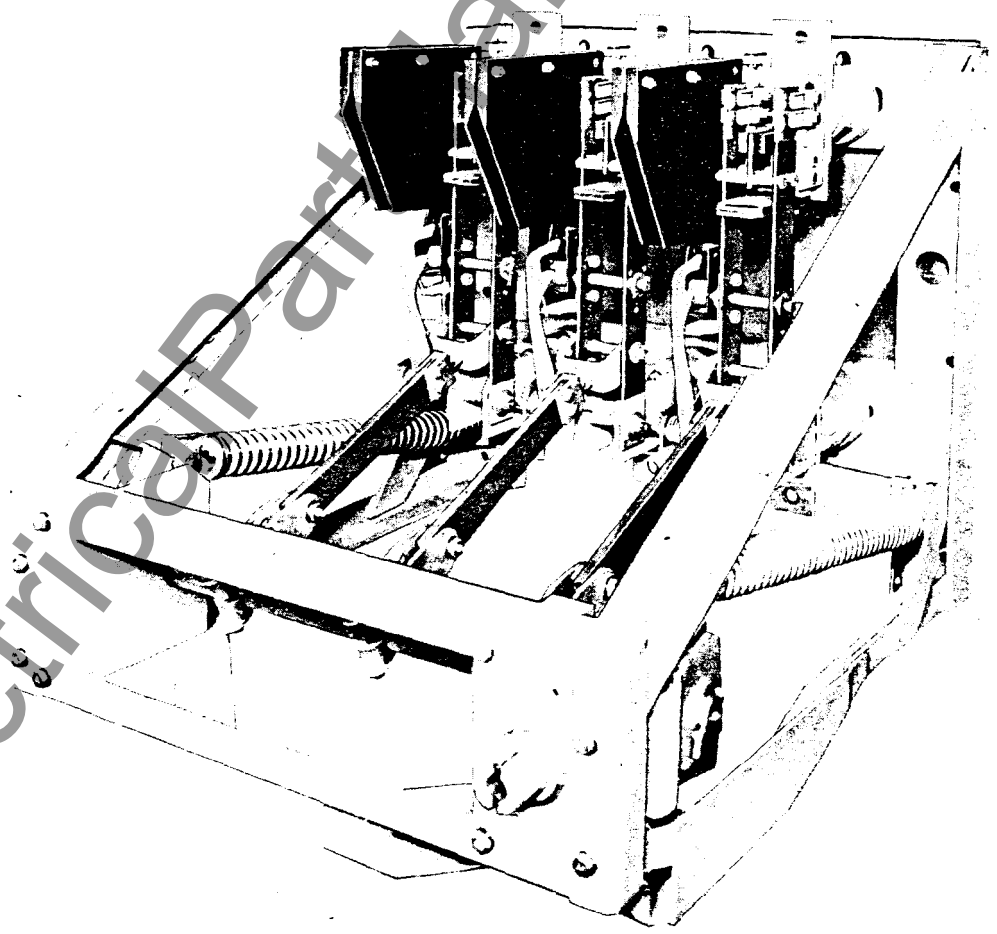
INSTRUCTIONS

GEI-88767F
Supersedes GEI-88767E

Load Break Switch

SE-100E
SE-100M
SE-100S



GENERAL ELECTRIC

CONTENTS

LOAD BREAK SWITCH

TYPE SE-100

INTRODUCTION

The type SE-100 load break switch is a manually or electrically operated, triple pole disconnecting switch with an integral interrupter that has capability of interrupting transformer magnetizing and load currents within its rating.

The switch is normally furnished with outside and interphase insulating barriers in a metal-enclosed housing. It can be connected either directly to the incoming side of a power transformer, the primary bus, or to cables by the use of potheads. When applied with power fuses, the combination serves as a successful switching and fault protection device.

On normal feeder or single circuit applications the stationary contacts of the load break switch should be connected to the source of power and the moving contact blades deenergized when the switch is in the open position. When the switch is used in more complex circuit configurations, such as "main-tie-main" or "double feed" circuits, a back feed can occur which results in the moving contact blades being energized during the opening operation. For these conditions on the 13.8 kV switch a special barrier is required to prevent flashover between the switch blades and the metal front of the enclosure. Special barriers are not required on the 4.8 kV load interrupter switch.

The SE-100S switch has a manually charged, spring stored energy operating mechanism capable of closing the switch against maximum rated short circuited current. Rotation of the operating handle through an arc of 180 degrees provides a positive action closing and opening operation by means of the stored energy springs.

The SE-100E switch is similar to the SE-100S except that it has an electrically charged, spring stored energy operating mechanism having the same closing capabilities. The switch is normally operated by energizing the integral electric motor that charges the springs for positive closing and opening operations. The switch can be quickly converted from electrical to manual operation, permitting operations with an operating handle for maintenance or emergency use.

*The SE-100M switch is a manually closed and opened switch with only load break capability as indicated on the nameplate. The operating handle must be rotated 180 degrees with a full positive motion to assure proper closing and opening with the direct drive mechanism. The operating handle is often interlocked with other devices such as secondary circuit breakers in order to assure sequential operation.

SE-100 SWITCH RATINGS

	Nominal Voltage KV	Max. Design Voltage KV	BIL KV	Continuous Current Amps	Load Break Current Amps	Close & Latch Current Amps	Momentary Current KA
SE-100E SE-100S	4.8	5.5	60	600	600	40,000	40
	4.8	5.5	60	1200	1200	61,000	61
	13.8	15.5	95	600	600	40,000	40
	13.8	15.5	95	1200	600	61,000	61
* SE-100M	4.8	5.5	60	600	400	400	40
	13.8	15.5	95	600	100	100	40

*Discontinued in 1973

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

To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

RATINGS

Refer to the nameplate for complete ratings of any particular switch. Do not apply the switch for any duty where voltage or current levels are greater than those given on the nameplate. The chart on the previous page gives the ratings for the basic switches.

The interrupting ability of the switch is accomplished by the use of an arc chute type interrupter working in conjunction with an auxiliary blade. As the switch is opened the auxiliary blade contacts are the last to separate and will initiate an arc within the interrupter. The hot arc causes gases to be released from the plastic arc chute sides in such volume that the arc is blown away from the rapidly moving auxiliary blade and is cooled by contact with the large area of arc chute sides. After the arc has been extinguished, the blades continue to open, providing a sufficient air gap to isolate the terminals.

RECEIVING, HANDLING AND STORAGE

RECEIVING AND HANDLING

Immediately upon receipt of the switch, an examination should be made for loss or damage sustained in transit. If injury or rough handling is evident, a damage claim should be filed immediately with the transportation company and the nearest General Electric Apparatus Sales Office should be notified.

Although damage due to handling is minimized because of the metal enclosure, it is expected that due care will be exercised in the unpacking and installation of the switch unit so that no damage will occur from careless or rough handling, or from exposure to moisture or dirt. Care should be exercised to prevent tools from striking any part of the housing or switch itself.

Loose parts associated with the switch are always included in the same crate. Check all parts against the packing list to be sure that no parts have been overlooked.

STORAGE

It is recommended that the switch be placed into service immediately in its permanent location. If this is not possible, the following precautions should be taken to insure proper storage conditions:

1. The switch should be stored in a warm dry location to protect the insulation parts from condensation.

2. The switch should be stored in a clean location free from corrosive gases or fumes. Particular care should be taken to protect the equipment from moisture and cement dust, as this combination has a very corrosive effect on many parts.

3. Machined parts of the operating mechanism should be coated with a heavy oil or grease to prevent rusting.

If the switch is stored for long periods of time, periodic inspections should be made to insure that corrosion of metallic parts or deterioration of insulation parts has not begun. Should the switch be stored under unfavorable conditions, steps should be taken to dry out or replace insulation parts before placing in service.

INSTALLATION

Each switch has been tested and inspected before shipment from the factory; however, before placing the switch in service the following items should be checked to assure that no change has occurred during shipment and storage.

MOUNTING

The switch must be mounted in the housing by supporting at both the front and rear. Care should be taken not to distort the frame by mounting on unflat or out-of-square surfaces as twisting may cause misalignment of the contacts. If necessary, shims should be used to prevent twisting.

CONNECTIONS

The connections on the 600 ampere switch may be made from above or below the insulator support. The 1200 ampere switch must have the upper connections above the upper insulator support and the lower connection below the hinge support insulator. Connection of bus bars to this terminal can

easily be made using the provided terminal bolts. After connections to the switch have been made, the switch alignment should be checked as listed below.

When furnished as a complete housing, the connections directly to the switch have been made at the factory. On these units, connections are made using the provided potheads, cable terminal connectors, etc.

SWITCH ALIGNMENT

Prior to placing the switch in service the following adjustments and alignment checks should be made to insure proper operation.

1. Before operating the SE-100E or SE-100S switch with the normal spring load, a slow closing of the blades should be made to check alignment. The power springs should be blocked as described under SPRING BLOCKING and the three poles of the switch operated slowly by the maintenance handle to assure freedom of motion and to check alignment. A slow closing operation can be made on the SE-100M switch with the normal operating handle.

2. Check the following items listed under ADJUSTMENTS before the switch is put in operation and during each period of maintenance.

   (a) Primary contact alignment.
   (b) Arc chute alignment.
   (c) Auxiliary blade release.
   (d) Primary contact wipe.
   (e) Primary contact gap.
   (f) Upper (closed) mechanism stops.

3. The primary insulators and other insulation parts should be wiped clean during installation as well as during each maintenance inspection.

4. To assure that the electrical connections have remained tight on the SE-100E and all switches having auxiliary switches, they should be checked during installation and during each maintenance inspection.

5. After the switch has been operated several times with the maintenance operating handle and the contact adjustments have been checked, the operating springs should be unblocked and the switch operated several times with the normal operating handle to assure proper closing and opening with the springs.

6. On the SE-100E switch check the control voltage at the motor terminals. Refer to CONTROL POWER CHECK.

7. If the switch has been stored for a long period of time, it is recommended that the insulation be checked with a standard 60 hertz high potential test. Refer to INSULATION TEST.

NOTE: If the switch secondary wiring is to be given a high potential test at 1500 volts, remove all the motor leads on the SE-100E from the terminal connection. Failure to disconnect the motor from the circuit may cause damage to the winding insulation.

8. A final inspection before energizing should be made in accordance with FINAL INSPECTION.

DESCRIPTION OF OPERATION

(SE-100E and SE-100S)

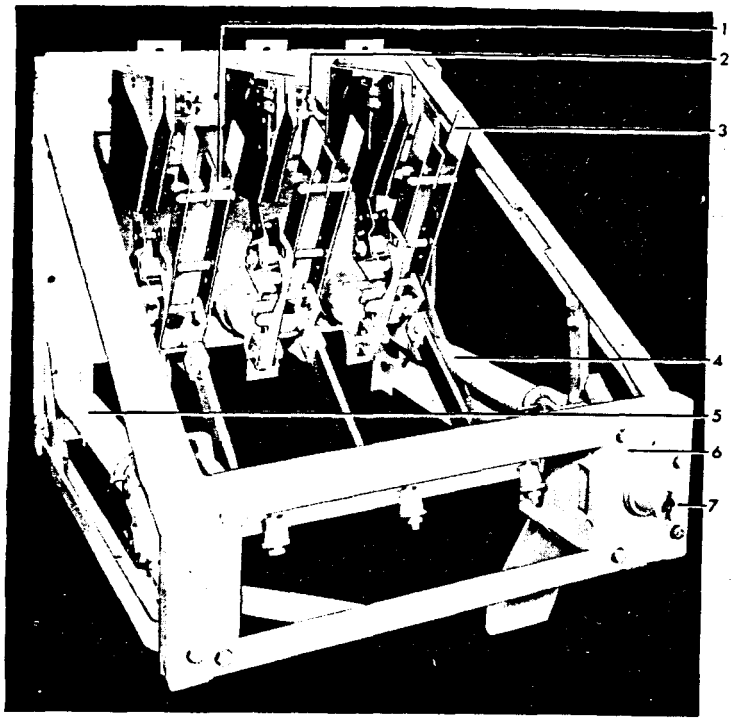
On the SE-100E and SE-100S switches both the closing and opening operation is accomplished by the spring-charged mechanism (6), Fig. 1, located on the front of the switch assembly. The operating springs are manually or electrically charged but are completely disengaged from the operating handle as they begin to operate the switch. In this way the actual operation of the switch is independent of the operator.

When operating either switch manually, the handle should be rotated with a positive motion throughout its entire stroke.

CLOSING OPERATION

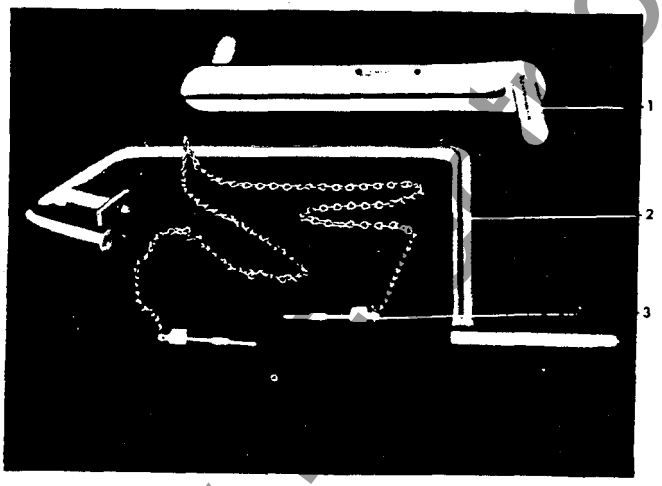
Closing the SE-100S switch, and the SE-100E switch set for manual operation, is accomplished by inserting the operating handle (1), Fig. 2, into the handle socket provided in the operating hub (7), Fig. 1, in the enclosure and rotating in a counterclockwise direction as far as possible (approximately 180 degrees).

After a few degrees of handle rotation, the mechanism will engage the primary spring (4), Fig. 1, located on the right side



1. Primary Blade Stop
2. Primary Contact Fingers
3. Primary Contact Blade
4. Primary Spring
5. Booster Spring
6. Operating Mechanism
7. Operating Hub

Fig. 1 (8035016) SE-100S Switch Partially Open



1. Operating Handle
2. Maintenance Handle
3. Spring Blocking Pin

Fig. 2 (8035232) Operating and Maintenance Handles

and compress it fully. Continued rotation of the handle will push the spring over the toggle position and it will start to discharge. A driving lug (5), Fig. 3, will engage the drive crank (3), which is directly connected to the main crank shaft (11) just as the primary spring leaves the toggle position. When the main crank shaft has rotated a few degrees, the fully charged booster spring (5), Fig. 1, located on the left side, will pass its toggle position and the full energy of both springs will close the switch with sufficient force to close and latch against the fault closing current rating on the nameplate.

During the closing operation the auxiliary blade will be held out of the chute until just before the arcing contacts (6), Fig. 4, are engaged, then it is released to enter the chute and latch into the arc chute contacts (2), Fig. 5. This sequence of operations will prevent prestrike in the interrupting area of the arc chute.

At any time during the operation, until the primary spring reaches its toggle position, the handle can be returned to its starting position and removed. The mechanism will completely reset to the starting position.

The SE-100E switch is normally electrically operated by energizing a motor (2), Fig. 6. An internal gear driving mechanism will charge the springs and operate the switch in the same manner as the mechanical handle drive.

When the closing switch contacts are made the start-stop relay (3), Fig. 6, will close contacts and energize the motor in the proper direction. At the same time a closing seal-in relay (4) assures a complete operation without hesitation and makes the closing of the SE-100E switch independent of the operator. During the closing operation an auxiliary switch (1) will open the motor circuit and arrange a series of contacts for an opening operation. It will also de-energize the start-stop relay that will close a set of contacts in the motor circuit, shunting the field coils around the armature, thereby effecting a dynamic brake. Refer to wiring diagram Fig. 12.

OPENING OPERATION

To open the SE-100S switch, and the SE-100E switch set for manual operation, the operating handle is inserted into the handle socket and rotated in a clockwise direction as far as possible (approximately 180 degrees).

After a few degrees of handle rotation, the mechanism will engage the primary spring (4), Fig. 1, and compress it fully. Continued handle rotation will push the spring over the toggle position and it will start to discharge. A driving lug (5), Fig. 3, will engage the drive crank (3) at the toggle position of the primary spring and will turn the main crank shaft (11). When the

1. Spring Stop Bolt
1A. Spring Stop Bolt
2. Spring Stop
3. Driving Crank
4. Hole for Spring Blocking Pin
5. Driving Lug
6. Buffer Rubber
7. Buffer Stop
8. Operating Rod
9. Operating Rod Crank
10. Operating Hub
11. Main Crank Shaft
12. Maintenance Handle

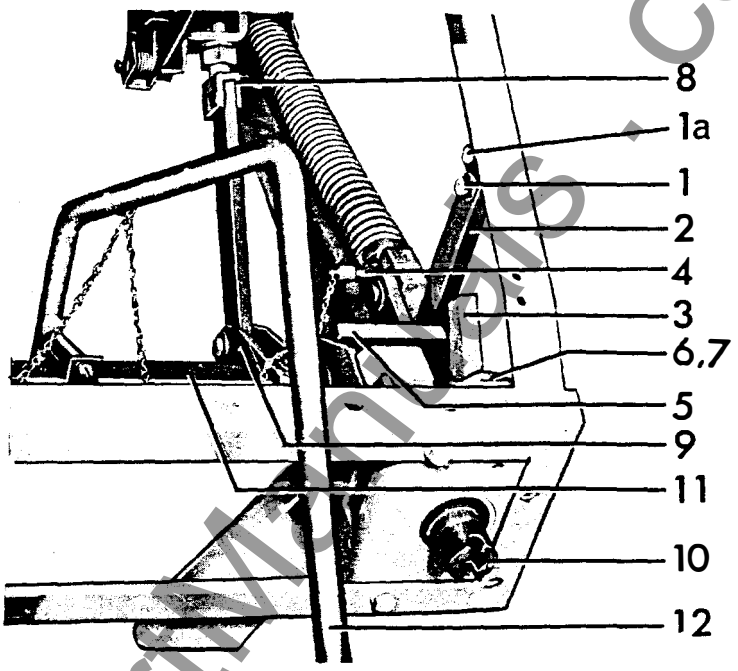
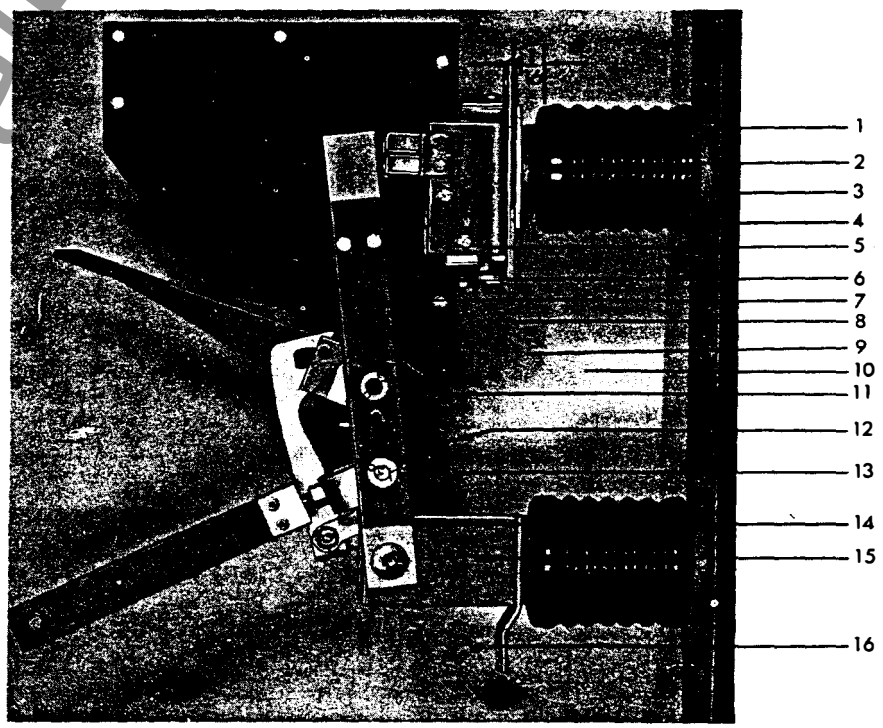
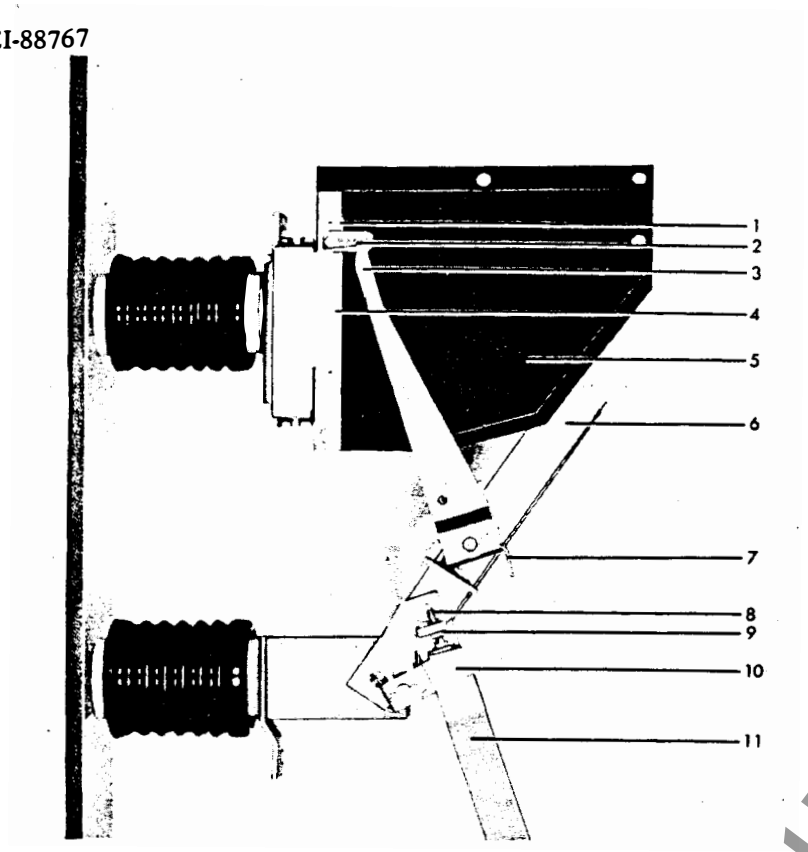


Fig. 3 (8037271) Spring Drive Mechanism

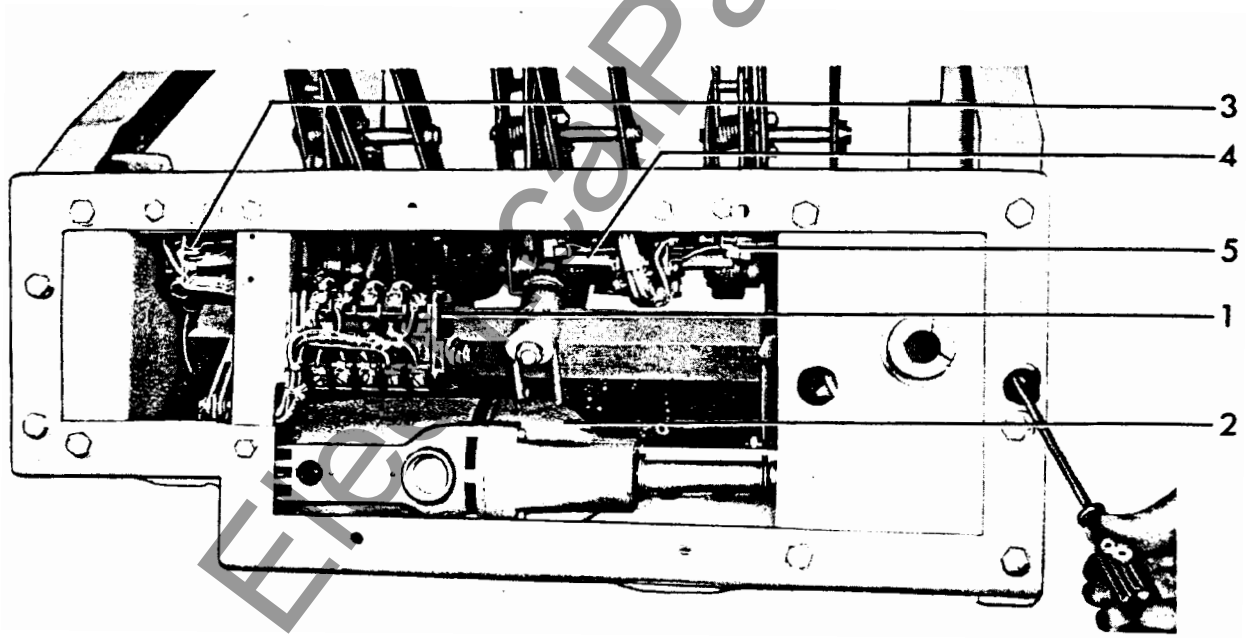
1. Interrupter Assembly
2. Interrupter Mounting Bolts
3. Shims
4. Contact Bolt
5. Primary Contact Fingers
6. Arcing Contact Fingers
7. Auxiliary Blade
8. Buffer Stop
9. Guide Block
10. Interrupter Mounting Bolts
11. Primary Contact Blade
12. Auxiliary Contact Blade
13. Pivot Pin for Auxiliary Blade
14. Auxiliary Blade Release Hook
15. Operating Rod Clevis Pin
16. Hinge Pin





1. Blade Stop Block
2. Arc Chute Contacts
3. Auxiliary Blade
4. Spacer
5. Arc Chute Side
6. Primary Contact Blade
7. Auxiliary Blade Spring
8. Camming Screw
9. Lock Nut
10. Auxiliary Blade Release Hook
11. Operating Rod

Fig. 5 (8035037) Unit Pole Opening



1. Auxiliary Switch
2. Motor
3. Start-Stop Relay
4. Close Relay
5. Open Relay

Fig. 6 (8037272) Electrical Operator

main crank shaft has rotated a few degrees past the primary spring toggle position, the spring will discharge, opening the switch, and charging the booster spring (5), Fig. 1, for the next closing operation.

The primary blade (11), Fig. 4, travel will cause the primary contacts (5) to part first and the arcing contacts (6) a few degrees later. The spring loaded auxiliary blade (3), Fig. 5, will remain latched to the contacts (2) inside the arc chute. At a predetermined position of the primary blades, the auxiliary blade will be released and will snap open at a high velocity.

As the arc chute contacts part, an arc is established between the auxiliary blade tip (3), Fig. 5, and the finger contacts (2). The hot arc releases gases from the plastic arc chute material dispersing the arc over a large area of the chute sides. The rapidly cooled arc is extinguished in the chute and the auxiliary blade will continue to travel until a sufficient air gap is achieved to withstand BIL voltages.

The SE-100E switch when opened electrically by the motor drive will have the same sequence of operations as when the manual handle is used. The electrical sequence is the same as described in the closing operation except seal-in relay (5), Fig. 6, is used.

ADJUSTMENTS

(SE-100E and SE-100S)

All adjustments should be checked during periodic inspections and whenever it becomes necessary to repair or replace parts that have become worn or defective while in service.

NOTE: BEFORE ATTEMPTING TO WORK ON EITHER THE SWITCH OR MECHANISM MAKE CERTAIN THAT THE SWITCH HAS BEEN DISCONNECTED FROM ALL PRIMARY VOLTAGE POWER SOURCES. ALSO THE OPERATING SPRINGS SHOULD BE BLOCKED TO PREVENT ACCIDENTAL CLOSING OR OPENING.

SPRING BLOCKING

For most of the adjustments it will be necessary to operate the switch slowly with the maintenance handle. To do this the power springs must be blocked using the following procedure. Refer to Fig. 3.

1. Make certain that the switch is in the open position.

2. Remove the rear bolt from position (1A) of the spring stop (2) located on the upper right angle frame. On 1200 ampere switches it may be necessary to loosen the front bolts of the right-hand barrier to have access to the bolts.

3. Rotate the stop until it is vertical, replace the bolt that had been removed in the lower location (1) and tighten.

4. The SE-100E mechanism must be put into the manual operation condition before operating with the manual handle. Disengage the electrical operator by sliding the yellow pawl block toward the center hub using a screw driver or other small tool. See Fig. 6. When the switch is open the pawl will appear in the right hole, if the switch is closed the pawl will appear in the left hole.

5. Using the normal operating handle rotate in a counterclockwise direction (direction of close) until the spring yoke on the right contacts the stop.

6. Remove operating handle and insert maintenance handle (2), Fig. 2, on main square shaft and screw the blocking pins (3) in the left and right spring guide at (4), Fig. 3. The springs are now safely blocked and the maintenance handle will open and close the switch for adjusting purposes.

UPPER (CLOSED) MECHANISM STOP

The upper buffer stops (3), Fig. 7, located on either side of the mechanism at the ends of the main crank shaft, must be adjusted to position the operating rod cranks when the switch is closed. Operate the switch to the fully closed position.

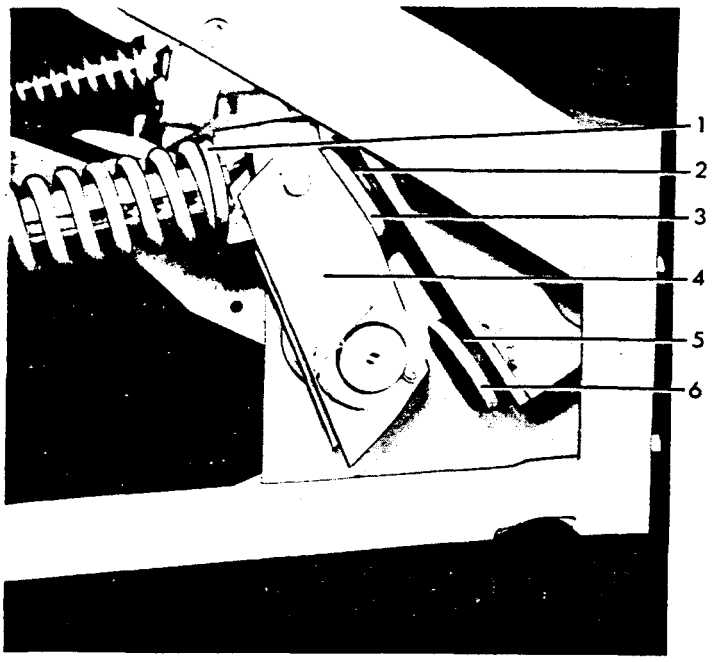
The operating rod must go over toggle approximately ¼ inch at the crank connection when the switch is closed. A simple means of measuring the correct toggle angle is to place a straight edge along the upper side of the operating rod and extend it until it is over the square main shaft (10), Fig. 8. The dimension from the straight edge to the closest corner of the square shaft should be 1/4 inch to 3/8 inch.

If adjustment of the stop is necessary, remove the cotter pin holding the stop (3), Fig. 7, and move washers and metal shims from the front to the rear (or the reverse) until the proper toggle angle is obtained. Adjust the stops at both ends of the main shaft the same amount to keep them balanced.

PRIMARY WIPE

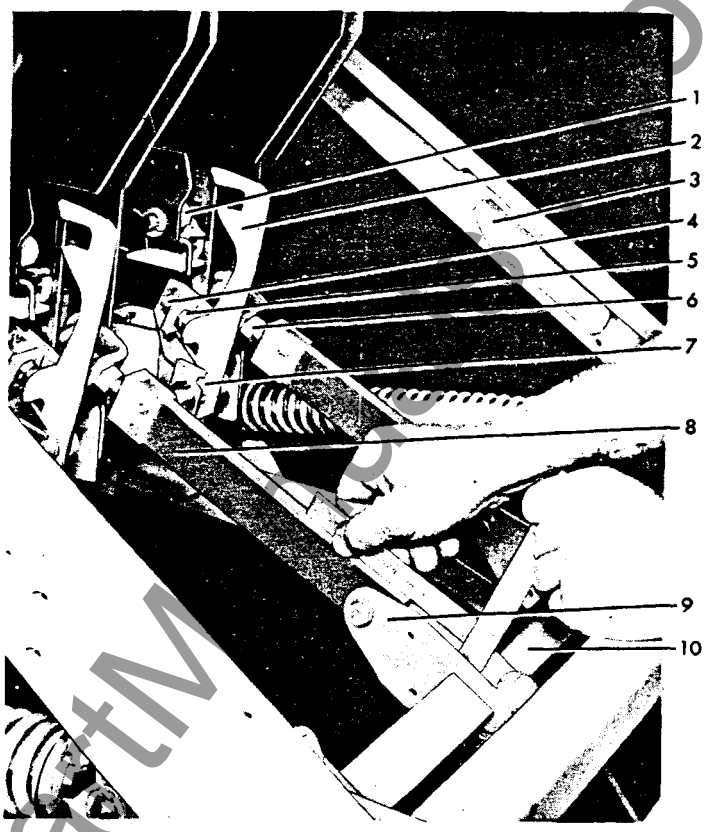
The operating rod must fully close the switch primary blades to obtain the correct primary finger wipe.

With the switch in the closed position, pull the top of the primary blades to the front with your hands to remove all linkage pin allowance. There should be 1/64 inch to 1/32



1. Collar
2. Buffer Rubber
3. Upper Buffer Stop
4. Booster Crank
5. Buffer Rubber
6. Lower Buffer Stop

Fig. 7 (8035014) Buffer Assembly



1. Auxiliary Blade Spring
2. Auxiliary Blade Release Hook
3. Spring Stop
4. Camming Screw
5. Lock Nut
6. Adjusting Nut
7. Release Hook Spring
8. Operating Rod
9. Operating Rod Crank
10. Main Crank Shaft

Fig. 8 (8035015) Switch Blade Adjustments

inch clearance between the buffer (8), Fig. 4, and the primary blade buffer stop (1), Fig. 1. There should also be 3/16 inch to 1/4 inch between the edge of the primary blade and the front of the primary contact support.

Adjust the length of the rod by use of the adjusting nuts (6), Fig. 8, to obtain the 3/16 inch to 1/4 inch gap then adjust the buffer (8), Fig. 4, by adding or removing shims to get the 1/64 inch to 1/32 inch clearance.

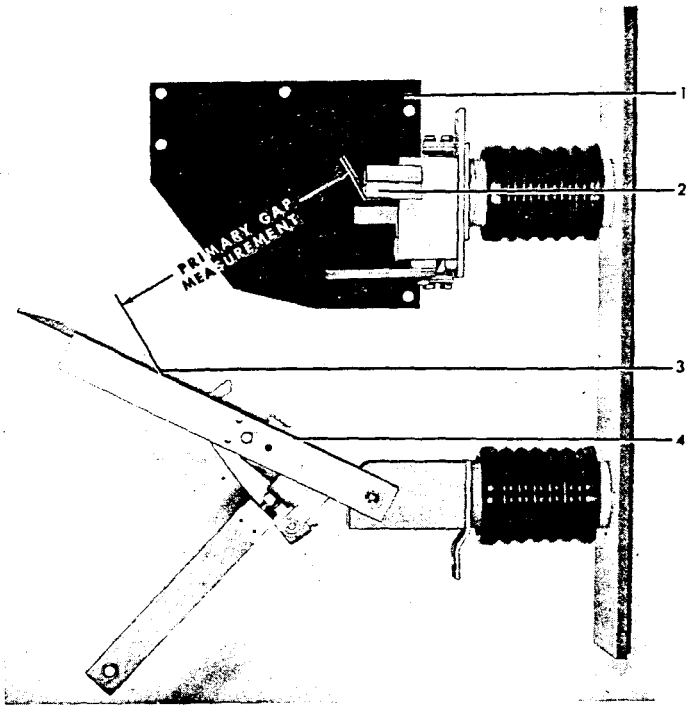
PRIMARY GAP

The primary gap should be measured with the primary blades in the normal position. A measurement should be made from the buffer stop or spacer (3), Fig. 9, to the primary finger (2). The same primary finger, the bottom finger, should be used on both 600 ampere and 1200 ampere switches. The dimension should be 11 inches plus or minus 3/8 inch. If this dimension is not correct, the lower buffer stop (6), Fig. 7, should be adjusted in a similar manner to the adjustment on the upper stop. Move shims and washers from the top to the bottom of the stop (or the reverse) as required. Adjust the stops at both ends of the main shaft the same amount to keep them balanced.

PRIMARY AND ARCING CONTACT ALIGNMENT

Close the primary blades (12), Fig. 10, slowly by the use of the maintenance handle and note the engagement of the primary contacts (4), arcing contacts (6 and 8), and guide block (10). The blades should center around the guide block with some clearance on either side. They should also be centered in the primary and arcing contact fingers.

If the blades press hard against the sides of the guide block, loosen the two bolts (11), Fig. 10, holding the block. Again



1. Interrupter Assembly
2. Stationary Primary Contact
3. Primary Blade Stop
4. Primary Blade

Fig. 9 (8035032) Unit Pole Fully Open

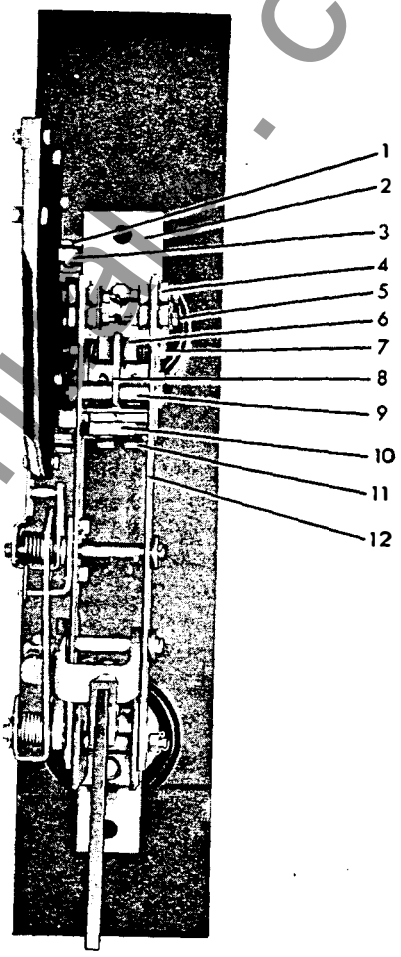
check the contact alignment. If the contacts are properly aligned, reposition the guide block and bolt securely.

If the contacts are not in alignment, loosen the bolts holding the top insulator and position the insulator to center the contacts. After securing the insulators, reposition the guide blocks and tighten the bolts.

Be certain the insulator is moved only in a horizontal direction. Vertical displacement may cause misalignment of the auxiliary blade contacts.

ARC CHUTE ALIGNMENT

The arc chute must be positioned to allow the auxiliary blade to enter and latch on a closing operation, and to release the auxiliary blade at the proper time on an opening operation.



1. Interrupter Mounting Bolts
2. Upper Terminal
3. Shims
4. Primary Contacts
5. Contact Bolts
6. Arcing Contact Fingers
7. Contact Bolt
8. Movable Arcing Contact
9. Tube Spacer
10. Guide Block
11. Buffer Block Bolts
12. Primary Contact Blades

Fig. 10 (8035033) Contact Arrangement

With the operating springs blocked, turn the contact arm (12), Fig. 4, slowly closed and check the entry of the auxiliary blade (7) into the arc chute (1). The blade should enter smoothly and be in the center of the opening. If the blade scrapes heavily on the sides of the chute, loosen the two bolts (2) at the top and the two bolts (10) at the bottom of the chute. Position the chute so that the blade will travel the full length without binding or heavy scraping, and tighten the bolts.

Refer to Fig. 4. A dimension of 1-1/6 inches should be maintained from the rear edge of the arc chute to the front edge of the primary finger contact support at all times when moving or re-aligning the chute. The arc chute contacts (2), Fig. 5, inside the chute should be properly positioned to latch the auxiliary blade when this dimension is maintained.

The auxiliary blade must be released by the contacts when the primary blade has been opened to a predetermined gap. With the operating springs blocked, open the primary contacts and slowly move the primary blade until the auxiliary blade is released. At the point of release the gap from the lower edge of the primary finger (the bottom finger (2), Fig. 9, to the buffer stop or spacer (3) should be 4-7/8 inches to 5-3/8 inches on the 4.8 kV and 7-1/8 inches to 7-3/4 inches on the 13.2 kV switch. If the gap is not correct the vertical location of the chute must be changed. For gaps greater than the above range, the chute must be raised, for gaps that are less the chute must be lowered. To adjust the chute, remove the upper and lower mounting bolts (2 and 10), Fig. 4. Move shims (3) from the bottom to the top of the support to decrease the gap. To increase the gap, move some of the top shims to the bottom support.

When the release gap is properly set, check again the dimension from the back edge of the chute to the primary contact finger support and the alignment of the auxiliary blade in the chute opening.

AUXILIARY BLADE RELEASE

The auxiliary blade release hook (14), Fig. 4, should be adjusted to hold the blade out of the arc chute until a predetermined position in the closing operation.

Close the switch slowly with the maintenance handle and note the position of the primary blades when the auxiliary blade is released by the hook. The hook should be adjusted by setting the camming screw (8), Fig. 5, to release the auxiliary blade within the range of 1/2 inch before the primary contacts touch. After adjustment is made the lock nut (9) should be tightened.

PRIMARY CONTACT PRESSURE

The primary finger pressure has been adjusted at the factory to be 12 pounds per contact on the 600 ampere switch and 24 pounds per contact on the 1200 ampere switch for normal standard momentary ratings. For special switches with 80 kA momentary ratings the contact pressure should be 32 pounds per contact. This can be measured with a pull scale exerting a pressure against the contact surface. The contact pressure of each finger (5), Fig. 4, should be measured individually. Increase or decrease the contact pressure by loosening or tightening the contact bolts (4).

ARCING FINGER CONTACT PRESSURE

The arcing finger contact pressure should be 12 pounds on all 600 ampere and 16 pounds on all 1200 ampere switches for normal standard momentary. For special switches with 80 kA momentary rating the contact pressure should be 24 pounds per contact. This pressure can again be measured with a spring scale against the contact surface. Loosen or tighten the contact bolts (7), Fig. 10, as necessary.

PRIMARY BLADE HINGE PRESSURE

The correct hinge pressure is essential for proper operation of the switch. The hinge pressure is properly set at the factory and normally will not require checking unless the blade assembly has been disassembled for maintenance or replacement of parts. The hinge pressure is difficult to measure; however, the torque required to move the primary blades can be easily measured and can be substituted for a pressure measurement. The break-away torque of the hinge (the torque required to start the blades moving) should be between 60 and 90 pounds-inches on the 600 ampere contact blades and between 85 and 110 pounds-inches on the 1200 ampere contact blades.

To obtain the starting torque at the blade hinge, the operating rod (8), Fig. 8, must be disconnected from the operating rod crank (9). The primary contacts, arcing contacts, and auxiliary blade contacts must be disengaged. With a spring scale pull at the buffer stop or spacer (1), Fig. 1, until the blade starts to move. The scale reading should be between 5½ and 8¼ pounds on the 600 ampere blade and between 8 and 10 pounds on the 1200 ampere blade. If adjustment is necessary, remove a cotter pin from either end of the hinge pin (16), Fig. 4, and tighten or loosen the nut as required. Move the nut in increments of one sixth of a turn to assure line-up of cotter pin hole and slot in the nut.

CONTROL POWER CHECK – SE-100E

After the switch has been opened and closed several times with the maintenance closing handle and all adjustments have been checked as described, the operating voltage should be

checked at the motor terminal board. Control power for electrical operation may be from either an alternating or direct current source. The operating ranges for the motor voltages are as follows:

NOMINAL VOLTAGE	ACCEPTABLE RANGE (CLOSED CIRCUIT VOLTAGE)
125 VDC	90 – 130 VDC
250 VDC	180 – 260 VDC
115 V60 Hz	95 – 125 V60 Hz
230 V60 Hz	190 – 250 V60 Hz

If the closed circuit voltage at the terminals of the motor does not fall in the specified range, check the voltage at the source of power and the line drop between the power source and switch. When two or more switches operating from the same power source are required to operate simultaneously, the close circuit voltage at the motor of each switch must fall within the specified limits.

AUXILIARY SWITCH

The auxiliary switch (1), Fig. 6, is mounted in the mechanism area and is operated by several links from the main shaft. The switch consists of "a" contacts that are open when the SE-100E switch is open and "b" contacts that are open when the SE-100E switch is closed. The contacts are used for relay operation and setting up the motor circuits for close and open operations. Several "a" and "b" contacts are available for special applications by the customer. An auxiliary switch can be added to the SE-100S when required for special customer applications.

DESCRIPTION OF OPERATION

(SE-100M) *

The SE-100M switch has a direct mechanical drive and the closing and opening energy is supplied by the operator.

When operating the switch, the handle must be rotated with a positive motion throughout its entire stroke.

CLOSING OPERATION

Closing the switch is accomplished by inserting the operating handle (1), Fig. 2, into the handle socket provided in the operating hub (7), Fig. 1, in the enclosure and rotating in a counterclockwise direction as far as possible (approximately 180 degrees).

During the closing cycle the auxiliary blade (7), Fig. 4, will be held out of the arc chute until the primary blades (11) are almost closed. Just before the primary contacts (5) touch, the auxiliary blade is released and will be the first part to close.

The mechanism has a direct gear drive to the main shaft of the switch and depends entirely on the operator to produce a smooth and positive motion to satisfactorily close the switch.

OPENING OPERATION

To open the switch insert the operating handle into the handle socket and rotate in a clockwise direction as far as possible (approximately 180 degrees).

The primary contacts (5 and 11), Fig. 4, will part first. When the primary blade gap is sufficient, the auxiliary blade (3), Fig. 5, will be released and will snap open at high velocity.

Again it must be emphasized that the mechanism has a direct gear drive to the main shaft of the switch and depends entirely on the operator to produce a smooth and positive motion to satisfactorily open the switch.

Unlike the SE-100S, on the SE-100M an operation must be completed once it is initiated. Do not initiate an operation and then return to original position.

ADJUSTMENTS

(SE-100M)

All adjustments should be checked during periodic inspection and whenever it becomes necessary to repair or replace parts that have become worn or defective while in service.

NOTE: BEFORE ATTEMPTING TO WORK ON EITHER THE SWITCH OR MECHANISM MAKE CERTAIN THAT THE SWITCH HAS BEEN DISCONNECTED FROM ALL PRIMARY VOLTAGE POWER SOURCES.

Many of the adjustments are the same as those on the SE-100E and SE-100S. Reference will be made to the appropriate descriptions. Slow operation of the SE-100M switch can be accomplished using the normal operating handle since the mechanism is direct drive.

*Discontinued 1973

UPPER (CLOSED) MECHANISM STOP

Refer to ADJUSTMENTS.

PRIMARY WIPE

When the switch is in the closed position, there should be no clearance between the primary blades and the primary finger support. The length of the operating rod should be adjusted so that there is noticeable force involved when the operating rod goes overcenter near the end of the closing stroke. When the switch is fully closed it should require between 30 and 40 pounds force to break the toggle. This force is applied at the bolt in the mechanism end of the operating rod and is applied downward perpendicular to the long axis of the operating rod. This force may be increased by lengthening the rod and decreased by shortening the rod.

PRIMARY GAP

Refer to ADJUSTMENTS.

PRIMARY CONTACT ALIGNMENT

Refer to ADJUSTMENTS.

ARC CHUTE ALIGNMENT

Refer to ADJUSTMENTS.

AUXILIARY BLADE RELEASE

The SE-100M hook release should be adjusted to release the auxiliary blade when the primary contacts and blade are 1/2 inch to 1 inch apart. Be certain the auxiliary blade latches into the arcing contacts in the chute on each operation. The auxiliary blade is released before the primary contacts are closed so that it will close first and give a positive closing action even when the switch is inadvertently operated slowly.

PRIMARY CONTACT PRESSURE

Refer to ADJUSTMENTS.

PRIMARY BLADE HINGE PRESSURE

Refer to ADJUSTMENTS.

GENERAL MAINTENANCE

Dependable service and safe operation of the equipment is contingent upon reliable operation of the switch and mechanism assembly. To maintain such service, it is recommended that a definite inspection and maintenance schedule be set up and followed. Load break switches may not always be readily available for servicing at frequent intervals; however, this does not relieve the user of the responsibility for care and inspection. The switches should be periodically inspected to make certain that they are in satisfactory serviceable condition. Serious shutdowns can often be avoided by locating potential sources of trouble in a early stage.

BEFORE ANY MAINTENANCE WORK IS PERFORMED, MAKE CERTAIN THAT THE SWITCH IS DISCONNECTED FROM ALL PRIMARY VOLTAGE POWER SOURCES AND GROUND LEADS OR EQUIVALENT HAVE BEEN ATTACHED TO BOTH SIDES OF THE SWITCH.

MAKE CERTAIN THAT THE SECONDARY CONTROL CIRCUITS HAVE BEEN DE-ENERGIZED ON THE ELECTRICALLY OPERATED SWITCHES, SE-100E.

PERIODIC INSPECTION

The frequency of the inspection and maintenance schedule is dependent upon the individual application and operating conditions and will differ on various installations. Operating experience gained by each operating company over a period of time will be of great help in determining this schedule. Factors which should be considered are: Importance of the switch to overall plant or system operation; frequency of operation and the magnitude of the currents switched; fault current exposure and the atmospheric conditions in which the switch normally operates. Extreme conditions of dust, moisture, corrosive gas, etc. can indicate that inspection and maintenance will be required more frequently. Very clean, dry operating conditions with low current switching duty can justify a longer period of time between inspections. It is recommended that an initial inspection be made on new switches at the time of installation and also after being in service for six months. Thereafter, the switch should be inspected and serviced annually unless the application conditions indicate the necessity for shorter periods of time between inspections. The following instructions give the items that should be included in an inspection and general recommendations on the maintenance of load break switches. Refer to section on ADJUSTMENTS for dimensions and procedure.

DO NOT WORK ON THE SWITCH OR MECHANISM UNLESS THE OPERATING SPRINGS HAVE BEEN PROPERLY BLOCKED WITH THE MAINTENANCE BLOCKING PINS.

INSULATION SYSTEM

The surface of insulation parts should be kept clean, dry, and unmarred to prevent deterioration and moisture absorption. This is particularly critical where abnormal conditions, such as salt deposits, cement dust, or acid fumes prevail and is necessary to avoid flashover as a result of accumulation of foreign substances on the insulation surfaces. Inspect porcelain insulators for breaks, cracks, or burns and replace when deterioration is evident. If organic insulation surfaces should become damaged, they should be lightly sanded, cleaned, and refinished with either clear varnish or clear resin. Allow to dry smooth and hard. If damage or burning is extensive, the part should be replaced. Smoke or dust collected between inspection periods should be wiped off, and if dampness is apparent, heaters should be installed in the switchgear compartment to insure dryness.

INTERRUPTERS

Since there are no moving parts, the interrupters will normally require little or no inspection unless there is evidence of damage to the arc chute sides or heavy contamination on the inner surfaces. During interruption, some of the residual products of the gaseous ablation will redeposit on the inside walls of the arc chute sides. This build-up of residue will gradually educe the resistance of the internal surfaces of the arc chutes and could result in longer interrupting times. The magnitude of the currents and the frequency of operation will determine how rapidly this deposit will affect the performance of the interrupter. A simple megger test will normally indicate the resistance of the arc chutes. Connect one lead of the megger to the steel interrupter support. The other lead should be connected to a metallic probe tightly inserted 1/2 inch into the arc chute side at a point midway across the diagonal edge. A resistance below 0.2 megohm (500V megger minimum), indicates necessity for cleaning the arc chute surfaces.

To disassemble the interrupter from the switch, remove the four bolts (2 and 10), Fig. 4, noting the position of the shims at the top and bottom of the support. Disassemble the interrupter by removing the bolts thru the arc chute sides. Make note of the position of any shims and spacers.

Remove the contamination from the inner surfaces of the arc chute sides by using a good grade of plastic polish. These surfaces should then be washed with clear water to eliminate residue from the polish. This method of cleaning will usually restore the resistance across the assembled arc chutes to a value in excess of 50 megohms. Severe erosion of the arc chute surfaces indicates the need to replace the interrupter assembly.

With the interrupter disassembled, the contact fingers (2), Fig. 5, should be inspected for excess wear or burning. Any protrusions caused by arc burning should be removed by filing. The flat area between the fingers functions to restrain the auxiliary blade during the opening operation. If this area is badly burned the contacts should be replaced.

Reassemble the interrupter and check that all spacers and shims have been properly positioned. Reassemble the interrupter on the switch and check that the proper number of shims are replaced above and below the support. Realign with the auxiliary blade per instructions in the section ADJUSTMENTS -- PRIMARY AND ARCING CONTACT ALIGNMENT.

CONTACTS

With the switch in the open position the arcing fingers and arcing blades should be examined carefully for smoothness. If roughness is present due to arcing, it can be smoothed off by the use of a fine file and crocus cloth. (Note: Do not remove more metal from the blade than is necessary.)

Also, examine the primary fingers and blades for burns or pits. If excessive burns are present the contacts should be replaced and the operation of the auxiliary blade checked. During major maintenance, the contact pressure of the primary and arcing contact fingers and at the primary blade hinge should be checked.

Examine the auxiliary blades for evidence of excessive arc erosion or damage to the arcing tips. The auxiliary blade must be replaced if the opening release position cannot be obtained.

After completing inspection of the contacts, check all contact and blade adjustments and clearances as listed under ADJUSTMENTS.

SWITCH ALIGNMENT

Using the maintenance operating handle, operate the switch through a closing and opening cycle. Check the alignment of the primary and arcing contact blades relative to the stationary contacts. Also, check for proper entry of the auxiliary blade into the interrupter, including the release positions for both closing and opening operations. Check for reasonably simultaneous closing of all contacts and for proper contacting in the close position. Inspect for evidence of corrosion or mechanical malfunctions. Clean and lubricate the switch parts as described under LUBRICATION.

MECHANISM

A careful inspection should be made to check for loose nuts, bolts, and loose or damaged set screws or other locking devices. All worm and miter gears and bearings should be ex-

amined for evidence of damage or excessive wear. Lubricate the mechanism as outlined under LUBRICATION.

Unblock the operating springs; open and close the switch several times with the operating handle to make certain that the mechanism operates freely throughout its entire stroke. Check the mechanism upper (closed) stop as described under ADJUSTMENTS.

On the SE-100S with an auxiliary switch and the SE-100E, check the secondary wiring for tightness of terminal connections and condition of insulation on the wires. In addition, examine the contacts and coils on the control relay to assure that they are in satisfactory condition.

The SE-100E should be opened and closed several times electrically to check for proper operation.

LUBRICATION

GENERAL

In order to maintain reliable operation, it is important that all parts of the switch assembly be properly lubricated at all times. All bearings and other parts of the mechanism subjected to wear have been properly lubricated, during assembly at the factory, using the finest grades of lubricants available. However, even the finest oils and greases have a tendency to oxidize with age, as evidenced by hardening and darkening in color. Elimination of the hardened lubricant is essential for the proper operation of the switch. Also frequent operation of the device causes the lubricant to be forced out from between the bearing surfaces. A simple lubrication will often clear up minor disturbances which might be mistaken for more serious trouble.

A definite lubrication schedule should be set up taking into consideration the frequency of operation of the switch and local conditions. Until such a schedule is worked out, the switch should be lubricated at each periodic inspection and also whenever it is overhauled or replacement of parts becomes necessary. It is also recommended that the device be operated at regular intervals to insure the user that the equipment is operating freely.

The lubrication chart, Fig. 11, is divided into two methods of lubrication. The first method outlines the maintenance lubrication which should be performed at the time of periodic maintenance, and requires no disassembly. The second method outlines a lubrication procedure similar to that performed on the device at the factory, and should be used when a general overhaul or partial disassembly of the switch is necessary.

General Electric Lubricants D50H15 and D50H47 are available in one-quarter pound collapsible tubes. It is so packaged to insure cleanliness and to prevent oxidation.

METHOD OF CLEANING BEARINGS

Sleeve Bearings.

Sleeve bearings located in the driving element and mechanism should be cleaned and relubricated with GE D50H15 lubricant at general overhaul periods. Bearings that are pressed into the frame or other mechanism members should not be removed. The main shaft bearings should be removed, cleaned, and relubricated with GE D50H15 lubricant at general overhaul periods. The hinge of the primary contact blade (16), Fig. 4, should be disassembled, cleaned, and lubricated with GE D50H47 lubricant at general overhaul periods. A thin film of GE D50H47 should also be applied to the silvered area of the primary contact blade where it enters the primary finger (5), Fig. 4. All other rolling or rubbing surfaces should have the dried, dirty grease removed and a thin film of fresh D50H15 lubricant applied.

DO NOT GREASE THE CONTACT END OF THE AUXILIARY BLADE.

Roller or Needle Bearings

Roller and needle bearings should be disassembled from the mechanism and the inner race removed. They should then be placed in a container of clean petroleum solvent or similar cleaner. DO NOT USE CARBON TETROCHLORIDE. If the grease in the bearings has become badly oxidized, it may be necessary to use alcohol (type used for thinning shellac) to remove it. Ordinarily, by agitating the bearings in the cleaning solution, and using a stiff brush to remove the solid particles, the bearings can be satisfactorily cleaned. Do not handle the bearings with bare hands as deposits from the skin onto the bearings are conducive to corrosion. If the bearings are touched, the contamination can be removed by washing in alcohol. After the bearings have been thoroughly cleaned, spin them in clean new light machine oil until the cleaner or solvent is entirely removed. Allow this oil to drain off and then repack them immediately with G-E lubricant D50H15 being sure all metal parts are greased. The inner races should then be assembled.

NOTE: If it becomes necessary to clean the bearings in alcohol (shellac thinner), be sure the alcohol is perfectly clean, and do not allow the bearings to remain in the alcohol more than a few hours. If it is desirable to leave the bearings in the alcohol for a longer time, an inhibited alcohol such as is used for anti-freeze should be used. Even then the bearings should

PART	LUBRICATION AT NORMAL MAINTENANCE PERIOD	ALTERNATE LUBRICATION REQUIRE DISASSEMBLY
Sleeve Bearings (Operating rod ends, auxiliary blade hinge, release hook, etc.)	Light application of SAE 20-30 oil.	Clean bearings then apply D50H15 grease.
Roller and Needle Bearings	Light application of SAE 20-30 oil.	Clean bearings then apply D50H15 grease.
Worm and Wheel Miter Gears	Apply D50H15 grease.	Wipe clean and apply D50H15 grease.
Motor	Light application of SAE 20-30 oil at rear oil hole only.	Light application of SAE 20-30 oil at rear oil hole only.
Contact Blade Hinge Assembly	No lubrication required.	Wipe clean and apply thin film of D50H47.
Silver plated Contacts External Arcing Contacts	Wipe clean and apply thin film of D50H47.	Wipe clean and apply thin film of D50H47.
Auxiliary Blade Tip	Do not lubricate.	Do not lubricate.

Fig. 11 Lubrication Chart

be removed from the alcohol within twenty-four hours. Precautions against the toxic effects of the alcohol must be exercised by wearing rubber gloves and by using the alcohol in a well ventilated room; excessive exposure to the fumes is sometimes unpleasant to personnel. Washing the bearings in the light oil, draining and repacking with lubricant D50H15 should follow immediately.

Bearings that are pressed into the frame or other members such as the motor support should not be removed. After removing the shaft and inner race the bearing can be cleaned satisfactorily with petroleum solvent or a similar cleaner and a stiff brush. Follow the procedure outlined above using a light machine oil and G-E lubricant D50H15 before reassembling the inner race and shaft.

FINAL INSPECTION

Before initially placing the SE-100 load break switch in service and at the end of each maintenance period, a final inspection should be made consisting of the following:

1. Check all nuts, bolts, washers, cotter pins, terminal connections, and other locking devices for tightness.

2. Check that all bearing surfaces of the mechanism have been lubricated.

3. Make sure that any place where the surface of the paint has been damaged during installation or maintenance is repainted immediately.

4. Replace all barriers, covers, and any other parts that may have been removed during installation or maintenance.

INSULATION TEST

A high potential test is recommended for switches whenever insulation parts have been repaired or replaced, or when the switch has been stored over an extended period of time or operated under unfavorable atmospheric conditions.

A standard one (1) minute, 60 Hz high potential test at 14000 volts rms for the 4.8 kV switch and 27000 volts rms for the 13.8 kV switch will normally indicate whether the device is satisfactory for service. With the switch contacts in the fully open position, apply the high potential to each terminal individually with all other terminals and the frame grounded. After high potential tests are made on organic insulating material, these materials should be inspected for visible leakage current paths, and necessary action must be taken to replace insulation that may have been affected by moisture absorption.

NOTE: BEFORE APPLYING A HIGH POTENTIAL TEST MAKE CERTAIN THAT THE SWITCH HAS BEEN DISCONNECTED FROM ALL PRIMARY VOLTAGE POWER SOURCES AND LOAD.

If the SE-100E secondary wiring is to be given a high potential test at 1500 volts–60 Hz, remove all the motor leads from the terminal board. Failure to disconnect the motor from the circuit may cause damage to the winding insulation.

RENEWAL PARTS

During the normal life of the switch, no renewal parts should be required. However, under certain applications having abnormal operating duty, some parts may become worn and will require replacement. For these applications, it is recommended that sufficient renewal parts be carried in stock to enable the prompt replacement of any worn, broken, or damaged parts. A stock of such parts minimizes service interruptions caused by breakdowns and saves time and expense. When continuous operation is a primary consideration, more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure replacements.

Renewal parts which are furnished may not be identical to the original parts since improvements are made from time to time. The parts which are furnished, however, will be interchangeable.

NOTE: The listed terms "Right" and "Left" apply when facing the front of the switch.

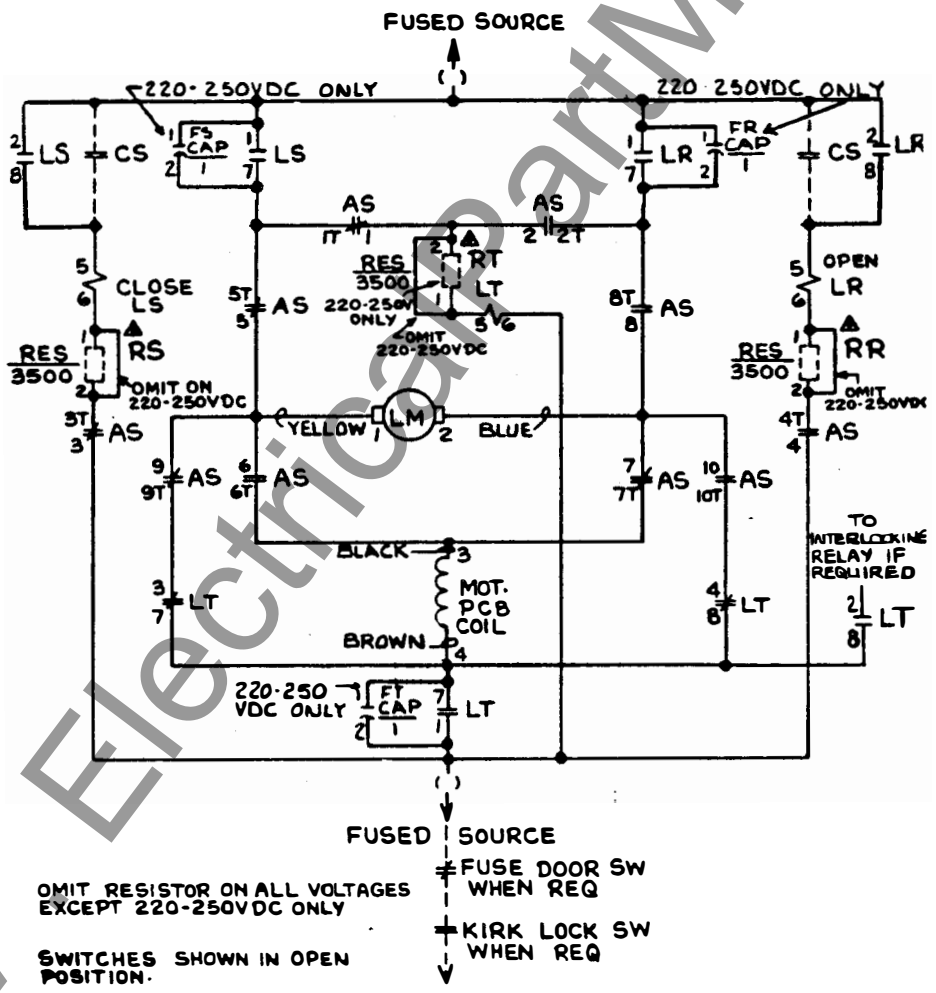


Fig. 12 (0227A1055) Schematic Wiring Diagram

ORDERING INSTRUCTIONS

1. Always specify the complete nameplate data of the load break switch.

2. Specify the quantity, catalog number (if listed), reference number (if listed), and description of each part ordered, and this bulletin number.

3. Standard hardware, such as screws, bolts, nuts, washers, etc., are not listed and should be purchased locally.

4. For prices, refer to the nearest office of the General Electric Company.

PARTS RECOMMENDED FOR NORMAL MAINTENANCE

In the following tabulations are listed those parts of the switch and operating mechanism which are usually recommended for stock for normal maintenance. Other parts can be obtained by contacting the nearest office of the General Electric Company.

RECOMMENDED RENEWAL PARTS FOR MOTOR OPERATED MECHANISM USED FOR TYPE SE-100E-1 LOAD BREAK SWITCH

Fig. No.	Ref. No.	Catalog No.	No. Req'd.	Description
6	2	 0105C9393P005 0105C9393P005 0105C9393P006 0105C9393P006	1	Spring Charging Motor* 125 VDC 115 V60 Hz 250 VDC 230 V60 Hz
6	3 4 5	 0137A7575P001 0137A7575P003 0137A7575P005 0137A7575P002	3	Relay, Start-Stop**, Close, Open 125 VDC 250 VDC 115 V60 Hz 230 V60 Hz
6	1	0137A9192G007	1	Auxiliary Switch Type SBM

*Refer to motor nameplate or summary for proper voltage rating.
**Refer to relay nameplate or summary for proper voltage rating.

RECOMMENDED RENEWAL PARTS FOR
TYPE SE-100, LOAD BREAK SWITCH

Fig. No.	Ref. No.	Ampere Rating	Catalog No. SE-100S SE-100E-1	Catalog No. SE-100M	No. Req'd.	Description
4	1	600	0105C9350G001	0105C9350G002	3	Interrupter Assembly – 4.8 kV
4	1	1200	0105C9350G001	–	3	Interrupter Assembly – 4.8 kV
4	1	600	0105C9350G002	0105C9350G002	3	Interrupter Assembly – 13.8 kV
4	1	1200	0105C9350G002	–	3	Interrupter Assembly – 13.8 kV
4	5	600	0121A7458P002	0121A7458P002	24	Primary Contact Finger
4	5	1200	0161A4219P002	–	48	Primary Contact Finger
*	*	600	0456A0806P001	0456A0806P001	12	Primary Contact Spring
*	*	1200	0456A0806P001	–	48	Primary Contact Spring
*	*	600	0105C9352P005	0105C9352P005	12	Primary Finger Retainer
*	*	1200	0105C9352P005	–	24	Primary Finger Retainer
4	7	ALL	0114C5395G002	0114C5318G009	3	Auxiliary Blade, 4.8 kV
4	7	ALL	0114C5395G001	0114C5318G009	3	Auxiliary Blade, 13.8 kV
4	11	600	0105C9365P003	0105C9365P003	6	Primary Contact Blade
4	11	1200	0105C9366P013	–	3	Primary Contact Blade
5	11	600	0114C5394G001	0114C5394G001	3	Operating Rod
5	11	1200	0114C5394G002	–	3	Operating Rod
10	6	600	0105C9360P001	–	6	Arcing Contact Finger
10	6	1200	0105C9360G002	–	6	Arcing Contact Finger
*	*	ALL	0151A5829P001	–	6	Arcing Contact Spring
10	8	600	0105C9366P004	–	3	Arcing Contact Blade
10	8	1200	0105C9366G001	–	3	Arcing Contact Blade

* Not Illustrated