

# **SIEMENS-ALLIS**

## **Switchgear**

### **INSTRUCTIONS**

**TYPES LA-600B, LA-800A AND LA-1600B (UNFUSED)  
AND  
TYPES LAF-600B, LAF-800A AND LAF-1600B (FUSED)  
LOW-VOLTAGE AC POWER CIRCUIT BREAKERS**

**18X5214-03  
November, 1980**

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The information contained within is intended to assist operating personnel by providing information on the general characteristics of equipment of this type. It does not relieve the user of responsibility to use sound engineering practices in the installation, application, operation and maintenance of the particular equipment purchased.

If drawings or other supplementary instructions for specific applications are forwarded with this manual or separately, they take precedence over any conflicting or incomplete information in this manual.

## WARRANTY

Siemens-Allis "LA" air circuit breakers are warranted to be free of defects in material and workmanship for a period of one year from date of initial operation but not more than eighteen months from date of shipment by company. This warranty is limited to the furnishing of any part which to our satisfaction has been proven defective. Siemens-Allis will not in any case assume responsibility for allied equipment of any kind. (See Siemens-Allis Warranty Form 20160).

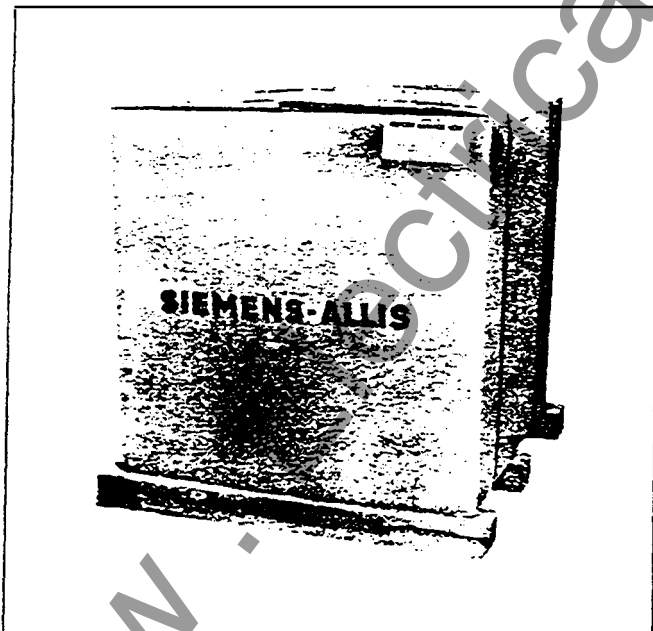
## INSTALLATION AND INSPECTION

### Introduction

Type "LA" 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); or (3) for stationary mounting in a customer's own enclosing case or switchboard. All "LA" circuit breakers are completely assembled, tested, and calibrated at the factory in a vertical position and must be so installed to operate properly. Customer's primary connections must be adequately braced against the effects of short circuit currents to prevent over-stressing the circuit breaker terminals.

### Receiving And Inspection For Damage

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. Shipping Point, consignee must file a claim with the carrier. If equipment is shipped F.O.B. Destination, the consignee must obtain the original of the carrier inspection report and notify Siemens-Allis immediately.



*Typical Shipping Method Used with "LA" Breakers*

### CAUTION

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.

Two shipping methods are used with "LA" circuit breakers:

1. Individually skidded with protective covering for domestic shipments.
2. Within a cubicle on export orders, when part of a switchgear lineup. Circuit breakers shipped in their cubicles are blocked to prevent accidental tripping during shipment. Note all caution tags, remove blocking bolts, and open circuit breaker contacts before installation.

### Storage

When circuit breakers are stored, wrap or cover them with a non-absorbent material to protect them from plaster, concrete dust, moisture or other foreign matter. Do not expose circuit breakers to the action of corrosive gases or moisture. In areas of high humidity or temperature fluctuations, space heaters or the equivalent should be provided.

## INSTALLATION

### General

The "LA" 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. Stationary-type circuit breakers should be enclosed in ventilated housings. If not enclosed, they must be mounted high enough to prevent injury to personnel either from circuit interruption, or from moving parts during automatic opening of the circuit breaker. Allow sufficient space to permit access for cleaning and inspection, and adequate clearance to insulating barriers above the circuit breaker to prevent damage from arcing during interruption. Before installing, make certain that the circuit breaker contacts are in the open position. Be sure to lubricate primary and secondary disconnect fingers with Siemens-Allis electrical contact lubricant supplied with accessories.

## CIRCUIT BREAKER

### NON-INTERCHANGEABILITY OF FUSED AND NON-FUSED LOW VOLTAGE POWER CIRCUIT BREAKERS

#### DANGER

DO NOT attempt to insert a fused power circuit breaker into a compartment which was built for a non-fused power circuit breaker. To do so could result in property damage, electrical shock, burns, other serious personal injury or possible death.

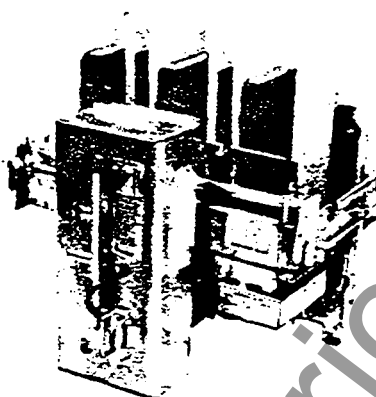
#### CAUTION

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

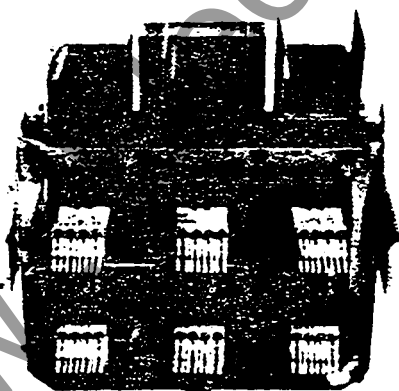
1. Determine the correct switchgear compartment for each circuit breaker by checking the Three-Line Diagram furnished with the drawings. The Three-Line Diagram shows the following for each circuit breaker compartment:

- a) Circuit breaker Type LA-600B, LAF-600B, LA-800A, etc.)
- b) Trip "XFMR" or "SENSOR" rating.
- c) Static Trip Type TS, TIG, TSG or *LimiTrip* Type LTI, LTS or LTSI.
- d) Type of operator (Manual Operator - M.O. or Electrical Operator - E.O.)
- e) Wiring Diagram Number
- f) Special Accessories (Undervoltage Trip, etc.)

LA-1600

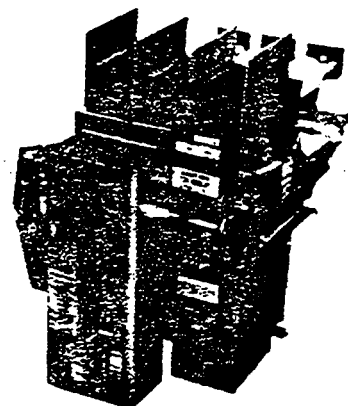


FRONT

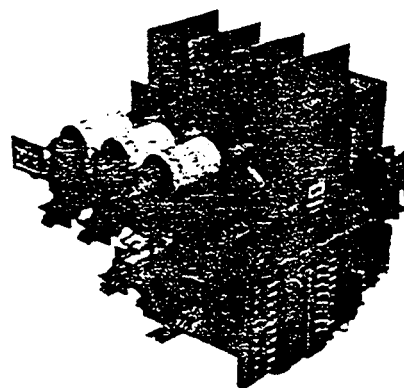


REAR

LAF-600



FRONT



REAR

Fused and Unfused Breakers with Static Trip II and LimiTrip Overcurrent Trip Devices

2. On fused breaker make sure trigger fuse linkage is reset. Breaker will remain trip free as long as this linkage is tripped.

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

4. Close and trip the circuit breaker. Refer to OPERATING PROCEDURE, page 6 for manually and electrically operated circuit breakers.

### DANGER

Do not work on energized equipment. Unauthorized personnel should not be permitted near energized equipment.

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, page 3 for a detailed description of the circuit breaker operating characteristics before placing the circuit breaker in service.

5. 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 II Instruction Book 18X4827-02 or to LimiTrip Book 18X10107 supplied with this equipment.

6. Circuit breakers are equipped with a drawout 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 8, and SPRING DISCHARGE INTERLOCK, page 9, for a description of these interlocks.

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

8. Now the circuit breaker is ready to be racked into the CONNECTED position. Refer to RACKING MECHANISM, page 8.

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

### Cautions To Be Observed In Installation And Operation

1. Read this Instruction Book 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 this unit, the racking mechanism must be returned to the test position before 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, wiring diagram number, circuit breaker type and static trip type, against the Three-Line Diagram to assure that circuit breakers are located in the proper compartments within the switchgear.

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

7. Close the compartment door and secure with knurled knob prior to racking to or from the CONNECTED position. Also, prior to closing the circuit breaker when in the CONNECTED position. Once the circuit breaker is closed, keep this door closed.

8. Once the circuit breaker is energized, it should not be touched, except for the exterior controls.

## OPERATION

### DESCRIPTION

The continuous current ratings of the LA-600B, LA-800A and LA-1600B circuit breakers are 600, 800 and 1600 amperes respectively. The interrupting ratings are as specified in Tables 1 and 2.

The circuit breakers are also available with integrally mounted current limiting fuses. The basic circuit breakers

are the same with or without fuses. The fuses mount on a bracket that is bolted to the side rails and upper studs on the back of the circuit breaker. The current limiting fuses increase the interruption rating to that of the fuses. Fused circuit breakers are identified as LAF-600B, LAF-800A and LAF-1600B. 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.

### DANGER

DO NOT attempt to insert a fused power circuit breaker into a compartment which was built for a non-fused power circuit breaker. To do so could result in property damage, electrical shock, burns, other serious personal injury or possible death.

The 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.

The LA-600B, LA-800A and LA-1600B circuit breakers use the same basic closing mechanism or operator. The closing springs used vary between sizes.

(A) Manual Charging

(B) Electrical Charging

(C) Combination Manual-Electrical Charging

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.

### TABLE 1

#### CIRCUIT BREAKER RATINGS AT 60 HERTZ \*

Voltage Ratings		Type	Frame Size Amperes	Short Circuit Rating (1) Symmetrical Amps.	Short Circuit Rating (2) & Short Time Rating Symmetrical Amps.	Cont. Current Rating, Amperes
Rated Voltage, Volts	Rated Maximum Voltage, Volts					
600	635	LA-600B	600	22,000	22,000	40-600
		LA-800A	800	30,000**	30,000	40-800
		LA-1600B	1600	50,000**	42,000++50KA	100-1600
480	508	LA-600	600	30,000	25,000	40-600
		LA-800A	800	30,000**	30,000	40-800
		LA-1600B	1600	50,000**	50,000	100-1600
240 & 208	254	LA-600B	600	42,000	25,000	40-600
		LA-800A	800	42,000	30,000	40-800
		LA-1600B	1600	65,000	50,000	100-1600

- \* For frequencies less than 50 Hertz, the interrupting ratings at 600 volts apply.
- \*\* The LA-800A is optionally available with 42,000 short circuit rating when equipped with instantaneous overcurrent trip device. The LA-1600B is optionally available with 65,000 short circuit rating when equipped with instantaneous overcurrent trip device.
- 1) Use when breaker is equipped with instantaneous overcurrent trip device.
- 2) Use when breaker is not equipped with instantaneous overcurrent trip device.

### TABLE 2

#### FUSED CIRCUIT BREAKER RATINGS AT 60 HERTZ

Voltage Ratings		Type	Frame Size Amperes	Short Circuit Rating Symmetrical Amps.	Range of Fuse Ratings Amperes	Cont. Current Rating, Amperes
Rated Voltage, Volts	Rated Maximum Voltage, Volts					
208 TO 600	600	LAF-600B	600	200,000	400-1200	40-600
		LAF-800A	800	200,000	400-1600	40-800
		LAF-1600B	1600	200,000	1200-3000	100-1600

(A) Manually Operated Breakers

**TABLE 3**  
**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 (8) after handle is returned to normal vertical position.
Tripping	Push in manual trip rod (48). OR If shunt trip is provided, operate remote trip control switch (CST). (See Fig. 2).

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 1, page 7, and Table 3, page 6. Detail (A) shows the position of the trip latch and toggle linkage when the circuit breaker is open and the closing springs are discharged. Movement of the charging handle downward rotates closing cam (65) against roller (28), thus pivoting closing cam (19) clockwise about pin (76). This extends the closing springs through link (23) and spring hanger (17). Rotation of cam (19) allows roller (41) in toggle linkage to be moved into position shown in Detail (B). Kickoff spring (59) moves rollers away from the stop block (31). Then the toggle linkage is moved by torsion spring until latch (35) clears trip latch (13). Spring (15) causes trip latch (13) to reset under latch (35). Trip flap (14) should normally stop against the front surface of latch (35).

When the closing springs are fully charged, roller (28) engages latch (7). Charging cam (65) 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 (8), latch (7) will disengage roller (28). Then closing springs cause cam (19) to rotate against the toggle rollers (41), 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 latch (13) to a position that releases latch (35), allowing toggle linkage to collapse to the position shown in detail (A).

To manually open the circuit breaker, press in manual trip rod (48). This bar engages the top of trip flap (14), which is, in turn, arranged to disengage the trip latch (13).

(B) Electrically Operated Circuit Breaker

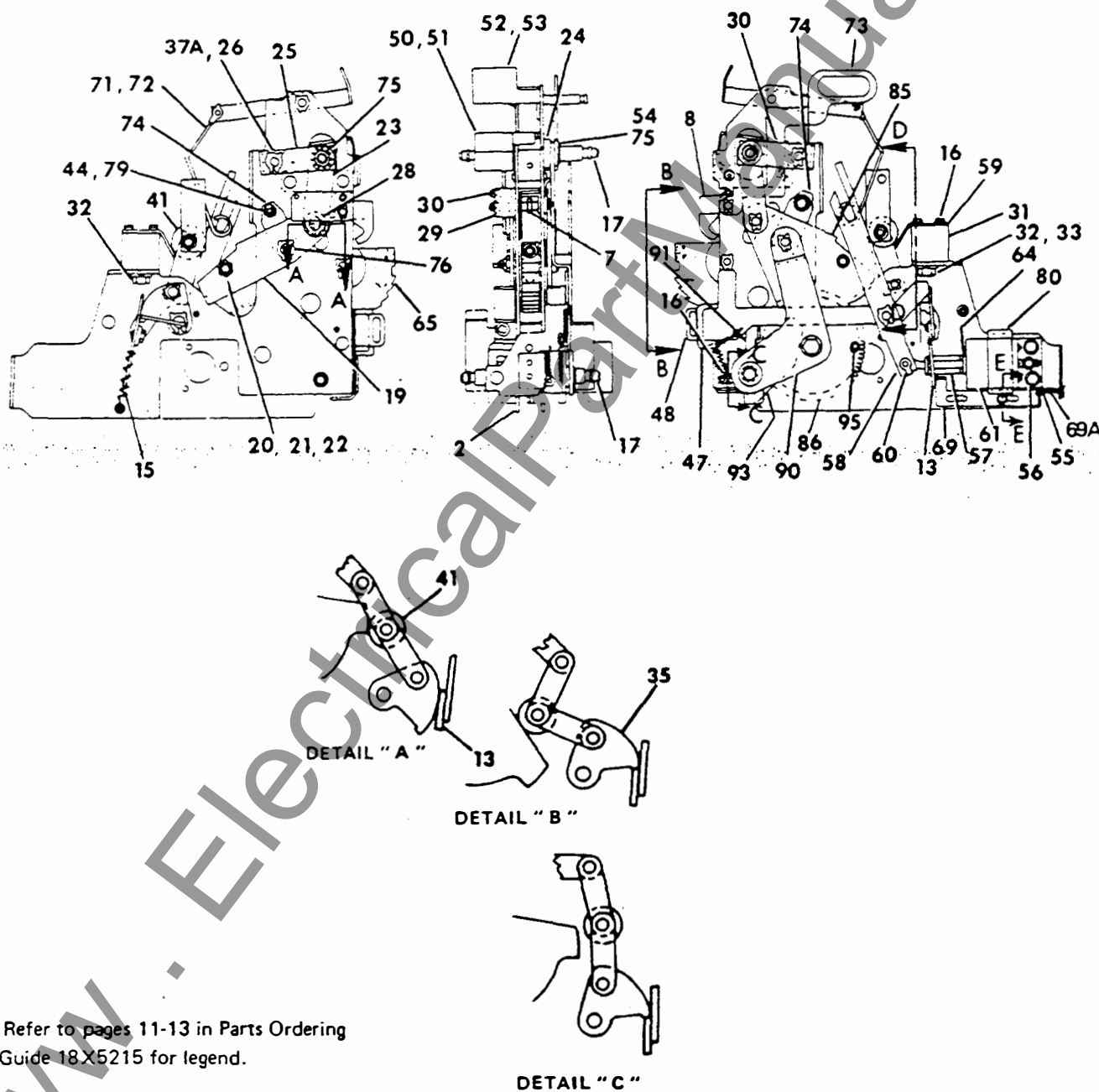
**TABLE 4**  
**OPERATING PROCEDURE**  
**ELECTRICALLY OPERATED CIRCUIT BREAKERS**

Operation	Procedure
Charging Springs	Energize control circuit. Move motor control switch on front of breaker to "ON" position.
Closing	After springs are charged, actuate remote close control switch (CSC). OR Push down firmly on spring-release latch hood (8).
Tripping	Actuate remote trip control switch (CST). OR Push in manual trip rod (48).

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 1, Table 4. With power available to the control circuit, closing the motor control switch (MI) will start the automatic charging cycle. The motor gear box pinion rotates gear (86) counterclockwise. Cam follower (95) engages an arm of wind and close cam (85), which rotates the cams in the same manner as for the manually charged circuit breaker. When the wind and close cam (85) reaches its charged position, the back of the cam engages switch lever (9), rotating the lever away from the

switch operator. Gear switch lever (93) 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 (86) lifts lever (93) 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 (8) 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 motor circuit. This prevents "pumping" or repeated attempts to close the circuit breaker if a tripping signal or fault is present.

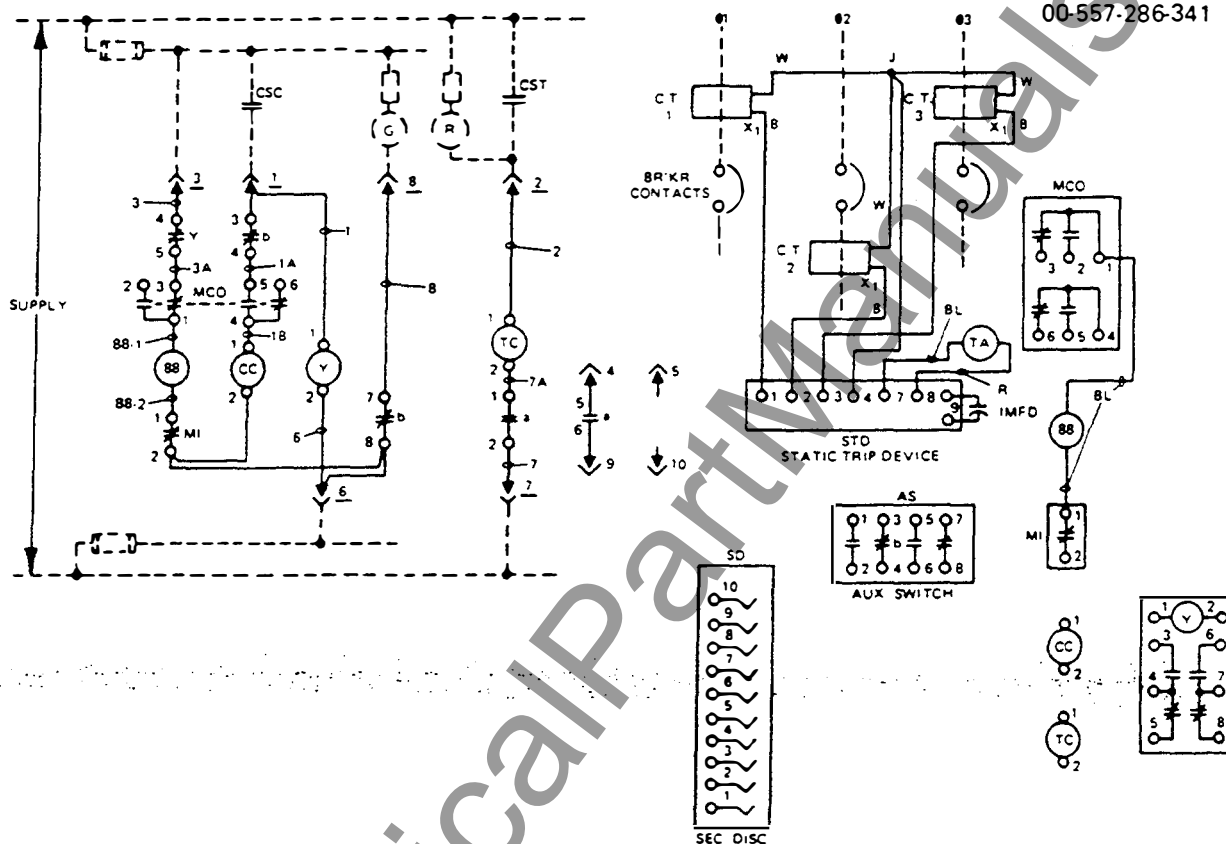


Refer to pages 11-13 in Parts Ordering Guide 18X5215 for legend.

Figure 1. LAF & LA-600B, LA-800A and LA-1600B Operator



CLASS C WIRING  
NO. 14 WIRE  
(SIS)  
00-557-286-341



- CC - CIRCUIT BREAKER CLOSING COIL
- TC - CIRCUIT BREAKER TRIP COIL
- Y - AUX. CLOSING RELAY - ANTI-PUMP
- MCO - MOTOR CUTOFF SWITCH
- BB - SPRING CHARGING MOTOR
- CSC - CONTROL SWITCH - CLOSE CONTACT
- CST - CONTROL SWITCH - TRIP CONTACT
- R - RED INDICATING LAMP
- G - GREEN INDICATING LAMP
- a - AUX. SWITCH - OPEN WHEN BR'KR. IS OPEN
- b - AUX. SWITCH - CLOSED WHEN BR'KR. IS OPEN
- MI - MOTOR CONTROL SWITCH
- CT - TRIPPING TRANSFORMER
- STD - STATIC TRIP DEVICE
- AL - ALARM DEVICE
- RC - ALARM DEVICE ELECT RESET COIL
- TA - TRIP ACTUATOR
- UV - UNDERVOLTAGE TRIP COIL

Figure 2. Typical Wiring Diagram - Electrically Operated Breakers

### (C) Combination E.O. & M.O. Operated Circuit Breaker

The combination manually and electrically operated circuit breaker 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.

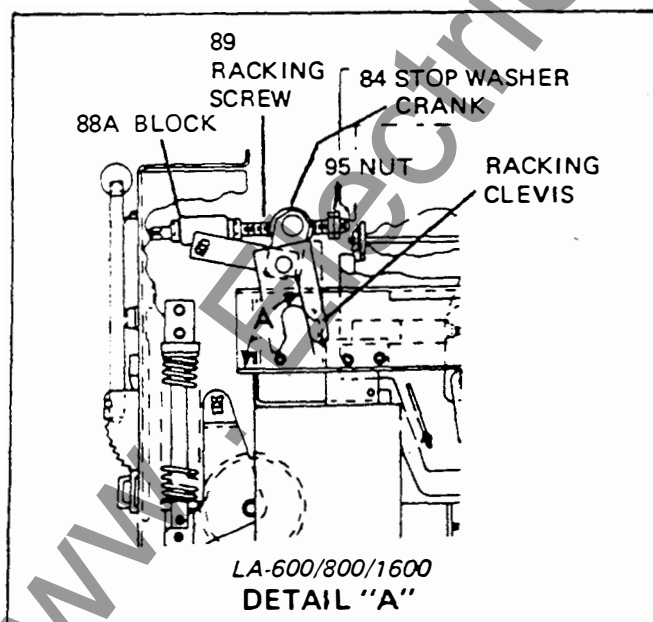
#### Drawout Interlock

Integral parts of the circuit breaker mechanism include provisions to:

1. Rack the circuit breaker in or out of the cubicle compartment.
2. Interlocking to prevent racking a closed circuit breaker into or out of the connected position.
3. Interlocking to prevent closing a circuit breaker until it is fully racked to the connect position.
4. Interlocking to prevent withdrawing a circuit breaker from the cubicle while the closing springs are charged.

#### RACKING MECHANISM

Refer to Figures 3 and 3A, pages 9 and 10. With the circuit breaker resting on the cubicle rail, the following sequence should be used to rack the circuit breaker into the cubicle.



#### CAUTION

On electrically operated breakers, be sure the motor control switch on the front of the breaker is "OFF"

1. Push trip bar in, lower interlock slide and insert racking crank.

#### NOTE

Interlock slide cannot be opened unless manual trip bar is pressed in. While the trip bar is pressed in, the circuit breaker is in the TRIP-FREE position and cannot be closed.

2. With the racking crank, rotate the racking screw (89) until the racking shaft is in the disconnected position. The 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. Counterclockwise rotation of the racking screw will rack the breaker into the TEST position. At the TEST position, the cover slide interlock can be closed, allowing the trip bar to reset and the circuit breaker can be operated. Between the TEST position and the CONNECTED position, interlock IT67 Figure 3A will engage the cubicle interlock cam IT509 Figure 3A and the circuit breaker will be held TRIP-FREE and cannot be closed.

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

4. To withdraw the breaker from the CONNECTED position, the procedure is the same only the racking screw rotation is clockwise.

5. Before attempting to operate the circuit breaker, the position of the device should be checked with reference to the marking in the cubicle, to be certain that it is fully connected. 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 detail (A), Figure 3, and by tightening the nuts against the stop washer (84), the two nuts (95), should be then locked against each other.

#### CAUTION

To avoid damage to the racking mechanism, do not rotate the racking crank in the counterclockwise direction, when in the CONNECTED position.

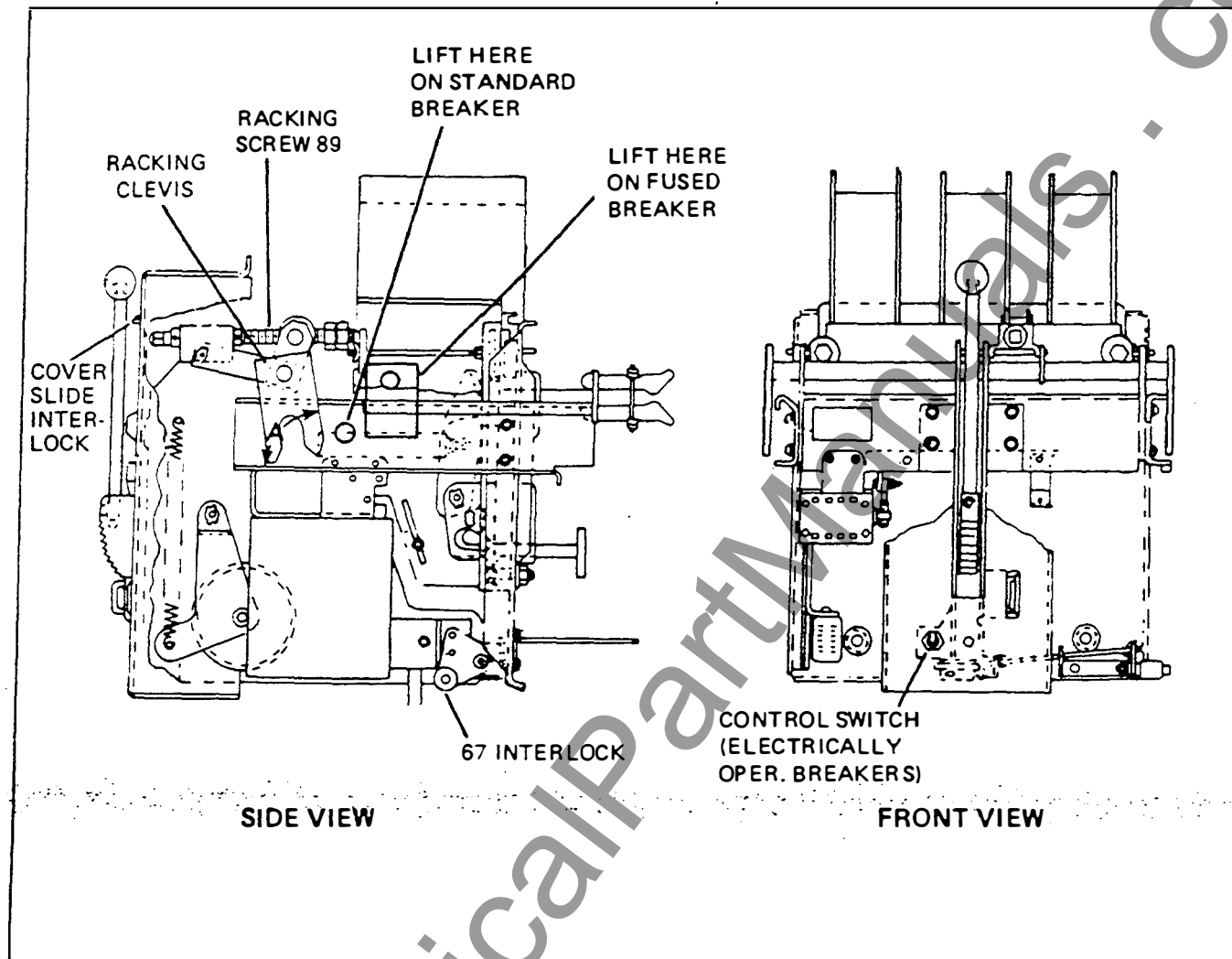


Figure 3A. Typical Racking Mechanism and Drawout Interlock

#### SPRING DISCHARGE INTERLOCK

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

#### CAUTION

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.

#### NOTE

Manual charge handle must be in the vertical position during racking. 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).

Note also that the spring discharge interlock produces a 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 control switch off in the TEST position, close and trip the circuit breaker normally in that position and then rack out in the normal manner.

## CAUTION

The slide interlock is not in place with cover removed. An open circuit breaker will close if the stored energy springs are automatically discharged while cover is removed.

### Lifting Bar (Figure 3A)

The lifting bar connects as shown for the standard circuit breaker. Additional lifting lugs IT424 Figures 9 & 10 are provided as part of the fused circuit breaker due to the overhand of the fuses which shifts the center of gravity.

## HANDLING INSTRUCTIONS

### Inserting Circuit Breaker

1. Place circuit breaker in front of rails, checking alignment to rails.

2. Push breaker to disconnect position. Safety lock (A) prevents accidental removal of breaker from cell.

3. Use crank to rack breaker into cell.

4. Check panel shutters (B) for free movement before closing panel.

### Removing Circuit Breaker

1. With circuit breaker in disconnect position, pull breaker out until stopped by safety lock.

2. Put on lifting bar and lift weight off rails with hoist.

3. Pull on safety lock handle to fully release breaker from cell.

4. Remove breaker from cell.

## MAINTENANCE AND ADJUSTMENTS

### Maintenance

Occasional checking, cleaning and exercising of the circuit breaker will promote long and trouble-free service. A periodic inspection and servicing, normally at intervals of one year, should be included in the maintenance routine. Circuit breakers located in areas subject to acid fumes, cement dust, or other abnormal conditions, require more frequent servicing. After a severe overload interruption, the circuit breaker should be inspected. Refer to ANSI Standard C37.16, Table 5 for recommended servicing intervals.

If the circuit breaker is not operated during extended periods, it should not remain in either the closed or open position any longer than six months. Maintenance opening and closing operations should be made to ensure freedom of movement of all parts.

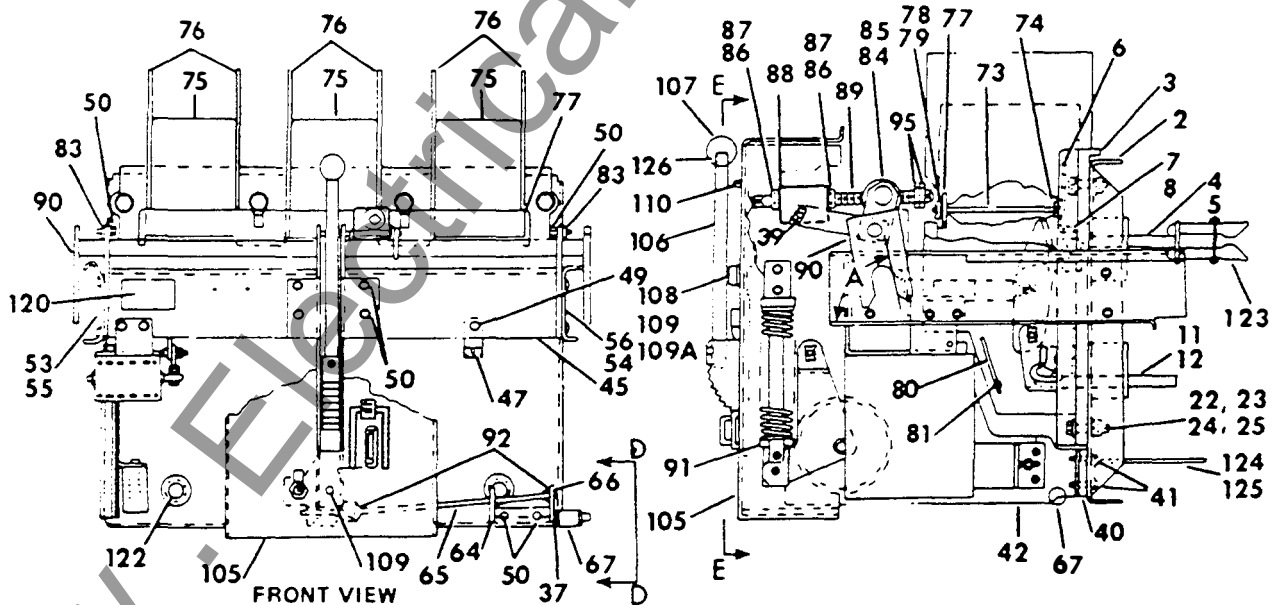
A suggested procedure to follow during maintenance inspections:

### DANGER

Do not work on energized equipment. Unauthorized personnel should not be permitted near energized equipment.

Plan the time for maintenance with operating personnel so that the switchgear can be de-energized, and safely grounded.

1. De-energize the primary and control circuits.
2. Rack circuit breakers to the disconnected position.
3. Remove circuit breaker from cubicle.



Refer to Figure 1, pages 3 and 4, of Parts Ordering Guide 18X5215 for legend.

Figure 4. Typical LA-1600B Breaker Outline

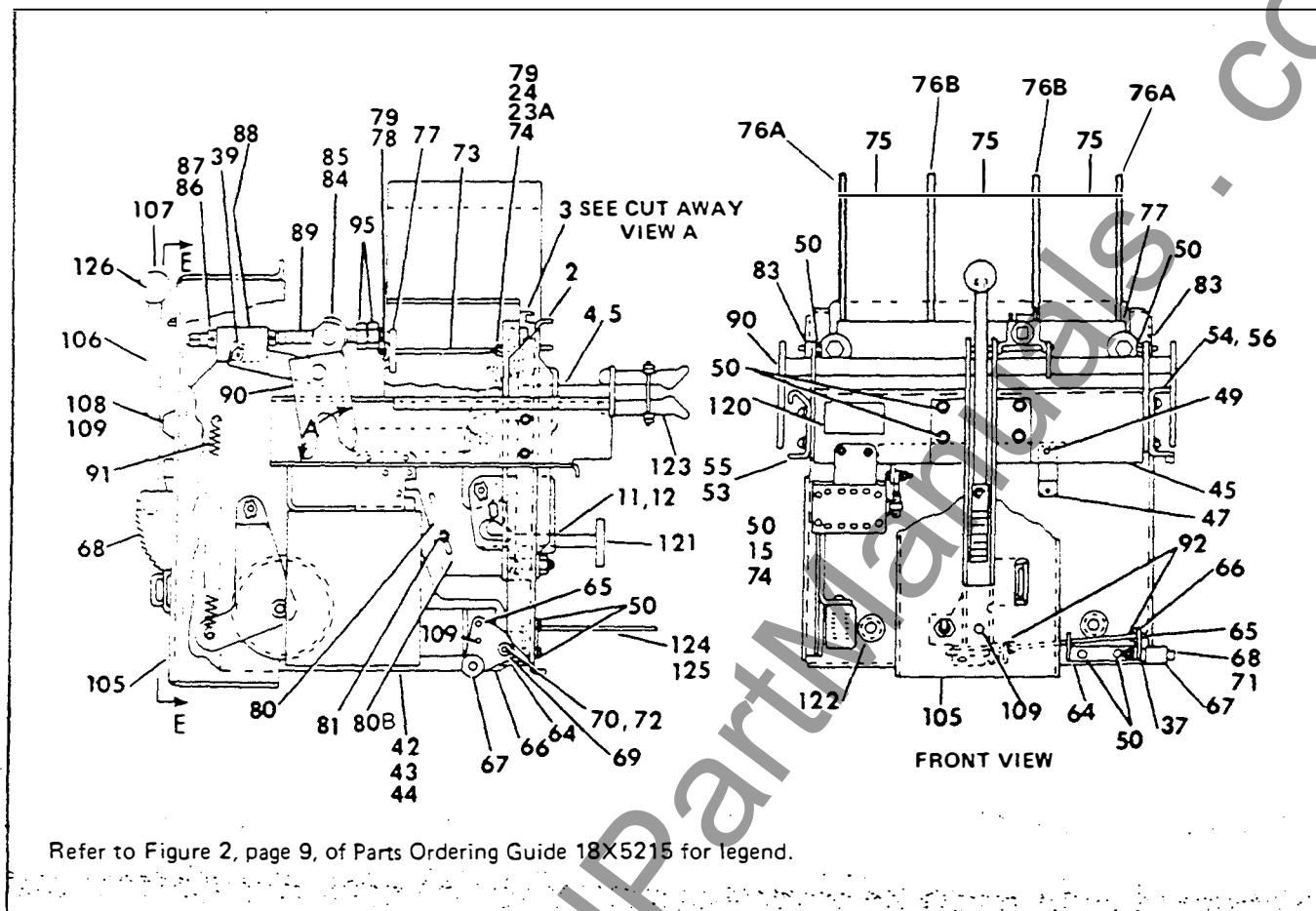


Figure 5. Typical LA-600B and LA-800A Breaker Outline

4. Remove arc chutes (Figures 4 and 5, Item 75), and examine for burned, cracked or broken parts. To remove arc chutes, proceed as follows:

a) Remove wing nuts from holding bar, remove bar and phase barriers.

b) Lift arc chutes vertically to clear arc runners.

5. Wipe the contacts with a clean cloth saturated with a non-toxic cleaning fluid.

6. Replace badly burned or pitted contacts. (See Contact Replacement, Page 17 and Lubrication Instructions, Page 28.)

7. Wipe all insulated parts with a clean cloth saturated with a non-toxic cleaning fluid.

8. Bearing pins and other sliding or rotating surfaces should be cleaned and then coated with a light film of grease. (See Lubrication Chart, Page 28.)

9. Charge the springs manually and maintenance close to check latch and linkage movement. (Rotate racking screw

to the approximate TEST position to clear spring discharge interlock before attempting to charge closing springs.)

10. Check circuit breaker adjustments. (See Adjustments, page 15.)

#### 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 petroleum-oil-base precision-equipment grease, such as Beacon P-290 (Exxon).

Grease with care to avoid getting grease on insulating members, since it may affect the dielectric strength. Faces of arcing contacts should not be lubricated. The rubbing surfaces of the main contact fingers and hinge contact fingers are lubricated with a coating of Siemens-Allis contact lubricant, 15-171-370-002. If dust has accumulated, disassembly is necessary to clean and relubricate these points. See Contact Replacement, Page 17 and Lubrication Instructions, Page 28.

**TABLE 5**  
**MAINTENANCE CLOSING**

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

**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 cam face.

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 do not have a manual charging handle, but it is available as a maintenance item. Figure 6 shows the charging handle installed in an electrically operated breaker after removal of the front cover from the breaker. 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 operation is the same for both the electrically operated and the manually operated circuit breaker. Refer to Table 5, Figure 6.

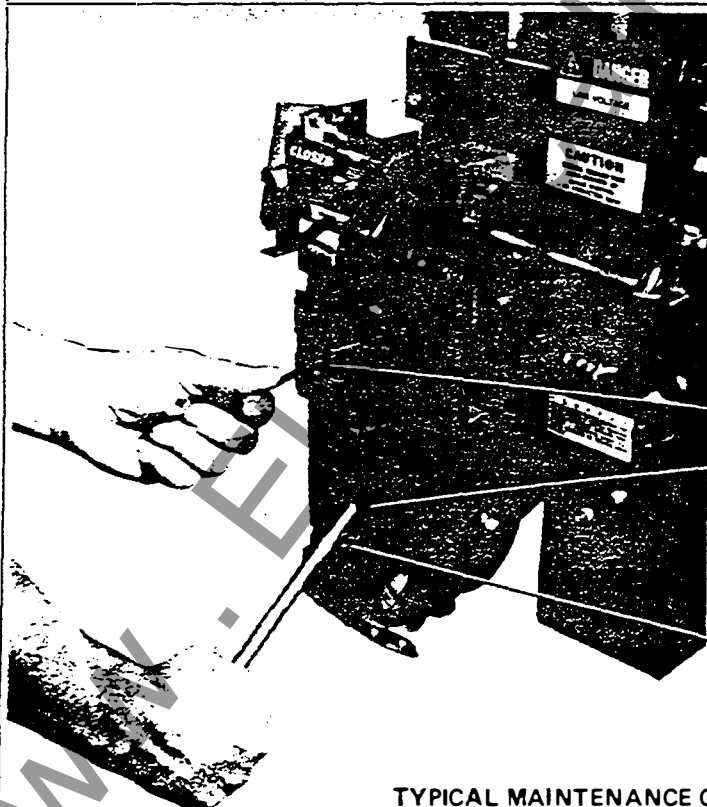
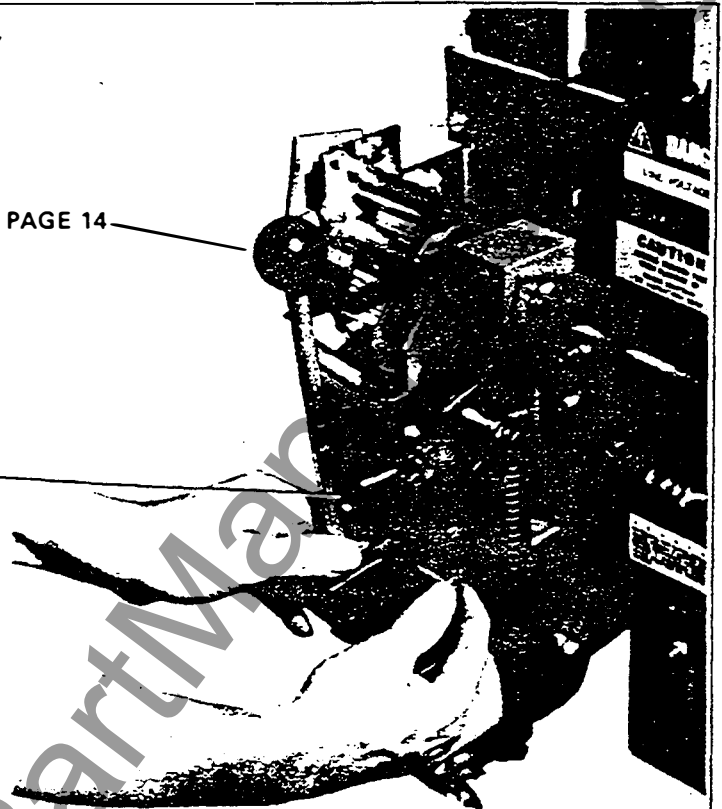
**CAUTION**

The procedure in Table 5 should be used for maintenance closing only. 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.

**MAINTENANCE CLOSING HANDLE ELECTRICALLY  
OPERATED BREAKERS**

MAINTENANCE CLOSING HANDLE SEE PAGE 14

RELEASE LATCH HOOD



SEE TABLE 5, FIGURE 1 & 2

STEP 3

STEP 2

MANUAL TRIP ROD

**TYPICAL MAINTENANCE CLOSING HAND PROCEDURE**

*Figure 6. Maintenance Closing*

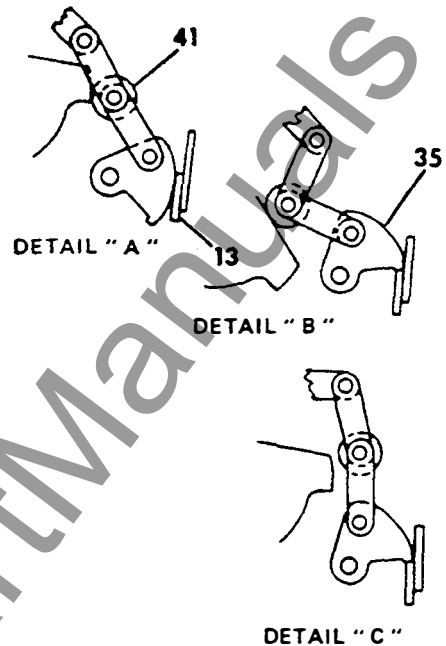


## Adjustments

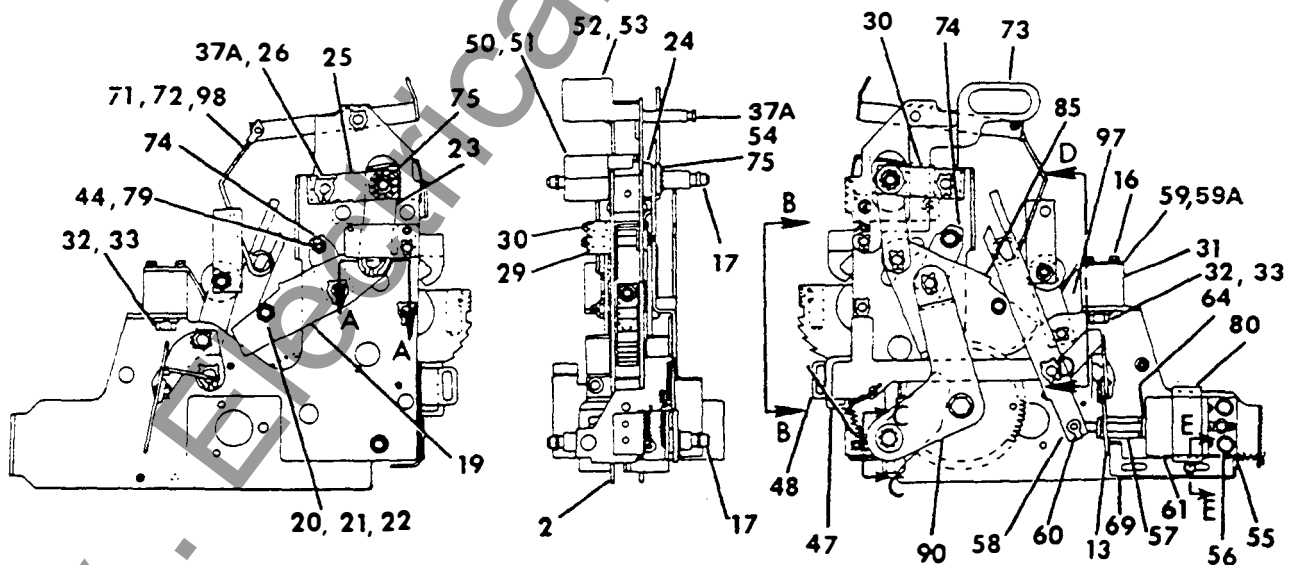
During maintenance inspections, the following items should be checked to ensure that the original settings are maintained:

### Trip Latch Engagement (Figure 7)

Toggle latch (35) should engage the full width of trip latch (13) when the circuit breaker is closed in the normal manner. The tension on spring (15) can be increased if required by bending spring tab on trip flap towards the front of the circuit breaker. Too much tension will interfere with the capability of the tripping actuator to move the trip flap, so over-bending should be avoided.



*Trip Latch Assembly*



Refer to Figure 3, pages 11-14, of Parts Ordering Guide 18X5215 for legend.

*Figure 7. Typical Operator Assembly*

### Main Contact Make (Figure 8)

Compression of contact fingers (9) must be between .093" and .125" (2.4 - 3.2 mm). This is the difference in the measurement from the breaker base to the tip of the finger contact surface when the breaker is open. Measure in the same place when the breaker is closed. This is checked with a normal closing operation — not maintenance closing. Adjustment is provided by positioning screws (35) after loosening nuts (36). Counterclockwise rotation of screws (35) increases compression. Care should be taken to retighten nuts (36) after adjustment. If it is desired to check contact pressure, a push-type spring scale can be used to compress contact fingers (9) with breaker open. Contact pressure should be between 20 and 30 pounds (9.1 - 13.6 kg) on each finger.

### Arcing Contact Make (Figure 8)

With the movable arcing contact (27) in any one phase touching the mating stationary contact when the circuit breaker is closed by the maintenance closing method (see Table 5), the phase-to-phase variation should not exceed .062" (1.6 mm). Adjustment may be made by positioning screws (35) 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 30 and 40 pounds (13.6 - 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 each blade separately.

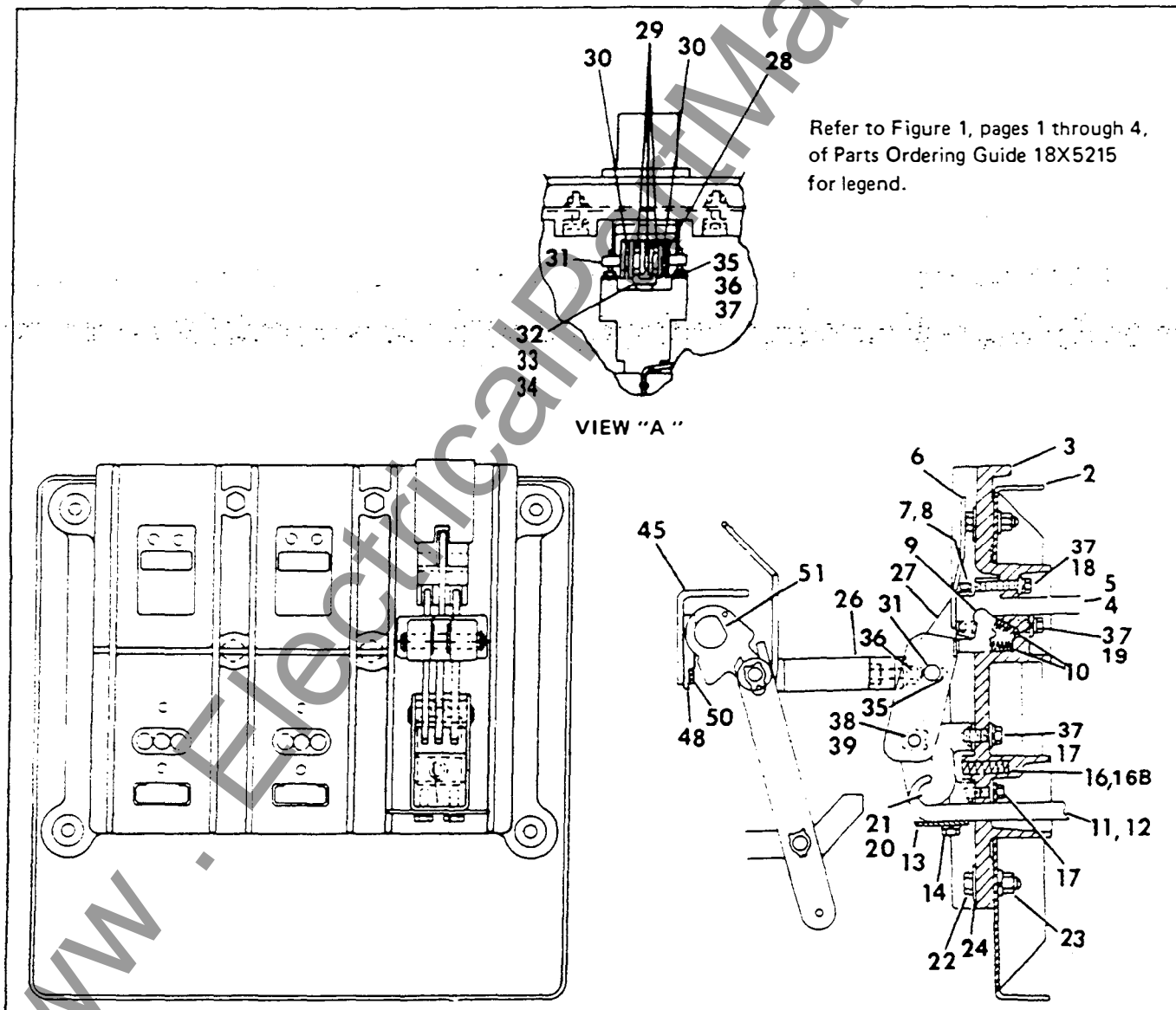


Figure 8. Contact Assembly

## CONTACT REPLACEMENT

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 (20, 21), main contact fingers (9), and arcing contacts (27), are spring loaded. Therefore, care must be used in removal and installation of any of the contacts.

### Main Contact Fingers (Figure 8)

With the circuit breaker contacts open and the stored-energy springs discharged, the main contact fingers (9) may be removed by loosening screws (18) enough to relieve the compression on springs (10). 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 (Figure 1, Item 123), may be removed from each phase and the circuit breaker inverted to rest on the ends of connectors (4) and (11). After the contact fingers are replaced, connector (4) 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 (Figure 8)

The stationary arcing contact is a part of connector (4) and may be replaced by proceeding as above. In this case, screws (18) must be removed. However, to provide clearance for removal of connector (4), first insert a 3/16" (4.7 mm) diameter rod at least 2" (50 mm) long through the opening in support (13). It may be necessary to compress contact (21) opposite arcing contact (27), in order to insert the rod. This will hold hinge contact fingers (21) in position to permit removal of pin (38). After removal of pin (38), main contact (28), and arcing contact (27) can be positioned so that connector (5) can be removed.

### Hinge Contact Fingers (Figure 8)

Hinge contact fingers (20, 21) may be removed as follows:

Remove top screw (17) from support (13), and replace it with a 1/4-20 screw at least 1 1/4" long. Remove lower

screws and then gradually back off the 1 1/2" screw to relieve the loading from springs (16). The hinge contact fingers can now be removed. To provide easier access to the hinge contact fingers, pin (38) may be removed after the loading is relieved from springs (16).

### Movable Arcing And Main Contact (Figure 8)

Either movable arcing contact (27), or main contact (28), or both, may be removed and replaced as follows:

Remove two screws on each side of lower connector. The complete movable contact assembly may now be brought to the bench. The location of spacers should be noted, if necessary.

## CAUTION

Extreme care should be taken to hold the assembly firmly to retain spring guide (32), and spring (33, 34) upon removal of the screws.

The movable arcing contact or main contact may now be easily replaced. 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 REPLACEMENT

When the static 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 static 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 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 static trip in the correct polarity relationship.

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

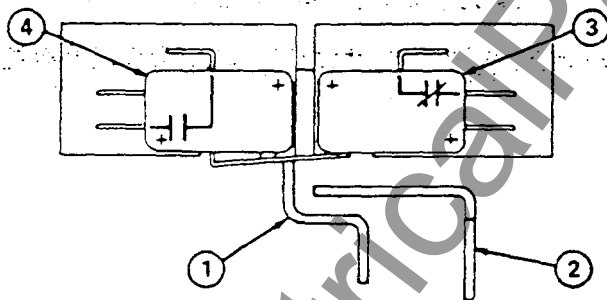
When the tripping actuator has been replaced, the circuit breaker should be given a FUNCTION TEST to ensure proper operation of all components. Refer to Siemens-Allis Instruction Book covering the trip device for the test instructions.

#### Motor Cutoff Switches (for electrically operated breakers)

##### BOTTOM VIEW

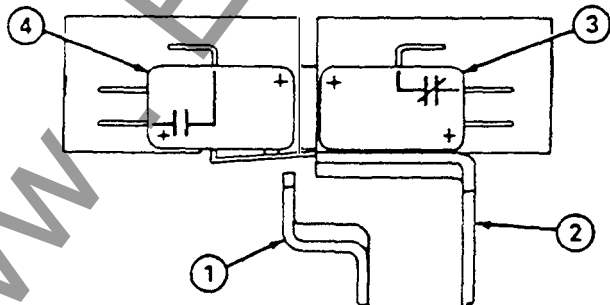
Position 1. Springs discharged; motor in stop position. Note that spring position lever (1) is forward actuating both switches.

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.

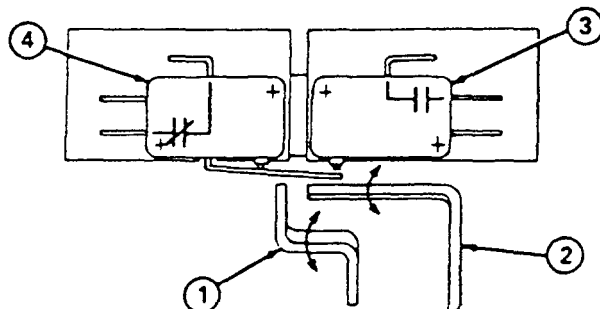


Position 2. Springs charging; motor not yet cutoff. While the springs are charging the motor/gear position lever (2) moves forward applying pressure to the switch actuating leaf.

The spring position lever (1) retracts as the springs reach full charge. The motor cutoff switch (3) is closed and the motor is running.



### 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 (95, Figure 7) on the large spur gear has disengaged from the wind and close cam (85). 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 1** In position 3 there is clearance between both levers and the switch actuating leaf. Clearance may be minimal (appx. 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.

**NOTE 2** **CAUTION!!** If the motor cutoff switch (3) does not open, the motor will continue to run and the cam follower (233) will re-engage wind and close cam (85, Figure 7) 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.

**CAUTION!!** The springs will discharge and the breaker close when the gear motor pinion is disengaged from the spur gear, the manual charging handle or maintenance closing mechanism can be used to prevent this. Pull handle down to support the closing springs while motor is being removed.

## FUSE FUNCTIONS

### FUSE FUNCTIONS

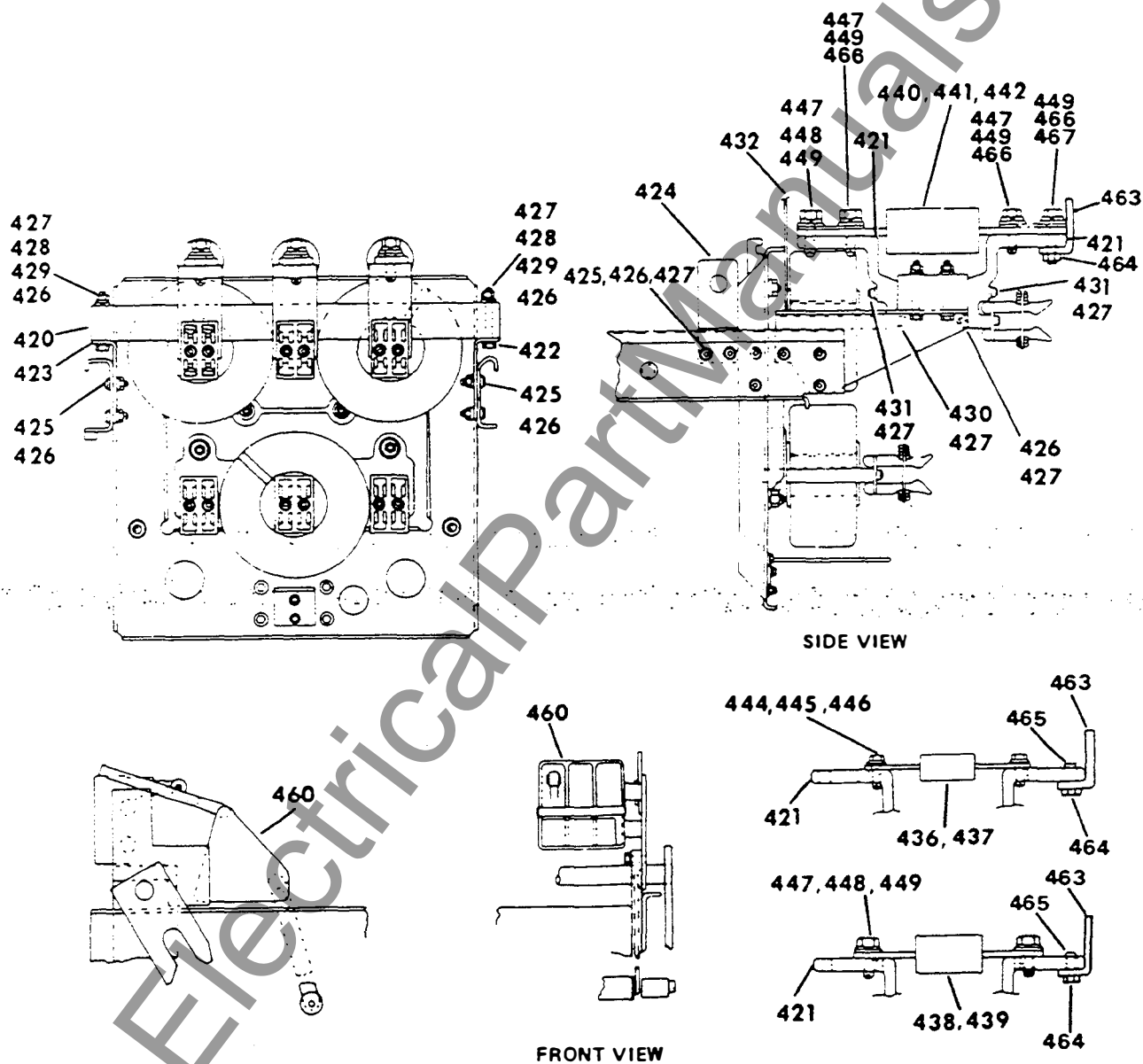
#### Current Limiting Fuses

Current limiting (C.L.) fuses are used to increase the interruption capacity beyond that of the breaker alone or to the limit the fault "let-thru" current down stream of their installation. The C.L. fuses used with LAF-600, LAF-800 and LAF-1600 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 of the same manufacturer, type and rating as supplied with the circuit breaker. Different fuses may not properly mount on the breaker and may have different protective characteristics.

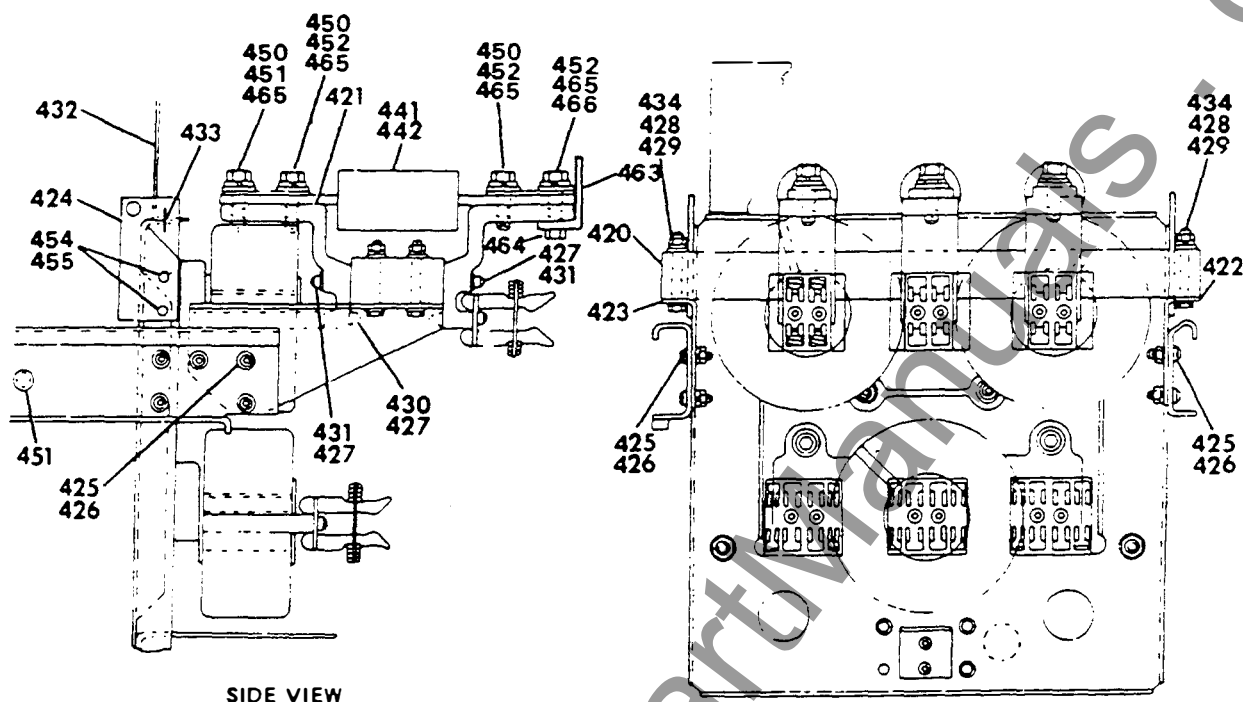
#### DANGER

Be sure to replace barrier, Item 463, Fig. 9 and 10 before installing in cubicle. Failure to do so could result in property damage, electrical shock, burns, personal injury or possible death.



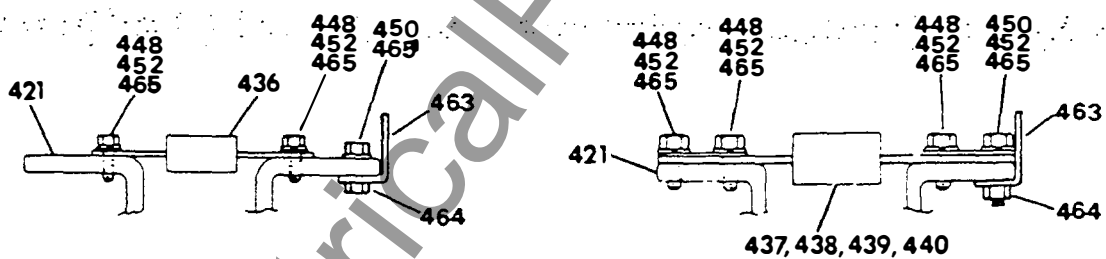
See Figure 14 of Parts Operating Guide 18X5215 for parts key.

Figure 9. Fuse Attachment Group LAF-600B, LAF-800A Breakers

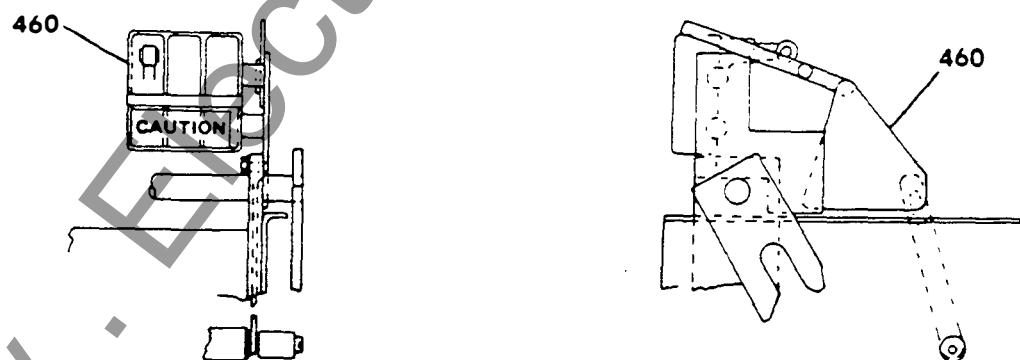


SIDE VIEW

REAR VIEW



FRONT VIEW



See Figure 15 of Parts Operating Guide 18X5215 for parts key.

Figure 10. Fuse Attachment Group LAF-1600B Breaker

# Open Fuse Trip Device (Figure 11)

## DANGER

Do not remove trigger fuse cover when breaker is in connected position. Line voltage may be available inside the trigger fuse assembly. To do so could result in property damage, electrical shock, burns, other serious personal injury or possible death.

The Open Fuse Trip mechanism has three functions. First, to trip the circuit breaker mechanically when a C.L. fuse has interrupted.

Second, to indicate which phase C.L. fuse has interrupted. The plunger on top of the trigger fuse (12), indicates visually which phase C.L. fuse has interrupted.

Third, 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.

The plunger operates arm (2), which moves the toggle, releasing the spring-loaded lever (19). This engages circuit breaker interlock through link (20). This trips the circuit breaker and hold the circuit breaker in the mechanical trip-free position.

The circuit breaker will remain trip free (cannot be closed) until the trigger fuse has been replaced and the associated trip mechanism reset lever (17), has been manually reset (pulled down).

To remove the trigger fuse, remove strap (14), remove plastic cover (13), then the trigger fuse.

To insert the trigger fuse, reverse the above procedure.

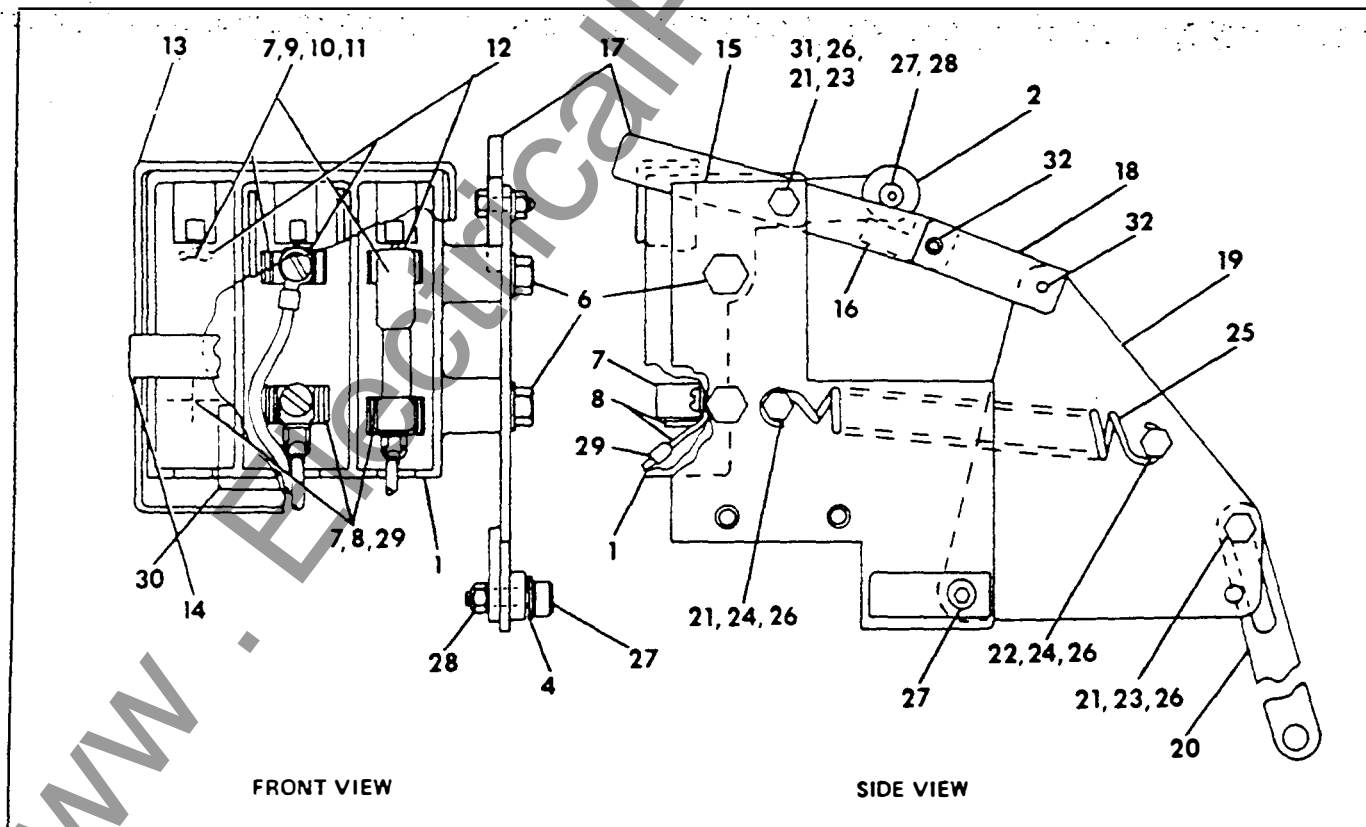


Figure 11. LAF-600B, LAF-800A and LAF-1600B Open Fuse Trip Device, Trigger Fuse Assembly



## ACCESSORIES

### Current Sensors — "LimiTrip"

The current sensors provided with the optional *LimiTrip* device are integrated units containing two cores with four terminals. Proper polarity is established when the terminals face away from the panel. *LimiTrip* sensors should never be subjected to primary current with the *LimiTrip* device disconnected from the sensor. The 3 current sensors used with the *LimiTrip* device are always mounted on the lower connectors of the circuit breaker. The sensors can not be used with Static Trip II and Static Trip II sensors can not be used with *LimiTrip*.

### Tripping Transformers — Static Trip II

There are several tripping transformer ratings available, each with seven calibrated pickup settings (Table 6). The tripping transformers mounted on the upper connectors of the circuit breaker are mounted with the polarity mark facing the breaker panel. The tripping transformer on the lower connector is mounted with the polarity mark facing away from the breaker panel.

TABLE 6. STATIC TRIP II TRIP RATING TABLE — AMPERES

Breaker Type and Frame Size	Tripping XFMR Rating (Primary)	Calibrated Pick-Up Settings Long Time Element							Max. Cont. Rating	Ground Element Calibrated Pick-Up Settings			
		A	B	C	D	E	F	G		15%	25%	50%	100%
LA-600B and LA-800A	80	40	50	60	70	80	90	100	100	May not trip			
	200	100	125	150	175	200	225	250	250	30	50	100	200
	400	200	250	300	350	400	450	500	500	60	100	200	400
	600	300	375	400	525	600	675	750	600*	90	150	300	600
	800*	400	500	600	700	800	900	1000	800**	120	200	400	800
*LA-600B only, 750 on LA-800A													
**LA-800A only													
Breaker Type and Frame Size	Tripping XFMR Rating (Primary)	Calibrated Pick-Up Settings Long Time Element							Max. Cont. Rating	Ground Element Calibrated Pick-Up Setting			
		A	B	C	D	E	F	G		15%	25%	50%	100%
LA-1600B	200	100	125	150	175	200	225	250	250	40	80	160	200
	400	200	250	300	350	400	450	500	500	80	160	320	400
	800	400	500	600	700	800	900	1000	1000	160	320	640	800
	1600	800	1000	1200	1400	1600	1800	2000	1600	320	640	1280	1600

TABLE 7. "LimiTrip" RATING TABLE — AMPERES

Breaker Type and Frame Size	Tripping XFMR Rating (Primary)	Long Time Element Calibrated Pickup Settings						Max. Cont. Rating
		A	B	C	D	E	F	
LA-600B and LA-800A	80	40	50	60	70	80	90	90
	200	100	125	150	175	200	225	225
	400	200	250	300	350	400	450	450
	600	300	375	450	525	600	675	600*
	800**	400	500	600	700	800	900	800**
LA-1600B	200	100	125	150	175	200	225	225
	400	200	250	300	350	400	450	450
	800	400	500	600	700	800	900	900
	1600	800	1000	1200	1400	1600	1800	1600

\*LA-600B only, 675 on LA-800A

\*\*LA-800A only

## OPTIONAL DEVICES

### Secondary Disconnect Assembly Option (Figure 12)

The electrical attachments are wired to the terminals of a secondary disconnect assembly which is mounted on the left side of the circuit breaker. Three blocks of ten terminals each can be mounted on the breaker. The

secondary disconnect assembly is accessible from the front of the circuit breaker and aligns with a stationary unit in the cubicle. The stationary contact strips should be lubricated with a light film of contact grease which is furnished with the switchgear.

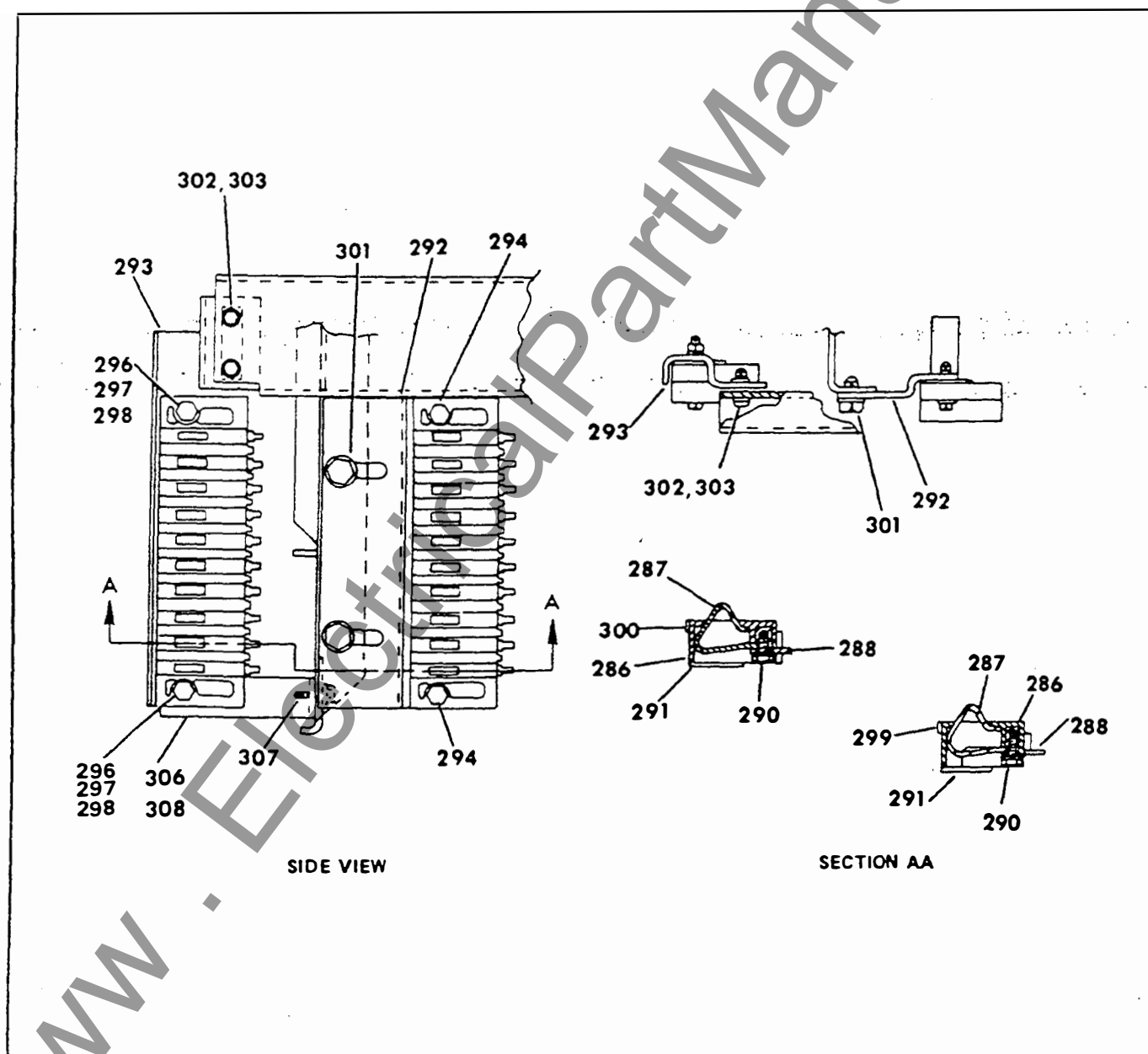


Figure 12. LA-600B, LA-800A and LA-1600B Secondary Disconnect Group

### Auxiliary Switch Option (Figure 13)

This is a rotary type and functions by direct connection to the circuit breaker mechanism. The contacts are factory set — "a" (open when the breaker is open) — "b" (closed when the breaker is open) position. However, each rotor (250), may be adjusted individually in steps of 30 degrees. This adjustment is made by removing cover

(257), and lifting the entire rotor assembly out of case (245) . . . after disconnecting arm (252) from the linkage. Cotter pin (256), and bearing (251), are removed to permit removal of rotors (250) from the shaft (249); To change rotors (250) from "a" to "b" position, the rotor should be rotated 60° in the clockwise direction after removal, and then replaced on the shaft in this new position.

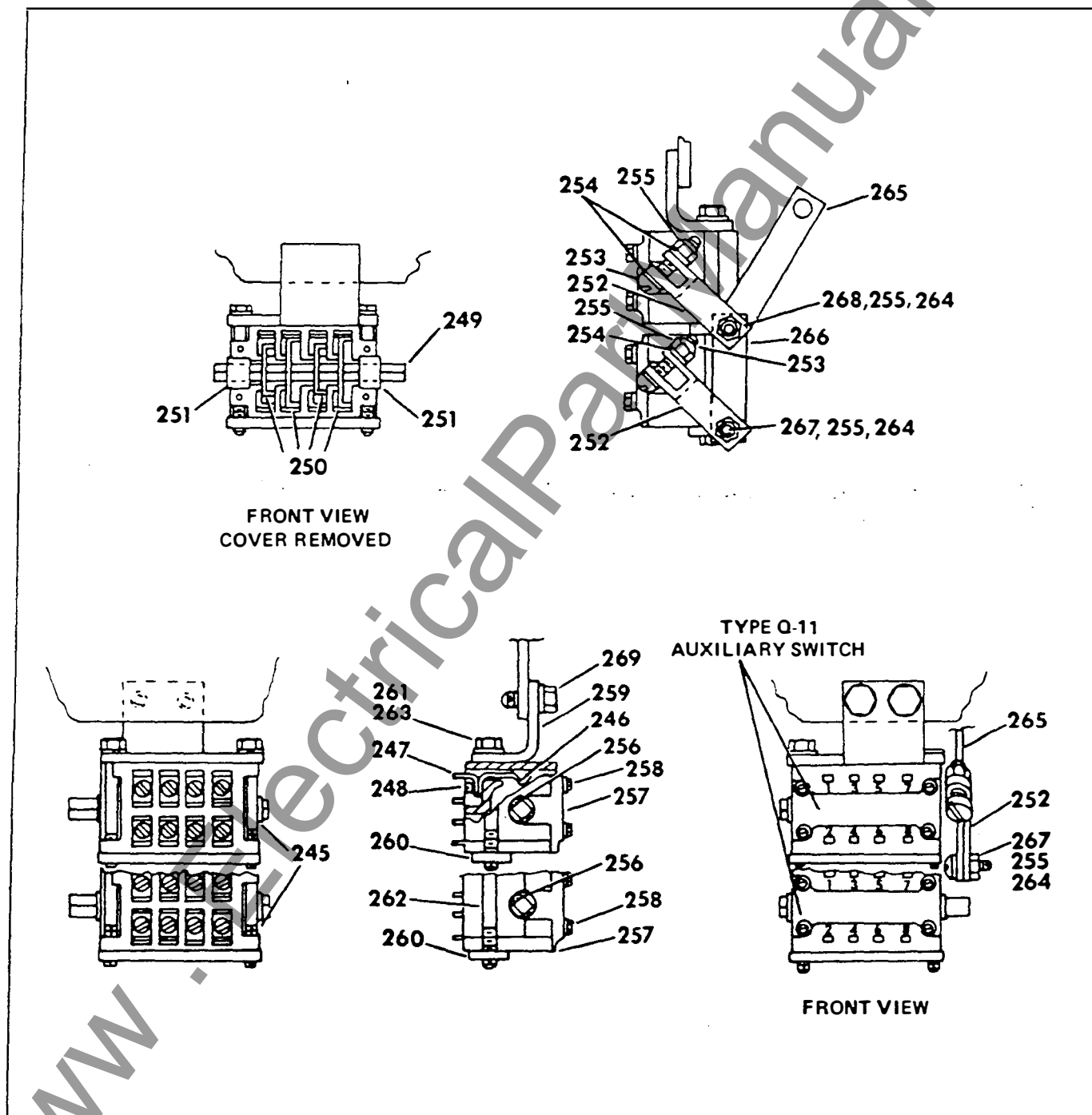


Figure 13. LA-6008, LA-800A and LA-16008 Auxiliary Switch Group

#### Undervoltage Trip Device Option (Figure 14)

This device automatically trips the circuit breaker on loss of voltage. Either instantaneous or time-delay operation can be supplied. A .06 inches (1.5 mm) gap should be maintained between flap extension and pull link (22), when the device is energized with 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.

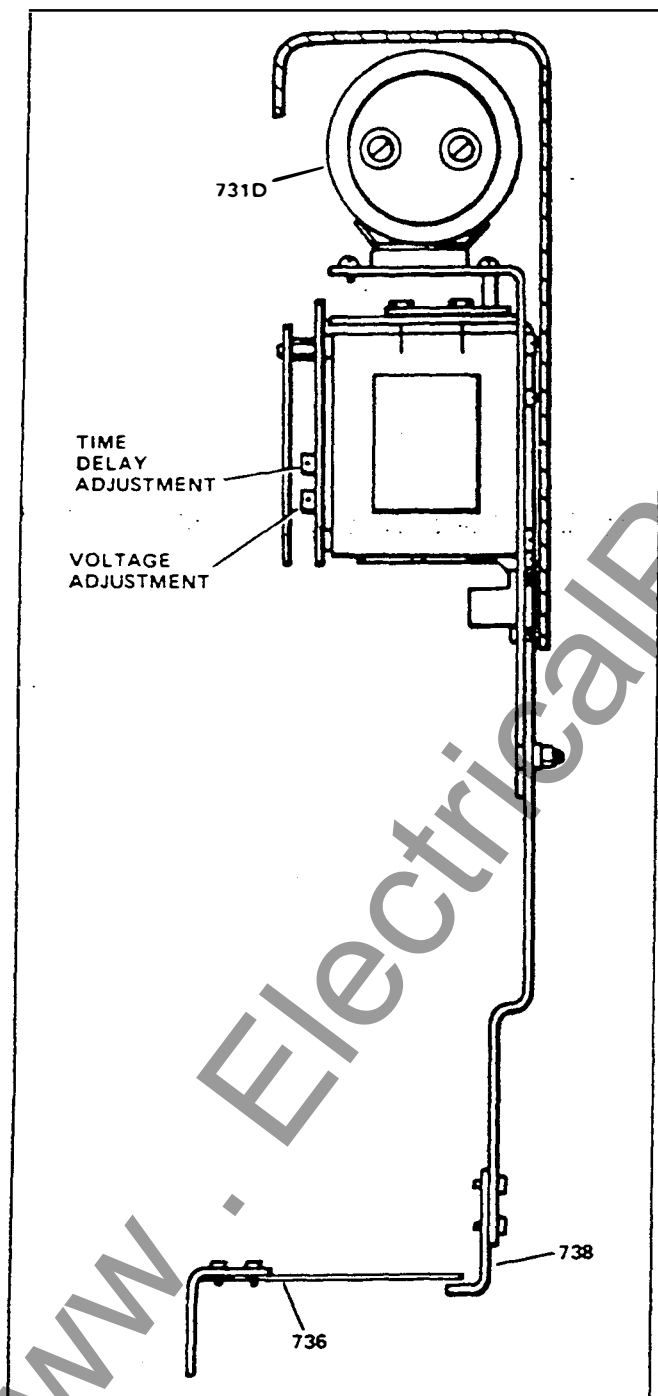


Figure 14. Undervoltage Trip with or without Time Delay

#### NOTE

Pick-up and drop-out are not individually adjustable. Time delay is adjustable from 1/2 to 4-1/2 secs.

#### Shunt Trip Option (Figure 15)

Each electrically operated circuit breaker is equipped with a shunt trip attachment for tripping from a remote location. Since the shunt trip coil is designed for a momentary duty cycle, an "a" auxiliary contact switch is used to interrupt its circuit immediately after the circuit breaker is tripped. Energization of the coil causes the armature to pick up and rotate the trip latch to trip the breaker. A compression spring (148) returns the armature to its normal position.

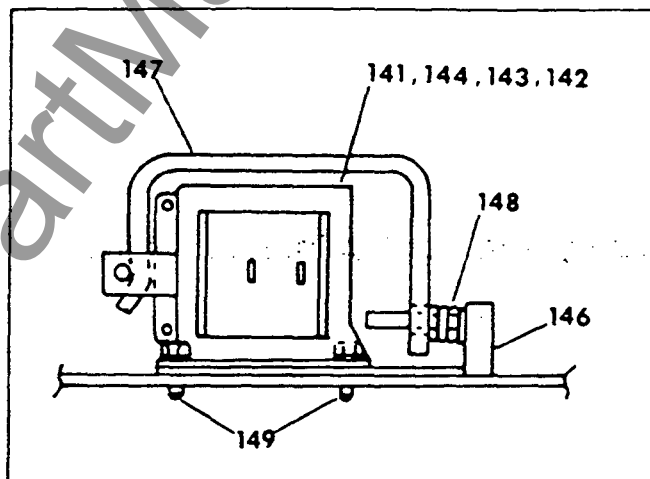


Figure 15. LA-600B, LA-800A and LA-1600B Shunt Trip Group

#### Static Trip Option

The optional tripping devices are covered in detail under their own instruction books which are referenced on the last page. Several types are available that provide a range of tripping functions.

The Static Trip II 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 static trip device to be removed from the circuit breaker. Just pull the trip device towards the front of the circuit breaker.

The *LimiTrip* device mounts on the same slide type bracket on the circuit breaker as Static Trip II and can be removed in a similar manner. If complete removal from the circuit breaker is required, disconnect the red and black actuator leads by separating the disconnect plugs and disconnect the leads to the current sensors at the sensor terminals (four leads to each sensor).

#### Bell Alarm Switch Option (Figure 16)

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.

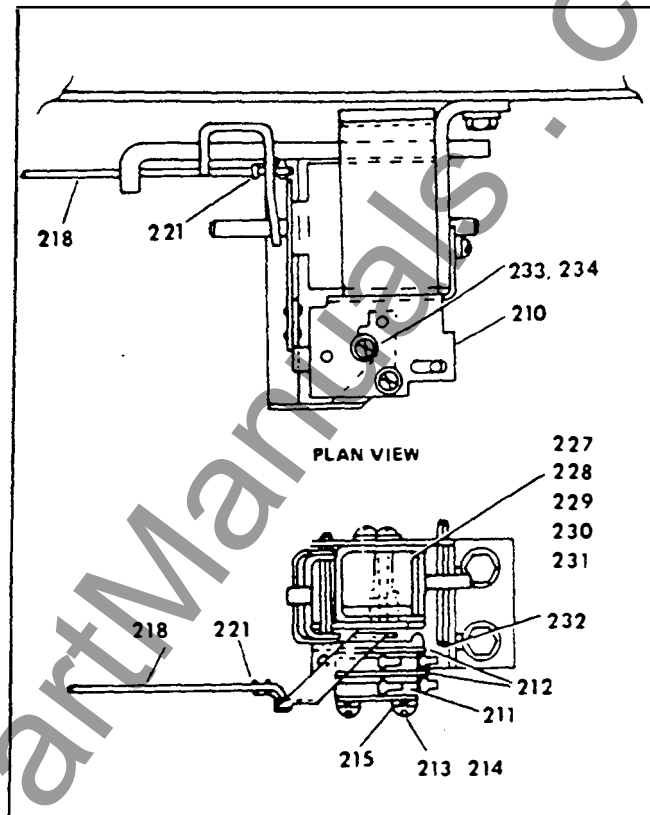


Figure 16. LA-600B, LA-800A and LA-1600B  
Alarm Switch Group, Bell Alarm

## LUBRICATION INSTRUCTIONS

### CIRCUIT BREAKER LUBRICATING INSTRUCTIONS

Periodic inspection of each circuit breaker is recommended at least once a year.

More frequent inspections are recommended, if severe load conditions, dust, moisture, or other unfavorable conditions exist.

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

During an inspection the breaker should be checked for proper operation, adjustment and lubrication. Adjustment procedures are described in the instruction book. Recommended lubrication points are shown in adjacent chart.

The lubrication chart outlines two methods of lubrication. The first method requires no disassembly and is suggested for the prevention of problems which could be created by severe environmental or operating conditions.

The second method follows a procedure similar to that performed on the breaker at the factory and should be used only in case of a general overhaul or disassembly.

### METHOD FOR CLEANING BEARINGS ON OLDER STYLE BREAKERS HAVING NEEDLE OR SLEEVE BEARINGS

Needle bearings are factory lubricated for life and should not require attention. However, the best of greases are affected by time and atmospheric conditions and may require service.

To lubricate these bearings when parts are disassembled, the following procedure is recommended: Clean in solvent, wash in alcohol, spin in light machine oil, drain and repack with Beacon P-325 grease. *Caution: Needle bearings should not be removed from the retaining part.*

The sleeve bearings should be removed, washed in clean solvent, drained and dried thoroughly before lubricating with Beacon P-290.

**LUBRICATION CHART**

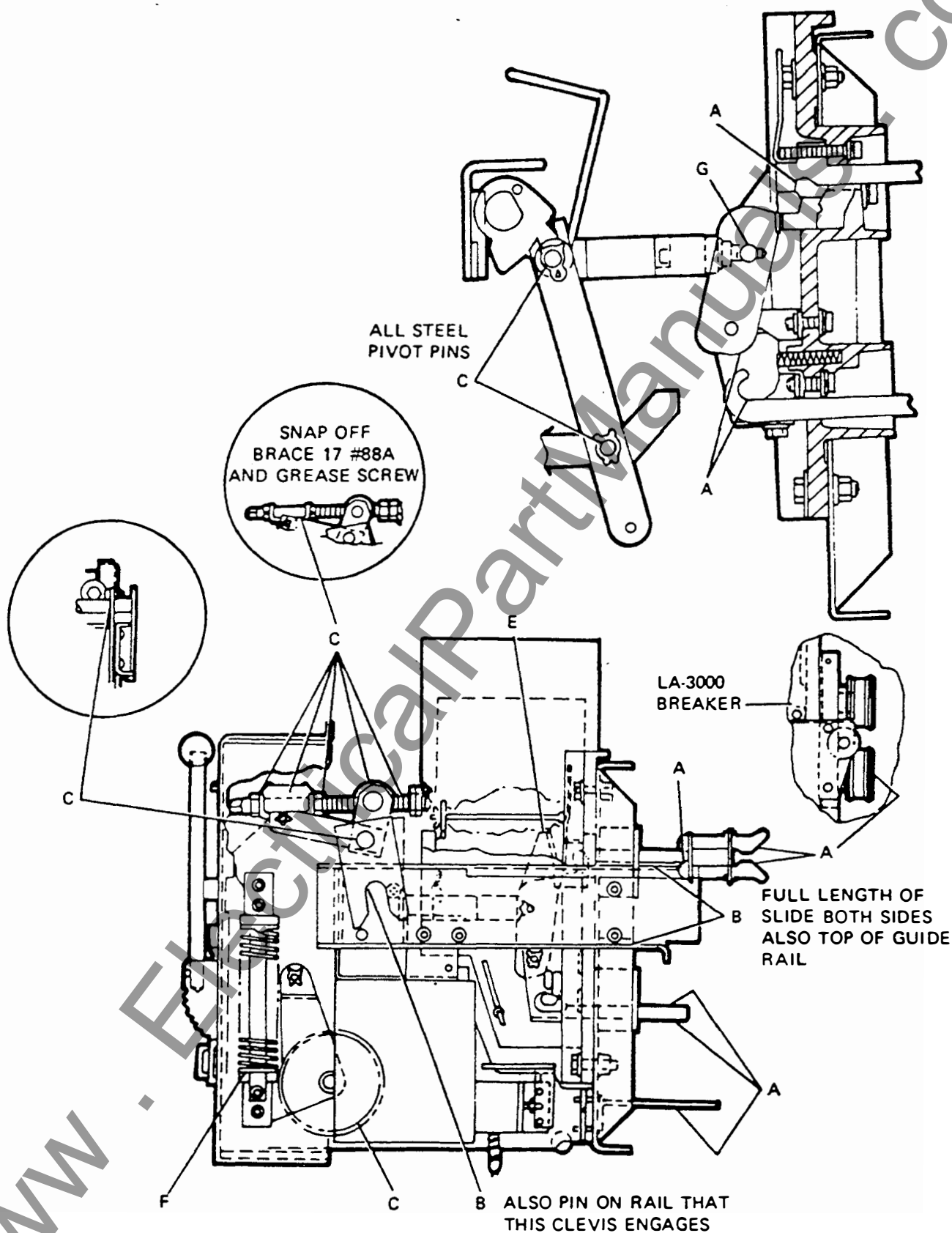
LUBRI- CATION KEY	PART DESCRIPTION	SUGGESTED LUBRICATION AT EVERY * OPERATIONS OR EVERY SIX MONTHS	LUBRICATION (REQUIRES DISASSEMBLY) RECOMMENDED EVERY 5 YEARS OR ANY COMPLETE OVERHAUL
A	CONTACT ARM HINGE ASSEMBLY.  PRIMARY DISCONNECT FINGERS, GROUNDING CONTACT.  SECONDARY DISCONNECT FINGERS.	WIPE CLEAN AND APPLY A FILM OF SIEMENS-ALLIS CONTACT LUBRICANT 15-171-370-002 IN LAYER 1/32" to 1/16" THICK.	
B	SLIDING SURFACES.	LIGHT APPLICATION OF *MOLYCOTE 557*	WIPE CLEAN AND APPLY *MOLYCOTE 557* LIBERALLY.
C	PIVOT PINS, ROTATING PARTS SUCH AS DRIVE PINION, GEAR.	LIGHT APPLICATION OF *MOLYCOTE PENELUBE* 15-171-270-002.	REMOVE PINS OR BEARINGS, CLEAN PER INSTRUCTIONS AND APPLY *BEACON P-290* 00-337-131-001.
D	GROUND SURFACES SUCH AS LATCHES, ROLLERS, PROPS, ETC.	WIPE CLEAN AND SPRAY WITH *MOLYCOTE 557* 15-171-270-001.	WASH CLEAN AND SPRAY WITH *MOLYCOTE 557* 15-171-270-001.
E	ARCING CONTACTS.	DO NOT LUBRICATE.	DO NOT LUBRICATE.
F	SPRINGS.	NO LUBRICATION REQUIRED.	
G	DRY PIVOT POINTS.	NO LUBRICATION REQUIRED.	NO LUBRICATION REQUIRED.

\* Lubrication should be checked and renewed as follows:

LA-600 operations between lubrications 1750

LA-1600 operations between lubrications 500

LA-3200, LA-4000 operations between lubrications 250



# SIEMENS-ALLIS

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## INSTRUCTION BOOK REFERENCES

Low Voltage Metal — Enclosed Switchgear Type ME and OME .....	18X1315
LimiTrip Static Trip Device Instructions .....	18X10107
Type LA-3000, LA-4000 & LA-4000F (E.O.) (Obsolete) .....	18X4583
Renewal Parts Ordering Guide for LA-3000 & 4000 (Obsolete) .....	18X4560
LA-3200A and LA-4000A (unfused) Circuit Breaker .....	18X5689
Renewal Parts Operating Guide for LA-3200A and LA-4000A .....	18X5690
Static Trip II Instructions .....	18X4827
Portable Test Set Type PTS-2 for Static Trip II (Obsolete) .....	18X4955
Portable Test Set Type PTS-3 for Static Trip I, Static Trip II and LimiTrip .....	18X10366

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