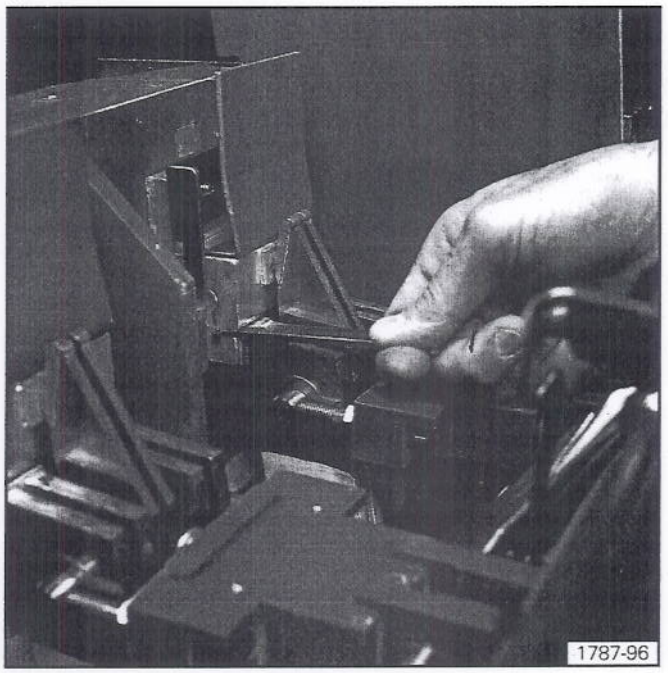


Figure 7. Check of Main Contact Make (Compression) Using GO/NO-GO Gauge

Contact Replacement (See **Figure 8**) 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 8**)
With the circuit breaker contacts open and the stored energy springs discharged, the main contact fingers (46) may be removed by loosening screws (44, 45) enough to relieve the compression on springs (47, 48). There are two springs behind each finger. It is important that they be positioned properly upon reinstallation. If difficulty is experienced in correctly positioning these springs, the upper and lower primary disconnects (168 **Figure 18**), may be removed from each phase and the circuit breaker tipped to rest on the ends of 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 8**)
The stationary arcing contact is a part of a connector (37) and may be replaced by proceeding as above. In this case, screws (44, 45) must be removed. However, to provide clearance for removal of connector the backpanel (33) may have to be loosened by removing screws (58, 59 and 23, **Figure 17**). By removing pin (98 and 99 **Figure 18**), the entire assembly can be lifted out.

Hinge Contact Fingers (See **Figure 8**)
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 8**)
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. When the overcurrent trip device issues a trip signal, the coil of the tripping actuator is energized, which causes the magnetic flux to shift to a new path, releasing the stored energy of a spring located inside the tripping actuator. The spring provides the energy to trip the breaker, moving the trip-flap clear of the toggle latch.

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

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

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

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

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.

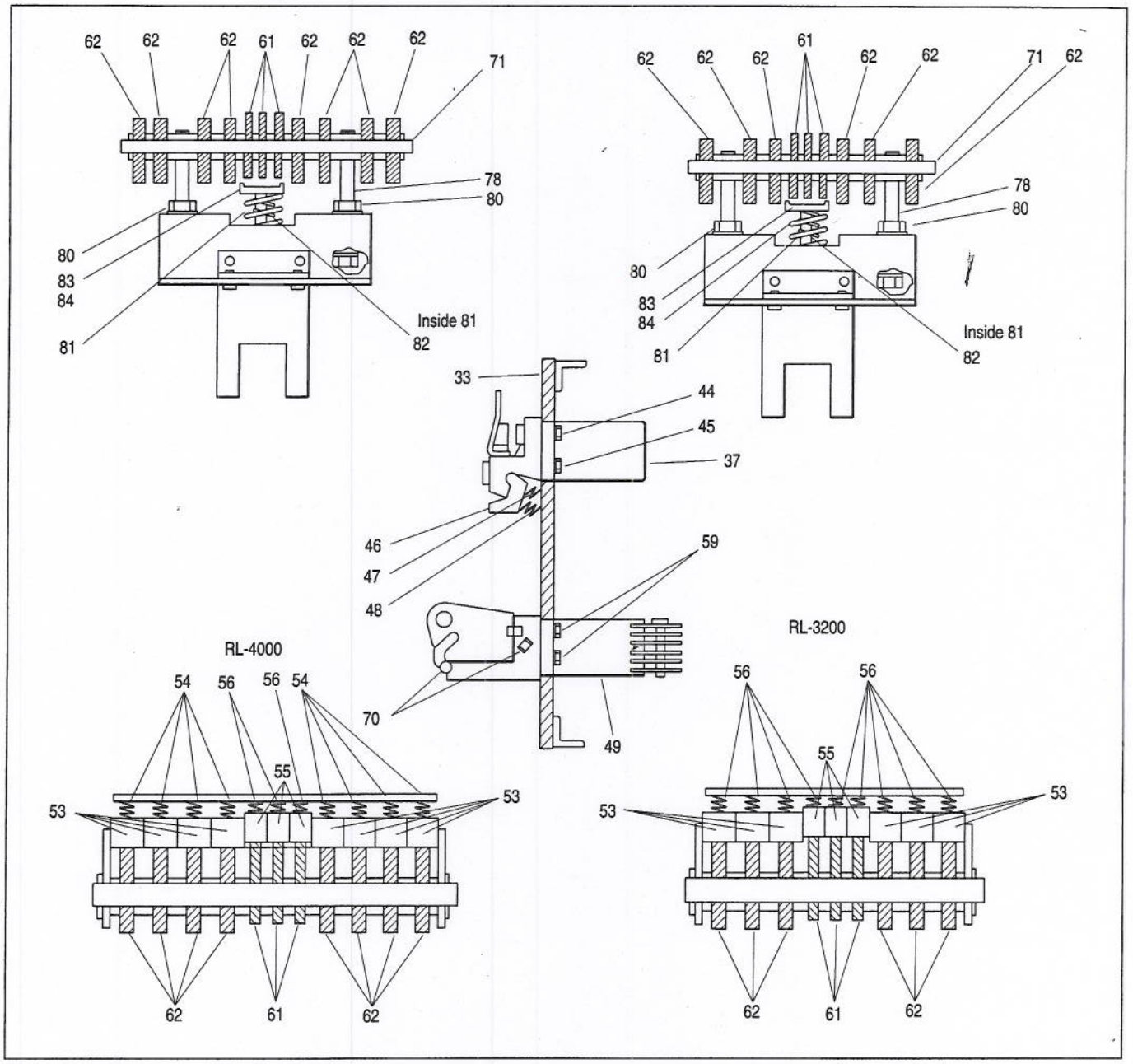


Figure 8. Typical Contact Assemblies

Motor Cutoff Switches (for Electrically Operated Circuit Breakers)

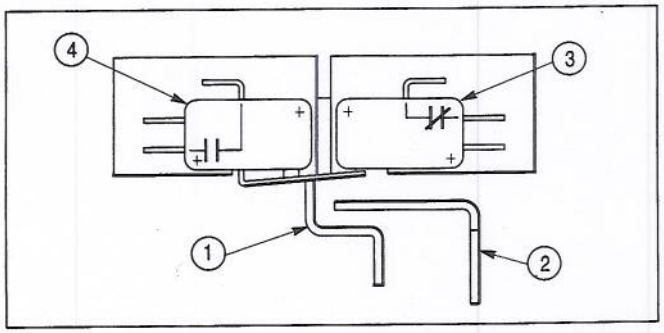


Figure 9a. Position 1. Springs discharged; motor in run position.

Position 1. Springs Discharged; Motor in Run Position.
(Note that **Figures 9a-9c** are depicted as viewed from below)

In **Figure 9a,** note that spring position lever (1) is forward, actuating both switches. Motor/gear position lever (2) is retracted. Motor cutoff switch (3) is closed. Application of power at this time will cause the motor to start, thereby charging the closing springs.

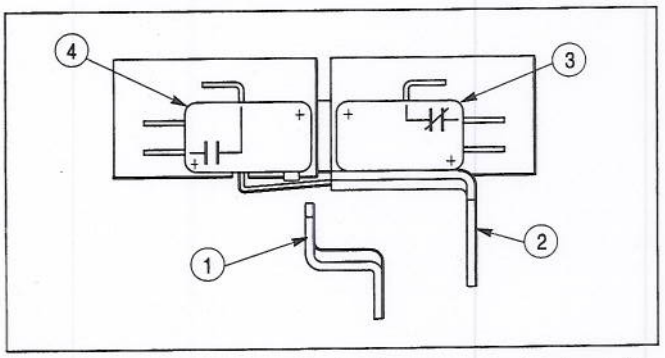


Figure 9b. Position 2. Springs charging; motor not yet cutoff.

Position 2. Springs Charging; Motor Not Yet Cutoff.
While the springs are charging the motor/gear position lever (2) moves forward, applying pressure to the switch actuating leaf. The spring position lever (1) retracts as the springs reach full charge. The motor cutoff switch (3) is closed and the motor is running.

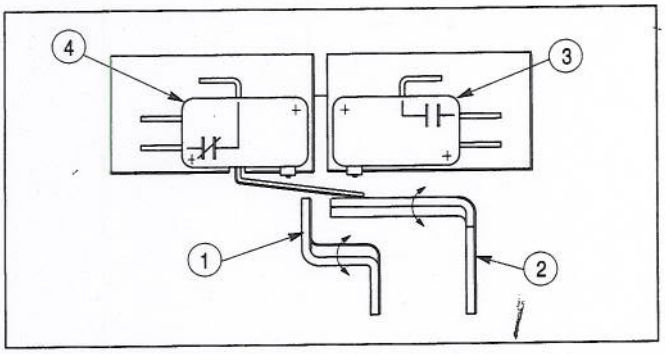


Figure 9c. Position 3. Springs charged; motor stopped.

Position 3. Springs Charged; Motor Stopped.
The springs have reached charged position. The motor/gear lever (2) has been retracted by roll pins on the large gear as the cam follower (82, **Figure 2**) on the large spur gear has disengaged from the wind and close cam (34, **Figure 2**). The motor cutoff switch (3) has opened, stopping the motor and the closing coil switch (4) has closed. Upon application of power to the closing circuit, the breaker will close. Switches then return to position 1 (**Figure 9a**).

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" (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 either remove the gear motor, or, alternatively, to rotate gear by using a ratchet wrench with 13/16 inch 12-point socket to rotate the motor pinion just enough to free the jam.

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

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

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 1/32" thick)	
B	Sliding surfaces	Light application of Molycote 557 (2) or Anderol 732 (3)	Wipe clean and apply Molycote 557 (2) or Anderol 732 (3) liberally
C	Pivot pins, rotating parts such as drive pinion, gear, etc.	Light application of Anderol 732 (3)	Remove pins, clean, and apply Beacon P-325 (4) or Anderol 732 (3)
D	Ground surfaces such as latches, rollers, props, etc.	Wipe clean and spray with Molycote 557 (2) or Anderol 732 (3)	Wash clean and apply Anderol 732 (3) or Beacon P-325 (4)
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) Anderol 732: part number 15-172-816-058
(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', on **Page 12**.

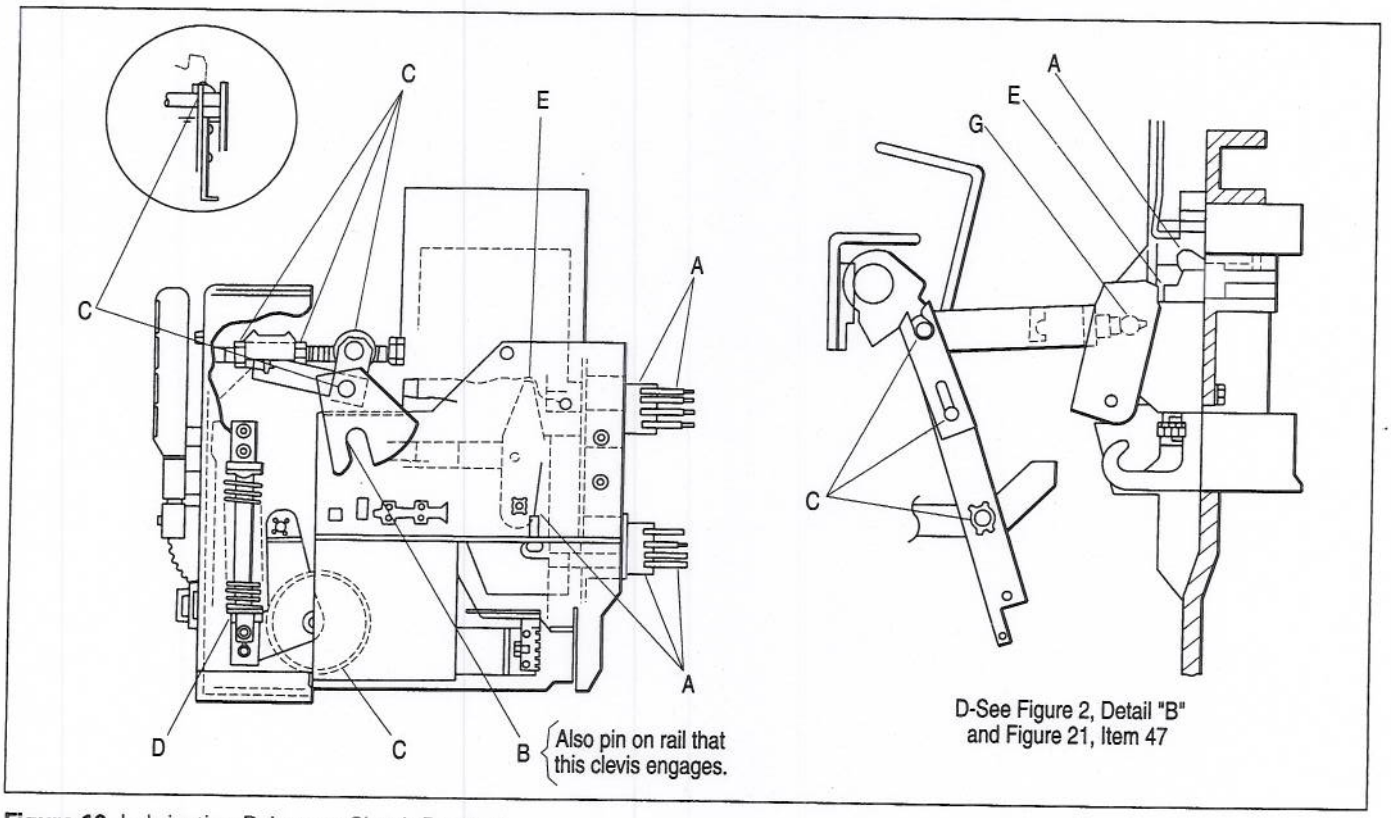


Figure 10. Lubrication Points on Circuit Breaker