Interrupter Field Replacement

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★Can also be used for discontinued 2015 and 2025 models.

February 12, 2024

Qualified Persons

⚠ WARNING

Only qualified persons who are knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone who is 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 installing or operating the Series 2000 Circuit-Switcher. Become familiar with the Safety Information and Safety Precautions on pages 4 through 6. The latest version of this publication is available online in PDF format at **sandc.com/en/support/product-literature/**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the Series 2000 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 a specific application. The application must be within the ratings furnished for the equipment. Ratings for the Series 2000 Circuit-Switcher are listed in the ratings table in Specification Bulletin 716-31. The ratings are also on the nameplate affixed to the product.

Special Warranty Provisions

The standard warranty contained in the seller's standard conditions of sale, as set forth in Price Sheet 150, applies to Series 2000 Circuit-Switchers and associated options, except that the first paragraph of said warranty is replaced by the following:

(1) General: The seller warrants to the purchaser for a period of five years from the date of shipment that the equipment delivered will be of the kind and quality specified in the contract description and will be free of defects of workmanship and material. Should any failure to conform to this warranty appear under proper and normal use within five years after the date of shipment, the seller agrees, upon prompt notification thereof and confirmation that the equipment has been stored, installed, operated, inspected, and maintained in accordance with recommendations of the seller and standard industry practice, to correct the nonconformity either by repairing any damaged or defective parts of the equipment or (at the seller's option) by shipment of necessary replacement parts.

Replacement parts provided by the seller under the warranty for the original equipment will be covered by the original-equipment warranty for its duration. Replacement parts purchased separately will be covered by the warranty contained in the seller's standard conditions of sale, as set forth in Price Sheet 150.

Warranty Qualifications

Warranty of Series 2000 Circuit-Switchers is contingent upon both of the following:

- Installation and adjustment of Series 2000 Circuit-Switchers in accordance with S&C's applicable instruction sheets
- Conformance with the inspection recommendations defined in S&C Data Sheet 716-590

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the Series 2000 Circuit-Switcher. Become familiar with these types of messages and the importance of these various 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. Their telephone numbers are listed on S&C's website **sandc.com**, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE

Read this instruction sheet thoroughly and carefully before installing a Series 2000 Circuit-Switcher.

Location of Safety and Instruction Labels and Tags

Reorder Information for Safety Labels			
Location	**Safety Alert Message**	**Description**	**Number**
A	**⚠ WARNING**	Do not remove steel outer wrapper...	G-5993
B	**⚠ WARNING**	DO NOT LIFT SWITCH WITH THIS BRACKET...	G-5713

⚠ DANGER

Series 2000 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 company operating procedures and rules. Where a discrepancy exists, users should follow their company's operating procedures and rules.

1. **QUALIFIED PERSONS.** Access to substation switching equipment 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, fall protection, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS AND TAGS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels and tags. Remove tags ONLY if instructed to do so.
5. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded.
6. **CIRCUIT-SWITCHER POSITION.** Always confirm the circuit-switcher **Open/Close** position by visually observing the position of the switch position indicator located on the high-speed base. Switches may be energized from either side.
7. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.
8. **OPERATION.** Circuit making and breaking is involved in the normal operation of this interrupter switch. To operate, follow the operating procedure as outlined on page 23 in S&C Instruction Sheet 716-501 for Model 2010, on page 34 in S&C Instruction Sheet 716-504 for Model 2020, on page 27 of S&C Instruction Sheet 716-500 for Model 2030, and on page 26 in S&C Instruction Sheet 716-502 for Model 2040.

Packing

The Series 2000 Circuit-Switcher interrupter is a porcelain-enclosed, hermetically sealed device containing sulfur-hexafluoride (SF_6) gas under pressure (75 PSI). To guard against breakage and possible hazard to personnel, the Series 2000 Circuit-Switcher interrupter is shipped in a bolted-on container.

Replacement interrupters are shipped with this container in place. Do not remove the interrupter container until so directed in the following instructions. A separate interrupter container and associated hardware is shipped with the replacement interrupter for use during replacement.

⚠ WARNING

DO NOT disassemble or modify the interrupters. The interrupters are pressurized at 75 PSIG. **Serious personal injury can result.**

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, 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 the shipment condition 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 and/or damage.

Overview

The following instructions are for field replacement of interrupters for Series 2000 Circuit-Switchers rated 69 kV through 230 kV.

The Series 2000 Circuit-Switcher interrupter is a porcelain-enclosed, hermetically sealed device containing sulfur-hexafluoride (SF_6) gas under pressure. It uses an operating rod driven to the **Open** position at high speed by means of a power train connected to the Series 2000 Circuit-Switcher operator to effect circuit interruption. This operating rod is also driven to the **Closed** position at high speed to effect circuit-closing within the interrupter.

⚠ DANGER

Make sure the circuit-switcher is de-energized, isolated from all power sources, and grounded at all six terminals before starting. **Working on an energized circuit-switcher will result in severe personal injury or death.**

Note: For Models 2020 and 2030 Series 2000 Circuit-Switchers with vertical interrupters, proceed to page 10. For Models 2010 and 2040 Series 2000 Circuit-Switchers with horizontal interrupters, proceed to page 20.

Complete the following steps to replace the interrupters in Models 2020 and 2030 Series 2000 Circuit-Switchers:

STEP 1. After following the user's standard procedures for clearing and tagging equipment on which work is to be performed, close the circuit-switcher by pressing the CLOSE pushbutton on the operator.● Then, remove the trip-circuit and control-circuit fuse holders or–on newer operators—open the control-source disconnect switch and remove the motor-and-closing circuit fuse holder from the operator. Push the MANUAL TRIP lever counter-clockwise to trip the interrupters. Do not replace the fuse holder(s) until so directed.

⚠ DANGER

To avoid serious injury or death, do not open the disconnect on Model 2020 circuit-switchers by means of the manual charging handle. The Series 2000 Circuit-Switcher operator must remain discharged during the interrupter replacement procedure.

STEP 2. 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. Note that 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 1.

(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 1.

(c) Attach suitable lifting slings to the lifting rings at one end of the container-half assembly. See Figure 2. Raise the container into position around the interrupter.

● TRIP/CLOSE pushbuttons are not included on operators specified with catalog number suffix "-J." In such instances, momentarily jumper terminals 1 and 3 to close the circuit-switcher.

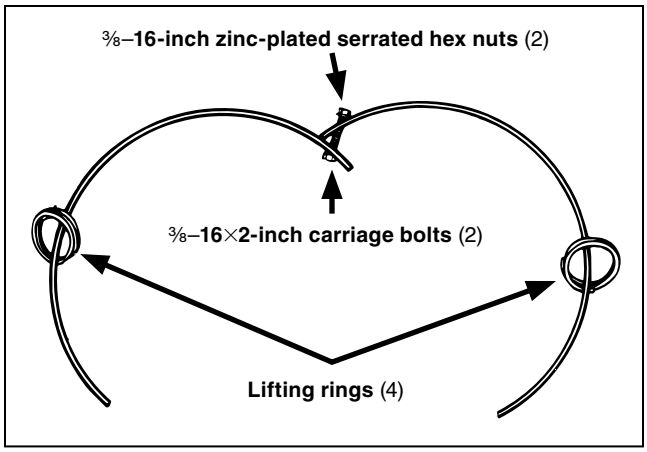


Figure 1. Assembling a spare interrupter container.

Figure 2. Raising a spare interrupter container into position on an interrupter being replaced. Model 2030 circuit-switcher illustrated; Model 2020 is similar.

(d) Using a screwdriver as necessary to spread the edges, snap the two halves together, as shown in Figure 3. Place a ⅜–16-inch zinc-plated serrated hex nut on each of the captive ⅜–16×2-inch carriage bolts that run the length of the container-halves.

(e) Attach the container-halves at the indicator end of the interrupter using one of the cables furnished. See Figure 3 (right). Thread the cable through the adjacent holes in the container-halves, as shown. Position the cable around the indicator end-casting, and then thread the cable through adjacent holes in the container-halves, on the other side. Do not attach clamps to the cable at this time.

(f) Attach the container-halves at the coupling end of the interrupter in a similar manner using the other cable furnished. See Figure 3 (left). Slide the container-halves back or forth as necessary to allow the cable to be threaded through the holes.

(g) Pull the cable taut at the indicator end of the interrupter and attach two of the clamps furnished. See Figure 3 (right). Securely tighten the clamp nuts.

(h) Pull the cable taut at the coupling end of the interrupter and attach the other two clamps furnished. See Figure 3 (left). Securely tighten the clamp nuts.

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

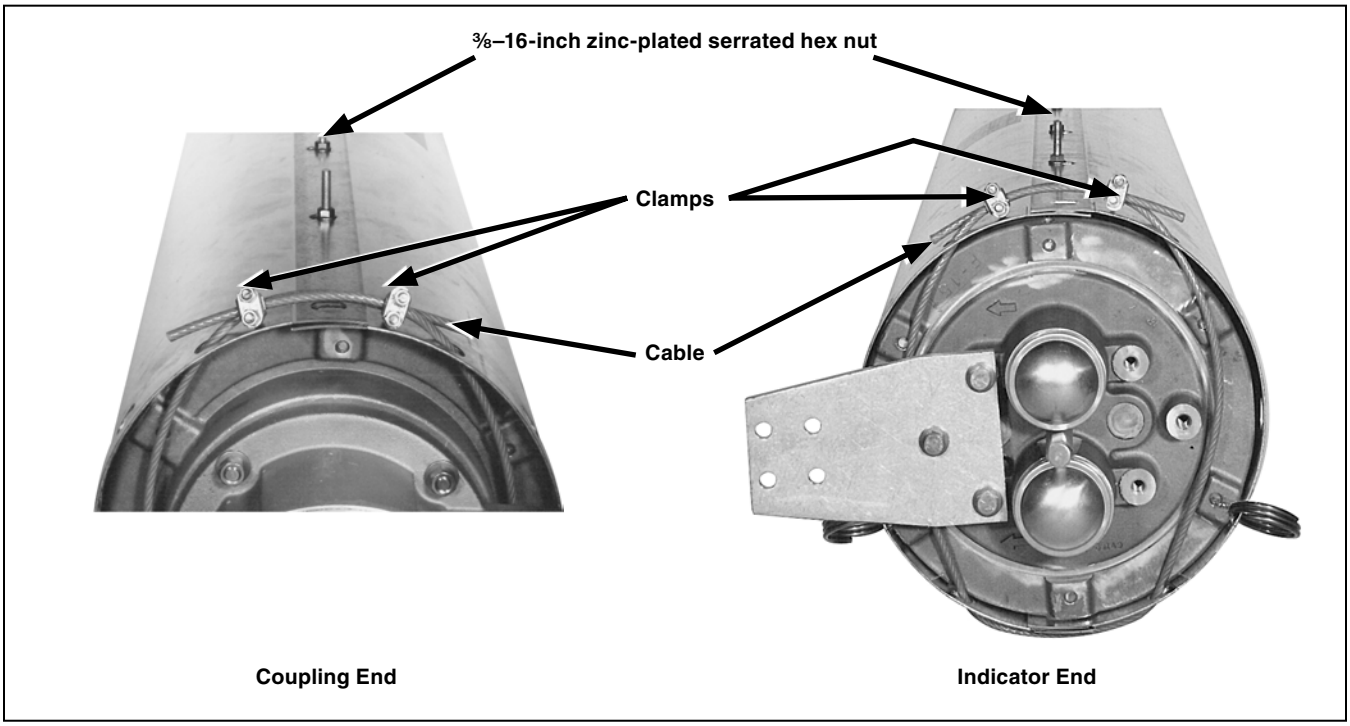


Figure 3. Attaching a spare interrupter container on an interrupter being replaced. A Model 2030 circuit-switcher is illustrated; Model 2020 is similar. The Models 2010 and 2040 interrupter is horizontal.

STEP 3. ***For Model 2020 circuit-switchers:*** Remove the high-voltage conductor from the upper terminal pad.

For Model 2030 circuit-switchers: Remove the high-voltage conductors from the upper and lower terminal pads.

Then, remove the three ½–13×1¼-inch hex-head stainless steel cap screws and Belleville washers used to attach the upper terminal pad to the interrupter. Retain the upper terminal pad for re-use in Step 12 on page 19. Now, attach the spare interrupter lifting bracket, furnished with the replacement interrupter (in a separate box), using the hardware just removed. See Figure 4. Securely tighten the cap screws.

STEP 4. Remove the four 5⁄16–18×¾-inch hex-head stainless steel cap screws used to attach the access cover to the side of the transition box on the insulating support column. See Figure 4. Remove the cover and place it and the hardware on a clean surface. They will be re-used in Step 11(f) on page 18.

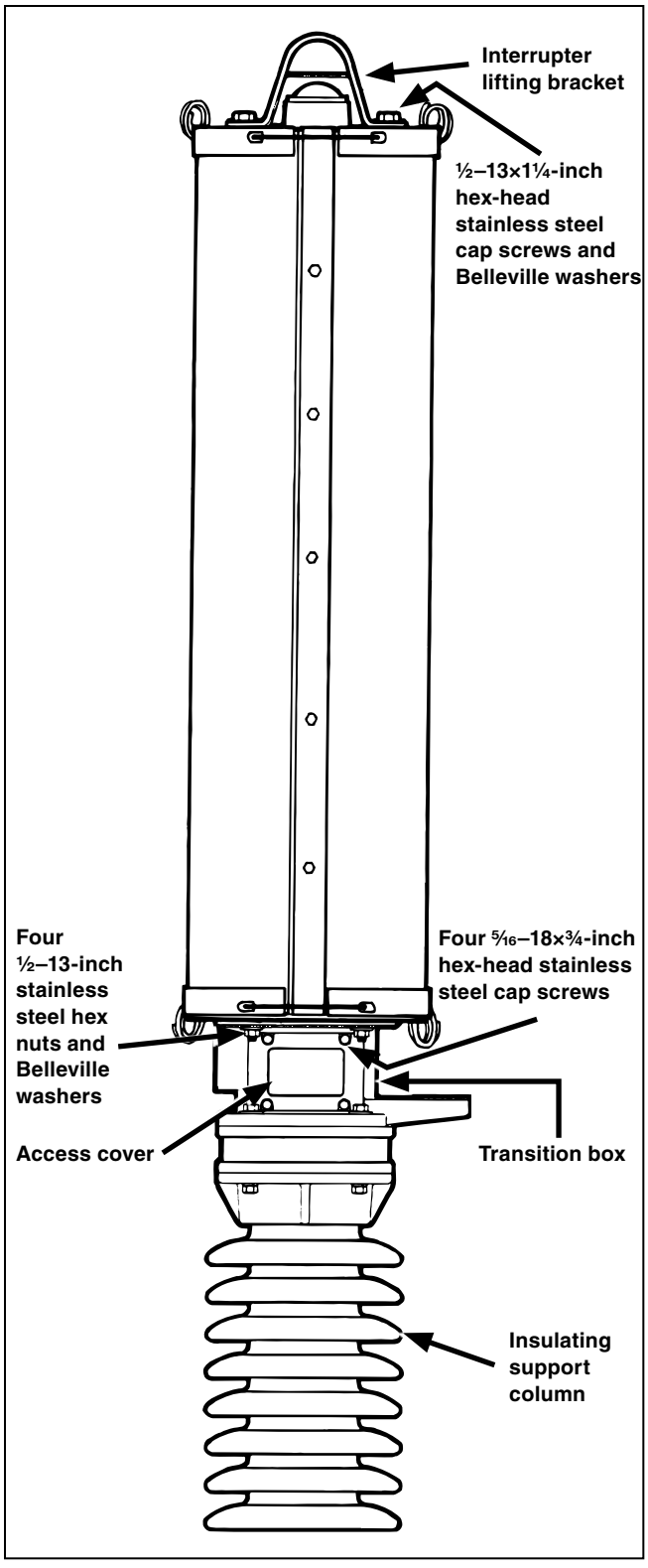


Figure 4. Removing the access cover from the transition box.

STEP 5. Prepare the interrupter for removal from the insulating support column as follows:

For circuit-switchers rated 69 kV through 138 kV: Refer to Figure 5 (top).

For circuit-switchers rated 161 kV and 230 kV: Refer to Figure 5 (bottom).

(a) Attach the spare stop bracket (marked with a black/yellow-striped label) and spacer (marked with a black/yellow-striped label) to the interrupter using the 5/16–18×2¼-inch hex-head stainless steel screw furnished. (These items are included with the replacement interrupter, in a separate box.) Hand-tighten the screw.

(b) Remove the pin retaining clip and connecting pin that attach the coupling to the operating rod link. Discard the connecting pin and pin retaining clip.

(c) Securely tighten the 5/16–18×2¼-inch hex-head stainless steel screw.

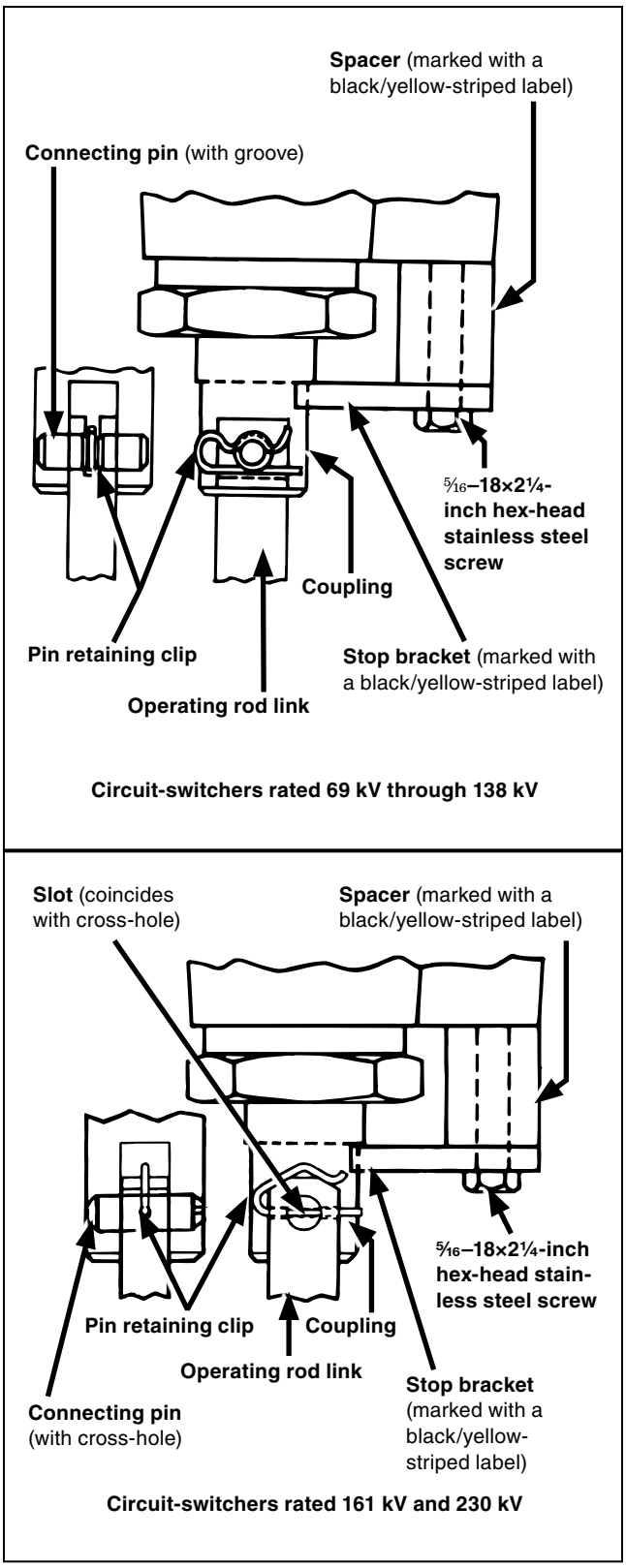


Figure 5. Disconnecting the interrupter from the operating rod link.

STEP 6. Attach a suitable lifting sling to the interrupter lifting bracket. Then, remove the four ½–13-inch stainless steel hex nuts and Belleville washers that attach the interrupter to the transition box on the insulating support column. See Figure 6. Retain this hardware for re-use in Step 11(c) on page 17.

⚠ WARNING

Lift the interrupter by the interrupter lifting bracket only. Do not lift the interrupter vertically by the container lifting rings. **Lifting the interrupter via any other means can cause damage to the interrupter or personal injury.**

STEP 7. Carefully lift the interrupter from atop the transition box of its associated insulating support column and lower it to the ground. Place the interrupter on the ground horizontally. Use care to avoid damaging the exposed coupling.

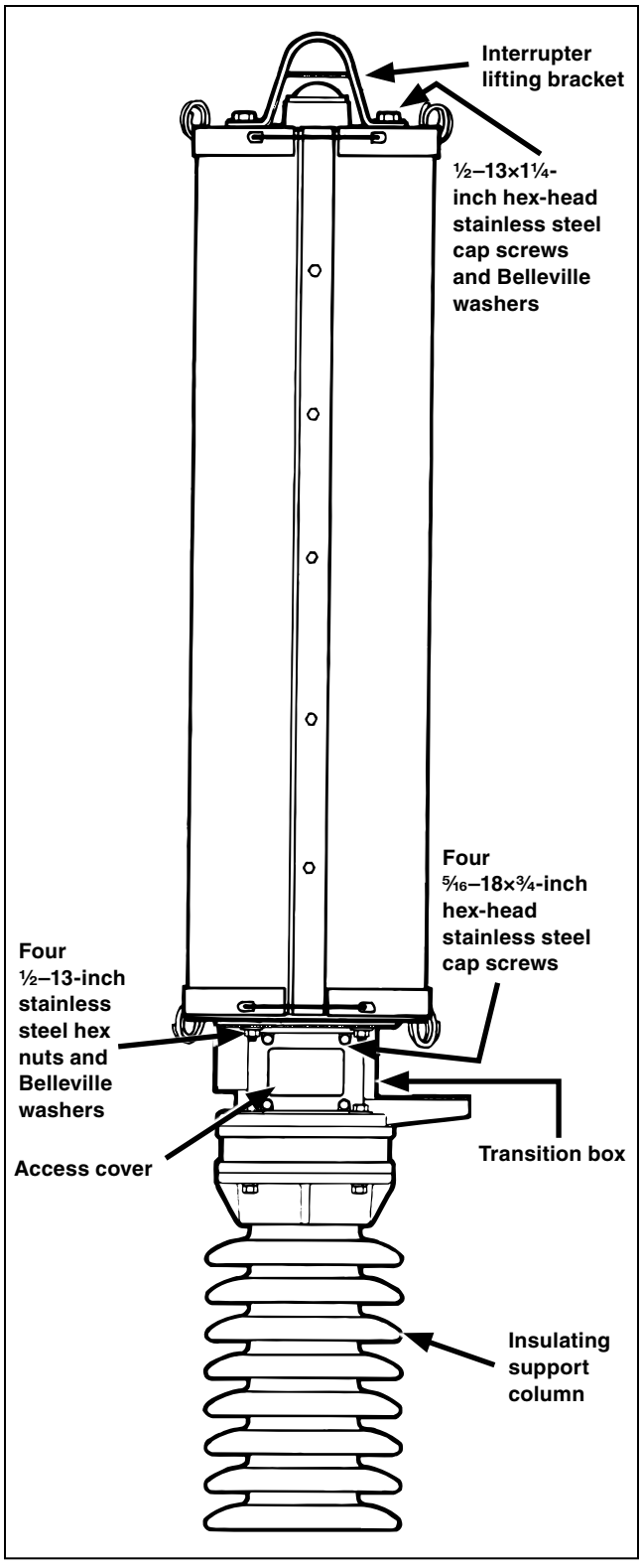


Figure 6. Removing access cover from transition box.

STEP 8. Open the replacement interrupter shipping crate. Attach two suitable lifting slings to the replacement interrupter (the center of gravity is at approximately the center of the unit). See Figure 7. Then, carefully remove the interrupter from the shipping crate and place it on the ground. Retain the shipping crate.

⚠ WARNING

Handling the pressurized interrupter without the container may cause damage to the porcelain and personal injury.

STEP 9. Attach a lifting sling to the lifting bracket on the replacement interrupter. Then, carefully lift the interrupter somewhat higher than the top of the transition box on the insulating support column. Use care to avoid damaging the exposed coupling.

Figure 7. Removing the replacement interrupter from the from shipping crate.

STEP 10. Prepare the replacement interrupter for attachment to the insulating support column as follows:

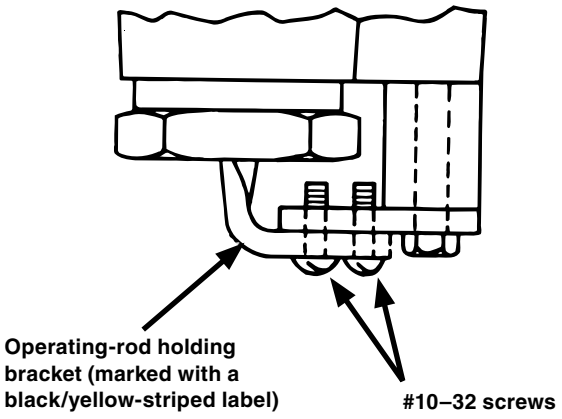
(a) Remove and discard the two #10–32 screws that connect the operating-rod holding bracket (marked with a black/yellow-striped label) for shipment. See Figure 8 (top).

⚠ CAUTION

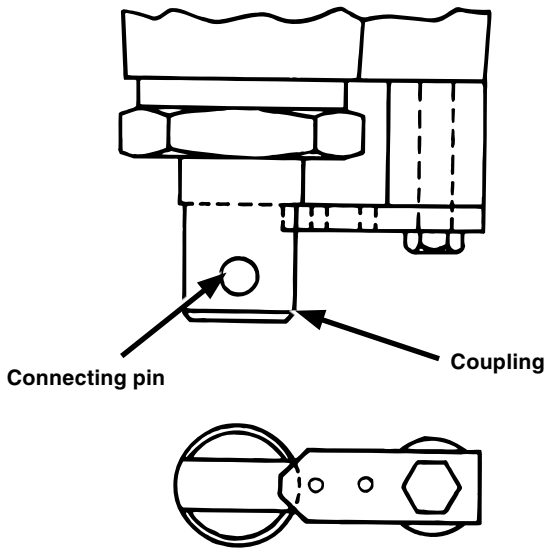
The operating rod is under pressure; when the two screws are removed, the holding bracket may move about ½-inch (13 mm). **To avoid minor injury from rapid parts movement, keep fingers clear of the operating rod.**

(b) Pull the holding bracket to move the operating rod to its fully **Open** position. See Figure 8 (bottom).

(c) Remove the connecting pin and pin retaining clip used to attach the holding bracket to the coupling. Retain the connecting pin and pin retaining clip for re-use in Step 11(d) on page 17, but discard the holding bracket.



Operating rod in the Shipping position



Operating rod in the fully Open position

Figure 8. Preparing a replacement interrupter for attachment to an insulating support column.

STEP 11. For interrupters with the **Remote Gas-Density Monitor** option, see the "Installing the Transmitter" section on page 29.

Attach the replacement interrupter to the insulating support column as follows. See Figure 9.

(a) Thoroughly wire-brush the top of the transition box and the mating surface on the interrupter, and immediately apply a liberal coating of Penetrox® A (available from Burndy Corporation) or other suitable aluminum connector compound to the brushed surfaces.

(b) Make sure the positioning mark on the bottom of the interrupter is aligned with the positioning mark on the top of the transition box. Then, carefully lower the interrupter on top of the transition box.

Note: One of the ½–13-inch stainless steel studs on the interrupter is longer than the other three to aid in assembly.

(c) Reattach a ½-inch Belleville washer and a ½–13-inch stainless steel hex nut, as retained from Step 6 on page 14, to each of the four studs. Tighten each nut securely.

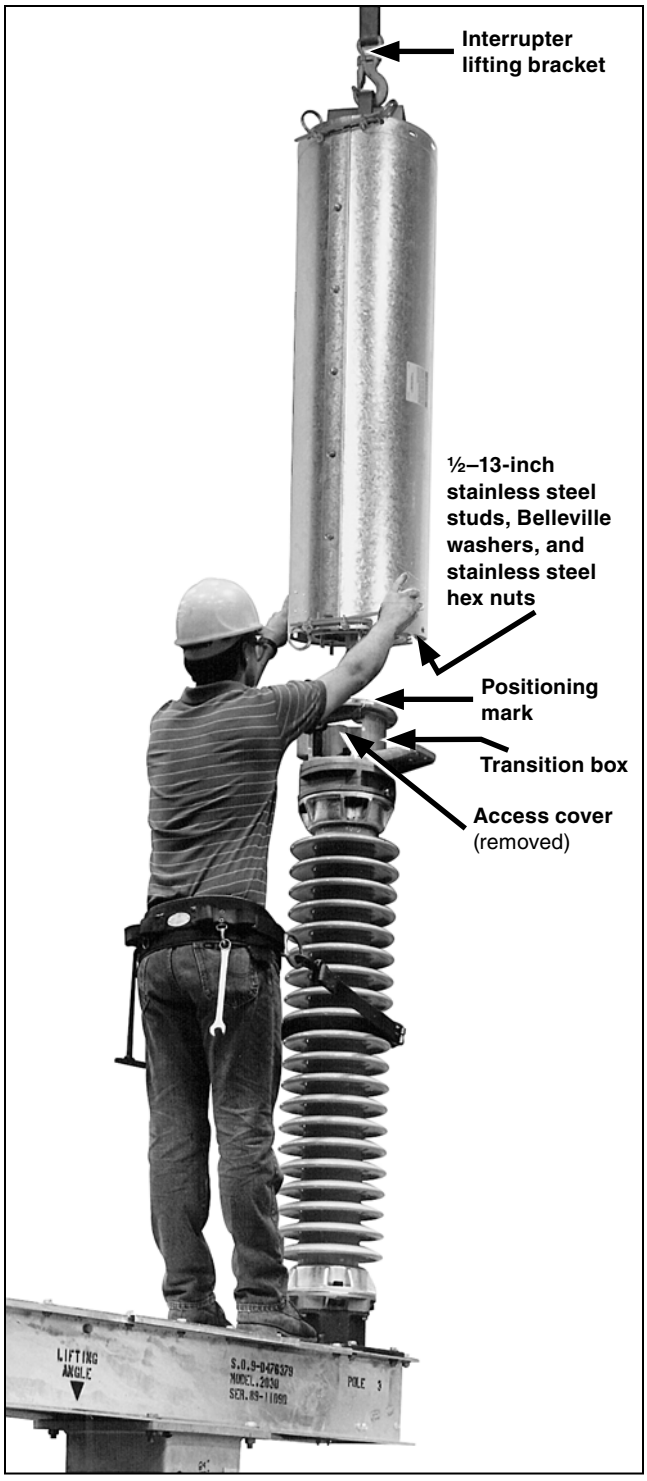


Figure 9. Attaching a replacement interrupter to an insulating support column. Model 2030 illustrated; Model 2020 is similar.

(d) ***For circuit-switchers rated 69 kV through 138 kV:*** Insert the connecting pin retained from Step 10(c) into the coupling and operating rod link. See Figure 10 (top). It will be necessary to loosen the 5⁄16–18×2¼-inch hex-head stainless steel screw indicated in Figure 10 (top) and withdraw it approximately ⅛-inch (3 mm) so the connecting pin can be inserted. Do not remove the screw at this time. Now, insert the pin retaining clip retained from Step 10(c) as indicated in Figure 10 (top). Make sure that the clip is positioned as shown.

For circuit-switchers rated 161 kV and 230 kV: Insert the connecting pin retained from Step 10(c) into the coupling and operating rod link. See Figure 10 (bottom). It will be necessary to loosen the 5⁄16–18×2¼-inch hex-head stainless steel screw indicated in Figure 10 (bottom) and withdraw it approximately ⅛-inch (3 mm), so that the connecting pin can be inserted.

Do not remove the screw at this time. Use a screwdriver blade in the slot at the end of the connecting pin to align the cross-hole in the connecting pin with the cross-hole in the operating rod link. Now, insert the pin retaining clip retained from Step 10(c) as indicated in Figure 10 (bottom). Make sure the clip is positioned as shown.

(e) Remove and discard the 5⁄16–18×2¼-inch hex-head stainless steel screw, stop bracket (marked with a black/yellow-striped label), and spacer (marked with a black/yellow-striped label) illustrated in Figure 10.

(f) Replace the access cover retained from Step 4 and securely tighten the associated 5⁄16–8×¾-inch hex-head stainless steel cap screws.

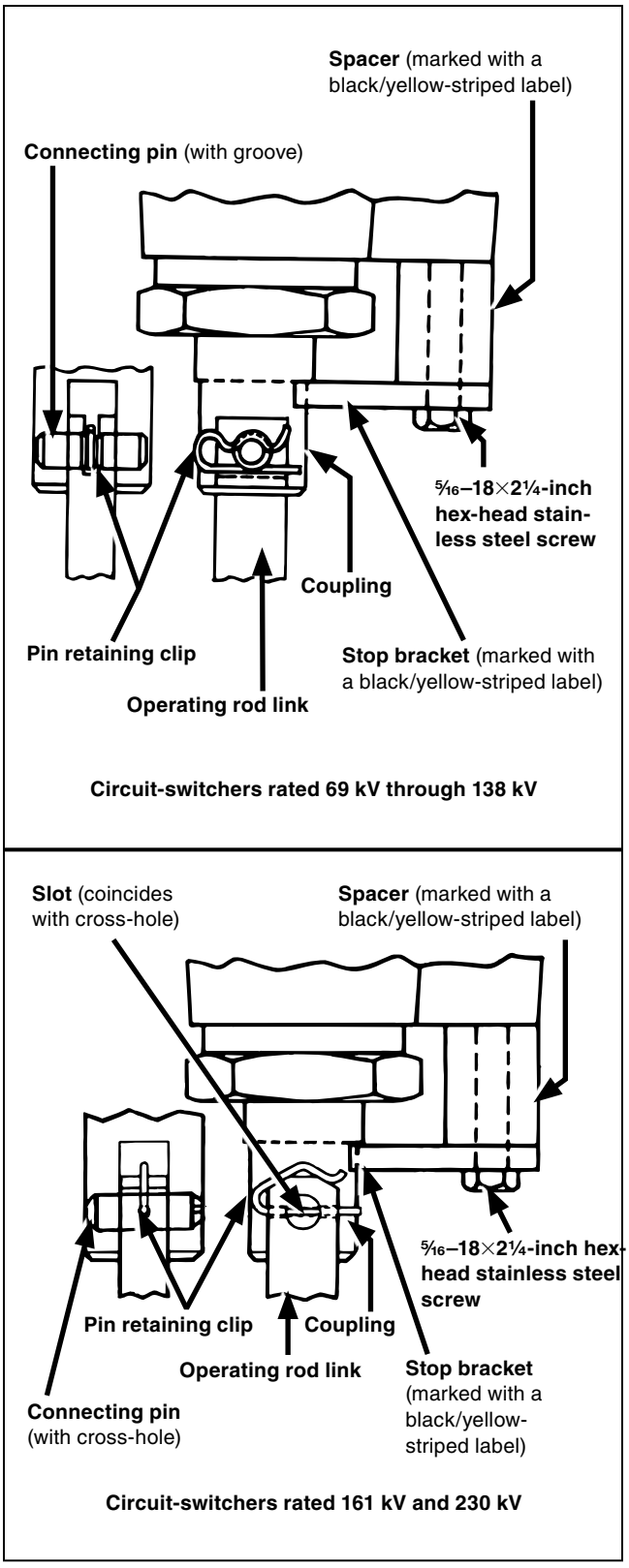


Figure 10. Disconnecting the interrupter from the operating rod link.

STEP 12. Remove the interrupter lifting bracket and associated ½-inch stainless steel hardware from atop the interrupter. Discard the lifting bracket but retain the hardware. Thoroughly wire-brush the indicator end-casting where the terminal pad is to be attached, as well as the mating surface on the upper terminal pad, and immediately apply a liberal coating of Penetrox A or other suitable aluminum connector compound to the brushed surfaces. Then, attach the upper terminal pad using three ½–13×1¼-inch hex-head stainless steel cap screws and Belleville washers. Reconnect the high-voltage conductor(s).

STEP 13. Remove the container from the replacement interrupter as follows:

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

(b) Remove and discard the two ⅜–16×1-inch and two ⅜–16×⅞-inch zinc-plated hex-head cap screws and flat washers that attach the two container-halves to the coupling end-casting of the interrupter.

(c) Remove and discard the two ⅜–16×1-inch and one ⅜–16×⅞-inch zinc-plated hex-head cap screws and flat washers that attach one of the container-halves to the indicator end-casting of the interrupter. Don't remove the remaining ⅜–16×⅞-inch cap screw—it's needed to temporarily retain the other container-half.

(d) Pry the container-halves apart with a screwdriver. One of the container-halves 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.

(e) Remove and discard the remaining ⅜–16×⅞-inch hex-head cap screw and flat washer that attach the other container-half. Then, discard this container-half.

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

STEP 14. Replace the trip-circuit and control-circuit fuse holders in the operator or, on newer operators, close the control-source disconnect switch and replace the motor-and-closing circuit fuse holder.

STEP 15. 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 16. Ship the replaced interrupter, transportation charges prepaid, to S&C Electric Company, Repair Center. For product returns, please contact the local S&C representative for proper return material authorization documentation.

Complete the following steps to replace the interrupters in Model 2010 and 2040 Series 2000 Circuit-Switchers:

STEP 1. After following the user's standard procedures for clearing and tagging equipment on which work is to be performed, close the circuit-switcher by pressing the CLOSE pushbutton on the operator.● Then, remove the trip-circuit and control-circuit fuse holders or—on newer operators—open the control-source disconnect switch and remove the motor-and-closing circuit fuse holder from the operator. Push the MANUAL TRIP lever counterclockwise to trip the interrupters. Do not replace the fuse holder(s) until so directed.

⚠ DANGER

To avoid severe personal injury or death, do not open the disconnect on Model 2010 circuit-switchers using the manual charging handle. The Series 2000 Circuit-Switcher Operator must remain discharged during the interrupter replacement procedure.

STEP 2. 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. Note that 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 11.

(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 11.

(c) Attach suitable lifting slings to the four lifting rings at the ends of the container-half assembly. See Figure 12. Do not loop slings from one end of the container to the other. Raise the container into position around the interrupter.

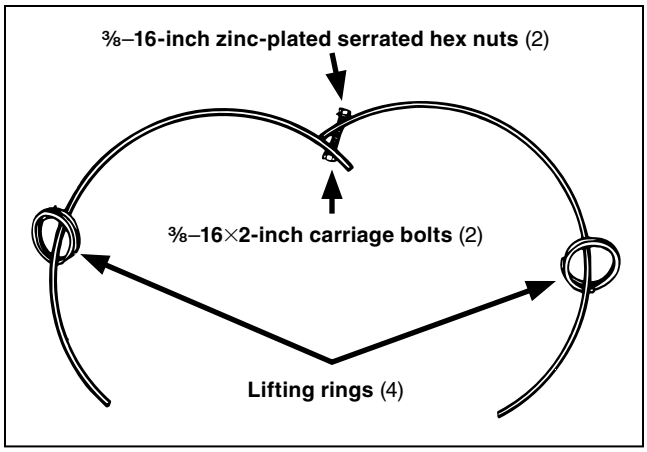


Figure 11. Assembling a spare interrupter container.

Figure 12. Raising a spare interrupter container into position on an interrupter being replaced. Model 2010 circuit-switcher illustrated; Model 2040 is similar.

● TRIP-CLOSE pushbuttons are not included on operators specified with catalog number suffix "-J." In such instances, momentarily jumper terminals 1 and 3 to close the circuit-switcher.

(d) Using a screwdriver as necessary to spread the edges, snap the two halves together as shown in Figure 13. Place a ⅜–16-inch zinc-plated serrated hex nut on each of the captive ⅜–16×2-inch carriage bolts that run the length of the container-halves.

(e) Attach the container-halves at the indicator end of the interrupter using one of the cables furnished. See Figure 13 (right). Thread the cable through adjacent holes in the container-halves, as shown. Position the cable around the indicator end-casting, and then thread the cable through adjacent holes in the container-halves on the other side. Do not attach clamps to the cable at this time.

(f) Attach the container-halves at the coupling end of the interrupter in a similar manner, using the other cable furnished. See Figure 13 (left). Slide the container-halves back or forth as necessary to allow the cable to be threaded through the holes.

(g) Pull the cable taut at the indicator end of the interrupter and attach two of the clamps furnished. See Figure 13 (right). Securely tighten the clamp nuts.

(h) Pull the cable taut at the coupling end of the interrupter and attach the other two clamps furnished. See Figure 13 (left). Securely tighten the clamp nuts.

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

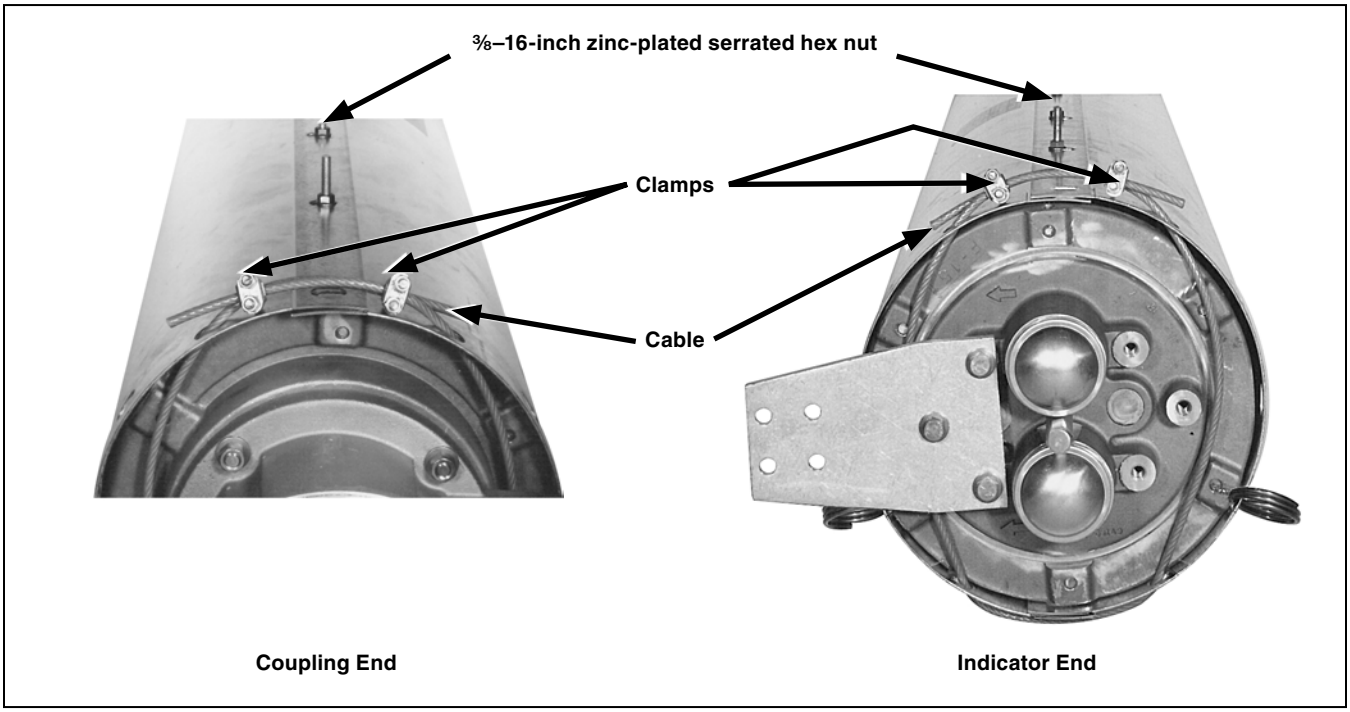


Figure 13. Attaching a spare interrupter container on an interrupter being replaced. The Model 2030 circuit-switcher illustrated; the Model 2020 is similar. The Models 2010 and 2040 interrupter is horizontal.

STEP 3. Remove the high-voltage conductor from the interrupter-end terminal pad and, on Model 2040 only, from the transition box-end terminal pad. Then, attach one of the shields for the interrupter pressure-relief device and LOW GAS PRESSURE indicator, furnished with the replacement interrupter (in a separate box), using two ½–13×1¼-inch hex-head stainless steel cap screws furnished. See Figure 14.

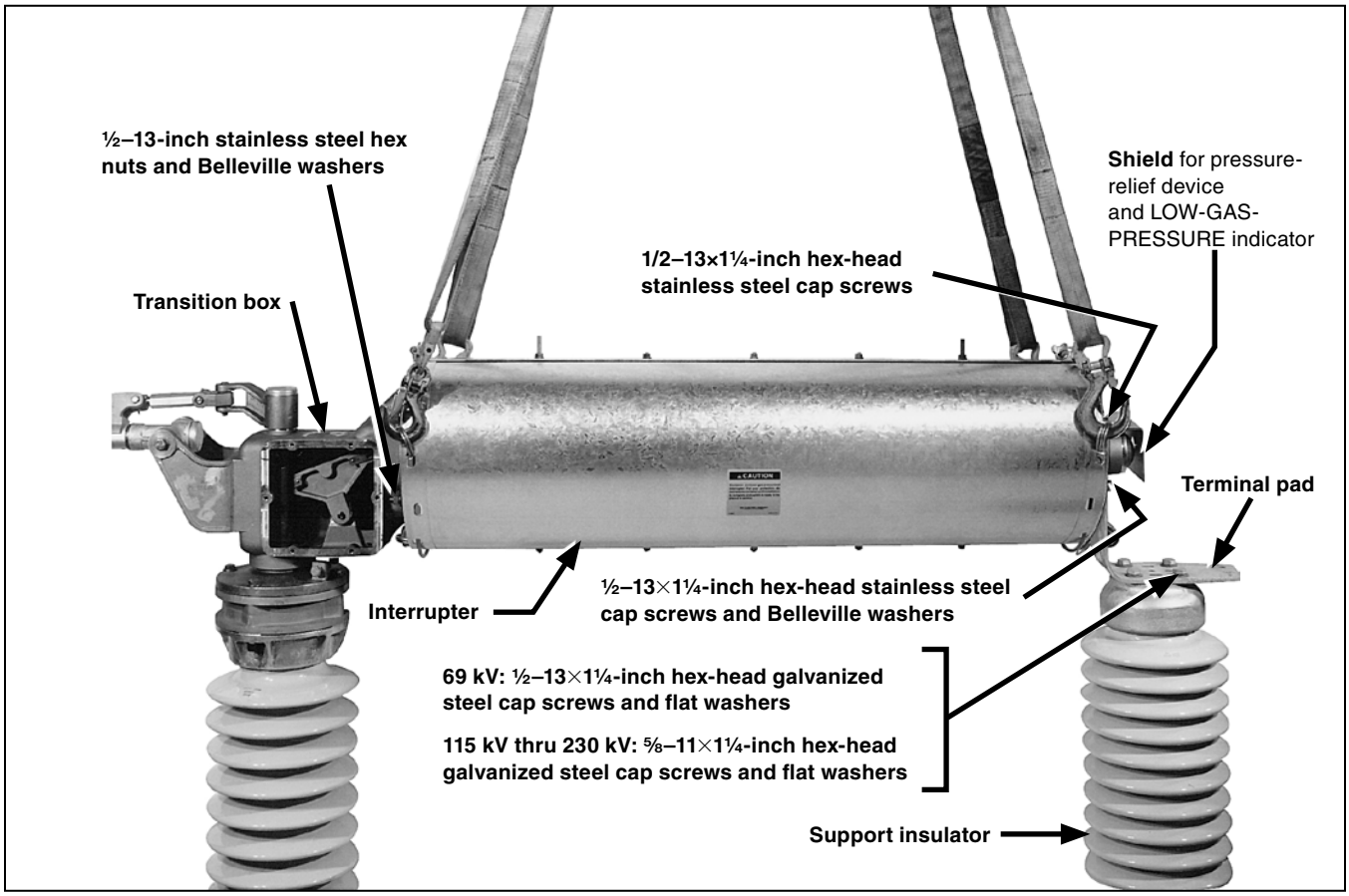


Figure 14. Removing an interrupter from a Model 2010 Series 2000 Circuit-Switcher. The Model 2040 is similar.

STEP 4. Remove the six 5/16–18×3/4-inch hex-head stainless steel cap screws used to attach the access cover to the side of the transition box on the insulating support column. See Figure 15. Remove the cover and place it and the hardware on a clean surface. They will be re-used in Step 15 on page 27.

STEP 5. Prepare the interrupter for removal as follows. See Figure 15.

(a) Attach the spare stop bracket (marked with a black/yellow-striped label) and spacer (marked with a black/yellow-striped label) to the interrupter using the 5/16–18×2 1/4-inch hex-head stainless steel screw furnished. (These items are included with the replacement interrupter, in a separate box.) Hand-tighten the screw.

(b) Remove the pin retaining clip and connecting pin that attach the coupling to the operating rod link. Discard the connecting pin and pin retaining clip.

(c) Securely tighten the 5/16–18×2 1/4-inch hex-head stainless steel screw.

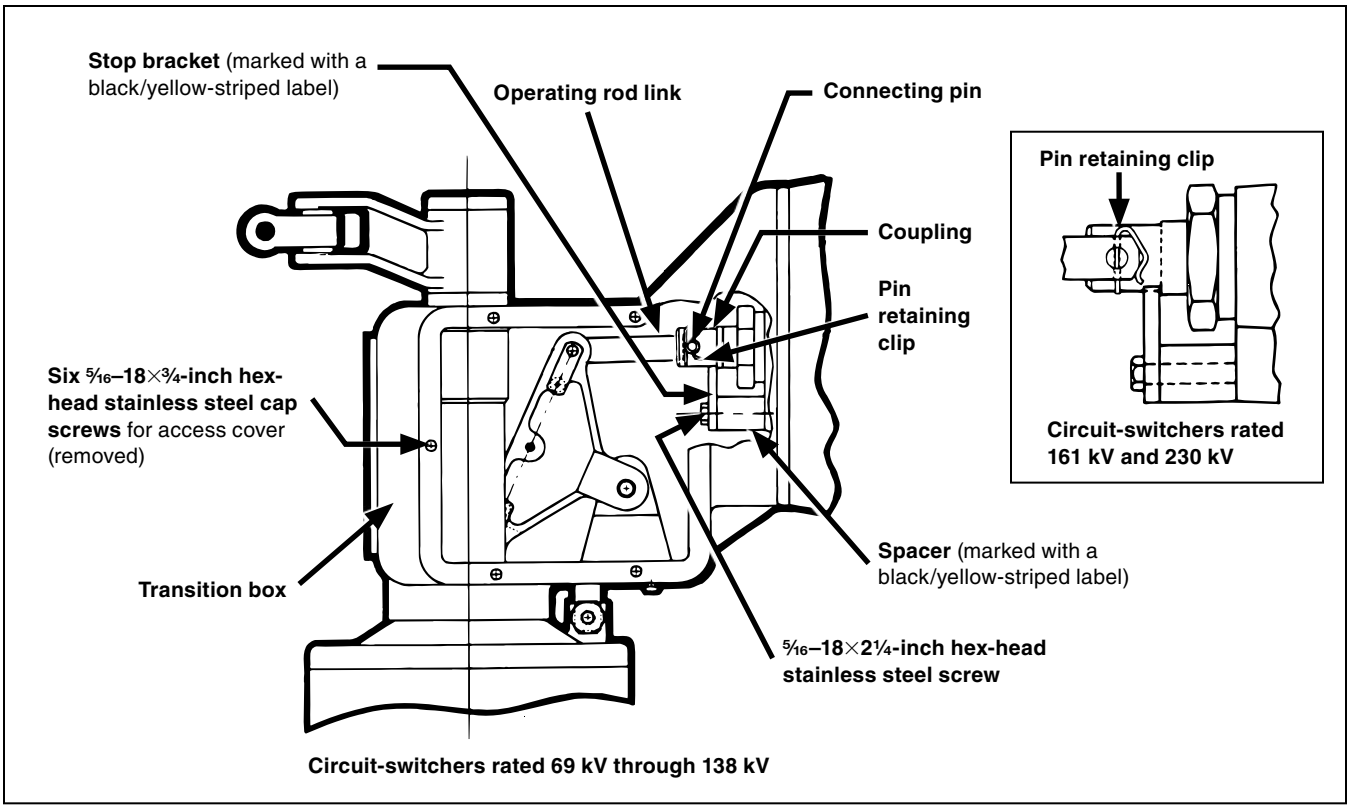


Figure 15. The transition box on a Model 2010 Series 2000 Circuit-Switcher rated 69 kV through 138 kV. The Model 2040 is similar. Inset illustrates a pin retaining clip used on circuit-switchers rated 161 kV and 230 kV.

STEP 6. Remove the four ½–13-inch stainless steel hex nuts and Belleville washers that attach the interrupter to the transition box. Also remove the four ½–13×1¼-inch hex-head galvanized steel cap screws and flat washers (for circuit-switchers rated 69 kV) or the four ⅝–11×1¼-inch hex-head galvanized steel cap screws and flat washers (for circuit-switchers rated 115 kV through 230 kV) used to attach the terminal pad to the support insulator. See Figure 16. Retain the hardware for re-use in Step 13 on page 26.

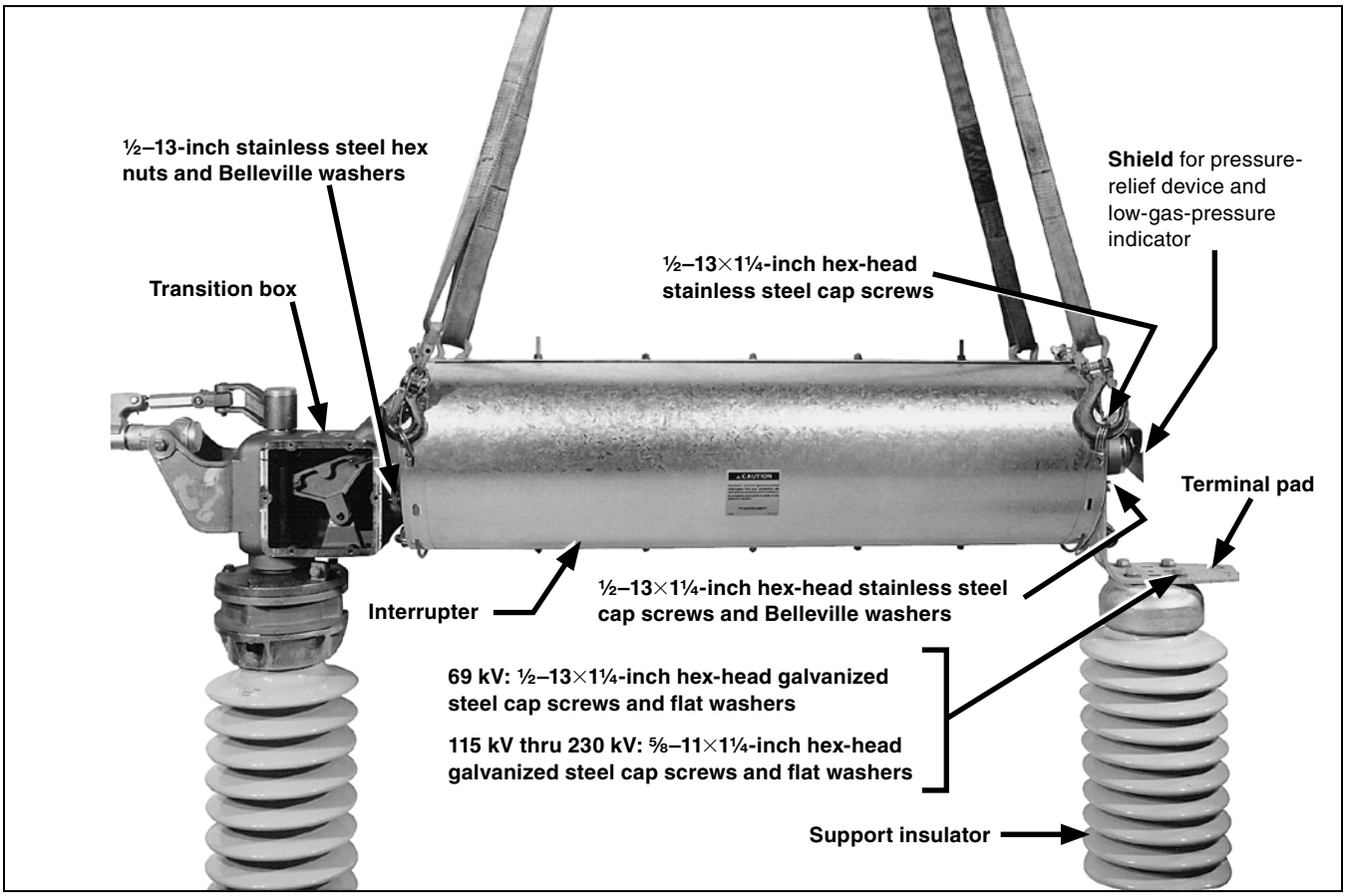


Figure 16. Removing an interrupter from a Model 2010 Series 2000 circuit-switcher. The Model 2040 is similar.

STEP 7. With a moderate strain on the lifting slings, carefully slide the interrupter away from the transition box and lower it to the ground. Use care to avoid damaging the exposed operating rod.

STEP 8. Remove the three ½–13×1¼-inch hex-head stainless steel cap screws and Belleville washers used to attach the terminal pad to the interrupter. Retain the terminal pad and hardware for re-use in Step 11.

STEP 9. Open the replacement interrupter shipping crate. Attach two suitable lifting slings to the replacement interrupter (the center of gravity is at approximately the center of the unit). See Figure 17. Then, carefully remove the interrupter from the shipping crate and place it on the ground. Retain the shipping crate.

⚠ WARNING

The interrupters are pressurized at 75 PSIG. Handling the pressurized interrupter without the container can cause damage to the porcelain and personal injury.

STEP 10. Remove the interrupter lifting bracket and associated ½-inch stainless steel hardware from the end of the replacement interrupter. (This bracket is not used in the interrupter replacement procedure for Model 2010 or Model 2040 circuit-switchers.) Attach the remaining shield for the interrupter pressure-relief device and LOW GAS PRESSURE indicator to the replacement interrupter using two of the ½–13×1¼-inch hex-head stainless steel cap screws that were just removed. Discard the remaining screws.

STEP 11. Thoroughly wire-brush the indicator end-casting of the replacement interrupter where the terminal pad is to be attached, as well as the mating surface on the terminal pad, and immediately apply a liberal coating of Penetrox A or other suitable aluminum connector compound to the brushed surfaces. Then, loosely attach the terminal pad to the replacement interrupter using the three ½–13×1¼-inch hex-head stainless steel cap screws and Belleville washers retained from Step 8.

Figure 17. Removing a replacement interrupter from the shipping crate.

STEP 12. Remove and discard the two #10–32 screws that connect the operating-rod holding bracket (marked with a black/yellow-striped label) for shipment. See Figure 18 (top).

> **⚠ CAUTION**
>
> The operating rod is under pressure; when the two screws are removed, the holding bracket may move about ½-inch (3 mm). **To avoid minor injury from rapid parts movement, keep fingers clear of the operating rod.**

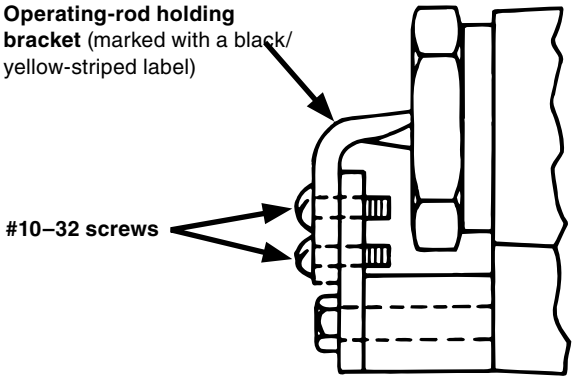
Pull the holding bracket to move the operating rod to its fully **Open** position. See Figure 18 (bottom). Then, remove the connecting pin and pin retaining clip used to attach the holding bracket to the coupling. Retain the connecting pin and pin retaining clip for re-use in Step 14 on page 27, but discard the holding bracket.

STEP 13. Attach two suitable lifting slings to the replacement interrupter and carefully lift and slide the interrupter into position. Use care to avoid damaging the exposed operating rod.

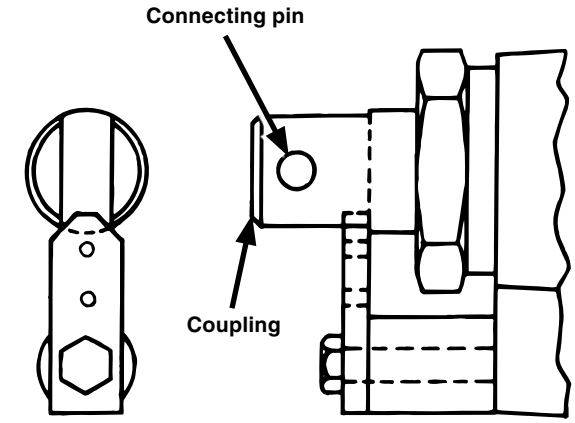
Thoroughly wire-brush the mating surfaces on the transition box and replacement interrupter, and immediately apply a liberal coating of Penetrox A or other suitable aluminum connector compound to the brushed surfaces.

Now, attach the replacement interrupter to the transition box using the four ½–13-inch stainless steel hex nuts and Belleville washers retained from Step 6 on page 24. Then, attach the terminal pad to the support insulator using the four ½–13×1¼-inch hex-head galvanized steel cap screws and flat washers (for circuit-switchers rated 69 kV) or the four ⅝–11×1¼-inch hex-head galvanized steel cap screws and flat washers (for circuit-switchers rated 115 kV through 230 kV) retained from Step 6.

Securely tighten all the hardware, including the cap screws used to attach the terminal pad to the replacement interrupter.



Operating rod in the Shipping position



Operating rod in the fully Open position

Figure 18. Preparing a replacement interrupter for attachment to a transition box.

STEP 14. ***For interrupters with the Remote Gas-Density Monitor option***: See the "Installing the Transmitter" section on page 29.

For circuit-switchers rated 69 kV through 138 kV: Insert the connecting pin retained from Step 12 on page 26 into the coupling and operating rod link. See Figure 19 (top). It will be necessary to loosen the 5⁄16–18×2¼-inch hex-head stainless steel screw indicated in Figure 19 (top) and withdraw it approximately ⅛ -inch (3 mm) so the connecting pin can be inserted. Do not remove the screw at this time. Now, insert the pin retaining clip retained from Step 12 as indicated in Figure 19 (top). Make sure the clip is positioned as shown. Finally, remove and discard the 5⁄16–18×2¼-inch hex-head stainless steel screw, stop bracket (marked with a black/yellow-striped label), and spacer (marked with a black/yellow-striped label) illustrated in Figure 19 (top).

For circuit-switchers rated 161 kV and 230 kV: Insert the connecting pin retained from Step 12 on page 26 into the coupling and operating rod link. See Figure 19 (bottom). It will be necessary to loosen the 5⁄16–18×2¼-inch hex-head stainless steel screw indicated in Figure 19 (bottom) and withdraw it approximately ⅛-inch (3 mm), so the connecting pin can be inserted. Do not remove the screw at this time. Use a screwdriver blade in the slot at the end of the connecting pin to align the cross-hole in the connecting pin with the cross-hole in the operating rod link.

Now, insert the pin retaining clip retained from Step 12 as indicated in Figure 19 (bottom). Make sure the clip is positioned as shown. Finally, remove and discard the 5⁄16–18×2¼-inch hex-head stainless steel screw, stop bracket (marked with a black/yellow-striped label), and spacer (marked with a black/yellow striped label) illustrated in Figure 19 (bottom).

STEP 15. Replace the access cover retained from Step 4 on page 23 and securely tighten the associated 5⁄16–8×¾-inch hex-head stainless steel cap screws.

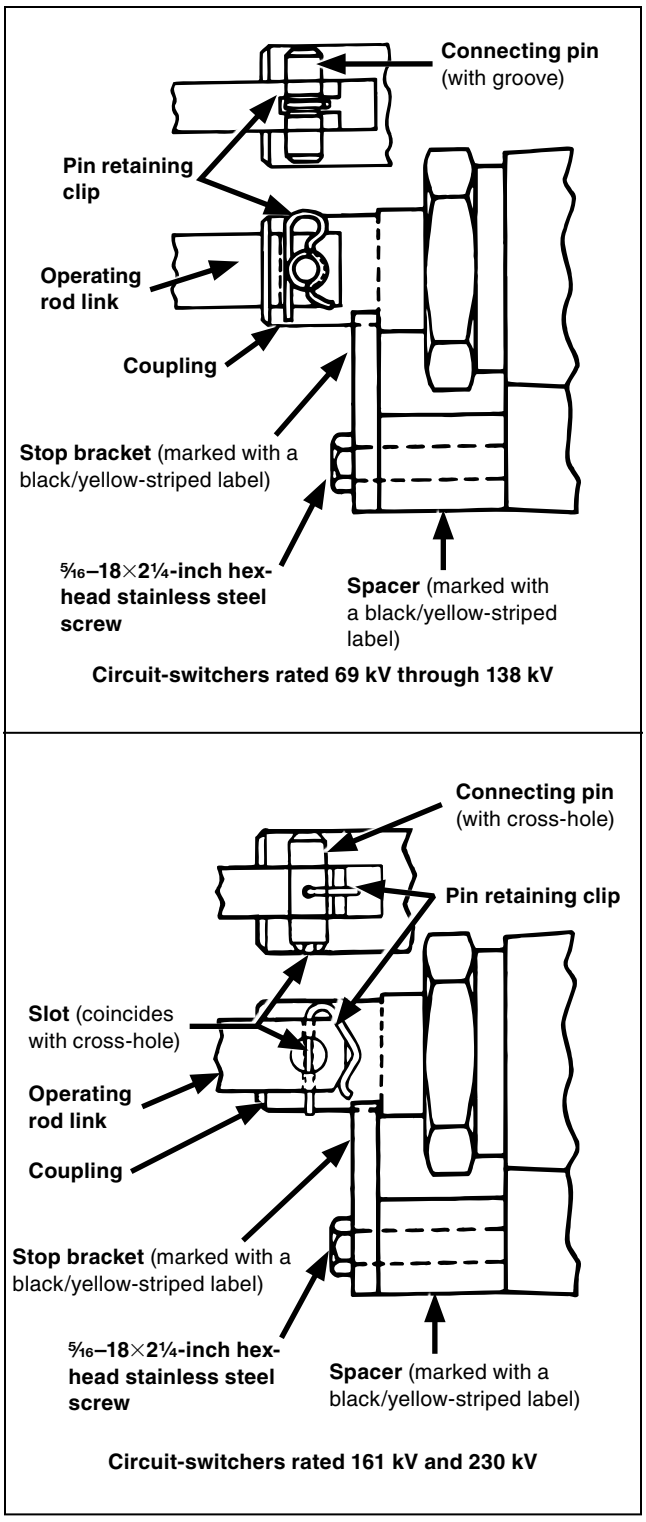


Figure 19. A coupling replacement interrupter.

STEP 16. Remove the shield for the pressure-relief device and LOW GAS PRESSURE indicator from the replacement interrupter. Discard the shield and its hardware. Reconnect the high-voltage conductor to the interrupter-end terminal pad and, on Model 2040, to the transition box-end terminal pad.

STEP 17. Remove the container from the replacement interrupter as follows:

(a) Remove and discard the ⅜–16-inch zinc-plated serrated hex nuts that run 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 that attach 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 that attach the upper container-half to the indicator end-casting of the interrupter.

(c) Pry the container-halves apart with a screwdriver. 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) Remove and discard the ⅜–16×⅞-inch hex-head cap screw and flat washer that attach 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 that attach 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.

STEP 18. Replace the trip-circuit and control-circuit fuse holders in the operator or—on newer operators—close the control-source disconnect switch and replace the motor-and-closing circuit fuse holder.

STEP 19. 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 20. Ship the replaced interrupter, transportation charges prepaid, to S&C Electric Company, Repair Center. For product returns, contact the local S&C representative for proper return material authorization documentation.

Installing the Transmitter

When replacing an interrupter on Series 2000 Circuit-Switchers with the **Remote Gas-Density Monitor** option, the transmitter must also be replaced. Following are the replacement and setup instructions for the remote gas-density monitor transmitter.

For installation and operating instructions for remote gas-density monitors in new circuit-switcher installations, refer to S&C Instruction Sheet 716-530, "S&C Series 2000 Circuit-Switchers, Remote Gas-Density Monitor: *Installation*."

STEP 1. Before mounting the replacement interrupter to its associated transition box, locate the red sensor cable on the base of the interrupter. Cut and remove the wire ties and the wire tie mounts securing the sensor cable, taking care not to damage the cable. Do not remove the shorting plug from the end of the green six-pin connector at this time. See Figure 20.

NOTICE

Exercise care when mounting the interrupter to the transition box. The sensor cable is factory-installed on the interrupter and cannot be replaced in the field if damaged. **Damage to the cable will necessitate returning the interrupter and transmitter to the factory for replacement and recalibration.**

STEP 2. On circuit-switchers with vertical interrupters (Model 2020 and Model 2030), the transmitter is mounted in place of the transition box access cover. Remove the four 5⁄16–18×3⁄4-inch socket-head cap screws and flat washers that secure the transmitter to the transition box. Reserve the mounting hardware and set the replaced transmitter aside in a protected area. See Figure 21.

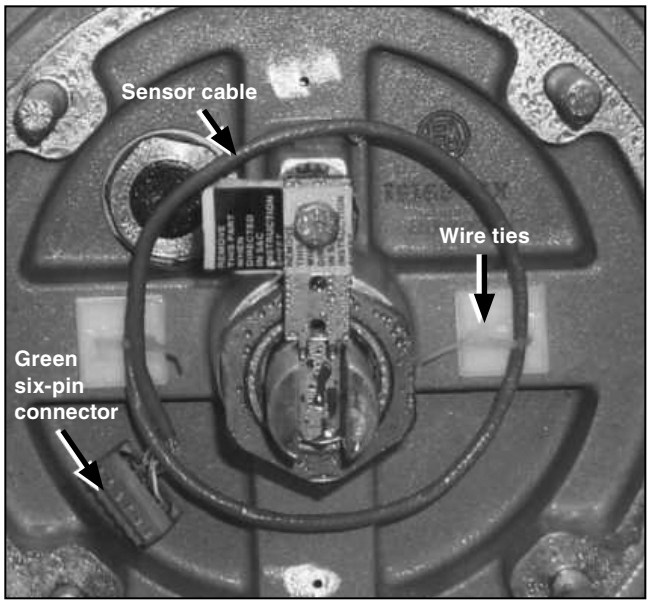


Figure 20. Location of sensor cable.

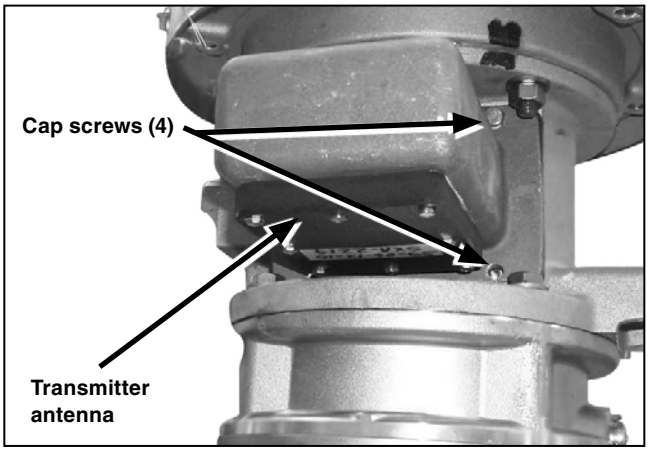


Figure 21. A transmitter mounted on a transition box with the antenna facing the ground. Remove the existing transmitter and return it with the replaced interrupter.

On circuit-switchers with horizontal interrupters (Model 2010 and Model 2040), the transmitter is mounted on an adapter panel. The adapter panel is mounted in place of the transition box access cover. Remove the six stainless steel 5⁄16–18×3⁄4-inch hex-head cap screws that secure the adapter panel to the transition box. Then, remove the four 5⁄16–18×3⁄4-inch cap screws and ESNA nuts that secure the transmitter to the adapter panel. Install the replacement transmitter onto the adapter panel. Save the adapter panel mounting hardware and set the replacement transmitter aside in a protected area. Save the replaced transmitter and return it to S&C Electric Company with the replaced interrupter. See Step 20 on page 28 for details.

NOTICE

Each transmitter is factory-calibrated to the interrupter with which it is shipped and must be installed on its associated interrupter. The serial number associated with the interrupter matches the serial number stamped on the transmitter. **Failure to keep transmitters with their associated interrupters can cause the remote gas-density monitoring system to malfunction.**

STEP 3. Before coupling the replacement interrupter to the operating rod, feed the sensor cable into the top of the transition box. Make sure the cable is fed through the transition box on the side of the operating rod that is toward the access opening. Feeding the sensor cable from behind the operating rod may cause the cable to catch on the rod during switch operation. See Figure 22.

NOTICE

Make sure the sensor cable is not caught on the circuit-switcher operating rod. **Failure to do so can cause the remote gas-density monitoring system to malfunction**.

STEP 4. Mount the replacement interrupter and couple it to the operating rod, as directed in the instructions for the circuit-switcher model.

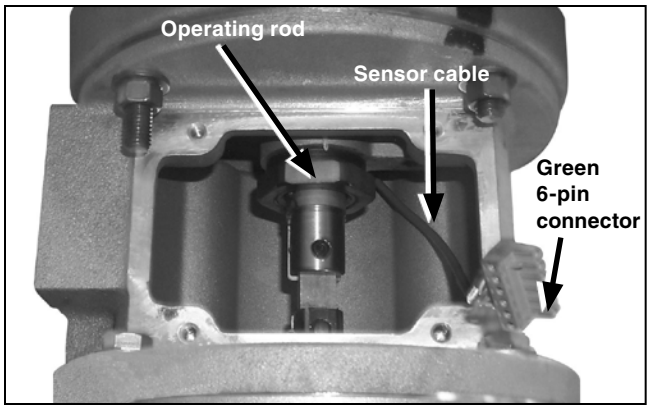


Figure 22. Inside of transition box showing sensor cable. Feed the cable through the transition box toward the front to avoid snagging on the operating rod.

STEP 5. Ground the transmitter to the transition box with the supplied grounding strap. Clamp one end of the grounding strap to the bottom of the transmitter housing and the other to the transition box. See Figure 23.

> **NOTICE**
>
> Make sure the transmitter is fully grounded before connecting the battery or sensor cables. **Static and/or electrical discharge from the interrupter can damage the transmitter circuit board and sensor cable.**

STEP 6. With the transmitter and transition box grounded, firmly plug the black, two-pin connector from the battery into the black two-pin socket on the transmitter circuit board. When properly installed, the locking tab on the connector will face away from the battery. See Figure 24.

STEP 7. Remove the shorting plug from the green six-pin connector located on the red sensor cable. Remove the shorting plug from the six-pin socket on the transmitter circuit board. Firmly plug the green six-pin connector from the interrupter into the green six-pin socket on the transmitter circuit board. See Figure 24.

STEP 8. Using the mounting hardware saved from Step 2 on page 29, reattach the transmitter to the transition box, making sure the black antenna cover faces the ground. See Figure 25. Repeat Steps 1 through 8 for each interrupter to be replaced. Retain the jumper for future use in the pocket on the operator enclosure door.

Note: Save the shorting plugs and install them on the replaced interrupters. When replacing an interrupter with the Remote Gas-Density Monitor option, ship the replaced transmitter to S&C Electric Company along with the replaced interrupter.

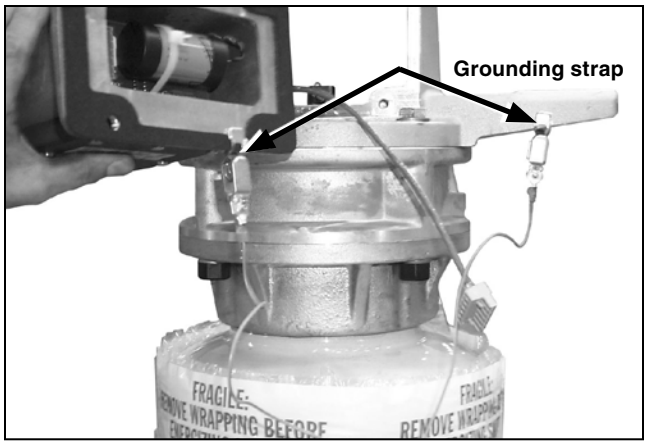


Figure 23. Attach one end of the grounding strap to the transmitter housing and the other end to the transition box.

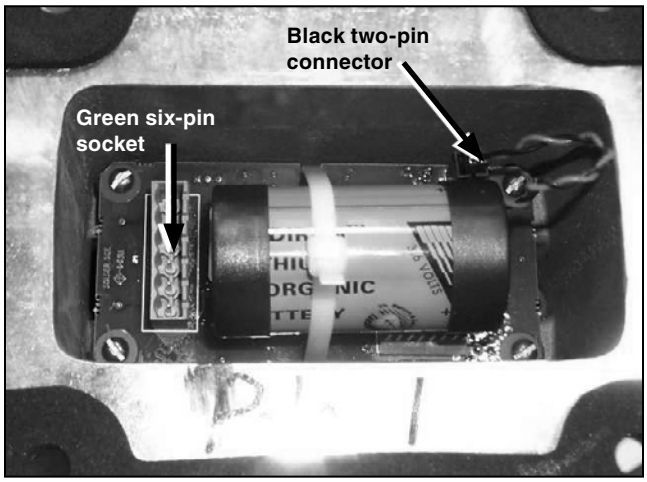


Figure 24. Plug the black two-pin connector from the battery into the black two-pin socket on the transmitter circuit board. Plug the green six-pin connector from the interrupter into the green six-pin socket on the circuit board.

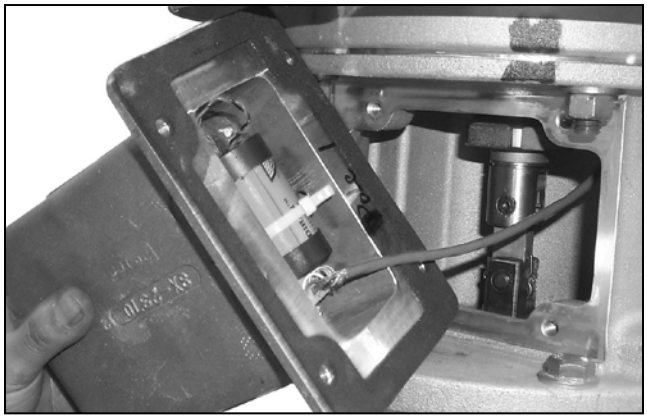


Figure 25. Reattach the transmitter to the transition box after making the battery and sensor cable connections.

Programming the Receiver

After replacing an interrupter and transmitter, the remote gas-density monitoring system must be reprogrammed. Programming "teaches" the receiver which transmitter radio signal corresponds to which interrupter.

A series of prompts on the LCD screen will guide users through the programming process.

NOTICE

All phases must be reprogrammed when an interrupter is replaced.

STEP 1. Attach the magnet tool to a hotstick long enough to reach the transmitter. The magnet tool, furnished with the original switch, is located on the inside of the switch operator door.

STEP 2. Press—and hold for 10 seconds—the system SET UP button located on the right side of the receiver. See Figure 26. The receiver unit will start to count down. See Figure 27. Release the SET UP button when prompted. See Figure 28. This will put the receiver in **Setup** mode.

NOTICE

Inadvertently releasing the SET UP button during countdown will stop the set-up and reset the receiver in regular **Monitoring** mode.

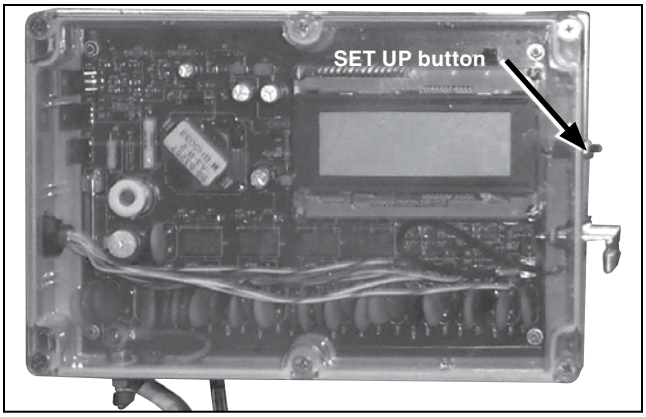


Figure 26. Location of the SET UP button on the receiver.

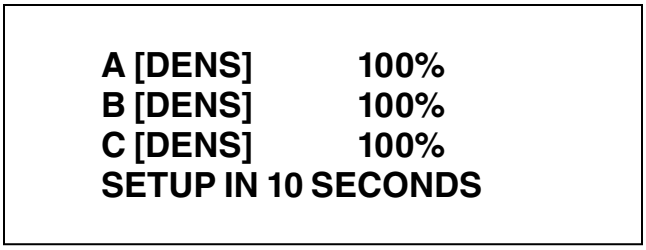


Figure 27. Receiver LCD screen while pressing and holding the SET UP button.

Figure 28. Receiver LCD screen during the start of Set-up mode.

STEP 3. Press—and hold for 5 seconds—the system SET UP button. The A-phase set-up prompt will be displayed. See Figure 29.

STEP 4. To initialize A-Phase, press and release the SET UP button again. Then, position and hold the magnet tool flush against the side of the transmitter as shown in Figure 30. Make sure the two poles of the magnet are aligned vertically. When the receiver starts counting signals from the transmitter, remove the magnet tool. See Figure 31.

When the magnet tool is applied correctly, the receiver will display the serial number of the interrupter/transmitter. After 10 rapid signals are detected, the display will prompt the user to move on to B-Phase, and then C-phase. Repeat Step 4 for B-phase and then again for C-phase. See Figures 31 and 32.

During normal operation, the transmitter sends a signal to the receiver antenna once every hour. When the magnet tool is applied to the transmitter, the transmitter is prompted to send a signal to the receiver once every second. The transmitter will continue to send this signal for up to 10 seconds after the magnet tool is removed.

The system will assign phase designations in the order in which the phases are initialized. The first phase initialized will be assigned the letter "A," the second "B," and the third "C." Make sure the phases are initialized in the order appropriate for the installation.

Store the magnet tool inside the switch operator door for future use.

S&C RGDM A-Phase Set Up. Use Magnet To Start A-Phase Remote. Press Button To Go

Figure 29. Receiver LCD screen prompt for the magnet tool.

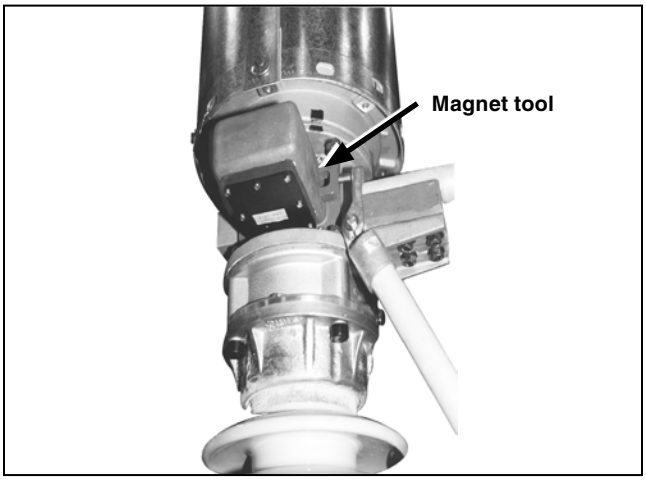


Figure 30. Position of the magnet tool. Place the magnet tool flush against the side of the transmitter with the serial number stamping.

S&C RGDM "A" Phase SS-0608-001 : 9

Figure 31. Receiver LCD screen counting transmissions from the transmitter box.

Got 10 Packets From SS-0608-001 Which Is Phase "A"

Figure 32. Receiver LCD screen after receiving 10 signals from the transmitter.

STEP 5. After all three phases are initialized, the LCD screen will show the three interrupter serial numbers in the order the phases were initialized. The display will sequentially alternate the messages shown in Figures 33a, 33b, and 33c.

Hold down the SET UP button for 5 seconds. This will clear the previous settings from the receiver and save the new settings. When the update has been completed, the LCD screen will display a "Release Button" prompt. Release the SET UP button. The receiver will reboot.

If the poles are not initialized in the correct sequence, wait for the receiver to time out and reboot (approximately 2 minutes). Disconnecting power to the operator during set-up will also reboot the system.

After programming is complete, the display will not indicate which interrupter/transmitter serial number is associated with each phase again. Make a note of which interrupter/transmitter serial number is associated with each phase for future reference.

STEP 6. Test the system by attaching the magnet tool to a hotstick long enough to reach the transmitter. Hold the magnet tool flush against the side of the transmitter, as shown in Figure 34. Repeat for each transmitter. Gas-density data will be transmitted to the receiver and shown on the LCD screen.

STEP 7. Check the pole-unit designations on the LCD screen and that the gas-density readings for all three phases are at 100%. If so, installation is complete. If the pole-unit designations are not correct, reprogramming of the receiver is required. Repeat Steps 5 through this step until the pole-unit designations are appropriate for the installation.

Check Serial Numbers
SS-0608-001
SS-0608-002
SS-0608-003

Figure 33a. The receiver LCD screen after all three phases are initialized.

If Serial Numbers
Are Correct Press &
Hold to Save Them

Figure 33b. The receiver LCD screen after all three phases are initialized.

If Serial Numbers
Are Wrong, Wait For
Receiver To Reset
And Do Setup Again.

Figure 33c. The receiver LCD screen after all three phases are initialized.

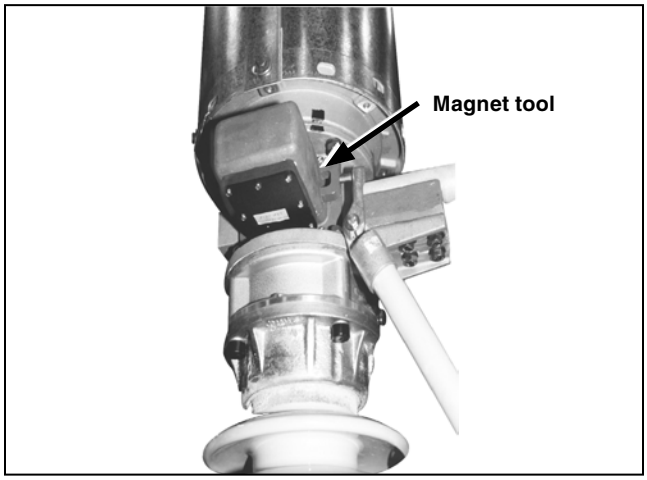


Figure 34. Position of the magnet tool. Place the magnet tool flush against the side of the transmitter with the serial number stamping.

To ensure a Series 2000 Circuit-Switcher's continued proper performance, it should be inspected in accordance with S&C's recommended schedule and procedures contained in S&C Instruction Sheet 716-590.