

SIEMENS-ALLIS

Switchgear

INSTRUCTIONS

**TYPES LA-600A/1600A
FUSED AND UNFUSED
AIR CIRCUIT BREAKERS
WITH
MANUAL OR ELECTRIC OPERATORS**

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INDEX

INSTALLATION AND INSPECTION	1
Introduction	1
Receiving and Inspection for Damage	1
Installation	1
Storage	2
Maintenance	2
OPERATION	3
Description	3
Manually-Operated Breaker	3
Electrically-Operated Breaker	4
Racking Mechanism, Drawout Interlock, and	
Lifting Bar	5
Spring Discharge Interlock	6
MAINTENANCE AND ADJUSTMENTS	8
Maintenance	8
Lubrication	9
Maintenance Closing	9
Adjustments	10
Trip-Latch Engagement	10
Main Contact Make	10
Arcing Contact Make	11

Contact Replacement	11
Main Contact Fingers	11
Stationary Arcing Contact	11
Hinge Contact Fingers	11
Moving Arcing and Main Contact	12
Tripping Actuator	12

FUSE FUNCTIONS	14
Current Limit Fuse	14
Trigger Fuse	14

TRIPPING TRANSFORMERS	15
-----------------------	----

OPTIONAL DEVICES	15
Secondary Disconnect Assem. Option	15
Auxiliary Switch Option	15
Shunt Trip Option	15
Undervoltage Trip Device Option	15
Bell Alarm Switch Option	17
Static Trip Option	17

ILLUSTRATIONS

Fig. 1 Typical LA-1600A Breaker Outline	18
Fig. 2 Typical LA-600A Breaker Outline	18
Fig. 3 LA-600A/LA-1600A Operator	19
Fig. 4 Typical Wiring Diagram — Electrically	
Operated Breakers	20
Fig. 5 Typical Racking Mechanism and	
Drawout Interlock	21
Fig. 6 Maintenance Closing	22
Fig. 7 Typical Panel Assembly	23
Fig. 8 Fuse Attachment Group LAF-600A Breaker	24
Fig. 9 Fuse Attachment Group LAF-1600A Breaker	25

Fig. 10 LAF-600A/1600A Anti-Single Phase Device,	
Trigger Fuse Assembly	26
Fig. 11 LA-600A/1600A Secondary Disconnect Group	27
Fig. 12 LA-600A/1600A Auxiliary Switch Group	28
Fig. 13 LA-600A/1600A Shunt Trip Group	29
Fig. 14 LA-600A/1600A Under Voltage Trip Attachment	30
Fig. 15 LA-600A/1600A Alarm Switch Group, Bell Alarm	31
Fig. 16 Motor Cutoff Switch Action	32
Fig. 17 Lubrication Points on Breaker	33
Fig. 18 Lubrication Chart	34

TABLES

Table 1 Operating Procedure — Manually-	
Operated Breakers	4
Table 2 Operating Procedure — Electrically-	
Operated Breakers	5

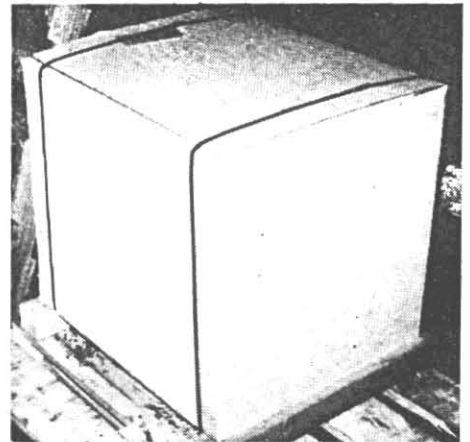
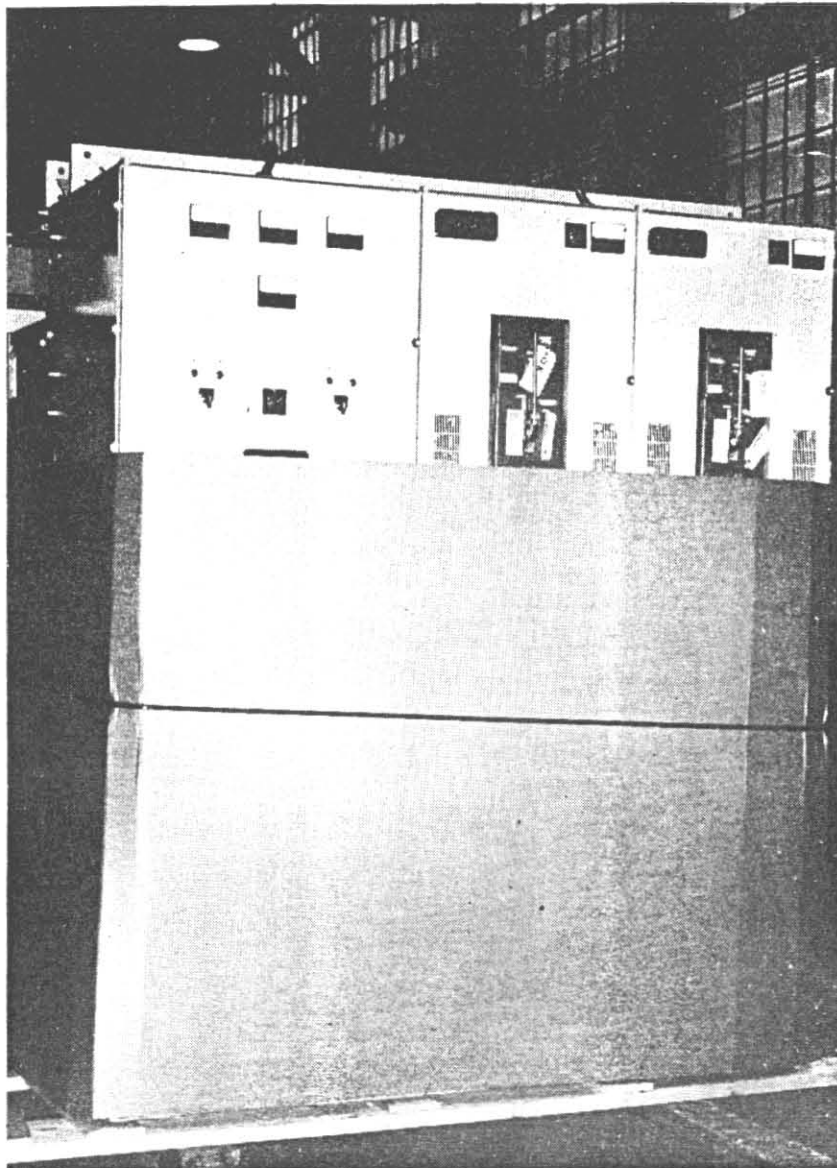
Table 3 Maintenance Closing	10
Table 4 Trip Rating Table — Amperes	16

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 5992-23.)



Typical Shipping Methods Used With "LA" Breakers

INSTALLATION AND INSPECTION

INTRODUCTION

The type "LA" air circuit breakers may be furnished for mounting in any one of three ways. They may be used in metal-enclosed switchgear of the drawout type, in individual enclosures (drawout type), or for stationary mounting in a customer's own enclosing case or switchboard. All "LA" 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 should be adequately braced against the effects of short circuit currents to prevent overstressing the breaker terminals.

RECEIVING AND INSPECTION FOR DAMAGE

Immediately upon receipt of this equipment, carefully remove all packing traces and examine parts, checking them against the packing list and noting any damages incurred in transit. If such is disclosed, a damage claim should be filed at once by the customer with the transportation company and Siemens-Allis notified.

Two shipping methods are used with "LA" breakers:

1. Individually with protective covering.
2. Within a cubicle when part of a switchgear lineup. Breakers shipped in their cubicles are blocked to prevent accidental tripping during shipment. Note all caution tags, remove blocking bolts, and open breaker contacts before installation.

INSTALLATION

The "LA" air circuit breaker is completely adjusted, tested, and inspected before shipment, but a careful check should be made to be certain that shipment or storage has not resulted in damage or change of adjustment. Circuit breakers should be installed in a clean, dry, well-ventilated area in which the atmosphere is free from destructive acid or alkali fumes. Stationary-type breakers should be mounted high enough to prevent injury to personnel either from circuit interruption or from moving parts during automatic opening of the breaker. Allow sufficient space to permit access for cleaning and inspection and adequate clearance to insulating barrier above the breaker to prevent damage from arcing during interruption. Before installing, make certain that the breaker contacts are in the open position.

1. After the breaker is installed in position, close it manually by the maintenance closing method (see MAINTENANCE AND ADJUSTMENTS, page 8) to check proper functioning of the mechanism and contacts.

CAUTION!!

MAKE SURE CIRCUIT IS NOT ENERGIZED.

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 putting the breaker in service.

2. Trip units and accessory devices should receive a thorough check prior to placing the breaker in service to be certain that adjustments are proper and parts are not damaged. Refer to Static Trip Device Instruction Book 18X4827.
3. Cubicle-mounted breakers of the drawout type are equipped with a drawout interlock to prevent movement of a closed breaker into or out of the connected position. See DRAW-OUT INTERLOCK, page 5 for a description of the interlock. Its operation should be checked before the breaker is energized.
4. Upon completion of the installation inspection, the breaker is ready to be energized after the control wiring, if any, is checked and the insulation tested.

STORAGE

When breakers are not to be put into immediate use, they should be wrapped or covered with a non-absorbent material to provide protection from plaster, concrete dust, or other foreign matter. Breakers should not be exposed to the action of corrosive gases or moisture. In areas of high humidity or temperature fluctuations, space heaters or the equivalent should be provided.

MAINTENANCE

Occasional checking and cleaning of the breaker will promote long and trouble-free service. A periodic inspection and servicing at least every six months should be included in the breaker maintenance routine.

If the circuit breaker is not operated during extended periods, the breaker 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.

CAUTIONS TO BE OBSERVED IN THE INSTALLATION AND OPERATION OF "LA" CIRCUIT BREAKERS

1. Read Instruction Book before installing or making any changes or adjustments on the breaker.
2. As the closing springs on stored-energy breakers may be charged in either the breaker open or closed position, extreme care should be taken to discharge the springs before working on the breaker.
3. When closing manually-operated breakers out of this unit, the racking mechanism must be returned to the test position before closing springs can be charged.
4. When closing manually-operated breakers, always grasp closing handle firmly until it is returned to the normal vertical position.
5. Check current ratings against single line diagram to assure that breakers are properly located in switchgear at installation.
6. Check the alignment of the secondary disconnect fingers to ensure against misalignment due to possible distortion of fingers during shipment and handling.
7. Once the breaker is energized, it should not be touched, except for operating, since most of the component parts are also energized.

OPERATION

DESCRIPTION

The LA-600A air circuit breaker has a maximum continuous current rating of 600 amperes, and an interruption rating of 25,000 amperes at 254, 508 volts 60 Hz, or 22,000 amperes at 635 volts 60 Hz. when used with the short time delay trip device. With instantaneous trip device, the interruption rating is 42,000 amperes at 254 volts, 30,000 amperes at 508 volts and 22,000 amperes at 635 volts.

The LA-1600A circuit breaker has a continuous current rating of 1600 amperes and an interruption rating of 50,000 amperes at 254 and 508 volts, or 42,000 amperes at 635 volts when used with the short time delay trip device. The interruption with instantaneous trip device is 65,000 amperes at 254 volts, 50,000 amperes at 508 volts and 42,000 amperes at 635 volts. All currents are symmetrical amperes and voltages are maximum.

The breakers are also available with integrally mounted current limit fuses. The basic breakers are the same with or without the fuses. The fuses mount on a bracket arrangement that is bolted to the side rails and upper studs on the back of the breaker. The current limit fuses increase the interruption rating to that of the fuses. Fused breakers are identified as LAF-600A, and LAF-1600A. Fused breakers are also equipped with an anti-single phase device to open the breaker if one or more current limit fuses open.

The 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.

Both the LA-600A and LA-1600A circuit breakers use the same closing mechanism or operator. The closing springs are larger for the 1600 ampere breaker. Three configurations of the operator are available for charging the closing springs.

These are manual charging, electrical charging and combination manual-electrical charging. All operators are identical except for the means of supplying energy to the closing springs.

A double-toggle, trip-free mechanism is used; that is, the breaker contacts are free to open at any time, if required, regardless of the position of the mechanism.

Manually-Operated Breakers

The breaker has a center-mounted frame so many of the latches and links are arranged in pairs, for descriptive purposes they will be referred to as single items. Refer to Figure 3 and Table 1. Detail "A" shows the position of the trip latch and toggle linkage when the 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) and extending the closing springs thru 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 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 flat (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 breaker can be closed. By pressing firmly on hood (8) latch (7) will disengage roller (28) and closing springs cause closing cam (19) to rotate against the toggle rollers (41) moving the toggle into its upright position, shown in detail "C". The closing cycle can be interrupted at any point by operation of one of the tripping means, which cause rotation of trip latch (13) to a position that release latch (35) allowing toggle linkage to collapse to the position shown in detail "A".

Manual opening of the breaker is accomplished by pressing on trip bar (48), this bar engages the top of trip flap (14) which is in turn arranged to disengage the trip latch.

TABLE 1 - OPERATING PROCEDURE - MANUALLY-OPERATED BREAKERS

<u>Operation</u>	<u>Procedure</u>
Charging Springs	Pull charging handle down all the way (approximately 120°) and return to normal vertical position. (Engagement of pawl with the ratchet teeth prevents handle reversal until the downward stroke is completed.)
Closing	Push down 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 Figure 4).

Electrically Operated Breaker

The mechanism of the electrically operated breaker is the same as the manually charged breaker except the manual charging handle is replaced by a motor and gear system. Refer to Figures 3 and 4 and Table 2. 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 breaker. When the wind and close cam (85) reaches its charged position, the back of the cam engages switch lever (91) 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, releasing 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 breaker can now be closed by manually releasing 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, thus preventing "pumping" or repeated attempts to charge the closing springs.

If the close circuit CSC switch is opened, the motor will automatically recharge the closing springs, if power is available for the motor circuit. The close coil circuit is always interrupted by the motor cut-off switch MCO. Trip free operation of the mechanism, discharging the springs on a closed breaker is prevented by completing the close coil circuit thru auxiliary contacts of the breaker.

TABLE 2 - OPERATING PROCEDURE - ELECTRICALLY-OPERATED BREAKERS

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

Combination Operated Breaker

The combination manually charged and electrically charged breaker includes both the motor-gear charging system as well as the manual charge handle. NOTE: Manual Handle must be in vertical position during electrical charging.

Racking Mechanism, Drawout Interlock and Lifting Bar

Cubicle mounted breakers of the drawout type include as integral parts the mechanism to rack the breaker in and out of the cubicle compartment, interlocking to prevent racking a closed breaker into or out of the connected position, and interlocking to prevent withdrawing a breaker from the cubicle while the closing springs are charged.

Refer to Figure 5, with the breaker resting on the cubicle rail, the following sequence should be used to rack the breaker into the cubicle.

CAUTION!!

ON ELECTRICALLY OPERATED BREAKERS, BE SURE MOTOR CONTROL SWITCH ON THE FRONT OF THE BREAKER IS OFF.

1. Push trip bar in and lower interlock slide (110), note, slide interlock cannot be opened unless manual trip bar is pressed in. While the trip bar is pressed in, the breaker is in the TRIP-FREE position and cannot be closed.
2. With the switchgear operating 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 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 floor mounted interlock cam does not engage the roller interlock (67) and the cover slide interlock can be closed, allowing the trip bar to extend and the breaker can be operated.

Between the TEST position and the CONNECTED position, the roller interlock (67) does engage the floor cam and the breaker will be tripped through the interlock mechanism, even if the cover slide is closed.

In the CONNECTED position, the roller interlock will again clear the floor cam of the cubicle. This prevents moving a closed breaker into or out of 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 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 5, and 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.

Spring Discharge Interlock

When racking the 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 (see figures 3 and 4), this in turn connects 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 BREAKER TO THE DISCONNECT POSITION.

NOTE:

Manual charge handle must be in vertical position during racking and racking mechanism must be returned to the test position before closing springs can be charged, while breaker is removed from 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 the breaker normally in that position, then rack out in the normal manner.

CAUTION!!

WITH COVER REMOVED AND CIRCUIT BREAKER CONTACTS OPEN, THE CIRCUIT BREAKER WILL CLOSE WHEN THE STORED ENERGY SPRINGS ARE DISCHARGED AUTOMATICALLY SINCE THE SLIDE INTERLOCK IS NOT IN PLACE.

Lift Bar

See Figure 5. The lifting bar connects as shown in Figure 5 for the standard breaker and the fused breaker. The additional lifting lugs are provided as part of the breaker because the additional overhang of the fuses shifts the center of gravity, and lifting from the usual position causes tipping of the device.

MAINTENANCE AND ADJUSTMENTS

CAUTION!!

BEFORE ANY MAINTENANCE WORK IS PERFORMED, MAKE CERTAIN THAT ALL CONTROL CIRCUITS ARE OPENED AND THAT THE BREAKER IS REMOVED FROM THE SWITCHGEAR UNIT. DO NOT WORK ON THE BREAKER OR MECHANISM WHILE IN THE CLOSED POSITION UNLESS THE TRIP LATCH HAS BEEN SECURELY WIRED OR BLOCKED TO PREVENT ACCIDENTAL TRIPPING. DO NOT WORK ON THE BREAKER OR MECHANISM WHILE THE CLOSING SPRINGS ARE CHARGED.

Maintenance

Occasional checking and cleaning of the breaker will promote long and trouble-free service. A periodic inspection and servicing at intervals of six months or 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 breaker should be inspected.

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 is given below.

1. De-energize the primary and control circuits.
2. Rack cubicle-mounted breakers of the drawout type to the disconnected position.
3. Remove breaker from cubicle.
4. Remove arc chutes (75, Figure 1 and 2) and examine for burned, cracked or broken parts. To remove arc chutes, proceed as follows:
 - a. Move breaker to disconnect position.
 - b. Turn racking screw until crank is in vertical position, giving maximum clearance between screw and holding bar.
 - c. Remove wing nuts from holding bar.
 - d. Tilt top of holding bar toward back of breaker and move bar down.
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 11)
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, next paragraph).
9. Crank racking mechanism so that the racking clevis (90, Figure 1) is in the test position or the vertical position of step 4b to permit charging of the closing springs.

10. Operate the breaker manually in maintenance closing position (see Maintenance Closing, below) to check latch and linkage movement.
11. Check breaker adjustments (see Adjustments, page 10).

NOTE:

After inspection and before inserting breaker in the cubicle or moving the breaker to test position, turn racking screw (89) until racking clevis (90) reaches its normal disengaged position.

Lubrication

Lubrication should be a part of the servicing procedure. Needle bearings are packed with grease and should require no further attention. Old grease should be removed from bearing pins and other non-current carrying rotating or sliding surfaces, and they should be wiped with a thin film of petroleum-oil-base precision-equipment grease such as BEACON P-290. Greasing should be done with care because excess grease tends to collect foreign matter which in time may make operation sluggish and may affect the dielectric strength of insulating members. Faces of main and arcing contacts should not be lubricated. The rubbing surfaces of the main contact fingers and hinge contact fingers are lubricated with a coating of A-C contact lubricant 15-171-370-002. If dust has accumulated disassembly is necessary to relubricate these points. (See Contact Replacement, page 11.)

Maintenance Closing

During inspection prior to installation and for routine maintenance inspections, the breaker contacts may be closed slowly to check clearances, contact adjustments, and movement of links and latches. The manual closing handle is used for maintenance closing the breaker.

Electrically-operated breakers do not have a manual closing handle, but a manual closing handle-cam assembly is available as a maintenance item. Figure 6 shows the maintenance closing handle being inserted in an electrically-operated breaker after removal of the front cover from the breaker. 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 chain 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 breaker and the manually-operated breaker. Refer to Table 3 and Figure 6.

CAUTION!!

THE PROCEDURE IN TABLE 3 SHOULD BE USED FOR MAINTENANCE CLOSING ONLY. MAINTAIN A FIRM GRIP ON THE MANUAL CHARGING HANDLE DURING THE CLOSING STROKE - THE BREAKER MAY SUDDENLY LATCH FULLY CLOSED AND APPLY UNEXPECTED FORCE TO THE CLOSING HANDLE,

TABLE 3. MAINTENANCE CLOSING

<u>Operation</u>	<u>Procedure</u>
Closing Contacts	<ol style="list-style-type: none"> 1. Pull charging handle DOWN ALL THE WAY (approximately 120°). 2. Place blade of screwdriver between hood and spring release latch and hold it in this position. 3. Slowly return handle to vertical position. Observe contact touch, mechanical operation, etc. 4. Remove screwdriver and pull charging handle to the fully charged position. Allow spring release latch to hold closing springs. Move charging handle to the vertical position. 5. Close breaker normally by pressing close hood.
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.

Adjustments

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

Trip Latch Engagement

(Refer to Figure 3.) Toggle latch (35) should engage the full width of trip latch (13) when the breaker is closed in the normal manner. To adjust, the tension on spring (15) can be increased by bending spring tab on trip flap towards the front of the breaker. Too much tension will interfere with the capability of the tripping actuator to move the trip flap, so over bending should be avoided.

Main Contact Make

(Refer to Figure 7.) Compression of contact fingers (9) should be between .093" and .125". This is the difference in the measurement from the breaker base to the tip of the finger contact surface when the breaker is open and the measurement 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 20-30 lbs.

Arcing Contact Make

(Refer to Figure 7.) With movable arcing contact (27) in any one phase touching the mating stationary contact when the breaker is closed by the maintenance closing method (see Table 3), the phase to phase variation should not exceed .062". Adjustment may be made by positioning screws (35) as in the previous paragraph, but 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 when checked with a pull-type spring scale at the base of the arcing contact tip insert with the breaker contacts closed.

Contact Replacement

(Refer to Figure 7.) 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 exercised in removal and installation of any of the contacts.

Main Contact Fingers

With the breaker contacts open and the stored-energy springs discharged, 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 and 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 (123, Figure 1) may be removed from each phase and the 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

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" diameter rod at least 2" 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

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 1-1/2" 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).

Moving Arcing and Main Contact

Either moving arcing contact (27) or main contact (28) or both may be removed and replaced as follows: Follow the steps outlined in the above paragraph including removal of pin (38) or if hinge contact fingers are not to be replaced, omit these steps and begin by placing a 3/16" diameter rod at least 2" long through the opening in support (13). Remove pin (38) if not removed previously.

The complete movable contact assembly may now be brought to a bench. It is suggested that a 1/2" thick piece of wood or phenolic be placed upright in a vise and the open slot in clevis (26) placed against it as a rest. The location of spacers should be noted.

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 moving arcing contact or the main contact may now be easily replaced. The reverse procedure is followed for re-installation. Care should be taken to replace spacers correctly. Check alignment and adjustment of contacts upon reassembly.

Tripping Actuator

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 as explained above, spacer washers may be added to obtain positive reset of the armature.

If adding spacers does not allow 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 remagnetized.

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 18X4827 for the procedures of the FUNCTION TEST.

Motor Cutoff Switches

The function and adjustment of the motor cutoff switches on electrically operated breakers is described in Figure 16.

FUSE FUNCTIONS

Current Limiting Fuse

(See Figure 8-9.) The C.L. Fuses are special purpose fuses having NEMA Class "J" or Class "L" characteristics and have an interrupting rating of 200,000 Amps RMS Symmetrical.

When replacement is required due to the C.L. fuse interrupting, replace only with a fuse of the same manufacturer and rating as supplied with the circuit breaker. Fuses of different manufacture will not mount on the breaker terminals.

Open Fuse Tripping Device

(See Figure 10.) The open fuse trip mechanism has three functions. The first function is to trip the circuit breaker mechanically when a C.L. fuse has interrupted.

The second function is 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.

The third function is 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) which engages circuit breaker interlock thru link (20). This trips the circuit breaker and holds 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.

CAUTION!!

THE TRIGGER FUSE (12) MUST BE INSERTED WITH THE PLUNGER FACING ARM (2). THE GAP DIMENSION OF 0 - .03" MAX. MUST BE MAINTAINED FOR EACH FUSE. BE SURE TO REPLACE BOTH THE TRIGGER FUSE AND IT'S CORRESPONDING C.L. FUSE BEFORE THE BREAKER IS RESET.

NOTE:

Do not remove Trigger Fuse cover when breaker is in connected position. Line voltage may be available inside the Trigger Fuse assembly.

ACCESSORIES

Tripping Transformers

There are a number of tripping transformer ratings available, each with seven calibrated pickup settings (Table 4).

The tripping transformers on the upper connectors of the circuit breakers are mounted with the polarity marks facing the breaker panel.

The tripping transformer on the lower connector is mounted with the polarity mark facing away from the breaker panel.

OPTIONAL DEVICES

Secondary Disconnect Assem. Option

The electrical attachments are wired to the terminals of a secondary disconnect assembly (see Figure 11) which is mounted on the left side of the breaker. Two blocks of ten terminals each can be mounted on the breaker. The secondary disconnect assembly is accessible from the front of the 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.

Auxiliary Switch Option

The auxiliary switch (see Figure 12) is of the rotary type and functions by direct connect to the breaker mechanism. The contacts are factory set for "a" (open when breaker is open) and "b" (closed when breaker is open) position, but 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 shaft (249). To change rotors (250) from "a" to "b" position, the rotor should be rotated 60° in the clockwise direction after removal and replaced on the shaft in this new position.

Shunt Trip Option

Each electrically-operated breaker is equipped with a shunt trip attachment for tripping from a remote location. (See Figure 13.) 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 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.

Undervoltage Trip Device Option

The undervoltage trip device (Figure 14.) automatically trips the breaker on loss of voltage. Either instantaneous or time-delay operation can be supplied. Adjusting screw (19) should be set to provide an air gap of .25" between the solenoid pole head and armature with the device de-energized as shown in the front view. A .06" gap should be maintained between flap extension and pull link (22) when the device is energized with the breaker closed. Pick-up and drop-out adjusting nut (13) should be set so that the device picks up at a voltage of 85% or less of rated value and drops out between 30% and 60% of the rated value.

NOTE:

Pick-up and drop-out are not individually adjustable.

On devices equipped with time delay airpot (2), the airpot adjusting screw can be set to provide a range of time delay between 0.5 and 4.5 seconds. Tightening the screw increases time delay.

TABLE 4 - TRIP RATING TABLE - AMPERES

Breaker Type and Frame Size	Tripping XFMR Rating (Primary)	Long Time Element Calibrated Pick-Up Settings							Max. Cont. Rating	Ground Element Calibrated Pick-Up Settings			
		A	B	C	D	E	F	G		15%	25%	50%	100%
LA-600A	80 Amps	40	50	60	70	80	90	100	100	-	-	40	80
	200 Amps	100	125	150	175	200	225	250	250	30	50	100	200
	400 Amps	200	250	300	350	400	450	500	500	60	100	200	400
	600 Amps	300	375	450	525	600	675	750	600	90	150	300	600
Breaker Type and Frame Size	Tripping XFMR Rating (Primary)	Long Time Element Calibrated Pick-Up Settings							Max. Cont. Rating	Ground Element Calibrated Pick-Up Settings			
		A	B	C	D	E	F	G		20%	40%	80%	100%
LA-1600A	200 Amps	100	125	150	175	200	225	250	250	40	80	160	200
	400 Amps	200	250	300	350	400	450	500	500	80	160	320	400
	800 Amps	400	500	600	700	800	900	1000	1000	160	320	640	800
	1600 Amps	800	1000	1200	1400	1600	1800	2000	1600	320	640	1280	1600

Bell Alarm Switch Option

The bell alarm switch option (see Figure 15) functions to operate a switch. A single pole double throw or a double pole double throw switch is available. The switch operator is connected to and is operated by the tripping actuator. The switch operator remains tripped even when the actuator is reset by the 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 breaker closing coil, to provide a lockout feature to prevent reclosing after a fault.

Static Trip Option

The static trip optional tripping devices are covered in detail under their own instruction book 18X4827. Several types are available that provide a range of tripping functions.

Any of the static trip devices are usable with any of the tripping transformers.

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 the trip device 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 from the static trip 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 breaker, by pulling the trip device towards the front of the breaker.

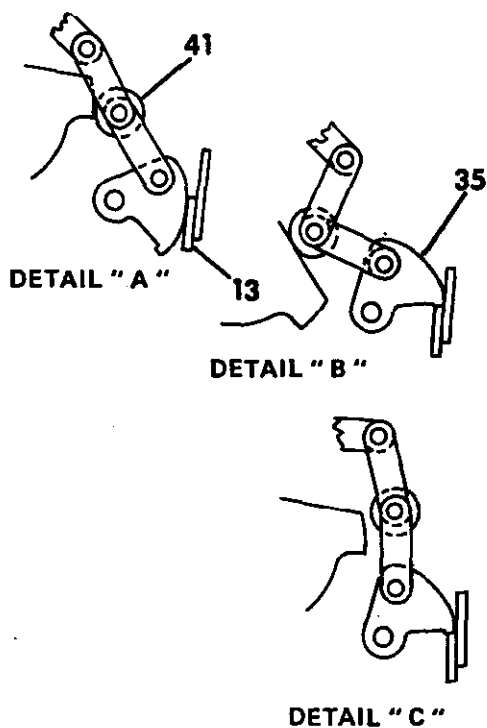
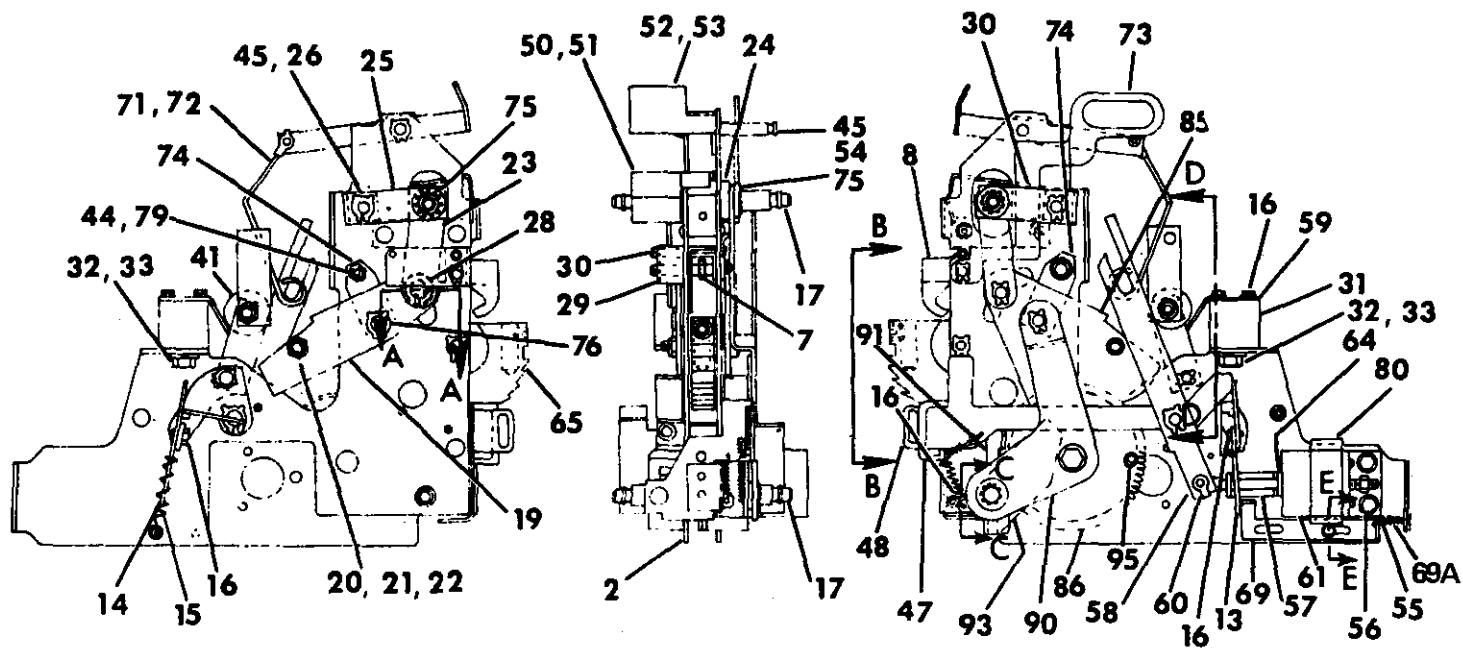
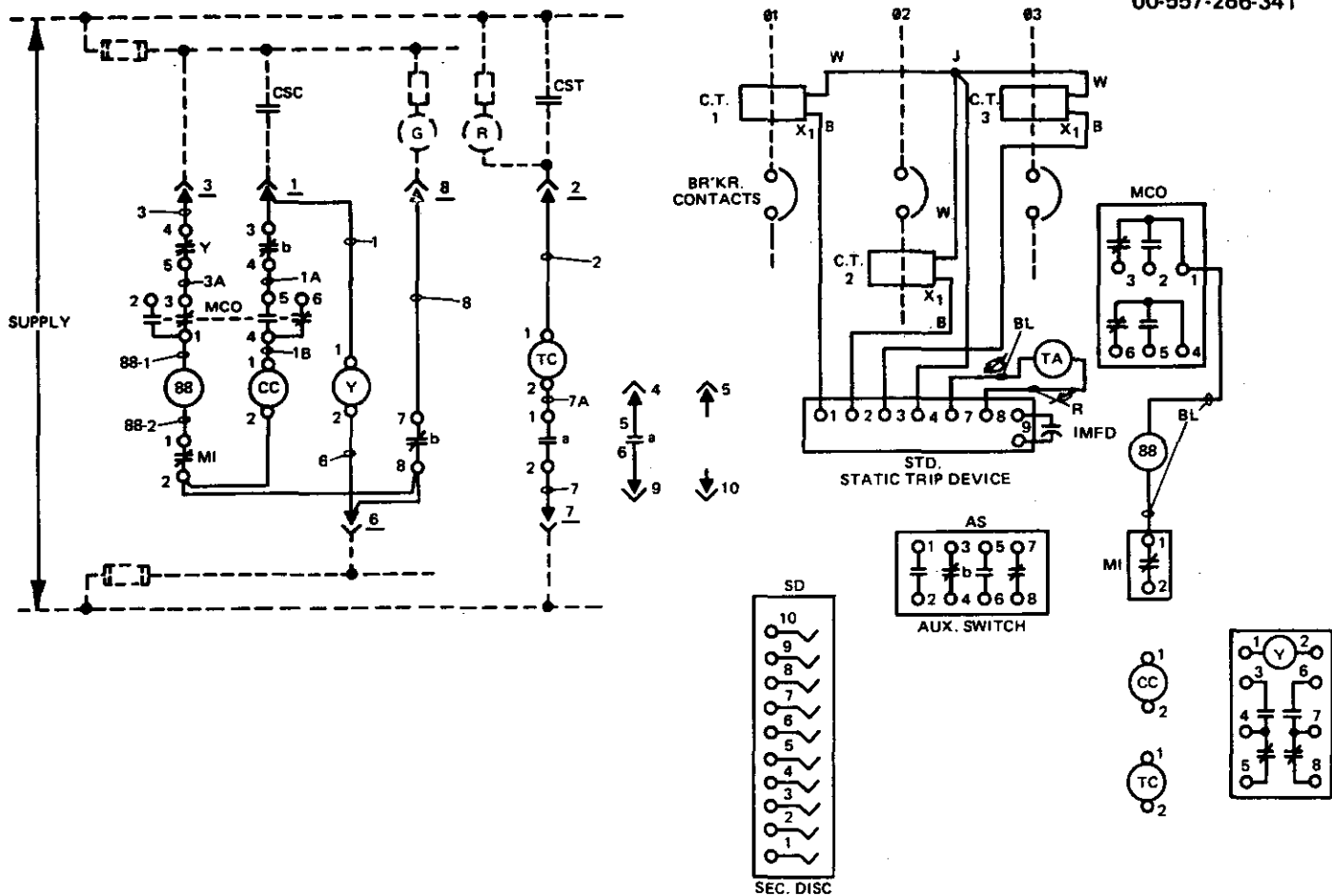


Fig. 3 - LA-600A/LA-1600A Operator



- 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

Fig. 4 - Typical Wiring Diagram - Electrically Operated Breakers

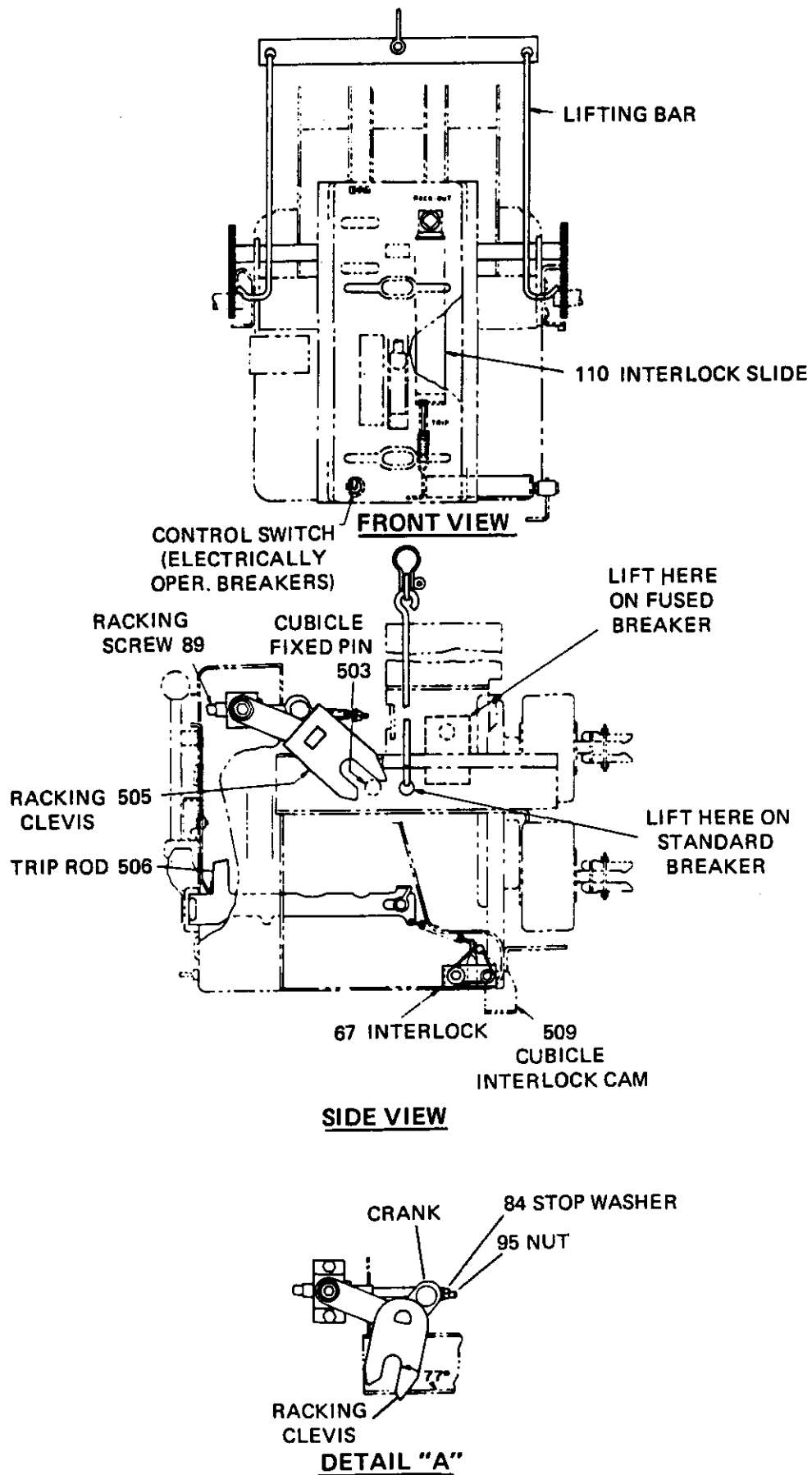


Fig. 5 — Typical Racking Mechanism and Drawout Interlock

MAINTENANCE CLOSING HANDLE
SEE PAGE 9

RELEASE LATCH HOOD

MAINTENANCE CLOSING HANDLE
ELECTRICALLY OPERATED BREAKERS

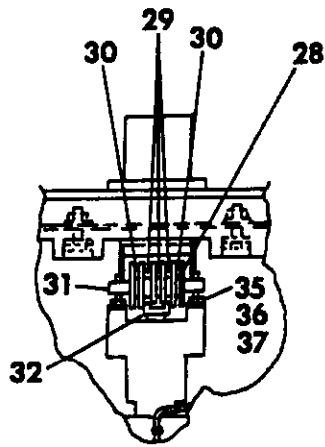
SEE TABLE 3, FIG. 1 & 2

STEP 1
STEP 2

TYPICAL MAINTENANCE
CLOSING HANDLE PROCEDURE

MANUAL TRIP ROD

Fig. 6 – Maintenance Closing



VIEW "A "

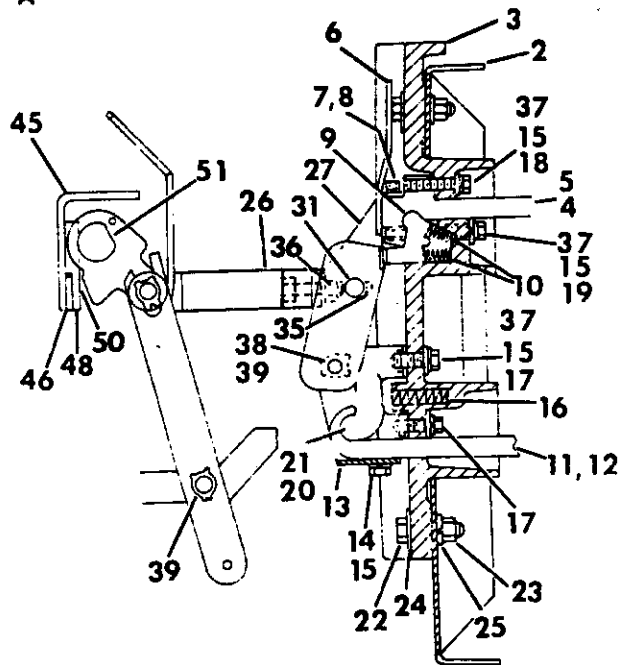
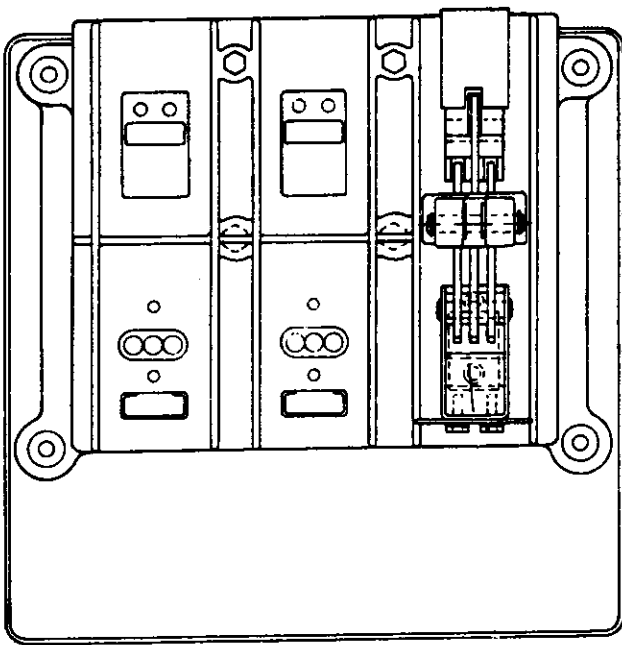


Fig. 7 - Typical Panel Assembly

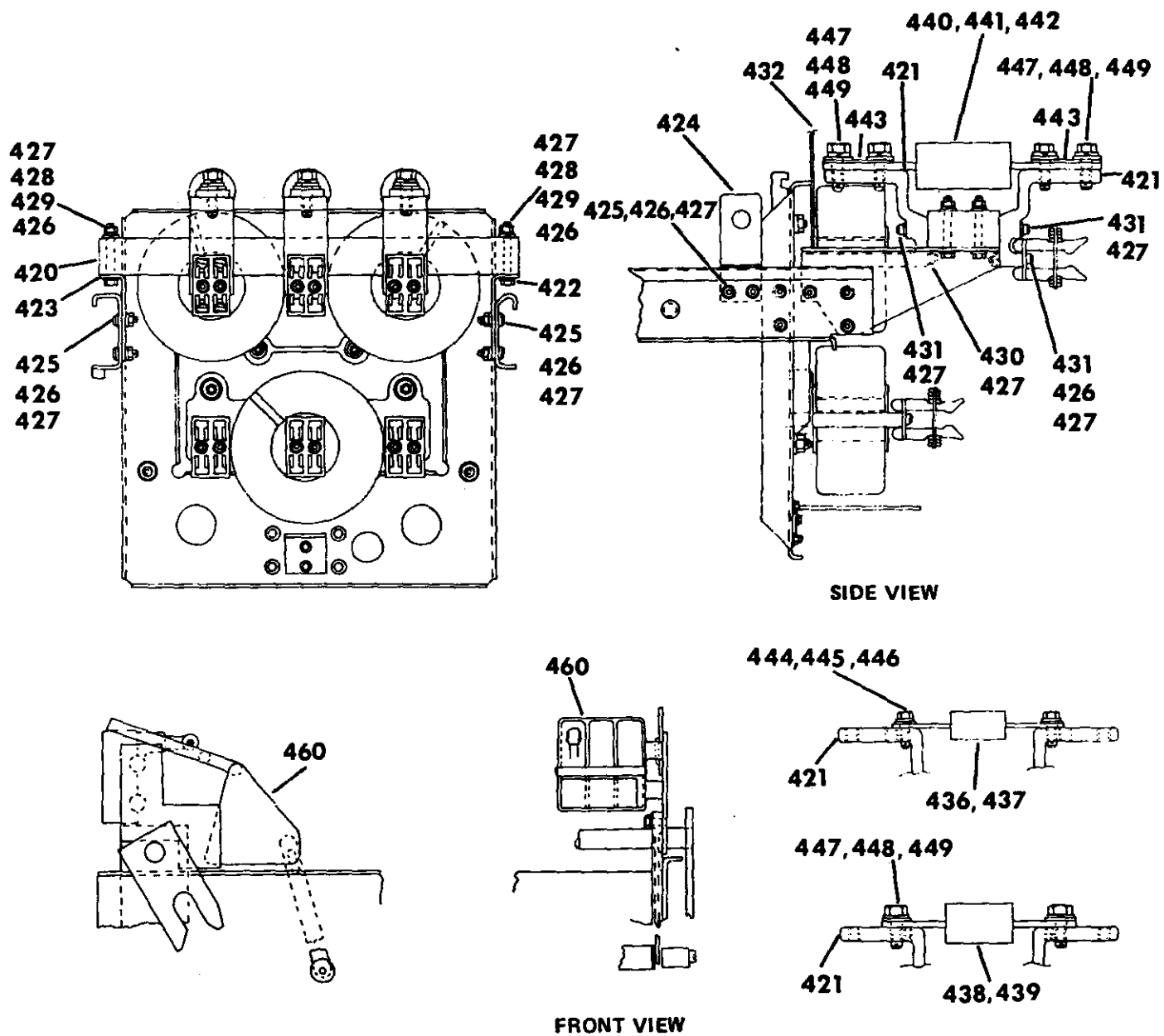
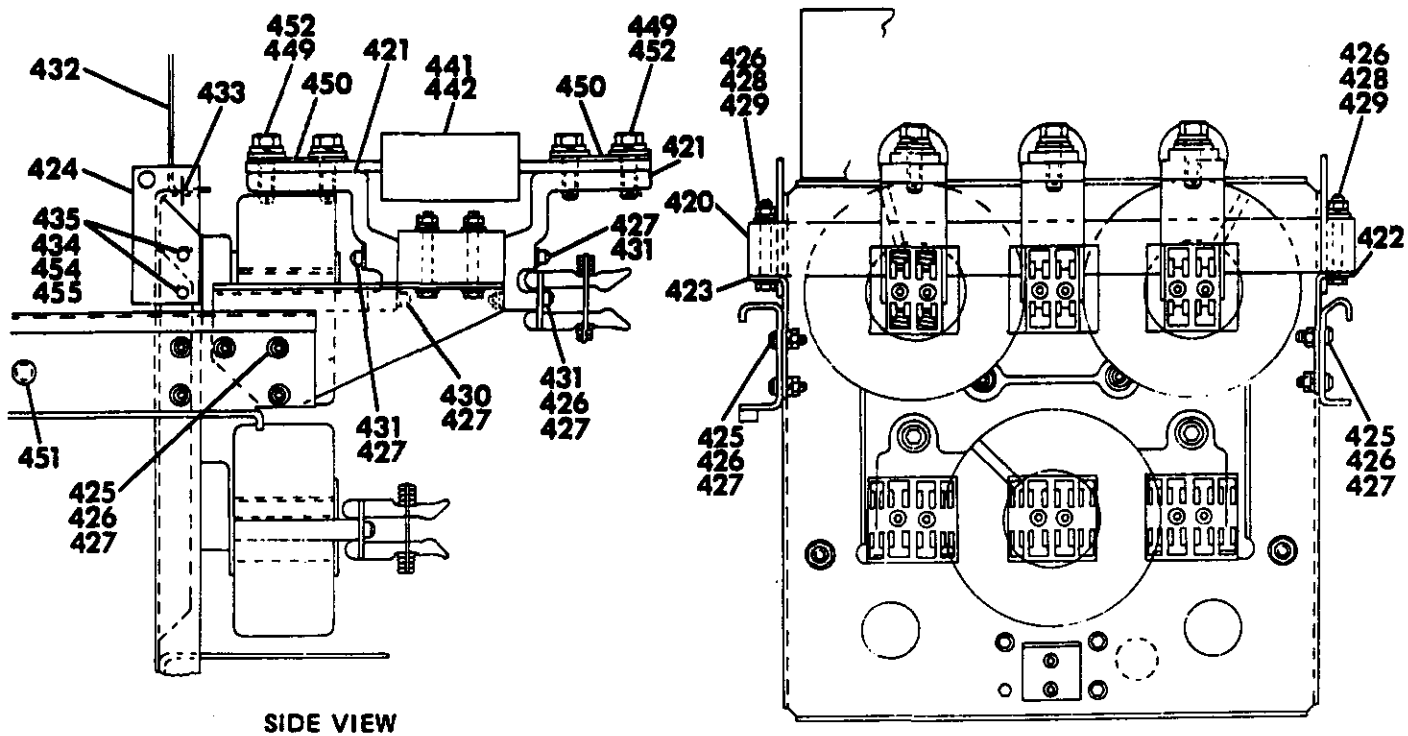
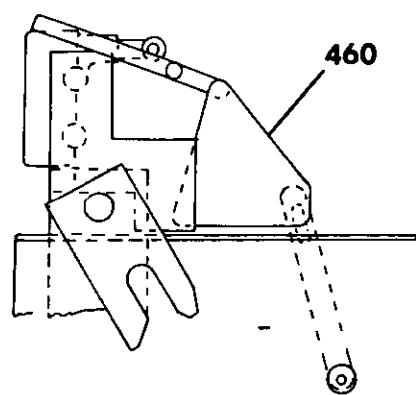
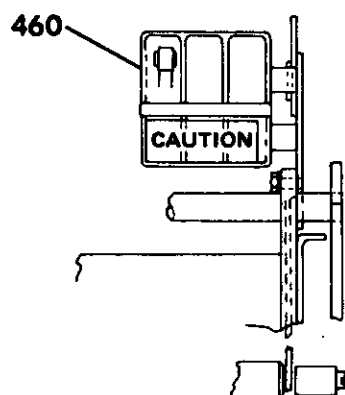
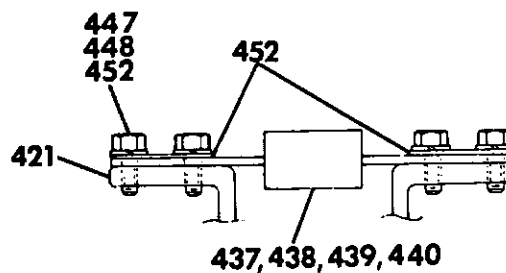
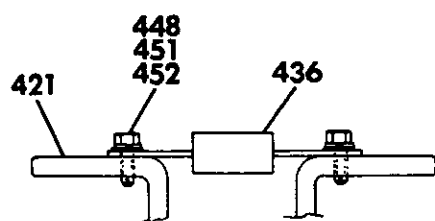


Fig. 8 - Fuse Attachment Group LAF-600A Breaker



SIDE VIEW

REAR VIEW



FRONT VIEW

Fig. 9 — Fuse Attachment Group LAF-1600A Breaker

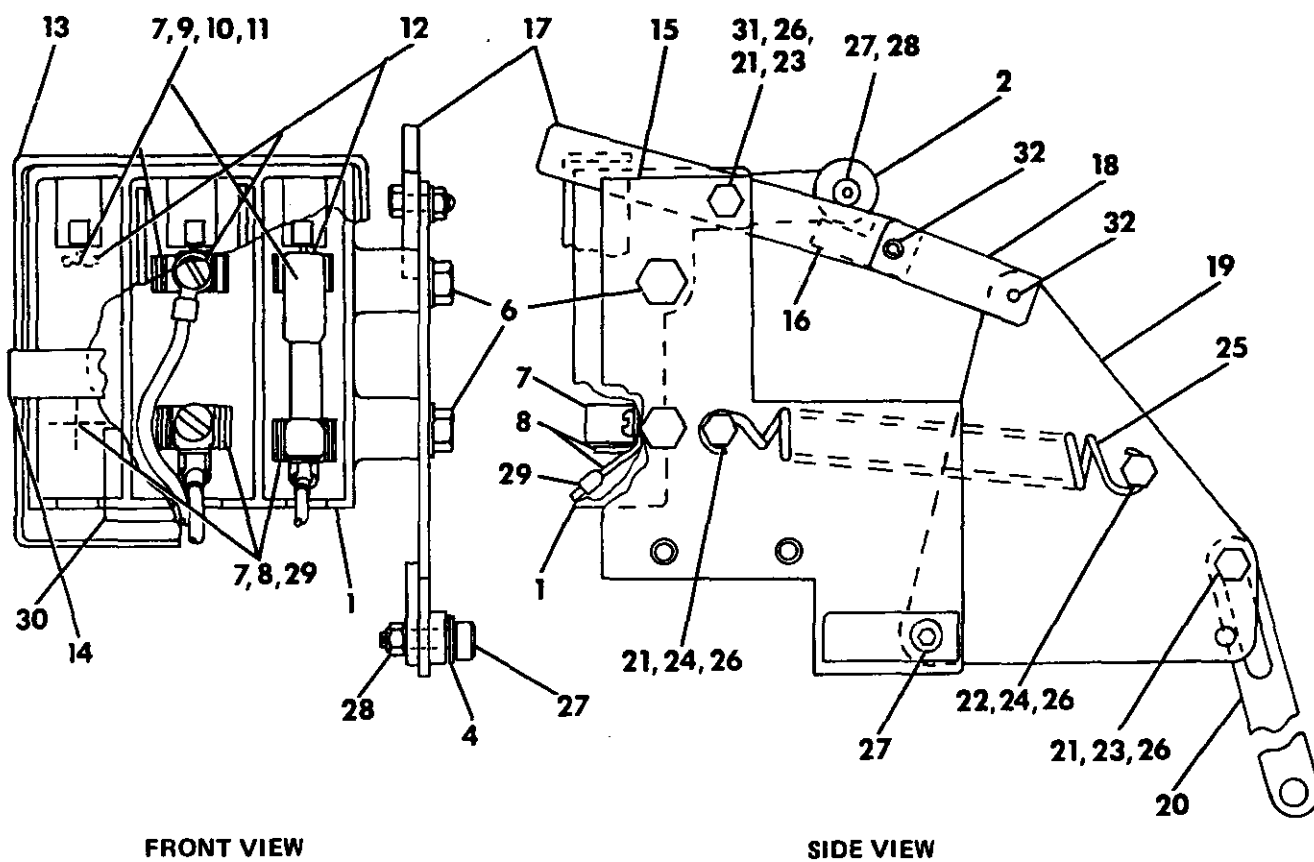


Fig. 10 — LAF-600A/1600A Open Fuse Tripping Device, Trigger Fuse Assembly

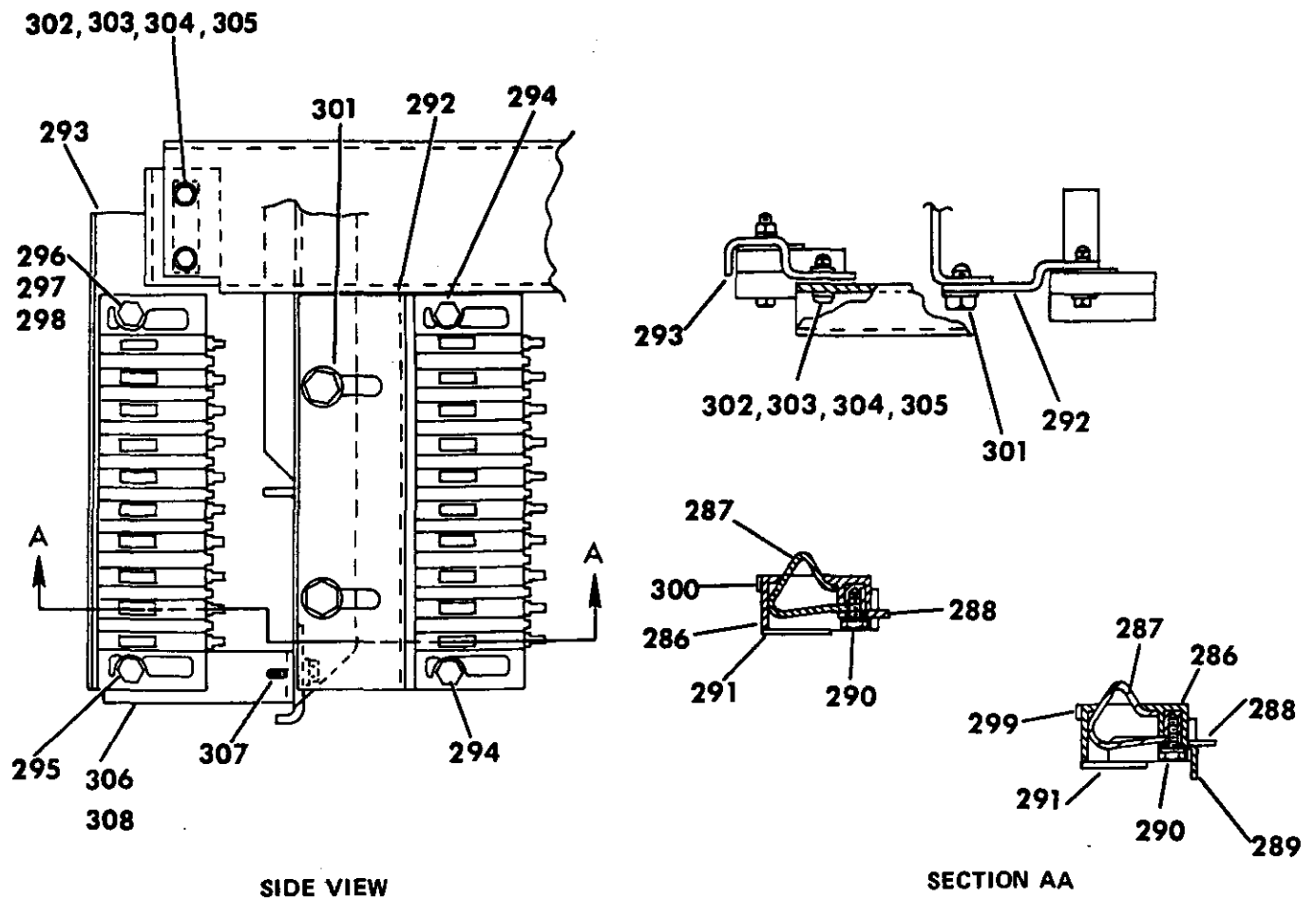


Fig. 11 – LA-600A/1600A Secondary Disconnect Group

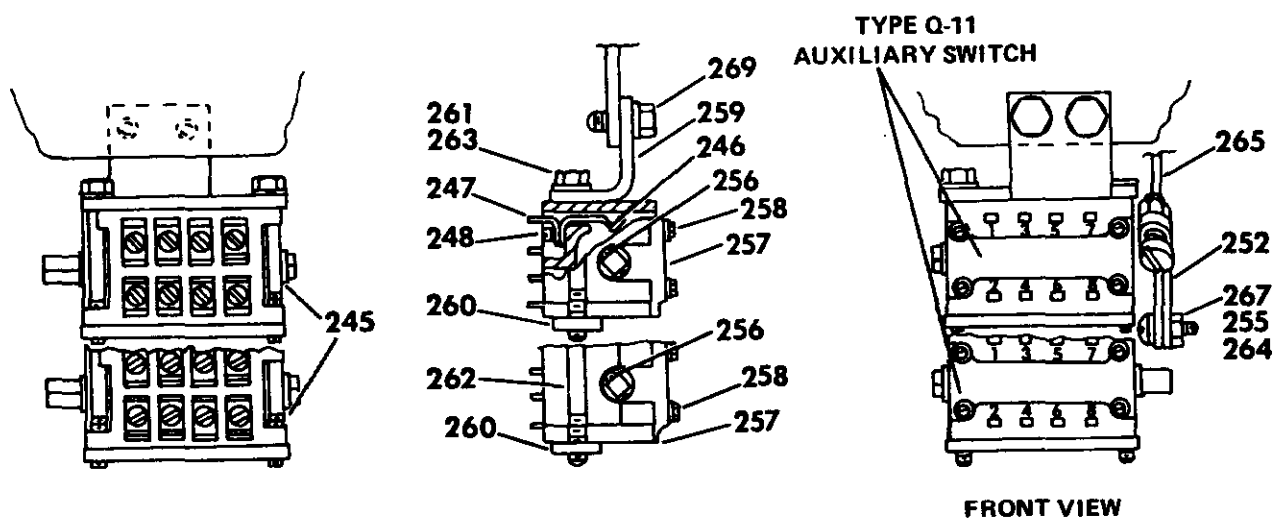
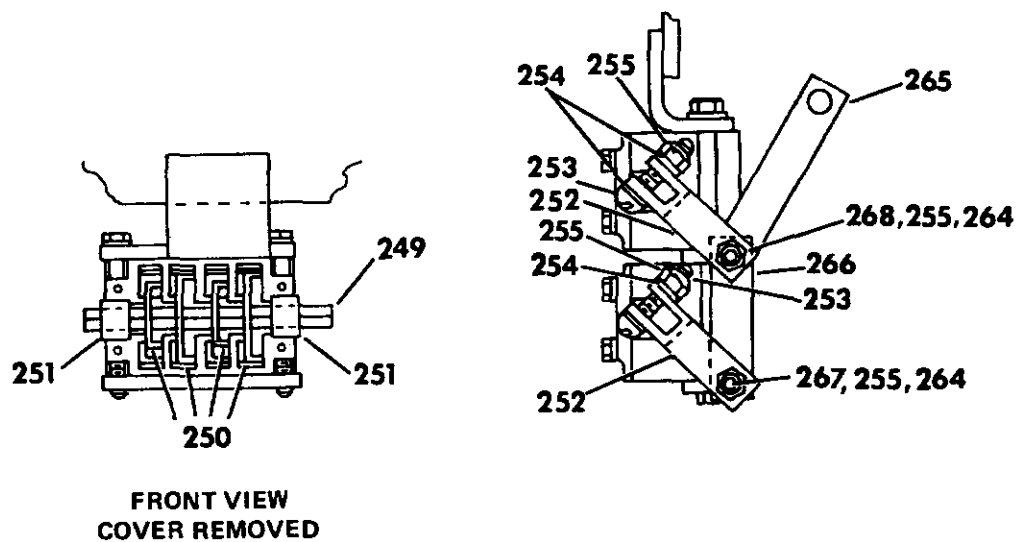


Fig. 12 - LA-600A/1600A Auxiliary Switch Group

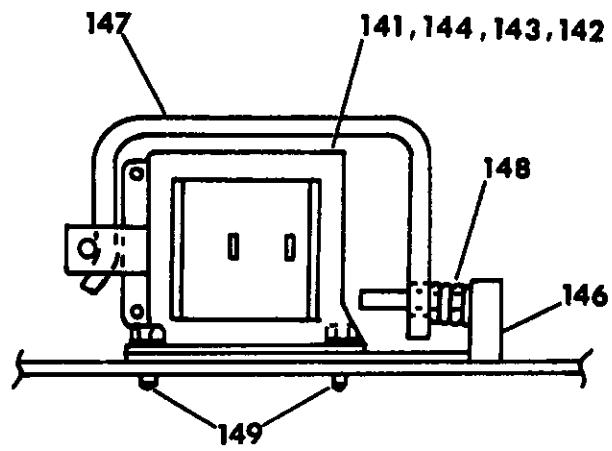


Fig. 13 – LA-600A/1600A Shunt Trip Group

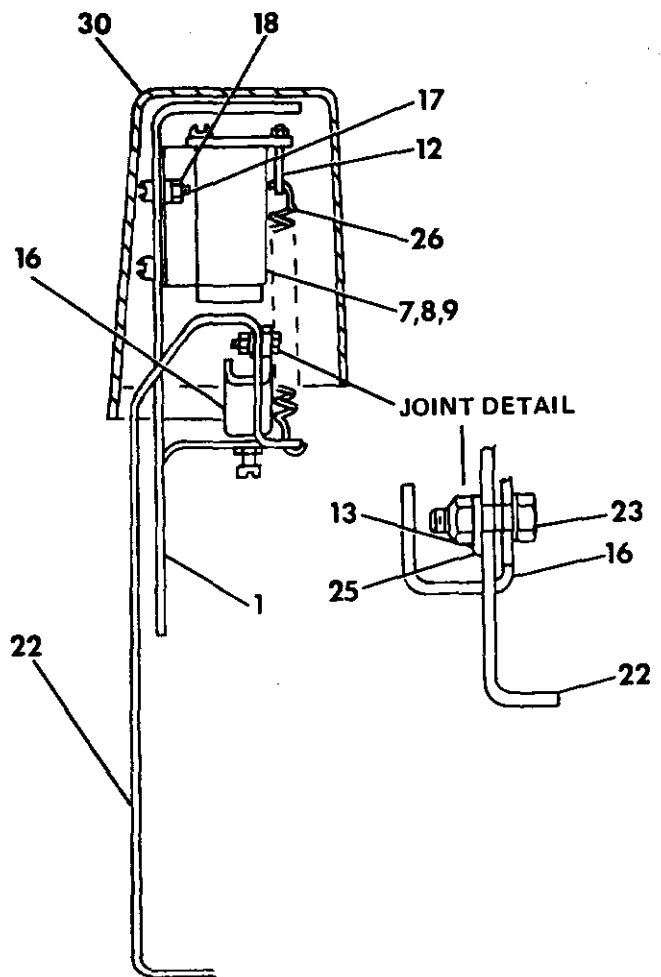
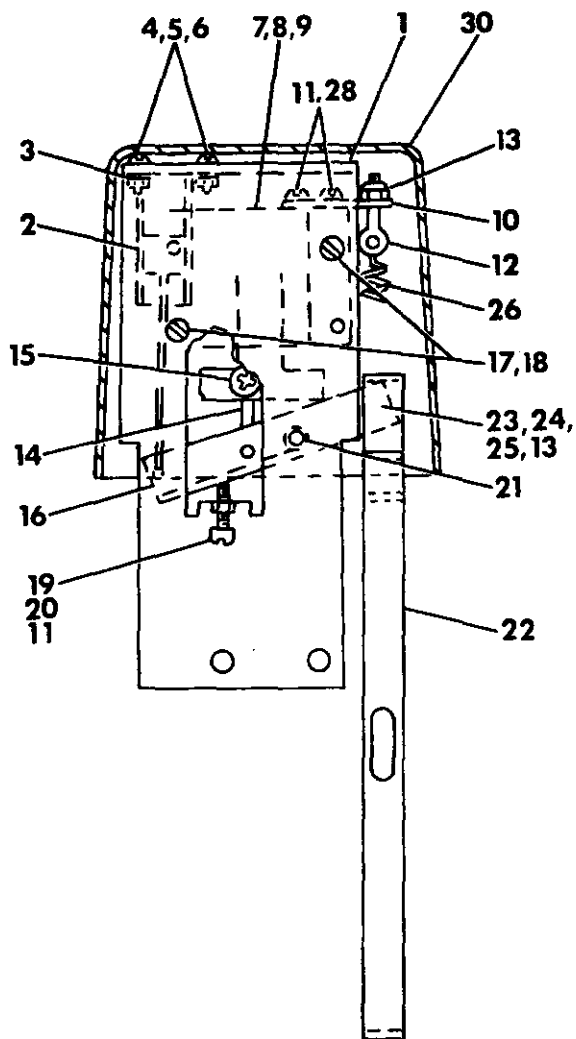
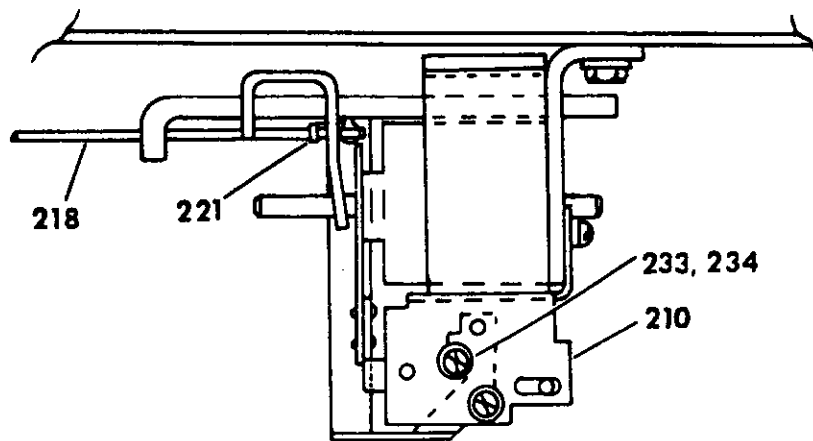


Fig. 14 – LA-600A/1600A Under Voltage Trip Attachment



PLAN VIEW

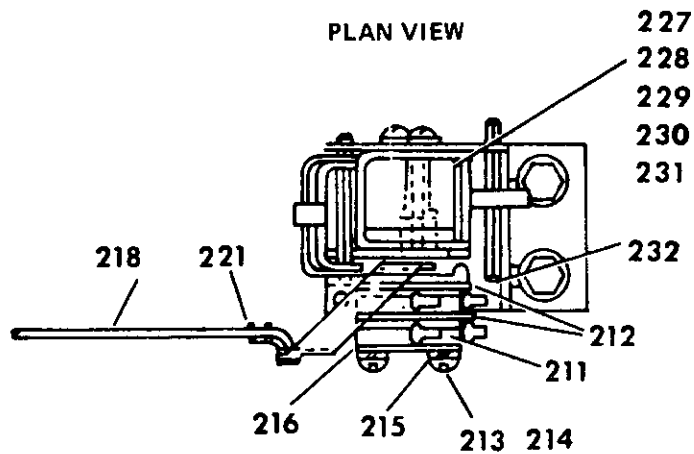
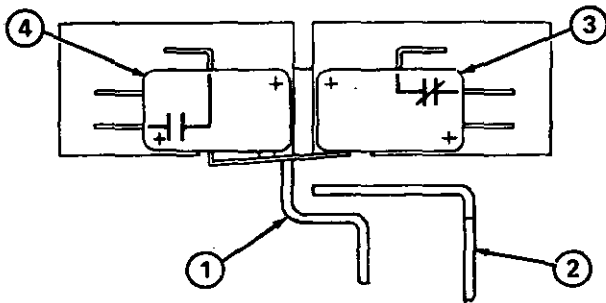


Fig. 15 – LA-600A/1600A Alarm Switch Group, Bell Alarm

BOTTOM VIEW

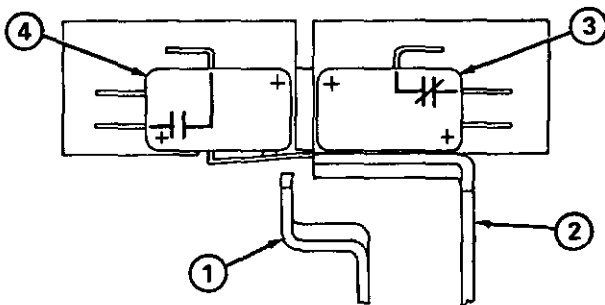
Position 1. Springs discharged; motor in stop position; note that spring position lever (1) is forward actu-

ating 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.



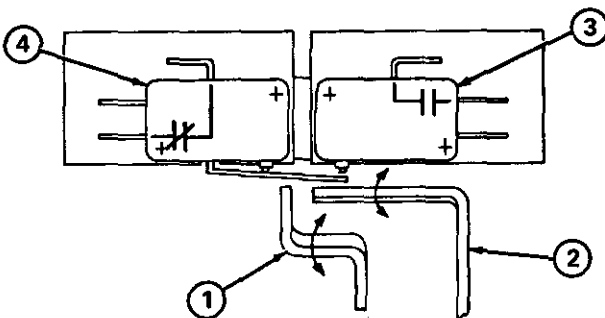
Position 2. Springs charging; motor not yet cutoff; while the springs are charging the motor/gear position

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 3, Book 18X5214) 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 (approx. 1/64) or up to 1/16 inch. 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 (95) will re-engage wind and close cam (85, Figure 3, Book 18X5214) 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.

Fig. 16 Motor Cutoff Switch Action

TYPICAL LUBRICATION CHART — L.V. BREAKERS

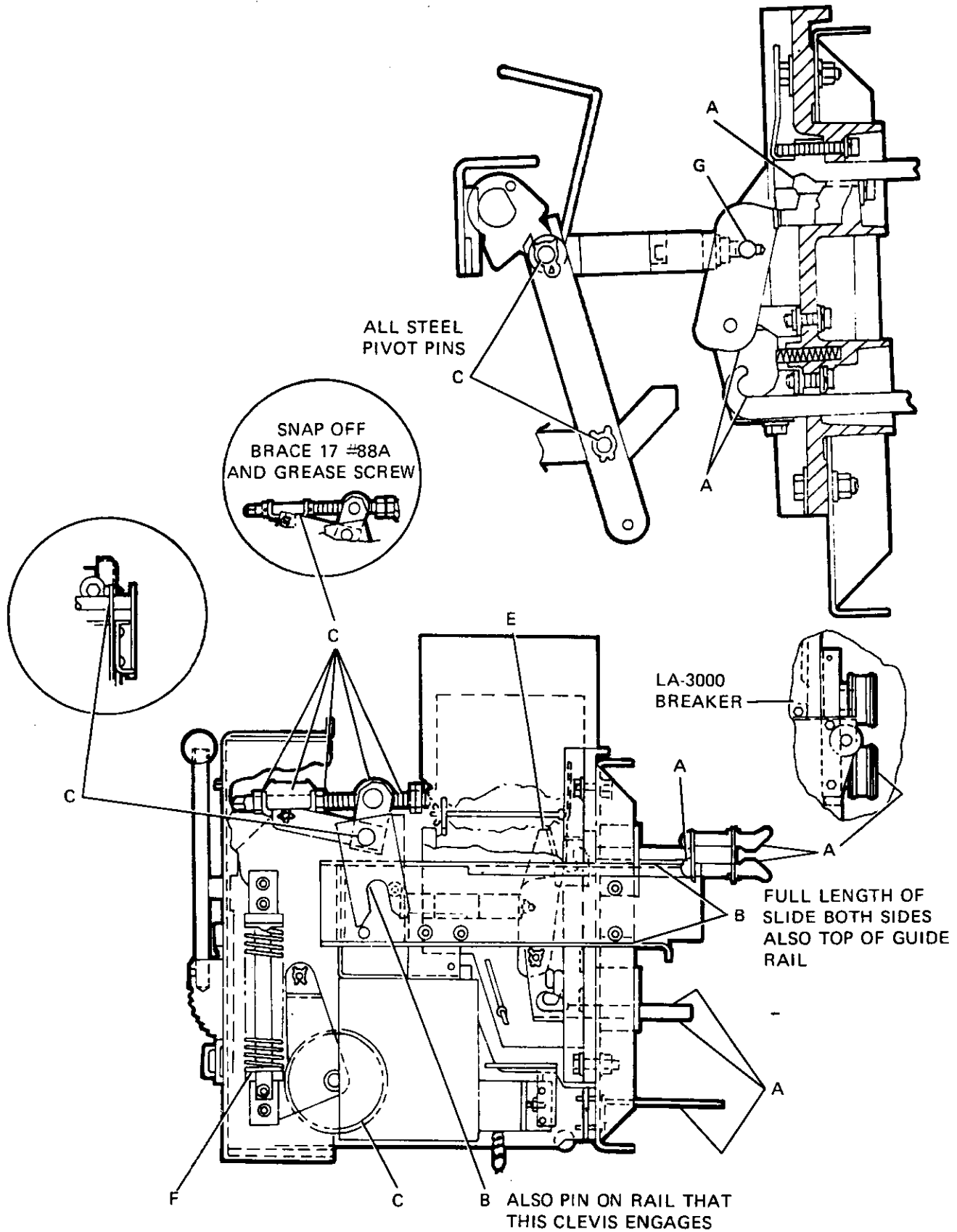


Fig. 17 — Lubrication Points on Breaker

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 ALLIS-CHALMERS 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-3000, LA-4000 operations between lubrications 250

NOTE: For breakers installed in areas where corrosion may develop on current carrying parts refer to Bulletin 18C5150 dated November, 1975.

Fig. 18 — Lubrication Chart