



INSTRUCTIONS
AND
RENEWAL PARTS

GEI-88767

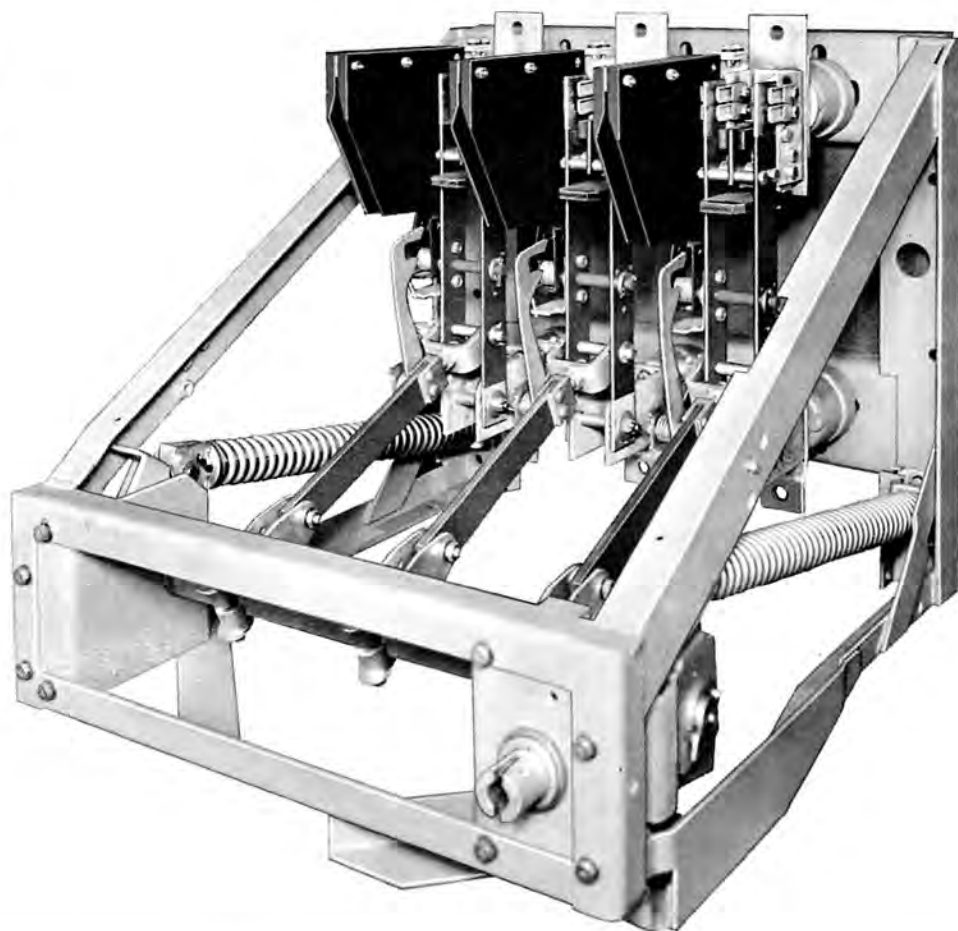
LOAD BREAK SWITCH

SE-100 M

SE-100 S

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SWITCHGEAR DEPARTMENT

GENERAL  **ELECTRIC**

PHILADELPHIA, PA.

LOAD BREAK SWITCHTYPE SE-100INTRODUCTION

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

The SE-100S has a manually charged, spring stored energy operating mechanism capable of closing the switch against maximum rated short circuited current.

The SE-100M is a manually closed and opened switch with load break abilities as indicated on the nameplate.

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 below gives the ratings for the basic switches.

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-100S	4.8	5.5	60	600	600	40,000	40
	4.8	5.5	60	1200	1200	61,000	61
	13.2	15.5	95	600	600	40,000	40
	13.2	15.5	95	1200	600	61,000	61
SE-100M	4.8	5.5	60	600	400	400	40
	13.2	15.5	95	600	100	100	40

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, operating 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.

The switch is normally furnished with outside and interphase insulating barriers in a metal-enclosed housing for connection 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.

Operation of the switch is accomplished by manual rotation of a handle through an arc of 180° . The SE-100S switch has a positive closing and opening operation supplied from the stored energy of springs. The SE-100M handle must be operated manually 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.

The interrupting ability of the switch is accomplished by the use of an arc chute type interrupter (5) Fig. 4 and an auxiliary blade (3). When the switch is opened the auxiliary blade contacts (2 & 3) are the last to part and will initiate an arc in the chute. The hot arc releases gases from the plastic chute in such volume that the arc is blown away from the rapidly moving auxiliary blade and cooled by contact with the large area of the chute sides. After the arc has been extinguished, the blade will continue to open producing 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

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.

Connection

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-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 all items listed under Adjustments before the switch is put in operation and during each period of maintenance.

DESCRIPTION OF OPERATION

On the SE-100S switch 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 mechanism is manually charged but is completely disengaged from the operating handle as it begins to operate the switch. In this way the actual operation of the switch is independent of the operator.

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

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

Closing Operation SE-100S

Closing the switch is accomplished by inserting the operating handle (1) Fig. 3 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 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. 2 will engage the drive crank (3), which is directly connected to the main crank shaft (11) Fig. 2, just as the primary spring leaves the toggle position. When the main crank shaft has rotated a few degrees, the fully charged booster spring, located on the left side, (5) Fig. 1 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 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. 7 are engaged, then it is released to enter the chute and latch into the arc chute contacts (2) Fig. 4. This sequence of operations will prevent pre-strike 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.

Opening Operation SE-100S

To open the switch the operating handle is inserted into the handle socket and rotated in a clockwise direction as far as possible (approximately 180°).

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. 2 will engage the drive crank (3) at the toggle position of the primary spring and will turn the main crank shaft (11). When the 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. 7 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. 4 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. 4 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.

Closing Operation SE-100M

Closing the switch is accomplished by inserting the operating handle (1) Fig. 3 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°).

During the closing cycle the auxiliary blade (7) Fig. 7 will be held out of the arc chute until the primary blades (11) are almost closed. Just before the primary contacts (5) Fig. 7 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.

Opening Operation SE-100M

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 & 11) Fig. 7 will part first. When the primary blade gap is sufficient, the auxiliary blade (3) Fig. 4 will be released and will snap open at high velocity.

ADJUSTMENTSSpring Blocking SE-100S

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. 2.

1. Remove the rear bolt from position (1A) of the spring stop (2) located on the upper right angle frame. On 1200 A switches it may be necessary to loosen the front bolts of the right hand barrier to have access to the bolts.
2. Rotate the stop until it is vertical, replace the bolt that had been removed in the lower location (1) and tighten.
3. Using the normal operating handle rotate in a counterclockwise direction (direction of close) until the spring yoke on the right contacts the stop.
4. Remove operating handle and insert maintenance handle (2) Fig. 3 on main square shaft and screw the blocking pins (3) Fig. 3 in the left and right spring guide at (4) Fig. 2. 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. 5 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 $\frac{1}{4}$ " 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. 6. The dimension from the straight edge to the closest corner of the square shaft should be $\frac{1}{4}$ " to $\frac{3}{8}$ ".

If adjustment of the stop is necessary, remove the cotter pin holding the stop (3) Fig. 5 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.

SE-100S

With the switch in the closed position, pull the top of the primary blades to the front with your hands to remove connection clearances. There should be $1/64"$ to $1/32"$ clearance between the buffer (8) Fig. 7 and the primary blade buffer stop (1) Fig. 1. There should also be $3/16"$ to $1/4"$ between the edge of the primary blade and the front of the primary contact support.

Adjust the length of the rod by the use of the adjusting nuts (6) Fig. 6 to obtain the $3/16"$ to $1/4"$ gap then adjust the buffer (8) Fig. 7 by adding or removing shims to get the $1/64"$ to $1/32"$ clearance.

SE-100M

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 over center 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

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 second from the top, should be used on both 600A and 1200 A switches. The dimension should be 11" plus or minus $3/8"$. If this dimension is not correct, the lower buffer stop (6) Fig. 5 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. 8 slowly by the use of the maintenance handle and note the engagement of the primary contacts (4), arcing contacts (6 & 8), and guide block (10). The blades should center around the guide block without bearing heavily 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 (2) bolts (11) Fig. 8 holding the block. Again 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 entry of the auxiliary blade; to latch, and finally, to release the auxiliary blade at the proper time.

With the operating springs blocked, turn the contact arm (12) Fig. 7 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 (2) bolts at the top (2) Fig. 7 and the (2) bolts (10) Fig. 7 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.

A dimension of 1-1/6" 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. Refer to Fig. 7. The auxiliary blade contacts (2) Fig. 4 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 second from the top) (2) Fig. 9 to the buffer stop or spacer (3) should be 4-7/8" to 5-3/8" on the 4.8 KV and 7-1/8" to 7-3/4" 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 lowered, for gaps that are less the chute must be raised. To adjust the chute, remove the upper and lower mounting bolts (2 & 10) Fig. 7. Move shims (3) from the bottom to the top of the support to increase the gap. To decrease 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 SE-100S

The auxiliary blade release hook (14) Fig. 7 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. 4 to release the auxiliary blade within 1/2" before arcing contact touching to contact touching. After adjustment is made the lock nut (9) Fig. 4 should be tightened.

Auxiliary Blade Release SE-100M

The SE-100M hook release should be adjusted to release the auxiliary blade when the primary contacts and blade are 1" to 1-1/2" 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

The primary finger pressure has been adjusted at the factory to be 12 pounds per contact on the 600A switch and 24 pounds per contact on the 1200A. This can be measured with a pull scale exerting a pressure against the contact surface. The contact pressure of each finger (5) Fig. 7 should be measured individually. Increase or decrease the contact pressure by loosening or tightening the contact bolts (4) Fig. 7.

Arcing Finger Contact Pressure SE-100S

The arcing finger contact pressure should be 12 pounds on all 600 A and 16 pounds on all 1200 A switches. This pressure can again be measured with a spring scale against the contact surface. Loosen or tighten the contact bolts (7) Fig. 8 as necessary.

Primary Blade Hinge Pressure

The correct hinge pressure is essential for proper operation of the switch. The hinge pressure is difficult to measure, but a required torque 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 pound-inches to 90 pound-inches on 600 A and 120 pound-inches to 150 pound-inches on 1200 A switches. This can be measured by pulling at the buffer stop or spacer (1) Fig. 1 on the primary blade with a spring scale without the primary contacts, arcing contacts, and auxiliary blade contacts engaged. The scale reading should be $5\frac{1}{2}$ to $8\frac{1}{4}$ # on 600 A and 11 to 14 # on 1200 A switches. If adjustment is necessary, remove a cotter pin from either side of the hinge pin (16) Fig. 7 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.

FINAL INSPECTION

Before placing the SE-100 into service, a final inspection should be made consisting of the following:

1. Check all nuts, washers, bolts, cotter pins and terminal connections for tightness.
2. See that all bearing surfaces of the mechanism have been lubricated.
3. Operate the device slowly several times by hand and note that there is no binding or excessive friction.
4. See that any place where the surface of the paint has been damaged during installation is repainted immediately.
5. Replace all barriers, covers, and any other parts that may have been removed during installation.

Hi-Potential Test

If the device has been stored for a long period of time before installation, it is recommended that the insulation be checked before it is placed in service. A standard 60 cycle high potential test at 14,000

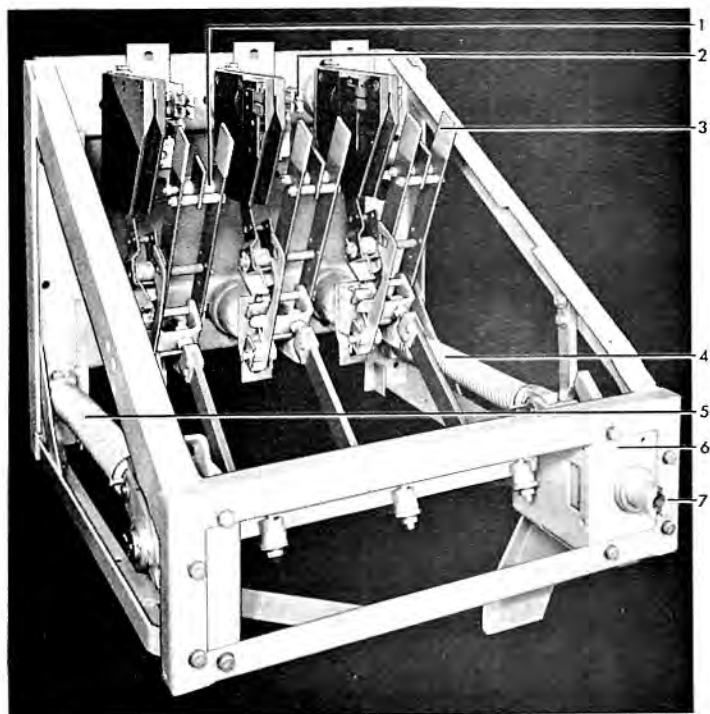
volts RMS for the 4.8 KV switch and 27,000 volts RMS for the 13.2 KV switch will normally indicate whether the device is satisfactory for service. With the switch contacts in the fully opened position, apply the high potential to each terminal individually for one minute with all other terminals and the frame grounded. After high potential tests are made all organic insulating 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. The high potential test is also recommended for devices which have been removed from service and stored over an extended period of time under unfavorable atmospheric conditions.

NOTE: Before applying a hi-potential test make certain that the switch has been disconnected from both the source and load.

RECOMMENDED RENEWAL PARTS

Description	Amp. Rating	KV Rating	Cat. No.	Quan. Per Switch
Primary Contact Finger	600	All	121A7458 P-2	24
Primary Contact Finger	1200	All	161A4219 P-2	48
Primary Contact Spring	600	All	456A806 P-1	12
Primary Contact Spring	1200	All	456A806 P-1	48
Primary Contact Finger Retainer	600	All	105C9352 P-5	12
Primary Contact Finger Retainer	1200	All	105C9352 P-5	24
Primary Contact Blade	600	All	105C9365 P-3	3
Primary Contact Blade	1200	All	105C9366 G-2	3
Primary Contact Blade	600	All	105C9365 P-8	3
*Arcing Contact Finger	600	All	105C9360 P-1	6
*Arcing Contact Finger	1200	All	105C9360 G-2	6
*Arcing Contact Spring	All	All	6176882 P-1	6
*Arcing Contact Blade	600	All	105C9366 P-4	3
*Arcing Contact Blade	1200	All	105C9366 G-1	3
Arc Chute Assembly	All	4.8	105C9350 G-1	3
Arc Chute Assembly	All	13.2	105C9350 G-2	3
Auxiliary Blade	All	4.8	105C9361 G-2	3
Auxiliary Blade	All	13.2	105C9361 G-1	3

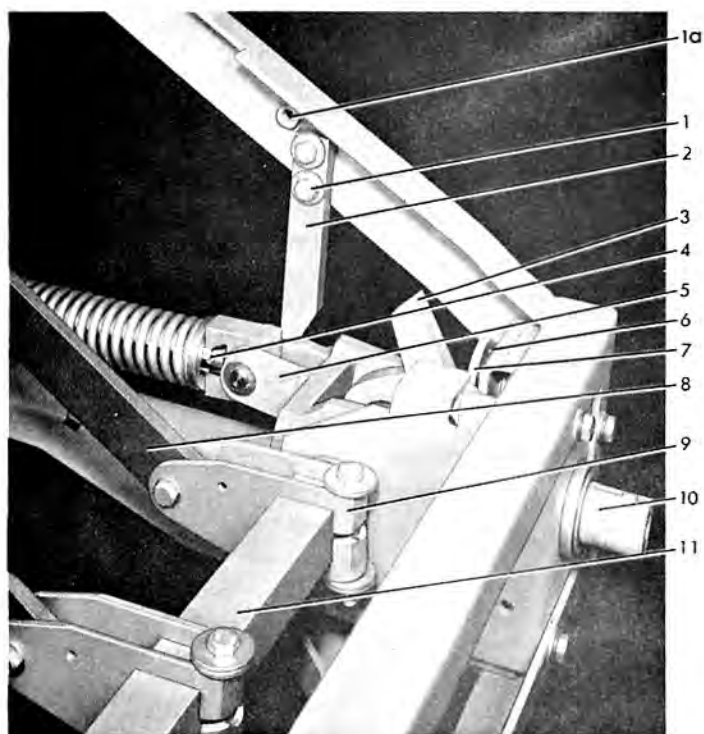
* Not required on SE-100M



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

Fig. 1 SE-100S Switch Partially Open



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

Fig. 2 8035013

Fig. 2 Spring Drive Mechanism

Fig. 3 8035232

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

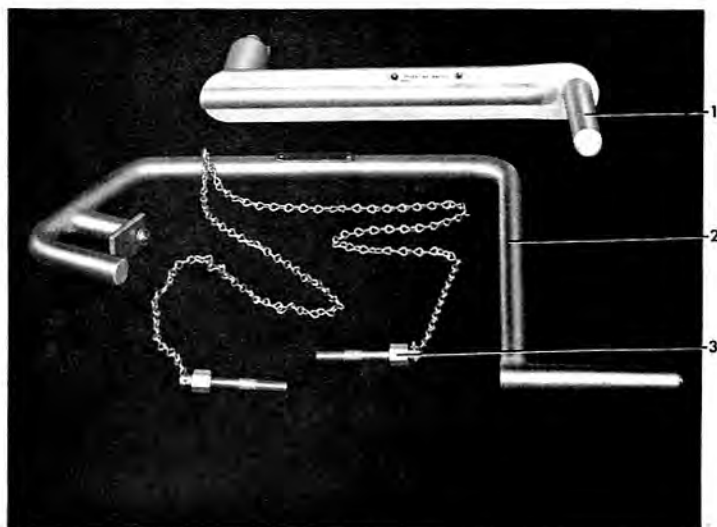


Fig. 3 Operating and Maintenance Handles

Fig. 4 8035037

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

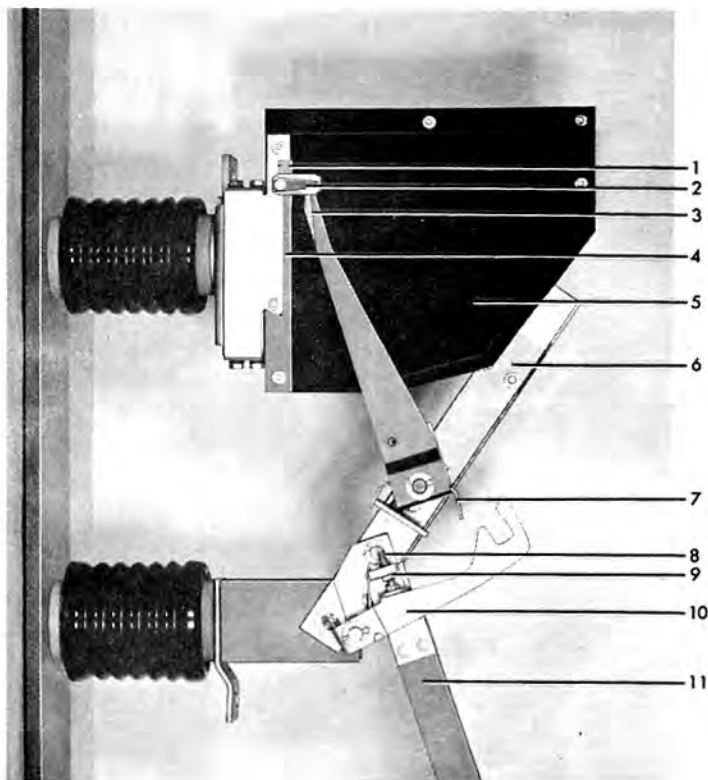
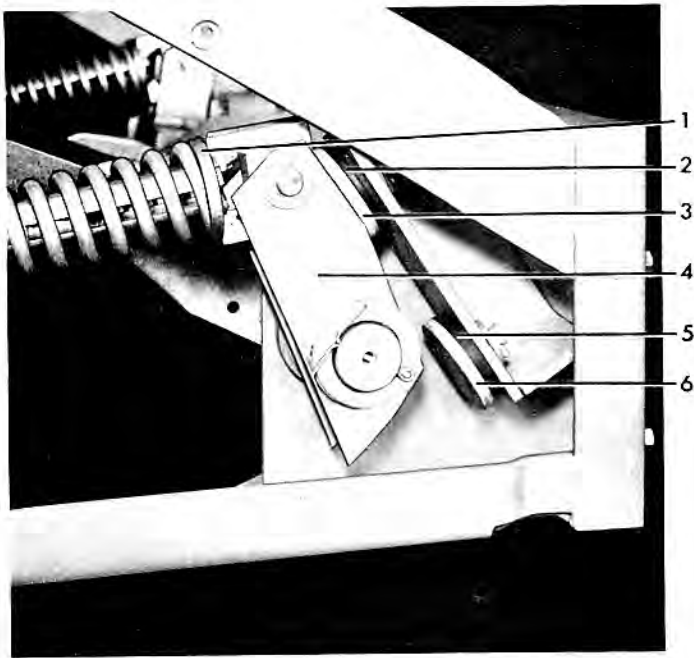
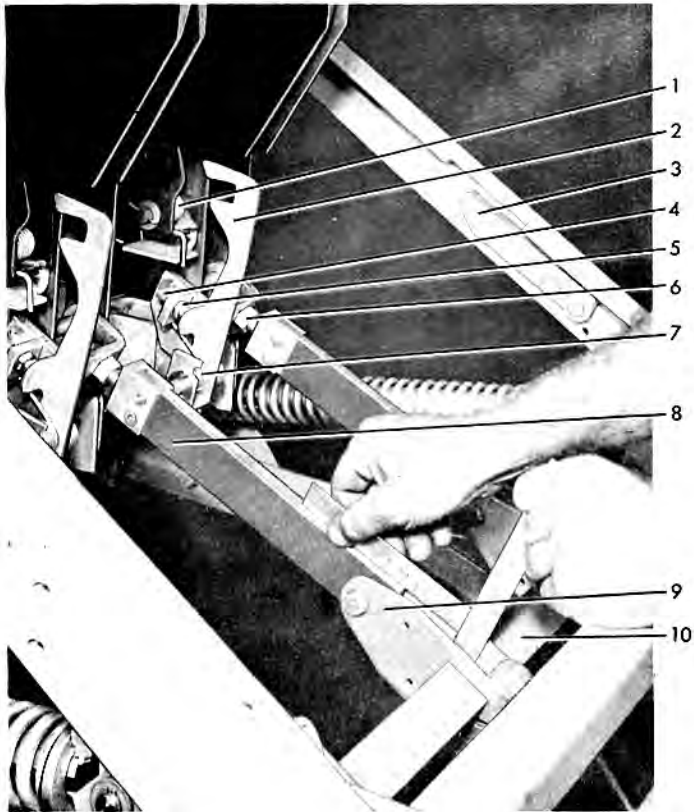


Fig. 4 Unit Pole Opening



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

Fig. 5 Buffer Assembly



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

Fig. 6 Switch Blade Adjustments

FIG. 5 8035014

FIG. 6 8035015

Fig. 7 8035035

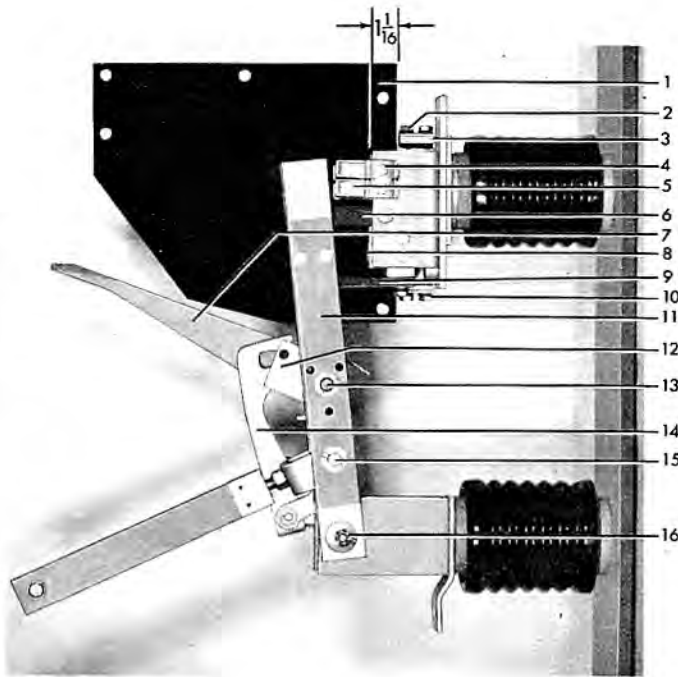


Fig. 7 Unit Pole Closing

1. Buffer Stop
2. Arc Chute 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. Arc Chute Mounting Bolts
11. Primary Contact Blade
12. Auxiliary Contact Blade
13. Rivot Pin for Auxiliary Blade
14. Auxiliary Blade Release Hook
15. Operating Rod Clevis Pin
16. Hinge Pin

Fig. 8 8035033

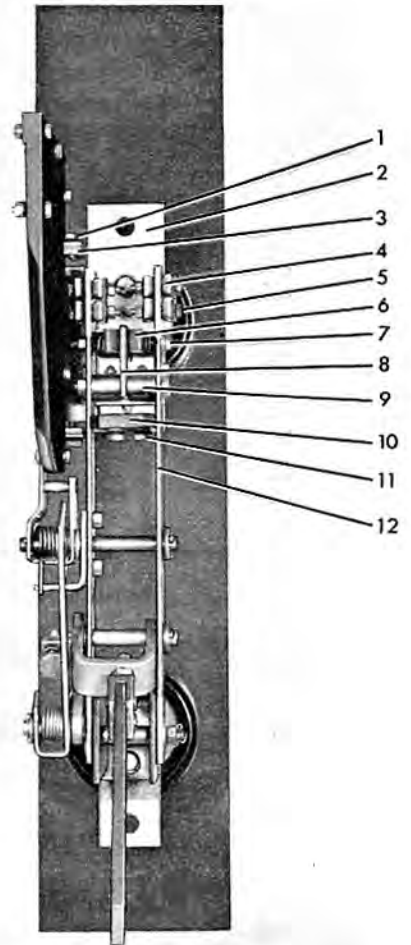
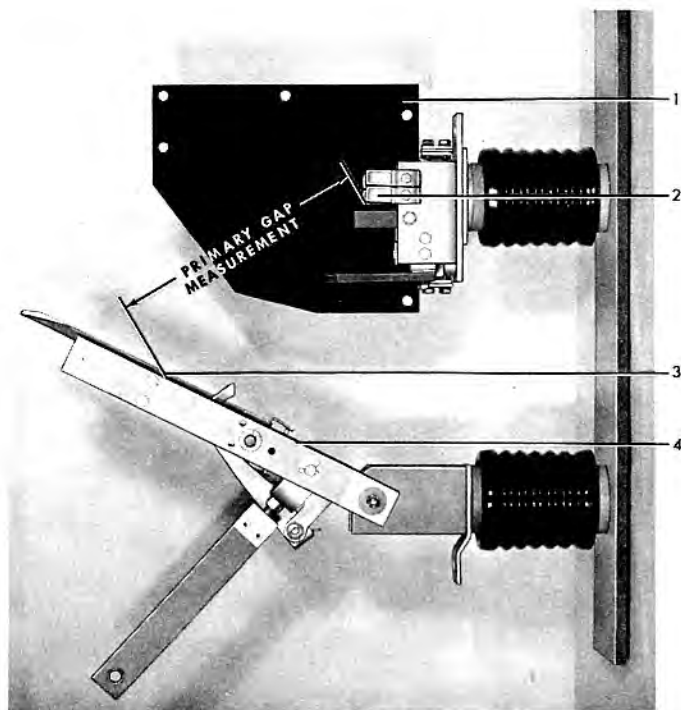


Fig. 8 Contact Arrangement

1. Arc Chute 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



1. Arc Chute
2. Stationary Primary Contact
3. Primary Blade Stop
4. Primary Blade

Fig. 9 Unit Pole Fully Open

FIG. 9 8035032

READY TO ASSIST YOU . . . When You Have Electrical Problems . . . Need Further Information . . . Require Ordering Instructions

SALES OFFICE CODE KEY

- * Industrial Equipment (including Agent and Distributor) Sales
- † Electric Utility Equipment Sales
- ‡ Marine and Defense Equipment Sales
- § Component Sales Operation

ALABAMA
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 * † Pine Bluff P. O. Box 1033

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 * † Macon 682 Cherry St.
 * † Savannah 31405 5002 Paulsen St.

IDAHO
 * † Boise 83706 1524 Idaho St.

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 * † Chicago 60680 840 S. Canal St.
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 * † Springfield 62701 607 E. Adams St.

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 * † Evansville 47714 2709 Washington Ave.
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 * † Davenport 52805 1039 State St., Bettendorf, Iowa
 * † Des Moines 50310 3839 Marie Hay Rd.
 * † Sioux City 51101 520 Pierce St.

KANSAS
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