Interrupter Replacement

Table of Contents

★ Instructions also applicable to similar models of Mark IV Circuit-Switchers and S&C Line-Rupter™ Switches.

February 2, 2026

Qualified Persons

⚠ WARNING

Only qualified persons knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution and transmission equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed
- The proper use of special precautionary techniques, personal protective equipment, insulated and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read This Instruction Sheet

NOTICE

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before replacing the interrupter. Become familiar with the Safety Information on page 3 and Safety Precautions on page 5. The latest version of this publication is available online in PDF format at **sandc.com/en/contact-us/product-literature/**.

Retain This Instruction Sheet

This instruction sheet is a permanent part of the Mark V Circuit-Switcher. Designate a location where users can easily retrieve and refer to this publication.

Proper Application

⚠ WARNING

The equipment in this publication is only intended for interrupter replacement on Mark V Circuit-Switchers. Ratings for the Mark V Circuit-Switcher are listed in the ratings table in Specification Bulletin 711-31. The ratings are also on the nameplate affixed to the product.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the product. Become familiar with these types of messages and the importance of these signal words:

⚠ DANGER

"DANGER" identifies the most serious and immediate hazards that will likely result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ WARNING

"WARNING" identifies hazards or unsafe practices that can result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ CAUTION

"CAUTION" identifies hazards or unsafe practices that can result in minor personal injury if instructions, including recommended precautions, are not followed.

NOTICE

"NOTICE" identifies important procedures or requirements that can result in product or property damage if instructions are not followed.

Following Safety Instructions

If any portion of this instruction sheet is unclear and assistance is needed, contact the nearest S&C Sales Office or S&C Authorized Distributor, or call the S&C Global Support and Monitoring Center at 1-888-762-1100. Telephone numbers are also listed on S&C's website, sandc.com.

NOTICE

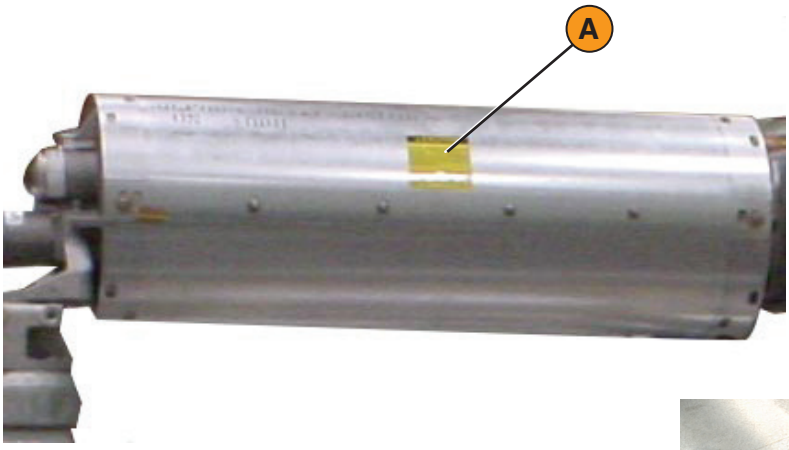
Read this instruction sheet thoroughly and carefully before replacing the interrupter.

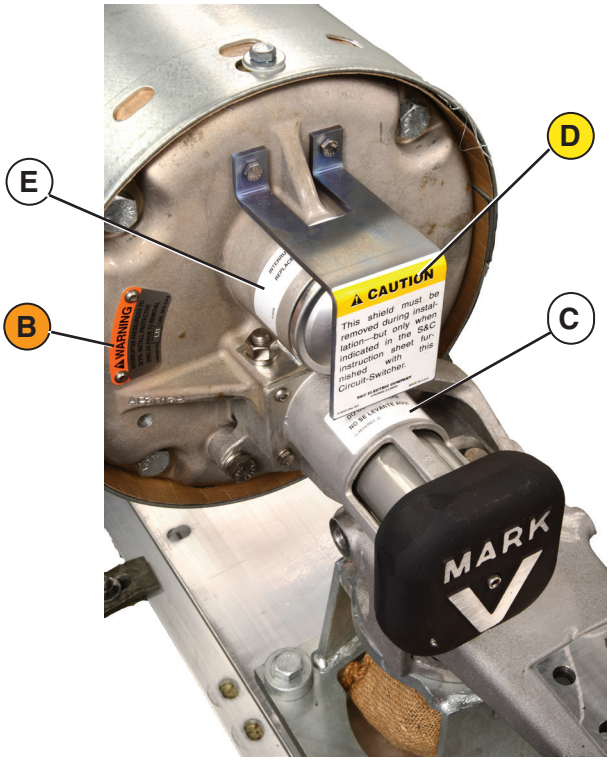
Replacement Instructions and Labels

If additional copies of this instruction sheet are required, contact the nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

It is important any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting the nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

Location of Safety Labels





Reorder Information for Safety Labels

Location	Safety Alert Message	Description	Part Number
A	⚠ WARNING	DO NOT remove steel outer wrapper until installation is complete.	G-5993
B	⚠ WARNING	Interrupter pressurized to <pressure> PSI. Install protective shields prior to removal.	G-9686 G-9860
C	INSTRUCTION	Do not lift here.	G-3824
D	⚠ CAUTION	This shield must be removed during installation–but only when indicated...	G-6043●
E	INSTRUCTION	Interrupter Part Number. Replace with catalog number...	G-6376

● Remove after installation when instructed.

⚠ DANGER

Mark V Circuit-Switchers operate at high voltage. Failure to observe the precautions below will result in serious personal injury or death.

Some of these precautions may differ from your company's operating procedures and rules. Where a discrepancy exists, follow your company's operating procedures and rules.

1. **QUALIFIED PERSONS.** Access to Mark V Circuit-Switchers must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules..
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **OPERATING MECHANISM AND BASE.** Mark V Circuit-Switchers contain fast moving parts that can severely injure fingers. Do not remove or disassemble operating mechanisms or remove access panels unless directed by S&C Electric Company.
6. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded. Voltage levels can be as high as the peak line-to-ground voltage last applied to the circuit-switcher. Units that have been energized or installed near energized lines should be considered live until tested and grounded.
7. **GROUNDING.** The Mark V Circuit-Switcher must be connected to a suitable earth ground at the base of the utility pole, substation ground system, or to a suitable building ground for testing, before energizing the switch and at all times when energized.

   The ground wire(s) must be bonded to a system neutral, if present. If the system neutral is not present, proper precautions must be taken to ensure the local earth ground, or building ground, cannot be severed or removed.
8. **SWITCH POSITION.** Always confirm the **Open/Close** position of each switch.
   - Switches and terminal pads may be energized from either side.
   - Switches and terminal pads may be energized with the switches in any position.
9. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.

Inspection

Examine the shipment for external evidence of damage as soon after receipt as possible, preferably before removal from the carrier's conveyance. Check the bill of lading to make sure all listed shipping skids, crates, cartons, and containers are present.

If there is visible loss and/or damage:

1. Notify the delivering carrier immediately.
2. Ask for a carrier inspection.
3. Note condition of shipment on all copies of the delivery receipt.
4. File a claim with the carrier.

If concealed damage is discovered:

1. Notify the delivering carrier within 15 days of receipt of shipment.
2. Ask for a carrier inspection.
3. File a claim with the carrier.

Also, notify S&C Electric Company in all instances of loss or damage.

Handling

Interrupters are porcelain-enclosed, hermetically sealed devices containing sulfur hexafluoride gas under pressure. To guard against breakage and possible hazard to personnel, the porcelain section of these interrupters must be encased in a bolted-on container during handling. Replacement interrupters are shipped with this container in place. Do not remove the container until so directed in the following instructions.

⚠ WARNING

Do not remove the protective container around the interrupter or pressure-relief shield until the replacement procedure is complete. Interrupters are pressurized to between 38 and 85 PSIG depending on the number of gaps in the interrupter.

Failure to keep the container and shield in place during replacement may cause equipment damage or serious personal injury.

Before Starting

⚠ DANGER

De-energize the circuit-switcher, isolate it from all high-voltage sources, and ground it at all six terminals before proceeding with interrupter replacement.

Failure to properly de-energize and ground the circuit-switcher will result in serious personal injury or death.

The following instructions are for field replacement of interrupters for Mark V Circuit-Switchers, vertical-break style rated 34.5 kV through 161 kV and center-break style rated 115 kV through 345 kV, with one, two, or three interrupting gaps per pole-unit. See Figure 1.

Though the text and illustrations refer to Mark Series Circuit-Switchers, the instructions are equally applicable to interrupter replacements for current and S&C Line-Rupter Switches.

The interrupter contains two movable rods: the main contact operating rod and the interrupting-contact operating rod. During interruption, both rods are driven to the **Open** position by stored energy, with the action controlled and sequenced by the brain. Both rods extend into the brain, where they are linked to spring-driven actuating arms. Motion is transmitted through metal bellows within the interrupters. For purposes of reference, the main-contact operating rod is the one closest to the supporting insulator stack.

Note: Replacement interrupters are no longer available for "twin-brain" 345 kV and 500 kV Mark IV Circuit-Switchers.

Tools Required

- A ¾-inch open-end or box wrench for the ½–13-inch hex nuts at the brain connection and the ½–13 × 1½-inch hex-head cap screws at the terminal end of the interrupter
- A 9/16-inch ratchet-type socket or open-end wrench for the ⅜-16 × 1¼-inch hex-head cap screws at the terminal end of the interrupter
- A flat-head screwdriver for the 10-32 slotted-head machine screws fastening the shunt cable inside the brain
- A wire brush and suitable compound for aluminum electrical-contact surfaces such as Penetrox® A (available from Burndy Corporation)
- Holding device positioning bolt. Refer to Step 4 on page 11.

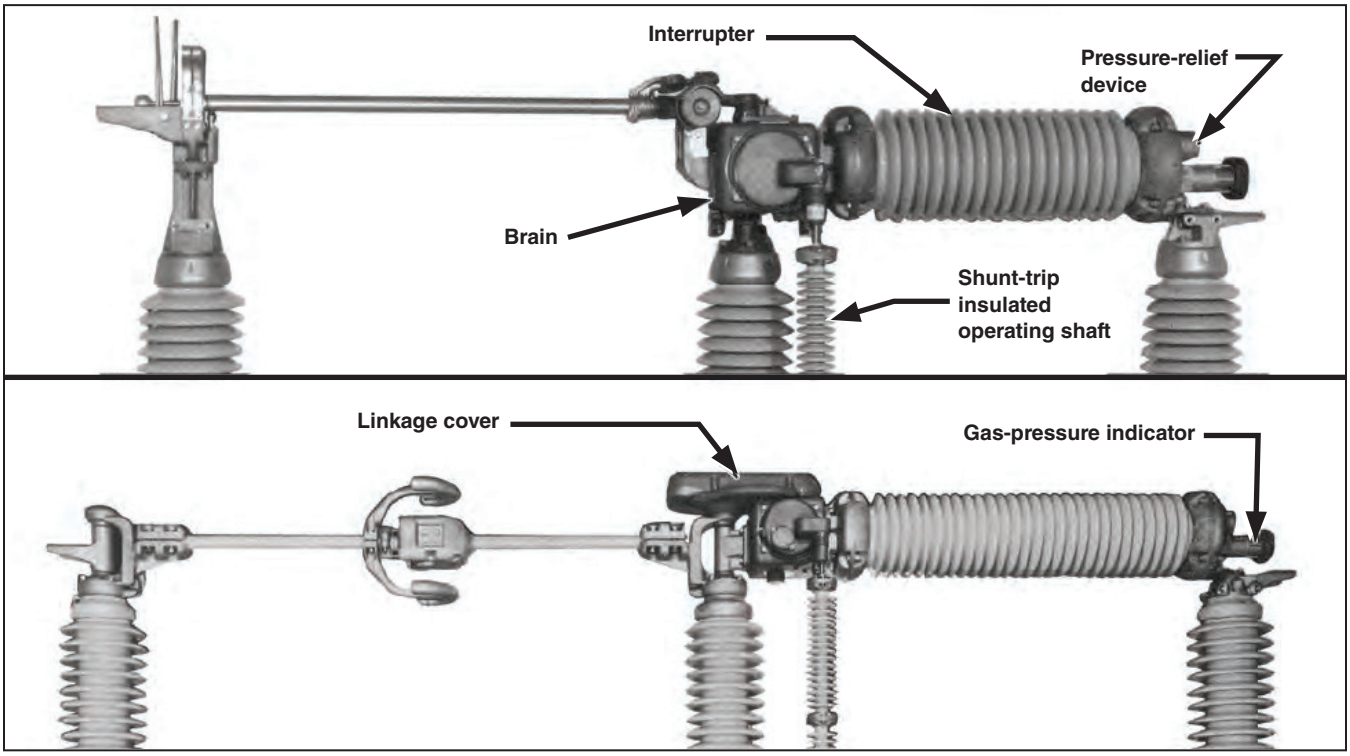


Figure 1. Views of Mark V Circuit-Switcher, vertical-break (top) and center-break (bottom) styles with shunt-trip device.

Removing the Existing Interrupter

To remove the interrupter to be replaced, complete the following steps:

STEP 1. After following the user's standard procedures for clearing and tagging equipment on which work is to be performed, operate the circuit-switcher to the fully **Open** position. In this position, subsequent steps may be performed without the possibility of tripping the latch releasing the stored energy in the spring-loaded brain mechanism.

To prevent inadvertent electrical operation of the switch operator, remove the motor-circuit and shunt-trip circuit two-pole pull-out fuseholders in the Type CS Switch Operator or, on earlier-model moto-mech switch operators, open the two-pole control-source disconnect switch and remove the control-source fuses.

STEP 2. Install the spare pressure-relief shield, furnished with the replacement interrupter (in a separate box), around the pressure-relief device of the interrupter to be replaced. See Figure 2. Secure the shield by tightening the clamp furnished.

STEP 3. Install the spare interrupter container, furnished with the replacement interrupter, around the interrupter to be replaced using the following procedure:

(a) Remove the two container-halves from the shipping crate. One of the container-halves is furnished with a loosely attached ⅜ – 16 × 2-inch carriage bolt at each end. Position this container-half so the carriage-bolt threads protrude through the holes at the ends of the other container-half as shown in Figure 2.

(b) Thread a ⅜ – 16-inch zinc-plated serrated hex nut on each of the two ⅜ – 16 × 2-inch carriage bolts. Tighten each hex nut just a few turns. See Figure 3.

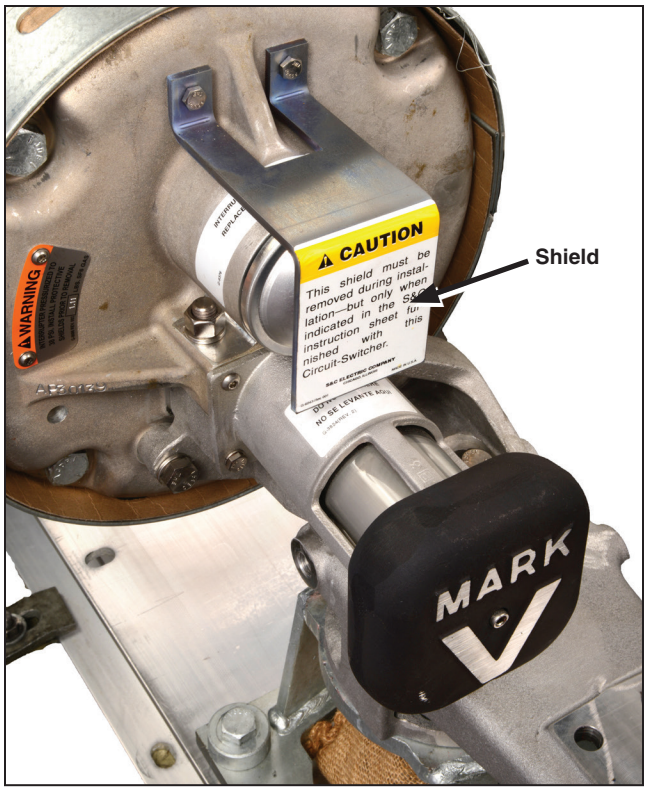


Figure 2. Installing pressure relief shield.

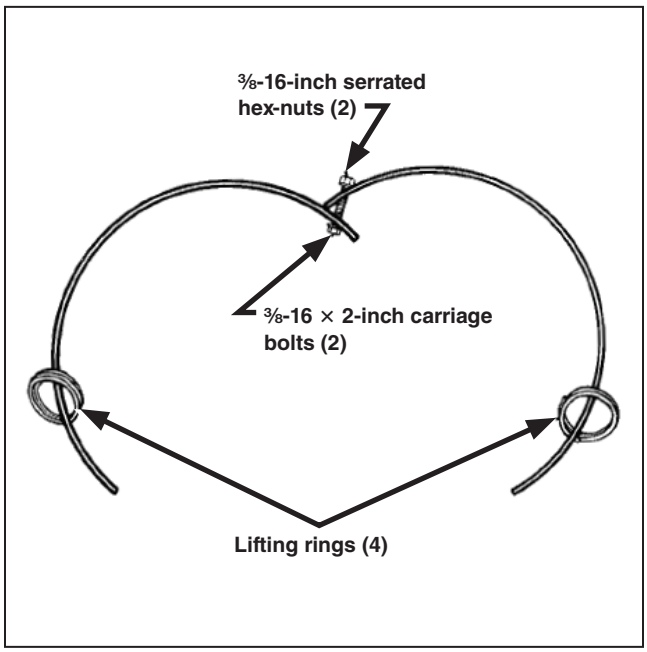


Figure 3. Assembling the spare interrupter container.

(c) Attach suitable lifting slings to the four lifting rings at the ends of the container-half assembly. See Figure 4. Do not loop slings from one end of the container to the other. Raise the container into position around the interrupter.

(d) Using a screwdriver as necessary to spread the edges, snap the two halves together as shown in Figure 4. Place a ⅜ – 16-inch zinc-plated serrated hex nut on each of the captive ⅜ – 16 × ¾-inch carriage bolts running the length of the container-halves. Do not remove the lifting slings until the interrupter has been removed and lowered to the ground, as directed in Step 9 on page 13.

(e) ***If tapped holes are provided in the indicator end casting and coupling end casting:*** Secure the container-halves to the indicator end casting using four ⅜ – 16 × ¾-inch zinc-plated hex-head cap screws and flat washers, inserted through the innermost holes at the end of the container-halves. See Figure 5 on page 10 (right). Then, secure the container-halves to the coupling end casting in the same manner. See Figure 5 on page 10 (left). Securely tighten the ⅜ – 16-inch zinc plated serrated hex nuts running the length of the container-halves.

If tapped holes are not provided in the indicator end casting and coupling end casting: Attach the container-halves at the indicator end of the interrupter using one of the cable-and-clamp assemblies furnished. See Figure 5 on page 10 (right). Thread the cables through the outermost hole at the bolted connection of the container-halves, as shown.

Position the cables around the pressure-relief device and the gas pressure indicator and thread the cables through the outermost hole at the bolted connection of the container-halves on the other side. Do not attach the clamp to the cables at this time.

Figure 4. Raising the spare interrupter container into position. Vertical-break style circuit-switcher shown; the center-break style is similar.

(f) Attach the container-halves at the coupling end of the interrupter in a similar manner using the other cable-and-clamp assembly furnished. See Figure 5 (left). Slide the container-halves back and forth as necessary to allow the cables to be threaded through the holes.

(g) Pull the cables taut at the indicator end of the interrupter and attach one of the clamps furnished. See Figure 5 (right). Securely tighten the clamp nuts.

(h) Pull the cables taut at the coupling end of the interrupter and attach the other clamp furnished. See Figure 5 (left). Securely tighten the clamp nuts.

(i) Securely tighten the ⅜ – 16-inch zinc-plated serrated hex nuts running the length of the container-halves.

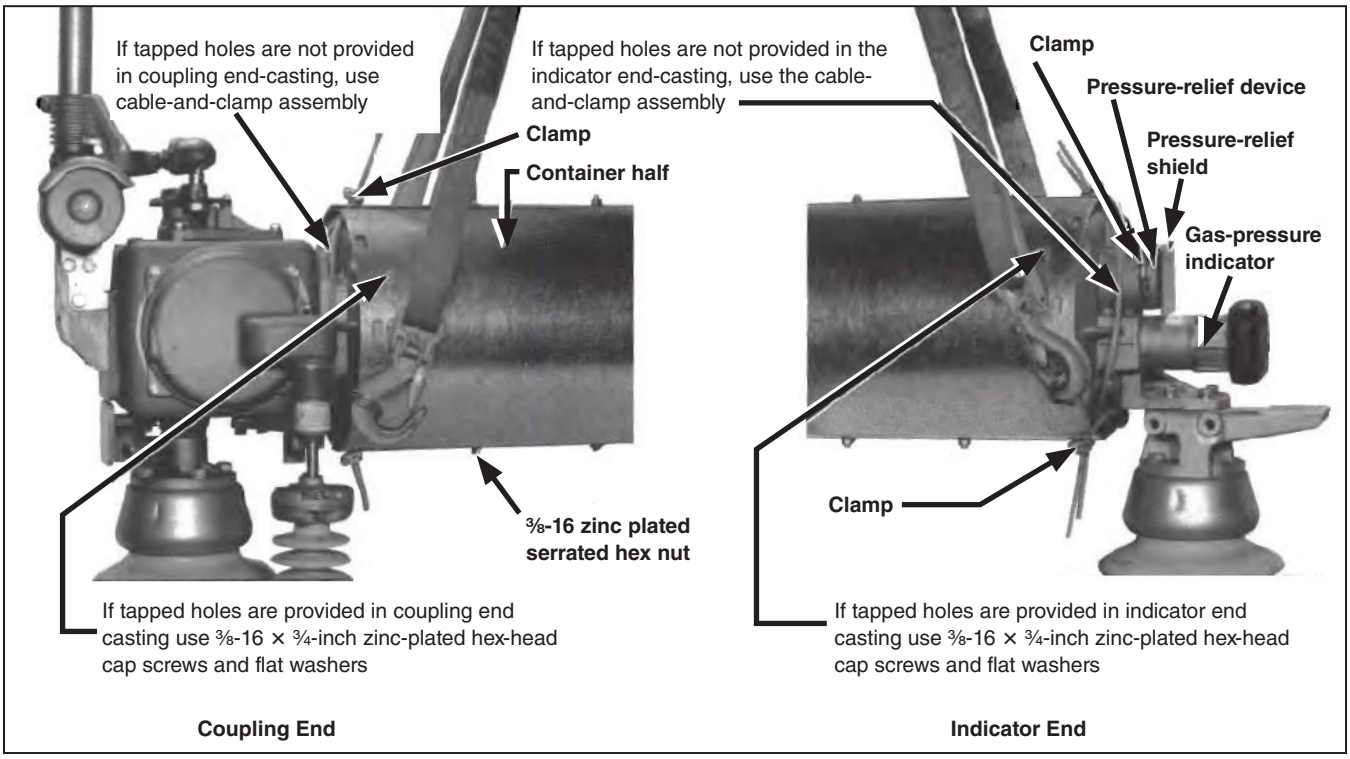


Figure 5. Attaching a spare interrupter container around the interrupter being replaced.

STEP 4. To ensure the circuit-switcher remains in the fully **Open** position, particularly while the interrupter is separated from the pole-unit, the holding device, if there are provisions for it, must be used and kept in place until Step 4 on page 14.

The holding device consists of a stop bushing, factory-set in the bracket attached to the underside of the brain, plus a tab on the brain operating shaft. Insert a ½ – 13 × 2¾-inch positioning bolt through the tab and stop bushing and secure it with a flat washer and nut, as shown in Figure 6.

STEP 5. For circuit-switchers equipped with the S&C Shunt-Trip Device, the silicone-rubber weather-sealing boot should be pulled downward to expose the tongue-and-groove coupling. See Figure 6.

NOTICE

Do not attempt to remove the opposite-side brain cover on which the interrupter target is located. It is not removable.

Remove the four ⅜– 16 × 1¼-inch hex-head cap screws (two may be shoulder bolts) from the brain cover on the side of the brain opposite from the interrupter target. See Figure 6. Retain the cap screws.

Use a small screwdriver, if necessary, to pry the cover loose, but use care not to damage the internal O-ring seal. Remove the brain cover. If the circuit-switcher is equipped with the S&C Shunt-Trip Device, the tongue-and-groove coupling will simultaneously disengage as the cover is removed.

STEP 6. Disconnect the shunt-cable assembly from the interrupting-contact operating rod by removing the two 10–32 slotted-head machine screws fastening it to the rod. See Figure 7. Discard these screws.

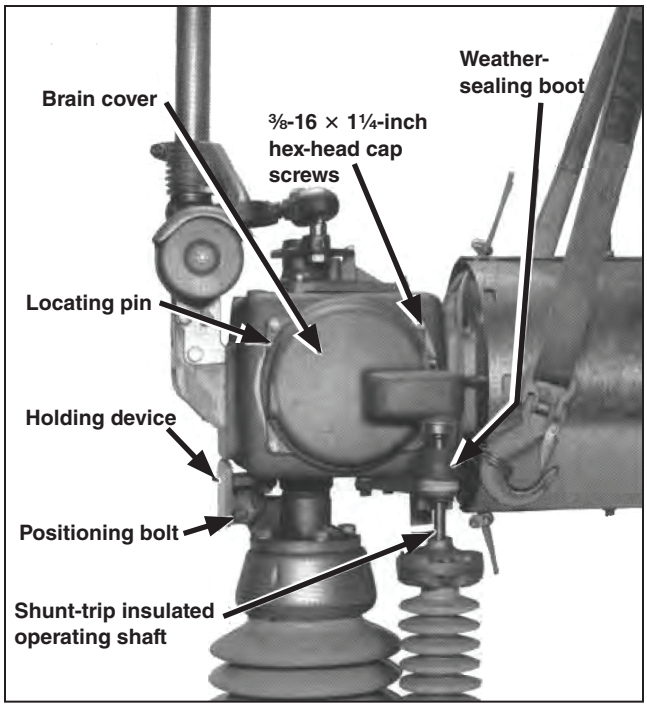


Figure 6. Vertical-break style circuit-switcher brain with holding device and shunt-trip device.

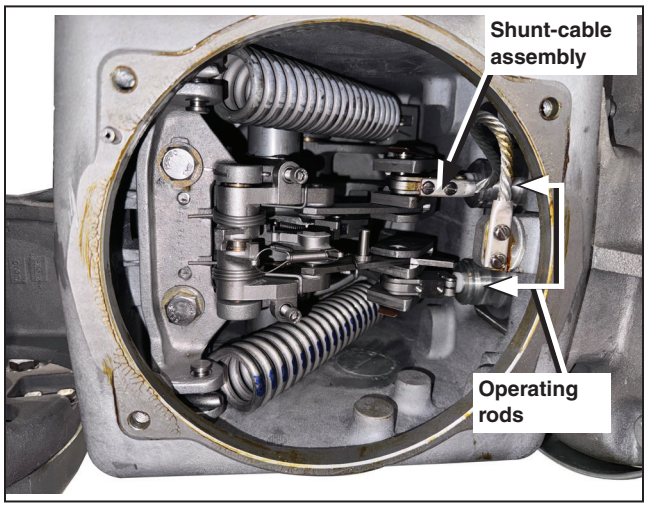


Figure 7. Disconnecting the shunt-cable assembly from the operating rods.

STEP 7. Lift the coupling-pin retainers on both operating rod actuating arms and swing the retainers toward the interrupter. Avoid excessive deflection that could overstress the retainers and cause distortion. Remove and discard the coupling pins. See Figure 8. A small screwdriver may be used to pry at the head of the pin.

⚠ WARNING

Gas pressure within the interrupter can force the operating rods to extend rapidly, approximately 6 inches (152 mm) from the coupling-pin connection, when the coupling pins are removed.

To avoid injury, keep hands and tools away from the line of travel of the rods before removing the coupling pins.

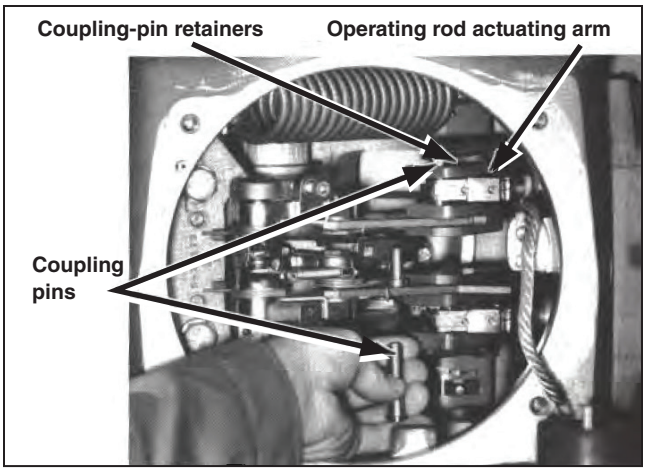


Figure 8. Removing the coupling pins.

STEP 8. Remove the four ½ – 13-inch hex nuts and lockwashers from the studs fastening the interrupter to the brain. Then, remove the four ½ – 13 × 1½-inch hex-head cap screws, lockwashers, and flat washers (or toothed washers) at the terminal end. See Figure 9. Retain this hardware.

STEP 9. With a moderate strain on the lifting slings, carefully slide the interrupter away from the brain. See Figure 10. As the unit is lowered, use care to avoid damaging the exposed operating rods.

STEP 10. Open the replacement interrupter shipping crate.

⚠ WARNING

Do not remove the protective container around the interrupter or pressure-relief shield until the replacement procedure is complete. Interrupters are pressurized to between 38 and 85 PSIG depending on the number of gaps in the interrupter.

Failure to keep the container and shield in place during replacement may cause equipment damage or serious personal injury.

Attach two suitable lifting slings to the replacement interrupter (the center of gravity is at approximately the center of the unit). Do not use the gas-pressure indicator for lifting. Then, carefully remove the interrupter from the shipping crate and place it on the ground. Retain the shipping crate.

STEP 11. Remove the cast-aluminum protective cover bolted to the coupling end of the replacement interrupter. Retain the protective cover for use on the replaced interrupter during shipment.

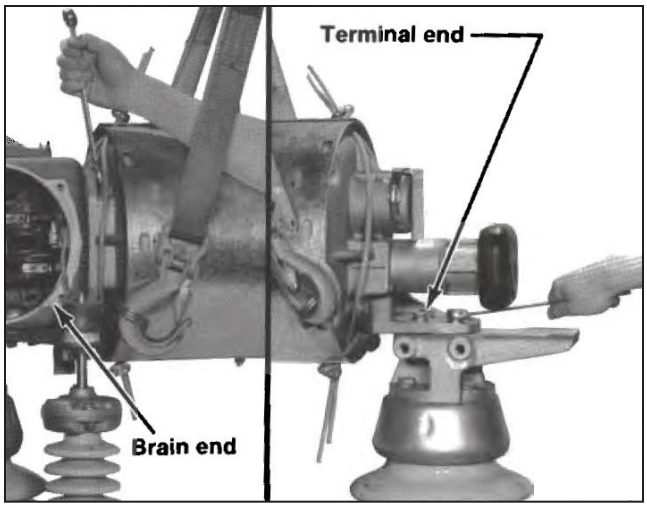


Figure 9. Unbolting the interrupter.

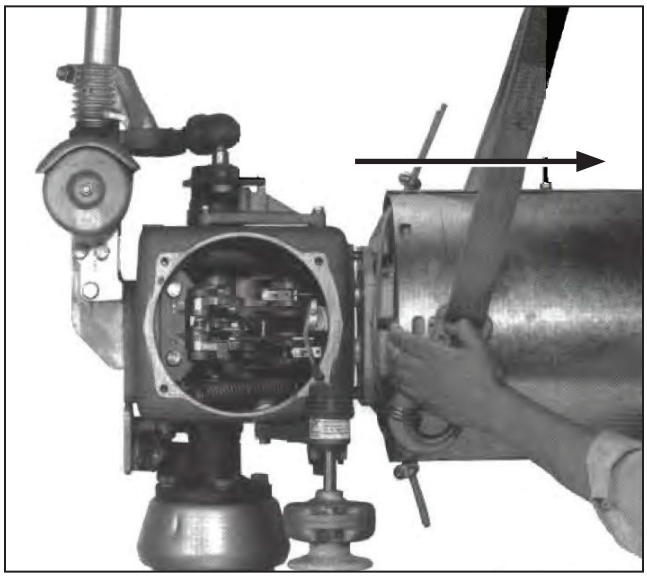


Figure 10. Separating the interrupter from the brain.

Installing the New Interrupter

To install the new interrupter, complete the following steps:

STEP 1. Hoist the replacement interrupter into position. Use extreme care to avoid damaging the exposed operating rods.

STEP 2. Apply Penetrox® A (available from Burndy Corporation) or other suitable aluminum connector compound to the brain and terminal mating surfaces and wire brush thoroughly.

STEP 3. Align the interrupter with the brain. This is the reverse of the procedure shown in Figure 10 on page 13. Carefully guide the operating-rod ends into the clevises of the actuating arms in the brain and, at the same time, guide the interrupter flange holes over the fastening studs in the brain.

Replace the ½ – 13-inch hex nuts and lockwashers. Thread the nuts on only far enough to secure the interrupter to the brain.

STEP 4. Align the mounting holes at the terminal connection and replace the ½ – 13 × 1½-inch hex-head cap screws, lockwashers, and flat washers (or toothed washers) but do not tighten the cap screws. Torque to final tightness the hex nuts at the brain connection. Snug the cap screws at the terminal connection but do not torque to final tightness.

STEP 5. Remove the holding-device positioning bolt used (in Step 4 on page 11) to secure the blade crank-arm to the crank-arm stop. Do not, however, close the circuit-switcher until after Step 10 on page 15.

STEP 6. Couple both operating rods to their respective actuating arms using the new coupling pins furnished. Swing the coupling-pin retainers over the ends of the coupling pins.

To facilitate insertion of the coupling pins, it may be necessary to partially close the circuit-switcher, by means of the manual operating handle of the S&C Type CS-1A Switch Operator or Manual Geared Operating Handle, just enough to "break" the overtoggle stance of the power-train linkage at the circuit-switcher base. Return the circuit-switcher to the fully **Open** position after the coupling pins have been inserted.

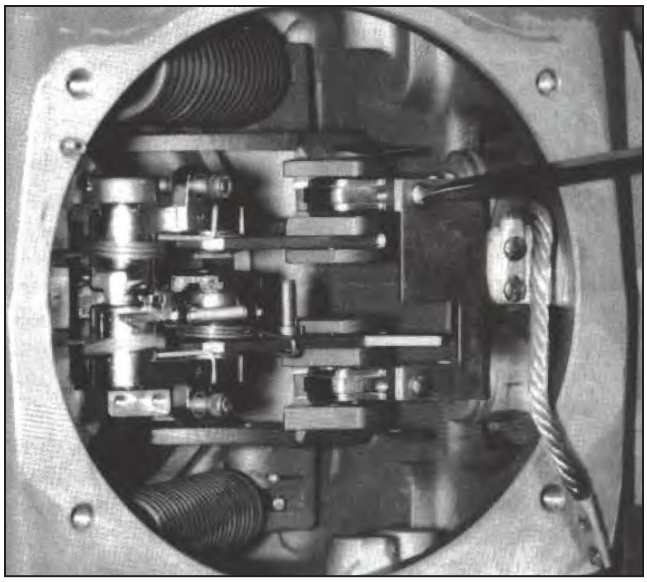


Figure 11. Removing the operating-rod retaining bracket from the new interrupter.

STEP 7. Remove the temporary operating-rod retaining bracket and keep it for use in Step 13 on page 17. See Figure 11 on page 14.

STEP 8. Disconnect the existing shunt-cable assembly by removing the two 10–32 slotted-head machine screws fastening it to the brain housing. See Figure 7 on page 11. Discard the shunt-cable assembly and the screws.

Connect one end of the new shunt-cable assembly to the interrupting-contact operating rod using the new self-locking 10–32 slotted-head machine screws furnished. Then, apply Penetrox A or other suitable aluminum connector compound to the other end of the new shunt-cable assembly and connect this end to the brain housing using the new self-locking 10–32 slotted-head machine screws furnished. The new cable must be routed in the same manner the existing cable was routed, as shown in Figure 7 on page 11.

Note: Two extra sets of self locking 10–32 slotted-head machine screws have been included. Replacement of the existing machine screws used to connect the shunt-cable assemblies in the two other pole-unit brains is highly recommended because of the improved long-term connection the self-locking machine screws provide.

STEP 9. Make sure all loose material is removed from inside the brain housing. Then, replace the brain cover. Use care to avoid damaging the O-ring. If a locating pin is present on the brain housing, use it as a guide for positioning the cover.

For circuit-switchers equipped with the S&C Shunt-Trip Device: The brain cover should be carefully placed to ensure the tongue-and-groove coupling of the shunt-trip insulated operating shaft properly engages while at the same time aligning the cover by means of the locating pin. Push the weather-sealing boot back to its original position.

Secure the brain cover using the four $\frac{3}{8}-16 \times 1\frac{1}{4}$-inch hex-head cap screws removed in Step 5 on page 11. If two of these are shoulder bolts, their correct positions are in the upper right and lower left holes.

For center-break style circuit-switchers: Do not replace the linkage cover at this time. This will be done in the next step.

STEP 10. Manually operate the circuit-switcher to the **Closed** position and then to the fully **Open and Positive-toggle** position of the drive-shaft assembly at the pole-unit base. The blade crank-arm at the top of the brain should now rest firmly against its open stop.

To achieve a **Positive-stop** position of the blade crank arm in the **Open** position, loosen the cap screws fastening the interrupter at the terminal end and, with the power train held securely to prevent the insulator stack(s) from rotating, move the interrupter sideways until the blade crank-arm stop is firmly against the blade crank-arm.

This is necessary to ensure positive latching of the stored-energy source within the brain.

Torque to final tightness the cap screws fastening the interrupter at the terminal end. For center-break style circuit-switchers, replace the linkage cover on the top of the brain.

Take this opportunity to check the alignment and engagement of the disconnect blades. If adjustment is required, follow the procedure as described in the instruction sheet originally furnished for the field assembly and erection of the particular circuit-switcher style applicable.

STEP 11. Remove the container from the replacement interrupter as follows:

(a) Remove and discard the ⅜– 16-inch zinc-plated serrated hex nuts running the length of the container.

(b) Remove and discard the ⅜ – 16 × ⅞-inch and two ⅜– 16 × 1-inch zinc-plated hex-head cap screws and flat washers attaching the upper container-half to the coupling end casting of the interrupter. Also remove and discard the ⅜ – 16 × ⅞-inch and two ⅜– 16 × 1-inch zinc-plated hex-head cap screws and flat washers attaching the upper container-half to the indicator end casting of the interrupter.

(c) Pry the container-halves apart with a screwed river. The upper container -half can now be removed and discarded-slotted holes are provided so a rope or lifting sling can be attached and the container-half more conveniently lowered to the ground.

(d) Now remove and discard the ⅜ – 16 × ⅞-inch hex-head cap screw and flat washer attaching the lower container-half to the coupling end casting of the interrupter, and the ⅜ – 16 × ⅞-inch hex-head cap screw and flat washer attaching the lower container-half to the indicator end casting of the interrupter. Then, discard this container-half.

(e) Finally, remove and discard the foam-core inner liner wrapped around the interrupter.

(f) Now remove the shield for the interrupter pressure relief device. Discard the shield and its hardware.

STEP 12. Replace the motor-circuit and shunt-trip circuit two pole pull-out fuseholders on Type CS Switch Operators. The circuit-switcher is now ready to be put into service.

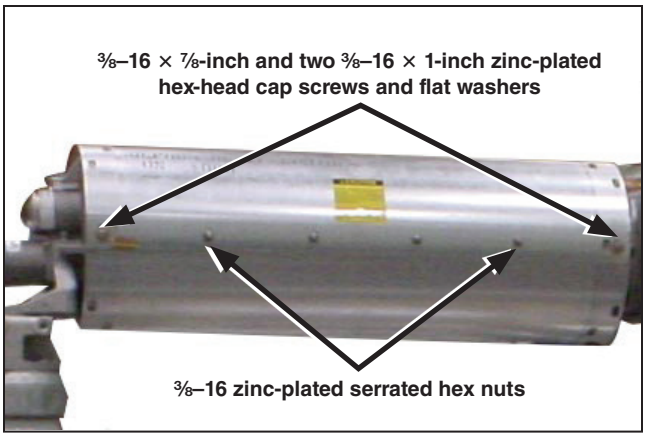


Figure 12. Removing the interrupter container.

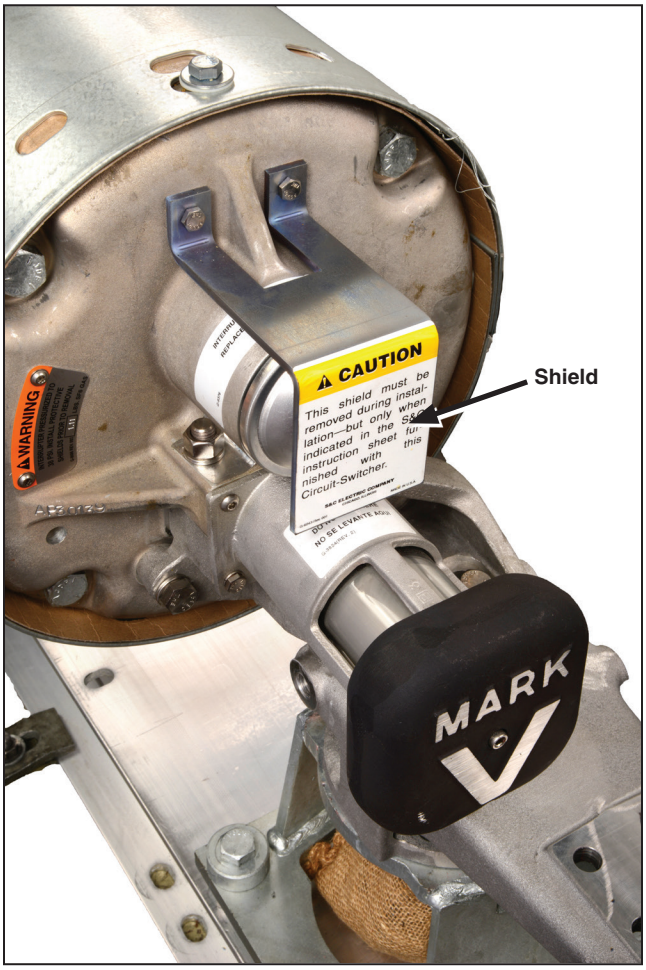


Figure 13. Remove the pressure relief shield.

STEP 13. Install the temporary operating-rod retaining bracket on the replaced interrupter. This is the reverse of the procedure shown in Figure 11 on page 14. Then, attach the cast aluminum protective cover to the coupling end of the replaced interrupter, to protect the operating rods.

STEP 14. Attach lifting slings to the four lifting rings on the replaced interrupter container. Do not loop slings from one end of the container to the other. Carefully lift the interrupter into the replacement interrupter shipping crate. Secure the interrupter and close the lid.

STEP 15. Contact your local S&C Sales Office for a serially numbered label to place on the shipping crate. The shipping address for returns is S&C Electric Company, 1800 Devon Avenue, Chicago, IL 60626. Please enclose a packing slip showing the purchase order or returned material authorization (RMA) number covering the exchange.