Field Assembly and Installation

Table of Contents

Section | Page
--- | ---
Introduction | 
Qualified Persons | 2
Read this Instruction Sheet | 2
Retain this Instruction Sheet | 2
Proper Application | 3
Warranty | 3
Safety Information | 
Understanding Safety-Alert Messages | 4
Following Safety Instructions | 4
Replacement Instructions and Labels | 4
Safety Precautions | 5
Assembly and Installation Procedures | 
Removal of Existing Pre-Insertion Resistors | 6
Removal of Existing Earlier-Production Pre-Insertion Inductors | 8
Installation of Knee-Brace Assembly on Integer Style Circuit-Switchers | 12
Installation of High-Strength Insulators on Integer Style Circuit-Switchers | 14
Replacement of Circuit-Closing Contacts on 34.5-kV through 69-kV Vertical-Break and Integer Style Circuit-Switchers | 16
Assembly Procedure for 34.5-kV through 69-kV Vertical-Break and Integer Style Circuit-Switcher Pre-Insertion Inductors | 17
Assembly Procedure for 115-kV and 138-kV Vertical-Break Style Circuit-Switcher Pre-Insertion Inductors | 22
Assembly Procedure for 230-kV and 345-kV Center-Break Style Circuit-Switcher Pre-Insertion Inductors | 26
Inspection Recommendations | 29

★ The pre-insertion inductor assemblies discussed herein are also suitable for use with equivalent models of Mark III and Mark IV Circuit-Switchers.
Qualified Persons

⚠️ WARNING

The equipment covered by this publication must be installed, operated, and maintained by qualified persons who are knowledgeable in the installation, operation, and maintenance of primary distribution fusing equipment along with associated hazards. A qualified person is one who is trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from non-live 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 the special precautionary techniques, personal protective equipment, insulating 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

Thoroughly and carefully read this instruction sheet before installing pre-insertion inductors. Familiarize yourself with “Safety Information” on page 4 and 5. The latest version of this publication is available online in PDF format at [www.sandc.com Support/Product Literature Library](http://www.sandc.com).

Retain this Instruction Sheet

This instruction sheet is a permanent part of your S&C Circuit-Switcher—Mark V or Mark VI. These instructions should be stored in the Mark V or Mark VI Circuit-Switcher instruction manual holder.
Proper Application

⚠️ CAUTION

The equipment in this publication is only intended for use in switching and protection of capacitor banks. The application must be within the ratings furnished for the equipment. Ratings for the Mark V or Mark VI Circuit-Switcher are listed on the nameplate on the side of the Mark V or Mark VI CS-1A Switch Operator.

These instructions are for field assembly and installation of S&C Pre-insertion Inductors to a Mark V or Mark VI Circuit-Switcher not originally furnished with this accessory, or to a Mark V Circuit-Switcher which was originally furnished either with earlier-production pre-insertion inductors or with now-discontinued S&C Pre-insertion Resistors.

These instructions are applicable to standard-duty pre-insertion inductors on already-installed Circuit-Switchers of the following styles and voltage ratings:

- Integer Style rated 34.5 kV through 69 kV,
- Vertical-Break Style rated 34.5 kV through 138 kV, and
- Center-Break Style rated 230 kV and 345 kV;
- As well as to enhanced-duty pre-insertion inductors on already-installed Circuit-Switchers of the following styles and voltage ratings:
  - Integer Style rated 34.5 kV through 69 kV, and
  - Vertical-Break Style rated 34.5 kV through 138 kV.

In single-bank and multiple-bank (back-to-back) capacitor switching applications, pre-insertion inductors limit inrush current, overvoltage, and audible noise at the capacitor bank bus. Pre-insertion inductors also limit switching-surge overvoltages at remote transformers.

Circuit-Switchers equipped with pre-insertion inductors are capable of two consecutive closing operations 5 minutes apart, followed by one closing operation every hour.

Warranty

The warranty and/or obligations described in S&C’s standard conditions of sale, as set forth in Price Sheet 150, plus any special warranty provisions, as set forth in the applicable product-line specification bulletin, are exclusive. The remedies provided in the former for breach of these warranties shall constitute immediate purchaser’s or end user’s exclusive remedy and a fulfillment of all seller’s liability. In no event shall seller’s liability to immediate purchaser or end user exceed the price of the specific product which gives rise to immediate purchaser’s or end user’s claim. All other warranties whether express or implied or arising by operation of law, course of dealing, usage of trade or otherwise, are excluded. The only warranties are those stated in Price Sheet 150, and THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY EXPRESS WARRANTY OR OTHER OBLIGATION PROVIDED IN PRICE SHEET 150 IS GRANTED ONLY TO THE IMMEDIATE PURCHASER AND END USER, AS DEFINED THEREIN. OTHER THAN AN END USER, NO REMOTE PURCHASER MAY RELY ON ANY AFFIRMATION OF FACT OR PROMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150.

The seller’s warranties are contingent upon the installation and adjustment of S&C Circuit-Switchers—Mark V and Mark VI in accordance with S&C’s applicable instruction sheets, data sheets, and/or data bulletins.
Safety Information

Understanding Safety-Alert Messages

There are several types of safety-alert messages which may appear throughout this instruction sheet as well as on labels and tags attached to the Circuit-Switcher and pre-insertion inductors. Familiarize yourself with these types of messages and the importance of the various signal words, as explained below.

⚠️ **DANGER**

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

⚠️ **WARNING**

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

⚠️ **CAUTION**

“CAUTION” identifies hazards or unsafe practices which can result in minor personal injury or product or property damage if instructions, including recommended precautions, are not followed.

⚠️ **NOTICE**

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

Following Safety Instructions

If you do not understand any portion of this instruction sheet and need assistance, contact your nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C’s website [www.sandc.com](http://www.sandc.com). Or call S&C Headquarters at (773) 338-1000. Or call S&C Headquarters at (773) 338-1000; in Canada, call S&C Electric Canada Ltd. at (416) 249-9171.

⚠️ **NOTICE**

Thoroughly and carefully read this instruction sheet before installing pre-insertion inductors.

Replacement Instructions and Labels

If you need additional copies of this instruction sheet, contact your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters. You can also download this instruction sheet from S&C’s website [www.sandc.com](http://www.sandc.com).

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

Mark V or Mark VI 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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>1. QUALIFIED PERSONS.</strong> Access to substation switching equipment must be restricted only to qualified persons. See “Qualified Persons” on page 2.</td>
<td><strong>6. CIRCUIT-SWITCHER POSITION.</strong> Always confirm the open/close position of Circuit-Switchers by visually observing the position of the blades. Switches may be energized from either side and with the blades in any position.</td>
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<tr>
<td><strong>2. SAFETY PROCEDURES.</strong> Always follow safe operating procedures and rules.</td>
<td><strong>7. MAINTAINING PROPER CLEARANCE.</strong> Always maintain proper clearance from energized components.</td>
</tr>
<tr>
<td><strong>3. PERSONAL PROTECTIVE EQUIPMENT.</strong> 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.</td>
<td><strong>8. OPERATION.</strong> Circuit making and breaking is involved in the normal operation of this interrupter switch and, as a result, “partway” opening or closing is undesirable. To operate, follow the operating procedure as outlined in the appropriate instruction sheet for your model of Mark V or Mark VI Circuit-Switcher.</td>
</tr>
<tr>
<td><strong>4. SAFETY LABELS AND TAGS.</strong> Do not remove or obscure any of the “DANGER,” “WARNING,” “CAUTION,” and “NOTICE” labels and tags. Remove tags ONLY if instructed to do so.</td>
<td></td>
</tr>
<tr>
<td><strong>5. ENERGIZED COMPONENTS.</strong> Always consider all parts live until de-energized, tested, and grounded.</td>
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</table>
Removal of Existing Pre-Insertion Resistors

Remove the components indicated below.

For pre-insertion resistors on 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers, refer to Figure 1, below.

For pre-insertion resistors on 115-kV and 138-kV Vertical-Break Style Circuit-Switchers, refer to Figure 2, below.

For pre-insertion resistors on 230-kV and 345-kV Center-Break Style Circuit-Switchers, refer to Figure 3, page 7.

Figure 1. Removal of existing pre-insertion resistors on 34.5-kV through 69-kV Vertical-Break and Integer Style Circuit-Switcher.

Figure 2. Removal of existing pre-insertion resistors on 115-kV and 138-kV Vertical-Break Style Circuit-Switcher.
Resistor assembly (as positioned for 345-kV Circuit-Switchers; remove and discard)

Resistor assembly (as positioned for 230-kV Circuit-Switchers; remove and discard)

Brain end

Arcing-arm assemblies (remove and retain)

Resistor assembly (as positioned for 230-kV Circuit-Switchers; remove and discard)

Resistor assembly (remove and discard)

Mounting adapter

Blade clamp

Figure 3. Removal of existing pre-insertion resistors on 230-kV and 345-kV Center-Break Style Circuit-Switchers.
Removal of Existing Earlier-Production Pre-Insertion Inductors

Remove the components indicated below.

For upgraded earlier-production 5-millihenry pre-insertion inductors (inductors mounted vertically) on 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers, refer to Figure 4, on page 9.

For earlier-production 5-millihenry pre-insertion inductors (inductors mounted at an angle) on 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers, refer to Figure 5, on page 9.

For earlier-production 10-millihenry pre-insertion inductors (inductors mounted vertically) on 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers, refer to Figure 6, on page 10.

For upgraded earlier-production 10-millihenry pre-insertion inductors (inductors mounted vertically) on 115-kV and 138-kV Vertical-Break Style Circuit-Switchers, refer to Figure 7, on page 10.

For earlier-production 10-millihenry pre-insertion inductors (inductors mounted at an angle) on 115-kV and 138-kV Vertical-Break Style Circuit-Switchers, refer to Figure 8, on page 11.
Figure 4. Removal of existing upgraded earlier-production 5-milliHenry pre-insertion inductors on 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers.

Figure 5. Removal of existing earlier-production 5-milliHenry pre-insertion inductors on 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers.
**Assembly and Installation Procedures**

**Figure 6.** Removal of existing earlier-production 10-millihenry pre-insertion inductors on 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers.

- Circuit-closing tongue contact (remove when directed on page 16, then discard)
- Special ¾-inch washer (remove when directed on page 16, then retain)
- Moving arcing-rod assembly (remove and discard)
- Stationary arcing-rod assembly (remove and discard)
- ⅜–13 × 1 ¾ inch hex-head stainless-steel cap screws, lockwashers, and clamps (remove and retain)
- Inductor assembly (remove and discard)
- Inductor mounting bracket (remove and discard)
- Circuit-closing jaw contacts (remove and discard)

**Figure 7.** Removal of existing upgraded earlier-production 10-millihenry pre-insertion inductors on 115-kV and 138-kV Vertical-Break Style Circuit-Switchers.

- Moving arcing-rod assembly (remove and discard)
- Stationary arcing-rod assembly (remove and discard)
- Inductor assembly (remove and discard)
- Inductor mounting bracket and support (remove and discard)

**Special C-inches**

1. Special C-inches
2. Z–13 Z-inch hex-head stainless-steel cap screws, lockwashers, and clamps (remove and retain)
Figure 8. Removal of existing earlier-production 10-milliHenry pre-insertion inductors on 115-kV and 138-kV Vertical-Break Style Circuit-Switchers.
NOTICE

Integer Style Circuit-Switchers require the installation of a knee-brace assembly on the base of the Circuit-Switcher at the jaw-contact end and, in some instances, at the interrupter end.

The following table summarizes the requirements for knee-brace assemblies.

<table>
<thead>
<tr>
<th>Rating, KV, Nom.</th>
<th>No. of Interrupting Gaps</th>
<th>Type of Pre-insertion Inductors</th>
<th>Knee-Brace Assembly Required at</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.5 &amp; 46</td>
<td>1</td>
<td>Enhanced-Duty</td>
<td>Yes</td>
</tr>
<tr>
<td>69</td>
<td>1</td>
<td>Enhanced-Duty</td>
<td>No</td>
</tr>
<tr>
<td>69</td>
<td>1</td>
<td>40-mH, 5.5-ohm Standard-Duty</td>
<td>Yes</td>
</tr>
<tr>
<td>69</td>
<td>2</td>
<td>40-mH, 5.5-ohm Standard-Duty</td>
<td>Yes</td>
</tr>
<tr>
<td>69</td>
<td>2</td>
<td>Enhanced-Duty</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Step 1**

Loosely assemble an upper clip angle and lower clip angle to each end of a knee brace using a %−11 × 1¾ galvanized hex-head cap screw, hardened flat washer, and hex nut. See Figure 9 on page 13, front view and top view.

**Step 2**

Loosely attach the knee-brace assembly to the Circuit-Switcher base in accordance with Dimension A, using a %−11 × 1¾ galvanized hex-head cap screw, hardened flat washer, and hex nut. See Figure 9 on page 13, top view and front view.

**Step 3**

Loosely attach the two support angles to the Circuit-Switcher mounting pedestal using two %−11 threaded rods, hardened flat washers, and hex nuts. See Figure 9 on page 13, front and side views.
Step 4

Loosely attach the lower clip angles to the support angles using \( \frac{5}{8} - 11 \times 1\frac{3}{4} \) galvanized hex-head cap screws, hardened flat washers, and hex nuts. See Figure 9, front and side views.

Step 5

Push the support angles up as far as they will go and make sure that there is no slack in the knee-brace assemblies. Verify the 28\(\frac{1}{4}\)-inch dimension shown in Figure 9, side view. Tighten all hardware.

Figure 9. Installation of knee-brace assembly.
NOTICE

Integer Style Circuit-Switchers rated 69 kV furnished with enhanced-duty pre-insertion inductors require the installation of high-strength insulators at the jaw-contact end of the Circuit-Switcher.

Install the high-strength insulators using the following procedure.

Step 1
Remove the four 1/2-13 x 1 1/4 hex-head stainless-steel cap screws and lockwashers which secure the terminal adapter to the insulator mounting bracket. See Figure 10 on page 15, side view. Retain the terminal adapter and hardware.

Step 2
Remove the two top 5/8-11 hex nuts, lockwashers, and flat washers securing the insulator mounting weldment. See Figure 10 on page 15, View A-A. While supporting the insulator with an appropriate lifting device, remove the two 5/8-11 x 1 1/2 hex-head cap screws, lockwashers, and four serrated washers securing the insulator mounting weldment to the switch base. Remove the insulator. Retain the hardware.

Step 3
Remove the pivot rod from the insulator mounting weldment and install it in the replacement insulator mounting weldment. See Figure 10 on page 15, View A-A. Attach the replacement insulator mounting weldment and replacement insulator mounting bracket to the high-strength insulator using eight 5/8-11 x 1 1/4 hex-head galvanized cap screws and lockwashers. Securely tighten the hardware.

Step 4
Attach the high-strength insulator assembly to the switch base using two 5/8-11 x 1 1/2 hex-head cap screws, lockwashers, and four serrated washers. See Figure 10 on page 15, View A-A. Secure the insulator mounting weldment with two 5/8-11 hex nuts, lockwashers, and flat washers. Securely tighten the hardware.

Step 5
Attach the terminal adapter to the insulator mounting bracket using four 1/2-13 x 1 1/4 hex-head stainless-steel cap screws and lockwashers. See Figure 10 on page 15, side view. Securely tighten the hardware.

CAUTION

Make sure that the Circuit-Switcher disconnect blades are correctly aligned with their jaw-contact assemblies.

Failure to obtain correct alignment at each pole-unit can result in damage to the Circuit-Switcher.
As the Circuit-Switcher disconnect blade is closed, the circuit-closing tongue contact should engage each of the circuit-closing jaw-contact members with equal pressure, and the current-carrying tongue contact should enter between the current-carrying jaw-contact members with equal clearance on each side. The silver-surfaced area of the current-carrying tongue contact should center laterally with the silver-surfaced current-carrying jaw-contact members, and the blade should rotate with slight pressure against the blade bumper stop and come to rest either on the stop or slightly above it.

If adjustment of the jaw-contact assembly is necessary to obtain the described alignment, refer to the instruction sheet furnished for the specific Circuit-Switcher involved and proceed as outlined therein.

Figure 10. Installation of high-strength insulators.
NOTICE

Vertical-Break Style and Integer Style Circuit-Switchers rated 34.5 kV through 69 kV require the installation of replacement circuit-closing contacts.

Install the high-strength insulators using the following procedure.

**Step 1**
Install the replacement circuit-closing jaw contacts on the jaw-contact terminal pad using two ½–13 × 1¾ hex-head stainless-steel cap screws, lockwashers, and clamps. See Figure 11 on page 20, side view. Adjust the contact height to 9¾± ½ inches as shown. Manually close the Circuit- Switcher and verify that the existing circuit-closing tongue contact engages both jaw contacts simultaneously. Securely tighten the hardware.

**Step 2**
Remove the existing circuit-closing tongue contact and special ¾-inch washer from the end of the disconnect blade assembly. Discard the contact but retain the washer. See Figures 1, 4, 5, or 6, as appropriate.

**Step 3**
Preassemble the replacement circuit-closing tongue contact by installing a ¾–11 stainless-steel hex nut and a ¾–16 stainless-steel hex nut to the ends of the contact. See Figure 11 on page 20, Detail A. Screw the hex nuts all the way down onto the contact. Screw the circuit-closing tongue contact onto the circuit-closing tongue contact support so that the center of the half-circle saddle is concentric to the ¾–16 threaded end of the circuit-closing tongue contact. See Figure 11 on page 21, View C-C.

**Step 4**
Install the special ¾-inch washer with the radius edge towards the ¾–16 hex nut. See Figure 11 on page 20, Detail A. Remove the circuit-closing tongue contact support clamp and screw the ¾–16 threaded end of the circuit-closing tongue contact assembly all the way into the disconnect blade. Make sure that the half-circle saddle of the circuit-closing tongue contact support is in sliding contact with the disconnect blade pipe. It may be necessary to screw the circuit-closing tongue contact support in or out on the circuit-closing tongue contact so that the half-circle saddle is in contact with the disconnect blade pipe. The circuit-closing tongue contact should be in a vertical position when the disconnect blade is being closed and the circuit-closing tongue contact is just making contact with the circuit-closing jaw contacts. See Figure 11 on page 20 and 21, side view and View D-D. Securely tighten the ¾–16 hex nut.

**Step 5**
Attach the circuit-closing tongue contact support clamp to the circuit-closing tongue contact support using two ¾–20×1¼ socket-head stainless-steel cap screws and securely tighten. See Figure 11 on page 20 and 21, View D-D. Install a ¾–18×½ socket-head set screw and securely tighten. Securely tighten the ¾–11 hex nut up to the circuit-closing tongue contact support. See Figure 11 on page 20 and 21, Detail A.
Assembly Procedure for 34.5-kV through 69-kV Vertical-Break and Integer Style Circuit-Switchers
Pre-Insertion Inductors

Prior to assembly of component parts, thoroughly wire-brush aluminum mating surfaces. Immediately coat these surfaces with Penetrox® A (available from Burndy Corporation). Repeat the following steps for each pole-unit.

**Step 1**

Loosely attach the inductor mounting bar to the top of the jaw-contact terminal pad, using four ½–13 × 2½ hex-head stainless-steel cap screws, eight hardened flat washers, and four ½–13 hex nuts furnished. See Figure 11 on page 20 and 21, top and side views.

**Step 2**

Loosely attach the inductor mounting brackets and spacers to each side of the terminal adapter on the front insulator stack, using four ¾-inch hex-head stainless-steel cap screws and four ¾-inch hardened flat washers. See Figure 11 on page 20 and 21, front and side views.

**Step 3**

For 34.5-kV through 69-kV Circuit-Switchers furnished with 10-millihenry standard-duty inductors:

Remove and discard the two ½–13 × ½ hex-head stainless-steel cap screws and two ½-inch hardened flat washers which secure the top inductor end cap to the inductor assembly. Attach the inductor lifting bracket to the top end cap using two ½–13 × 1¼ hex-head stainless-steel cap screws and two hardened flat washers. Securely tighten the hardware. See Figure 11 on page 20 and 21, front and top views. Proceed to Step 4.

For 34.5-kV and 46-kV Circuit-Switchers furnished with 10-millihenry or 18-millihenry enhanced-duty inductors and 69-kV Circuit-Switchers furnished with 18-millihenry enhanced-duty inductors:

Remove and discard the four ½–13 × ¾ hex-head stainless-steel cap screws and four ½-inch hardened flat washers which secure the top inductor end cap to the inductor assembly. Attach the inductor lifting bracket to the top end cap using two ½–13 × 1¼ hex-head stainless-steel cap screws and two hardened flat washers. Securely tighten the hardware. See Figure 11 on page 20, front and top views. Proceed to Step 4.

For 69-kV Circuit-Switchers furnished with 40-millihenry standard-duty inductors or enhanced-duty inductors:

Attach the inductor lifting bracket to the top end cap of the inductor assembly using two ½–13 × 1¼ hex-head stainless-steel cap screws and two hardened flat washers. Securely tighten the hardware. See Figure 11 on page 20 and 21, front and top views.

**Step 4**

For 34.5-kV through 69-kV Circuit-Switchers furnished with 10-millihenry standard-duty inductors:

Lift the inductor assembly atop the inductor mounting bar and inductor mounting brackets. Attach the bottom end cap of the inductor assembly to the inductor mounting bar and inductor mounting brackets using the four studs on the end cap, four ½-inch hardened flat washers, and four ½–13 stainless-steel hex nuts. Securely tighten the hardware. See Figure 11 on page 20 and 21, side and front views. Proceed to Step 5.

For 69-kV Circuit-Switchers furnished with 40-millihenry standard-duty inductors and 34.5-kV through 69-kV Circuit-Switchers furnished with 10-millihenry, 18-millihenry, or 40-millihenry enhanced-duty inductors:

Lift the inductor assembly atop the inductor mounting bar and inductor mounting brackets. Attach the bottom end cap of the inductor assembly to the inductor mounting bar and inductor mounting brackets using four ½–13 × 2¼ hex-head stainless-steel cap screws and four ½-inch hardened flat washers. Securely tighten the hardware. See Figure 11 on page 20 and 21, side and front views.
Step 5
Securely tighten the four $\frac{3}{8}-13 \times 2\frac{1}{4}$ hex-head stainless-steel cap screws which attach the inductor mounting bar to the top of the jaw-contact terminal pad. See Figure 11 on page 20, side and top views.

Step 6
Securely tighten the four $\frac{5}{8}-11 \times 1\frac{3}{4}$ hex-head stainless-steel cap screws which attach the inductor mounting brackets and spacers to each side of the terminal adapter on the front insulator stack. See Figure 11 on page 20 and 21, side and front views.

Step 7
Remove the two $\frac{3}{8}-13 \times 1\frac{1}{4}$ hex-head stainless-steel cap screws and two hardened flat washers securing the lifting bracket to the top end of the inductor assembly.

Step 8
Loosely attach the inductor jaw-contact assembly to the contact support tube using two $\frac{3}{8}-16 \times \frac{3}{4}$ hex-head stainless-steel cap screws and two serrated washers. See Figure 11 on page 20 and 21, side and front views.

Step 9
Loosely attach the contact support tube to the inductor assembly top end cap using two support tube mounting clamps, four $\frac{3}{8}-13 \times 1\frac{1}{4}$ hex-head stainless-steel cap screws, and four $\frac{3}{8}$-inch serrated washers. See Figure 11 on page 20, top view.

Step 10

⚠ CAUTION ⚠

Make sure that the Circuit-Switcher disconnect blades are correctly aligned with their jaw-contact assemblies.

Failure to obtain correct alignment at each pole-unit can result in damage to the Circuit-Switcher.

As the Circuit-Switcher disconnect blade is closed, the circuit-closing tongue contact should engage each of the circuit-closing jaw-contact members with equal pressure, and the current-carrying tongue contact should enter between the current-carrying jaw-contact members with equal clearance on each side. The silver-surfaced area of the current-carrying tongue contact should center laterally with the silver-surfaced current-carrying jaw-contact members, and the blade should rotate with slight pressure against the blade bumper stop and come to rest either on the stop or slightly above it.

If adjustment of the jaw-contact assembly is necessary to obtain the described alignment, refer to the instruction sheet furnished for the specific Circuit-Switcher involved and proceed as outlined therein.

Step 11
Manually close the Circuit-Switcher so that the circuit-closing tongue contact engages both contacts of the inductor jaw-contact assembly with equal pressure on each side. See Figure 11 on page 21, View B-B. Adjust the contact support tube to attain the dimension shown in Figure 11 on page 21, Detail A. Securely tighten the four $\frac{3}{8}-13 \times 1\frac{1}{4}$ hex-head stainless-steel cap screws which secure the support tube mounting clamps to the inductor assembly top end cap.
Step 12
Level the inductor jaw-contact assembly vertically while maintaining the circuit-closing tongue contact engaged between the inductor contacts with equal pressure. See Figure 11 on page 20 and 21, View B-B. Securely tighten the two ¾-16 × ⅞ hex-head stainless-steel cap screws which attach the inductor jaw-contact assembly to the contact support tube. See Figure 11 on page 20 and 21, side and front views.

Step 13
Continue closing the Circuit-Switcher and verify that the circuit-closing tongue contact continues to engage both contacts with equal pressure as it exits the inductor contact assembly. See Figure 11 on page 21, View B-B. If adjustment is necessary, proceed to Step 14. If adjustment is not necessary, proceed to Step 15.

Step 14
Loosen the ¾-16 stainless-steel hex nut which secures the circuit-closing tongue contact to the disconnect blade and loosen the two ⅜-20 × 1½ socket-head cap screws and ⅜-18 × ⅞ socket-head set screw which secure the circuit-closing tongue contact support to the disconnect blade. See Figure 11 on page 21, Detail A and View D-D. Rotate the circuit-closing tongue contact on the disconnect blade so that the tongue contact engages both contacts of the inductor jaw-contact assembly with equal pressure as it exits the assembly during closing. Securely tighten the ¾-16 stainless-steel hex nut, the two ⅜-20 × 1½ socket-head cap screws, and the ⅜-18 × ⅞ socket-head set screw.

Step 15
Manually operate the Circuit-Switcher to recheck that the circuit-closing tongue contact is centered on the contacts of the inductor jaw-contact assembly during closing and opening. Lubricate the contact surfaces with S&C Catalog Number 9999-043 lubricant, furnished. See Figure 11 on page 21, Detail A.

⚠️ CAUTION

Contact surfaces must be properly lubricated. Failure to lubricate these surfaces can result in excessive contact wear.

Use Shell Gadus® S2 U1000 2 Lubricant, S&C Catalog Number 9999-043, Shell Darina SD2, Dow 33, or equivalent.

NOTICE

The circuit-closing tongue contact does not simultaneously engage the inductor jaw-contact assembly and the circuit-closing jaw contacts.

Step 16
Inspect the exterior finish of the inductor winding for damage or exposure of the fiberglass roving. Use the touch-up kit, furnished, to refinish any damaged surfaces. Refer to the “Inspection Recommendations” section on page 29.

Should the inductor winding be damaged to the extent that coiled conductor is exposed, the inductor must be removed from service and replaced.
Figure 11. Assembly details of pre-insertion inductors for 34.5-kV through 69-kV Vertical-Break Style and Integer Style Circuit-Switchers. 10-millihenry inductors illustrated.
Assembly Procedure for 115-kV and 138-kV Vertical-Break Style Circuit-Switcher Pre-Insertion Inductors

Prior to assembly of component parts, thoroughly wire-brush aluminum mating surfaces. Immediately coat these surfaces with Penetrox A (available from Burndy Corporation). Repeat the following steps for each pole-unit.

**Step 1**

*Loosely* attach the inductor mounting bar to the top of the jaw-contact terminal pad, using four \(\frac{3}{8}\)-inch x \(\frac{3}{4}\) hex-head stainless-steel cap screws, eight hardened flat washers, and four \(\frac{3}{8}\)-inch hex nuts furnished. See Figure 12, top and side views.

**Step 2**

Refer to Figure 12, front view, and insert—from the underside—four \(\frac{3}{8}\)-inch x \(\frac{3}{4}\) hex-head stainless-steel cap screws and hardened flat washers through the tapped holes on each face of the terminal adapter. *Loosely* attach the inductor mounting brackets to the terminal adapter using four \(\frac{3}{8}\)-inch hardened flat washers and \(\frac{3}{8}\)-inch hex nuts furnished. See Figure 12 on page 22 and 23, front and side views.

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**Figure 12.** Assembly details of pre-insertion inductors for 115-kV and 138-kV Vertical-Break Style Circuit-Switchers.
Step 3
Attach the inductor lifting bracket to the top end cap of the inductor assembly using two $\frac{1}{2}-13 \times \frac{3}{4}$ hex-head stainless-steel cap screws and hardened flat washers furnished. See Figure 12 on page 22, top view. Securely tighten the hardware.

Step 4
Lift the inductor assembly atop the inductor mounting bar and the inductor mounting bracket. Attach the bottom end cap of the inductor assembly to the inductor mounting bar and inductor mounting bracket using four $\frac{1}{2}-13 \times 2\frac{1}{4}$ hex-head stainless-steel cap screws and hardened flat washers. See Figure 12 on page 22, side view. Securely tighten the hardware.

Step 4
Securely tighten the $\frac{1}{2}-13 \times 2\frac{1}{4}$ hex-head stainless-steel cap screws which attach the inductor mounting bar to the top of the jaw-contact terminal pad.

Step 4
Securely tighten each $\frac{3}{8}-11$ hex nut attaching the inductor mounting bracket to the terminal adapter, while holding the associated $\frac{3}{8}-11 \times 1\frac{1}{4}$ hex-head stainless-steel cap screw to prevent it from turning. See Figure 12, front view. Now tighten each $\frac{3}{8}-11$ hex nut $\frac{1}{8}$ additional turn.

Step 7
Remove and retain the hardware securing the inductor lifting bracket to the top end cap of the inductor assembly and remove the lifting bracket.
Assembly and Installation Procedures

Step 8
Remove and retain the appropriate ½–13 × ¾ hex-head stainless-steel cap screw and hardened flat washer from the top end cap of the inductor assembly. See Figure 12 on page 22, top view. Loosely attach the stationary arcing-rod assembly to the top end cap using two ½–13 × 1¾ hex-head stainless-steel cap screws and hardened flat washers furnished. Insert a ½–13 × ¾ hex-head stainless-steel cap screw and hardened flat washer into each of the other three tapped holes in the top end cap; securely tighten each of these screws.

Step 9

⚠️ **CAUTION**

Make sure that the Circuit-Switcher disconnect blades are correctly aligned with their jaw-contact assemblies.

Failure to obtain correct alignment at each pole-unit can result in damage to the Circuit-Switcher.

As the Circuit-Switcher disconnect blade is closed, the circuit-closing tongue contact should engage each of the circuit-closing jaw-contact members with equal pressure, and the current-carrying tongue contact should enter between the current-carrying jaw-contact members with equal clearance on each side. The silver-surfaced area of the current-carrying tongue contact should center laterally with the silver-surfaced current-carrying jaw-contact members, and the blade should rotate with slight pressure against the blade bumper stop and come to rest either on the stop or slightly above it.

If adjustment of the jaw-contact assembly is necessary to obtain the described alignment, refer to the instruction sheet furnished for the specific Circuit-Switcher involved and proceed as outlined therein.

Step 10
Loosely attach the moving arcing-rod support to the disconnect blade in accordance with the 3¾-inch dimension shown in Figure 12 on page 22, Detail A.

Step 11
Manually close the Circuit-Switcher so that the minimum metal-to-metal clearance between the current-carrying tongue contact and the nearest circuit-closing jaw contact is equal to Dimension A, as shown in Figure 12 on page 22 and 23, side view and front view. With the Circuit-Switcher disconnect blade in this position, rotate the moving arcing rod to the horizontal position, as shown in Figure 12 on page 23, front view. Fully tighten the two ¼–20 × 1¾ socket-head stainless-steel cap screws. Apply Loctite “A,” furnished, to the two cap screws.

Step 12
Using the tapped hole in the moving arcing-rod support as a guide, drill a ½-inch diameter hole, 3 inches deep in the disconnect blade. See Figure 12 on page 23, Detail B. Drive in the groove pin furnished, then stake the support casting.
Step 13
Manually close the Circuit-Switcher so that the minimum metal-to-metal clearance between the current-carrying tongue contact and the nearest circuit-closing jaw contact is equal to Dimension A, as shown in Figure 12 on page 22, side view and front view. Now adjust the stationary arcing-rod assembly to attain a 0-inch to $\frac{1}{8}$-inch gap between the stationary arcing rod and the moving arcing rod. See Figure 12 on page 22, front view. Securely tighten the two $\frac{5}{8}-13 \times 1\frac{1}{4}$ hex-head stainless-steel cap screws. Lubricate the contact surfaces with an appropriate lubricant, such as S&C Catalog Number 9999-043 or equivalent. See Figure 12 on page 23, front view.

⚠️ CAUTION
Contact surfaces must be properly lubricated. Failure to lubricate these surfaces can result in excessive contact wear.

Use Shell Gadus® S2 U1000 2 Lubricant, S&C Catalog Number 9999-043, Shell Darina SD2, Dow 33, or equivalent.

Step 14
Manually operate the Circuit-Switcher to recheck the alignment between the moving and stationary arcing rods. During closing, the clearance between the moving and stationary arcing rods should be 0 inch to $\frac{1}{8}$-inch, as shown in Figure 12 on page 22, front view. Readjust the stationary arcing-rod assembly, if necessary, then securely retighten the cap screws on the inductor assembly end cap.

Step 15
Verify that the minimum metal-to-metal clearance between the stationary arcing rod and the nearest current-carrying jaw contact is equal to Dimension A, as shown in Figure 12 on page 22, front view. If necessary loosen the four $\frac{5}{8}-13 \times 2\frac{1}{4}$ hex-head stainless-steel cap screws which secure the inductor assembly to the inductor mounting bar and inductor mounting bracket and reposition the inductor assembly; then securely retighten the cap screws. Make sure that the 0-inch to $\frac{1}{8}$-inch gap between the stationary arcing rod and the moving arcing rod shown in Figure 12 on page 22, front view, has been maintained.

Step 16
Inspect the exterior finish of the inductor winding for damage or exposure of the fiberglass roving. Use the touch-up kit, furnished, to refinish any damaged surfaces. Refer to the “Inspection Recommendations” section on page 29.

*Should the inductor winding be damaged to the extent that coiled conductor is exposed, the inductor must be removed from service and replaced.*
Assembly and Installation Procedures

Prior to assembly of component parts, thoroughly wire-brush aluminum mating surfaces. Immediately coat these surfaces with Penetrox A (available from Burndy Corporation). Repeat the following steps for each pole-unit.

★Step 1
With the Circuit-Switcher in the fully closed position, attach the inductor mounting adapters as follows:

(a) Draw guide marks at the juncture of the tongue-contact disconnect blade and its associated blade-hinge assembly to use as a reference so that, during this step, the disconnect-blade contact alignment (longitudinal and rotational) can be maintained. Next, remove the tongue-contact disconnect-blade clamp and replace it with an inductor mounting adapter using four ⅜–13 × 1⅜ hex-head stainless-steel cap screws, serrated washers, and split lockwashers. Make sure that the inductor mounting surface of the adapter is level (parallel to the pole-unit base), and that the disconnect blade is aligned with its blade-hinge assembly in accordance with the guide marks previously drawn. Then fully tighten the cap screws. (For 345-kV Circuit-Switchers, repeat this procedure for the jaw-contact disconnect blade.)

(b) For 230-kV Circuit-Switchers, attach a second inductor mounting adapter to the jaw-contact disconnect blade—using the blade clamp which was removed as directed in (a) above—positioned as shown in Figure 13 on page 28, side view. Make sure that the inductor mounting surface of the adapter is level. Then fully tighten the cap screws.

Manually open and then reclose the Circuit-Switcher and verify, during the closing stroke, that the circuit-closing contact members are in proper mesh and that the current-carrying tongue contact enters the current-carrying jaw contact evenly with no tendency to clash against either side. Should adjustment be necessary, realign the tongue-contact disconnect blade only, as directed in the instruction sheet furnished for the Circuit-Switcher.

Step 2
Mount the two inductor assemblies on the inductor mounting adapters, using four ⅜–13 stainless-steel hex nuts and hardened flat washers. Securely tighten the nuts.

Step 3
Attach the arcing-arm assemblies to the inductor assemblies as shown in Figure 13 on page 28, side view, using four ⅜–13 × 1⅜ hex-head stainless-steel cap screws, serrated washers, and split lockwashers. Mounting holes of inductor arm assemblies are slotted to permit adjustment of arm.

★ Step applies only if pre-insertion inductors are being added to an installation not originally furnished with now-discontinued pre-insertion resistors.
Assembly and Installation Procedures

Step 4
Manually open the Circuit-Switcher to the point where the arcing-arm tips are aligned vertically, i.e., tip over tip. At this point of minimum separation, adjust the arms to obtain a clearance equal to Dimension A, as shown in Figure 13 on page 28, side view. If necessary, use the special shims (furnished) between the arcing-arm assemblies and the inductor assemblies to attain this clearance.

Continue opening the Circuit-Switcher until reaching the point where the metal-to-metal separation between the disconnect blades is equal to Dimension B, as shown in Figure 13 on page 28, top view. Then, while maintaining this disconnect-blade positioning, loosen the four $\frac{1}{2}$-13 x 1 1/2 hex-head stainless-steel cap screws which secure each arcing-arm assembly and adjust the angle of both arcing arms by equal amounts to obtain a separation equal to Dimension C, as shown in Figure 13 on page 28, top view.

Recheck to make sure that Dimension A has been maintained; if necessary, repeat the above procedure. Then fully tighten the $\frac{1}{2}$-13 x 1 1/2 hex-head stainless-steel cap screws which fasten the arcing-arm assemblies to the inductor assemblies.

Step 5
At the location indicated in Figure 13 on page 28, side view, remove one of the $\frac{1}{2}$-13 x 1 1/2 hex-head stainless-steel cap screws from the blade clamp at the jaw-contact end of the disconnect blade (not applicable to 345-kV Circuit-Switchers). At the inside corner of the bolt cavity, drill a $\frac{1}{4}$-inch diameter hole through the clamp and the wall of the disconnect blade—aim the drill to enter the blade on center. Insert the $\frac{1}{4}$-inch diameter Spirol pin furnished. Replace and fully tighten the clamp bolt.

Step 6
Inspect the exterior finish of the inductor winding for damage or exposure of the fiberglass roving. Use the touch-up kit, furnished, to refinish any damaged surfaces. Refer to the “Inspection Recommendations” section on page 29.

Should the inductor winding be damaged to the extent that coiled conductor is exposed, the inductor must be removed from service and replaced.

★ Step applies only if pre-insertion inductors are being added to an installation not originally furnished with now-discontinued pre-insertion resistors.
Figure 13. Assembly details of pre-insertion inductors for 230-kV and 345-kV Center-Break Style Circuit-Switchers. 230-kV Circuit-Switcher illustrated.
For Vertical-Break Style and Integer Style Circuit-Switchers:
Clean the exterior finish of the inductor windings on frequently operated Circuit-Switchers (typically 200 or more closing operations per year) annually, using a nontoxic, nonflammable solvent. Clean the exterior finish of the inductor windings on less-frequently operated Circuit-Switchers every 2500 closing operations or five years, whichever occurs first.

While cleaning the inductor windings, inspect for damage or exposure of the fiberglass roving. Use the touch-up kit, furnished, to refinish any damaged surfaces. First, thoroughly wire-brush the surface to be refinished, then sand with No. 1 sandpaper. Smooth the surface with No. 0 sandpaper. Brush on the paint. Drying time is approximately six hours. Should the inductor winding be damaged to the extent that coiled conductor is exposed, the inductor must be removed from service and replaced.

After cleaning and inspecting the inductor windings, inspect the moving and stationary arcing rods to verify their proper setting. These components should be replaced if they show significant wear or erosion.

For Center-Break Style Circuit-Switchers:
Inspect the exterior finish of the inductor windings for damage or exposure of the fiberglass roving every 2500 closing operations or five years, whichever occurs first. Use the touch-up kit, furnished, to refinish any damaged surfaces. First, thoroughly wire-brush the surface to be refinished, then sand with No. 1 sandpaper. Smooth the surface with No. 0 sandpaper. Brush on the paint. Drying time is approximately six hours. Should the inductor winding be damaged to the extent that coiled conductor is exposed, the inductor must be removed from service and replaced.

After inspecting the inductor windings, inspect the arcing-arm assemblies to verify their proper setting. These components should be replaced if they show significant wear or erosion.