S&C Alduti-Rupter® Switches Outdoor Distribution

Three-Pole Double-Break Style and Three-Pole Double-Break Integer Style
Live Parts Replacement on Switches with Catalog Number Supplement "-R10"
34.5 kV and 46 kV

Instructions for Installation

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S&C ELECTRIC COMPANY
Specialists in Electric Power Switching and Protection

Instruction Sheet 761-608
August 9, 2004

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Supersedes Instruction Sheet 761-608 dated 8-30-99

INTRODUCTION

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 overhead electric power distribution equipment along with the 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 replacing switch live parts. Familiarize yourself with "SAFETY INFORMATION" on pages 3 and 4.

Also, thoroughly and carefully read the instructions for checking switch alignment and operation contained in S&C Instruction Sheet 761-500, “S&C Alduti-Rupter Switches: Double-Break Style, Rotating Operating Mechanism;” S&C Instruction Sheet 761-505, “S&C Alduti-Rupter Switches: Double-Break Style, Reciprocating Operating Mechanism;” S&C Instruction Sheet 761-506, “S&C Alduti-Rupter Switches: Double-Break Integer Style, Rotating Operating Mechanism;” or S&C Instruction Sheet 761-507, “S&C Alduti-Rupter Switches: Double-Break Integer Style, Reciprocating Operating Mechanism,” as appropriate.

Retain this Instruction Sheet

This instruction sheet is a permanent part of your S&C Alduti-Rupter Switch. Designate a location where you can easily retrieve and refer to this publication.

Proper Application

⚠ CAUTION

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the equipment. Refer to “PROPER APPLICATION” on page 5 for complete application information.

Warranty

The standard warranty contained in S&C’s standard conditions of sale, as set forth in Price Sheet 150, is applicable to the S&C Alduti-Rupter Switch covered in this instruction sheet except when it is power operated using a switch operator of other than S&C manufacture.

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 Alduti-Rupter Switch. 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, or call S&C Headquarters at (773) 338-1000, Monday through Friday between 8:30 AM and 5:00 PM Central Standard Time. (In Canada, call S&C Electric Canada Ltd. at (416) 249-9171, Monday through Friday between 8:00 AM and 5:00 PM Eastern Standard Time.)

NOTICE

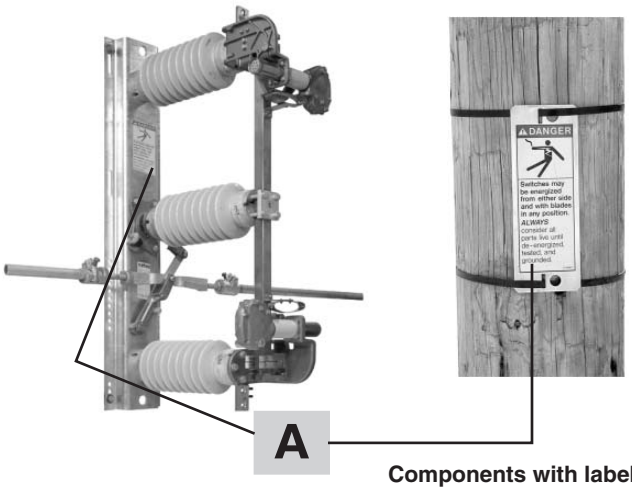
Thoroughly and carefully read this instruction sheet before operating your S&C Alduti-Rupter Switch.

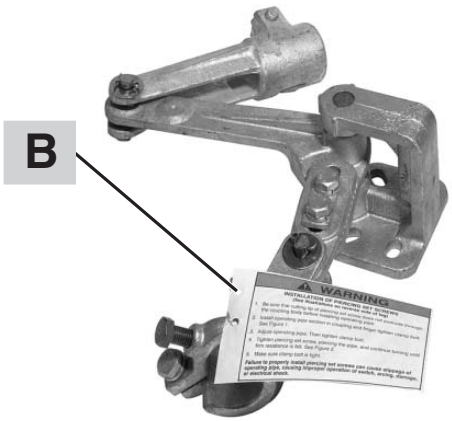
Replacement Instructions and Labels

If you need additional copies of this instruction sheet, contact your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

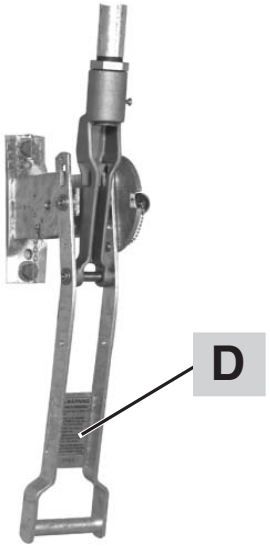
It is important that any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

Location of Safety Labels and Tags

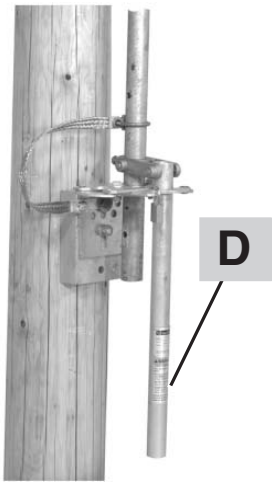




Components with labels and tags attached



Reciprocating Handle



Rotating Handle

Reorder Information for Safety Labels

Location	Safety-Alert Message	Description	Part Number
A	⚠ DANGER	Electrocution Hazard	G-6580-1
B	⚠ WARNING	Piercing Set Screws	G-3176R1▲
C	⚠ WARNING	Electrocution Hazard – Grounding Strap	G-6596▲
D	⚠ WARNING	Handle Operation	G-4400R5

▲ This part is a tag which is to be removed and discarded after the switch is installed and adjusted.

Switching Ratings

⚠ CAUTION

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the equipment.

In most applications, Alduti-Rupter Switches are capable of switching rated continuous load currents at full voltage. The ratings for the particular switch are listed on nameplates attached to the operating handle and the switch. See Figure 1.

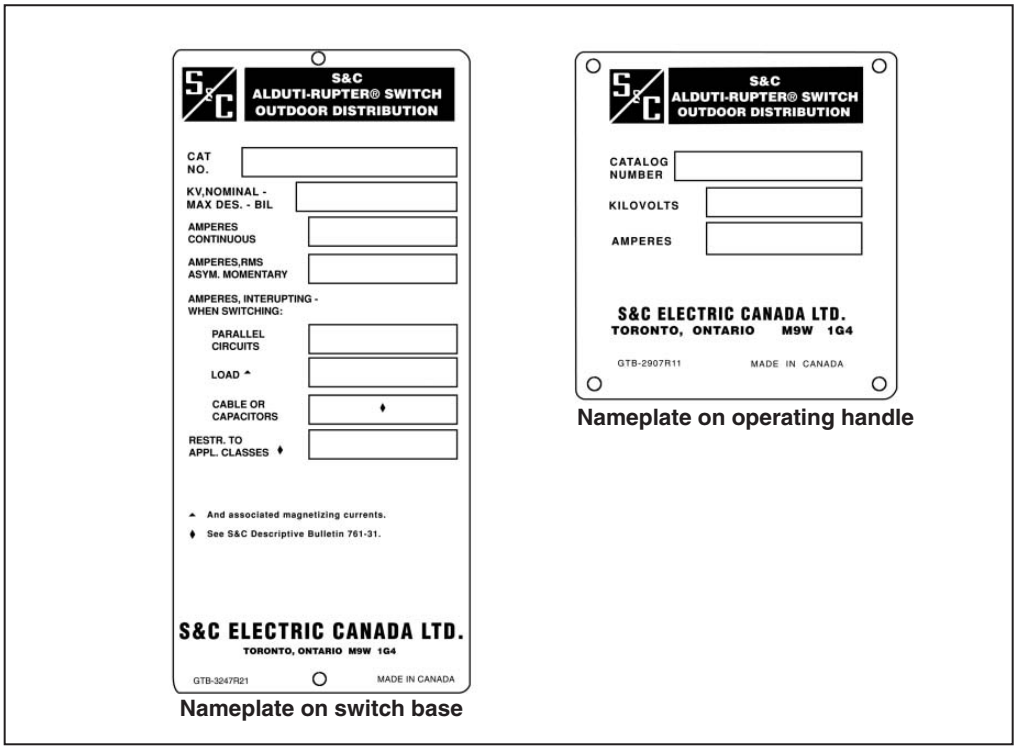


Figure 1. Switch nameplates with ratings.

These interrupter switches are *not* intended for breaking fault currents.

COMPONENTS

Contents of the Kit

This kit contains one or more of the following:

- A blade assembly, and/or
- A terminal base casting, and/or
- A stationary contact assembly, comprised of a current-carrying contact assembly and an arcing contact assembly

For one pole of a Three-Pole Double-Break Style Alduti-Rupter Switch rated 34.5 kV or 46 kV bearing catalog number supplement "-R10" (for example, 320304R10) or Three-Pole Double-Break Integer Style Alduti-Rupter Switch rated 46 kV. Such switches have been manufactured since January 1998.

BEFORE STARTING

⚠ DANGER

Make sure that the Alduti-Rupter Switch is de-energized, isolated from all power sources, and grounded at all six terminals before starting. **Working on an energized switch can result in severe personal injury or death.**

Disconnecting Switch Pole or Switch

Step 1

Place the switch in the open position.

For Double-Break Style Switches

Disconnect the switch pole by removing the ½″ stainless-steel attachment pin from the toggle mechanism. See Figure 2.

Retain the pin, flat washer, spacer(s) and, cotter pin for reassembly later.

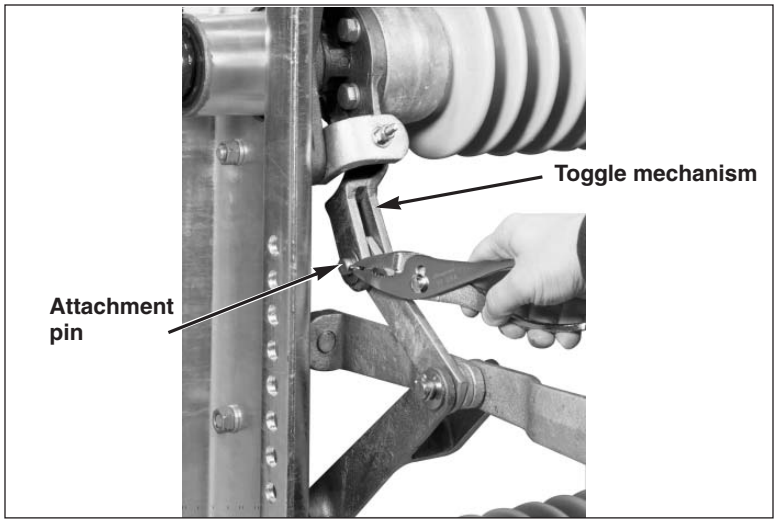


Figure 2. Disconnecting switch pole.

For Double-Break Integer Style Switches

While supporting the upper section of vertical operating pipe, disconnect the pipe coupling connecting the pipe to the switch drive shaft or drive lever by removing the ½″ stainless-steel attachment pin. See Figures 3 and 4.

Retain the pin, flat washer, and cotter pin for reassembly later.

NOTICE

If *only* a blade assembly, *only* a terminal base casting, or *only* a stationary contact assembly is being replaced, disregard any of the following steps which obviously do not apply.

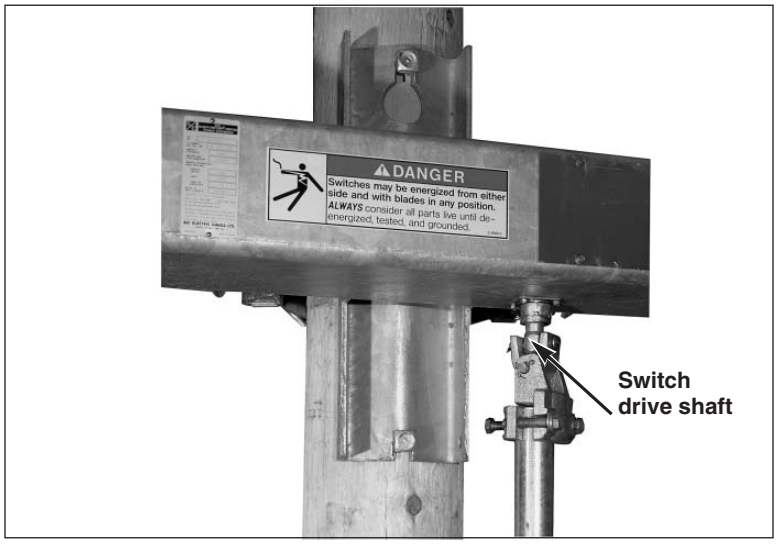


Figure 3. Disconnecting switch with rotating operating mechanism.

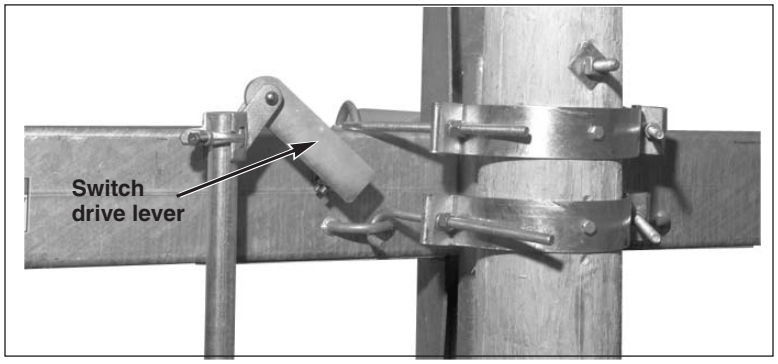


Figure 4. Disconnecting switch with reciprocating operating mechanism.

Removing Existing Blade Assembly

Step 2

If a blade assembly is being replaced, detach it by removing the four ½″—13 × 2½″ hex-head galvanized steel cap screws and ½″ galvanized steel lockwashers which secure the blade clamp assembly to the rotating insulator. See Figure 5.

Discard the blade assembly, blade clamp, and associated hardware.

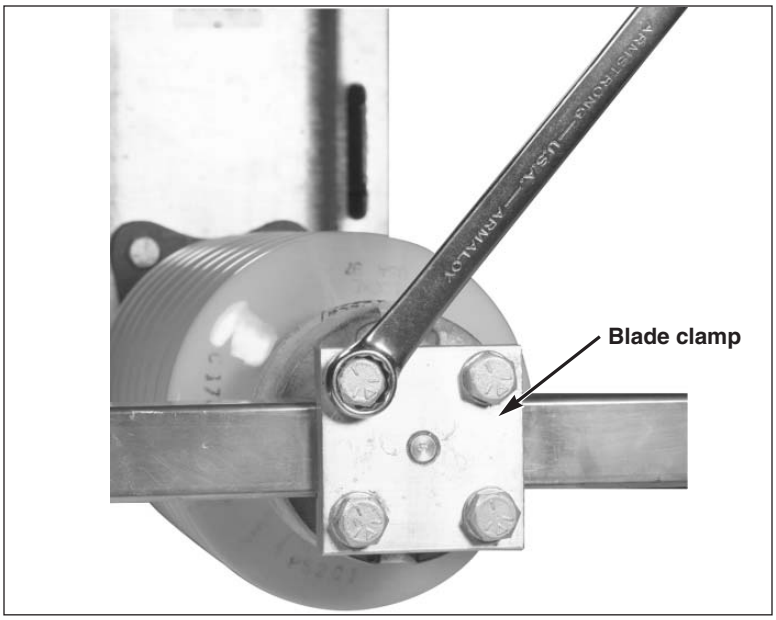


Figure 5. Removing blade assembly.

Removing Existing Terminal Base Casting

Step 3

If a terminal base casting is being replaced, detach it by removing the four ½″—13 × 1¼″ hex-head galvanized steel cap screws and ½″ galvanized steel lockwashers which secure it to its respective stationary insulator. See Figure 6.

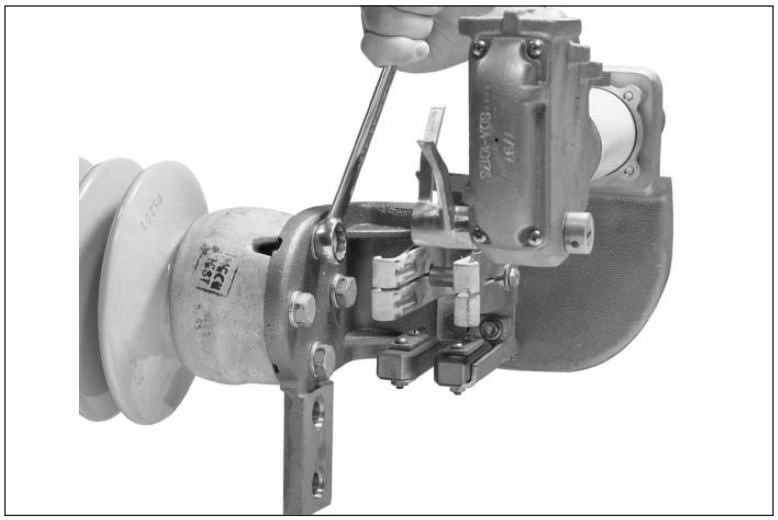


Figure 6. Removing terminal base casting.

Step 4

If the current-carrying contact assembly is to be reused, detach it from the terminal base casting by removing the two 5⁄16″—18 × 1″ hex-head stainless-steel cap screws, 5⁄16″ stainless-steel lockwashers, 5⁄16″ stainless-steel flat washers, and nut plate which secure it to the terminal base casting. See Figure 7.

Retain this hardware for reassembly later.

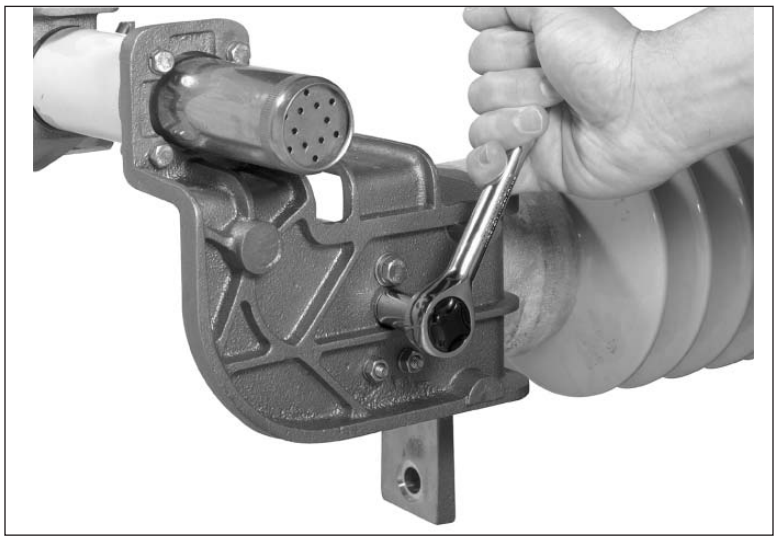


Figure 7. Removing current-carrying contact assembly.

Step 5

If the arcing contact assembly is to be reused, detach it from the terminal base casting by removing the two ¼″—20 × ¾″ hex-head stainless-steel cap screws, ¼″ stainless-steel lockwashers, ¼″ stainless-steel flat washers, and ¼″ stainless-steel nuts which secure it to the terminal base casting. See Figure 8.

Retain this hardware for reassembly later.

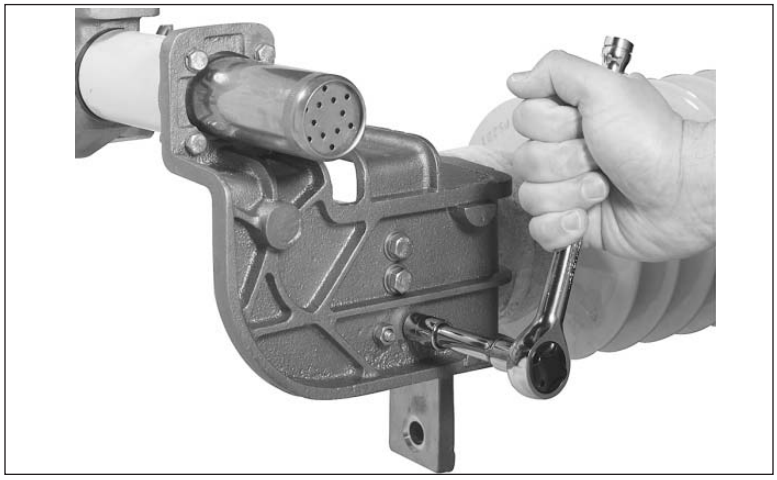


Figure 8. Removing arcing contact assembly.

Step 6

If the interrupter is to be reused, detach it from the terminal base casting by removing the four ¼″—20 × 1″ hex-head stainless-steel cap screws and ¼″ stainless-steel lockwashers which secure it to the terminal base casting. See Figure 9.

Retain this hardware for reassembly later.

Discard the terminal base casting and associated hardware.

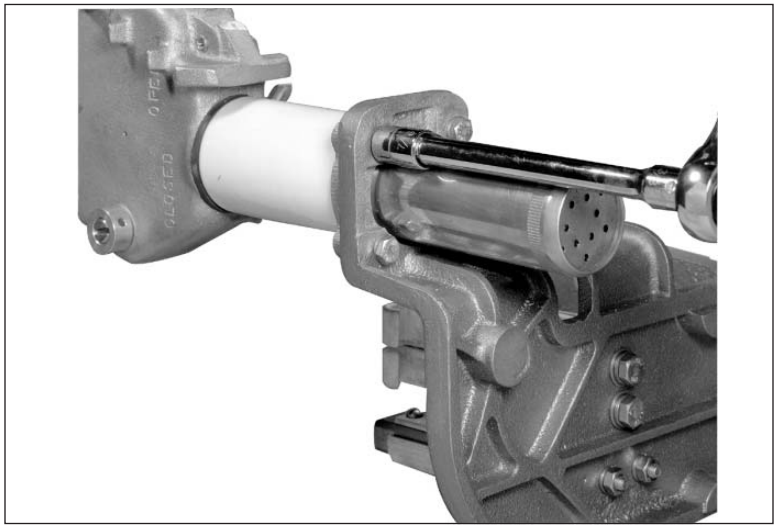


Figure 9. Removing interrupter.

Removing Existing Stationary Contact Assembly

Step 7

If a current-carrying contact assembly is being replaced, detach it from the terminal base casting by removing the two 5⁄16″—18 × 1″ hex-head stainless-steel cap screws, 5⁄16″ stainless-steel lockwashers, 5⁄16″ stainless-steel flat washers, and nut plate which secure it to the terminal base casting. See Figure 10.

Discard the current-carrying contact assembly and associated hardware.

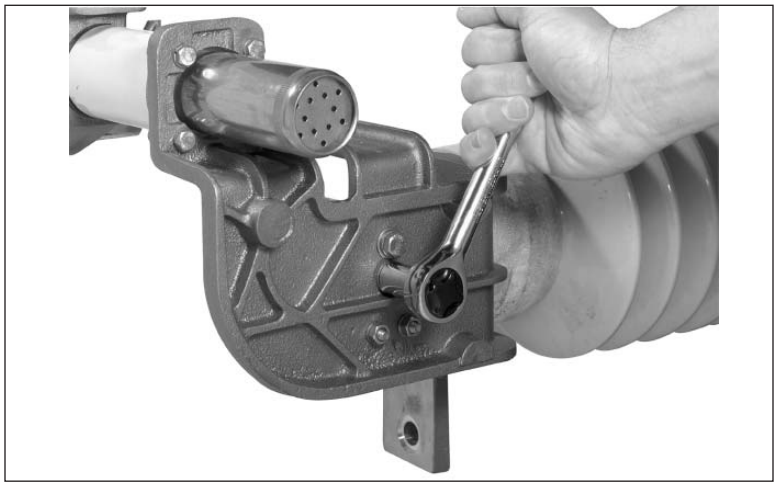


Figure 10. Removing current-carrying contact assembly.

Step 8

If an arcing contact assembly is being replaced, detach it from the terminal base casting by removing the two ¼″—20 × ¾″ hex-head stainless-steel cap screws, ¼″ stainless-steel lockwashers, ¼″ stainless-steel flat washers, and ¼″ stainless-steel nuts which secure it to the terminal base casting. See Figure 11.

Discard the arcing contact assembly and associated hardware.

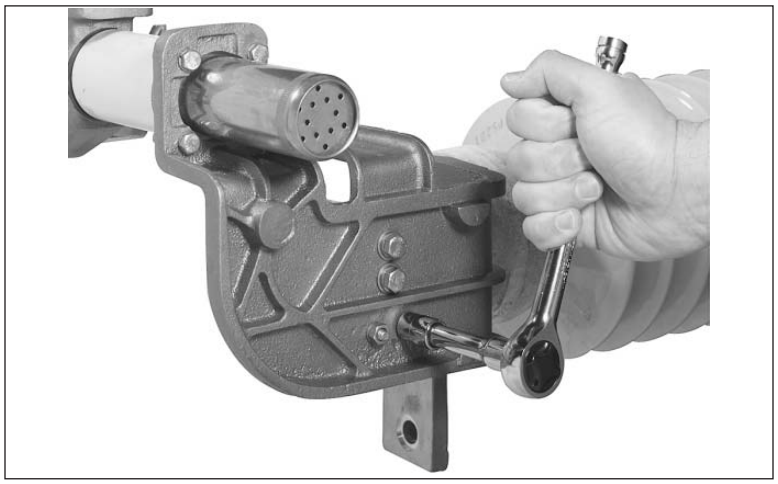


Figure 11. Removing arcing contact assembly.

Installing Replacement Blade Assembly

Step 9

Apply a light coating of No-Ox-Id "A Special" oxidation-inhibiting grease (available from Sanchem Incorporated) to the replacement blade at the surfaces that are in contact with the blade clamp and insulator. See Figure 12.

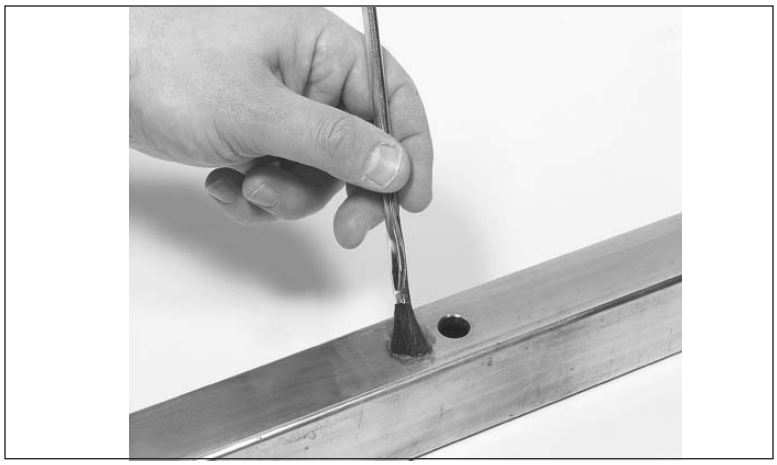


Figure 12. Applying oxidation-inhibiting grease to replacement blade.

Step 10

Align the blade clamp pin with the hole in the center of the replacement blade. Attach the blade and blade clamp assembly to the center insulator in the blade-closed position, using four ½″—13 × 2½″ hex-head galvanized steel cap screws and ½″ galvanized steel lockwashers furnished. See Figure 13.

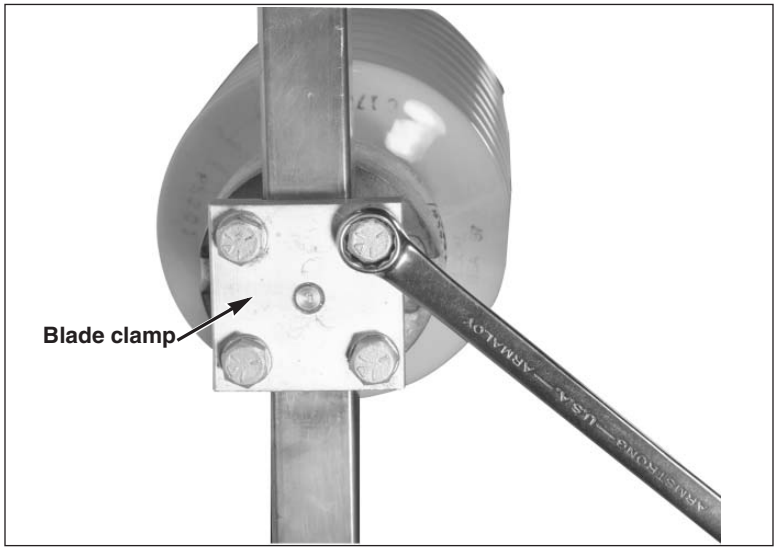


Figure 13. Attaching blade and blade clamp assembly.

Step 11

Check that the blade parallels the switch-pole base, then torque—in a diagonal pattern— the blade assembly cap screws to final tightness (35 ft.-lbs.). See Figure 14.

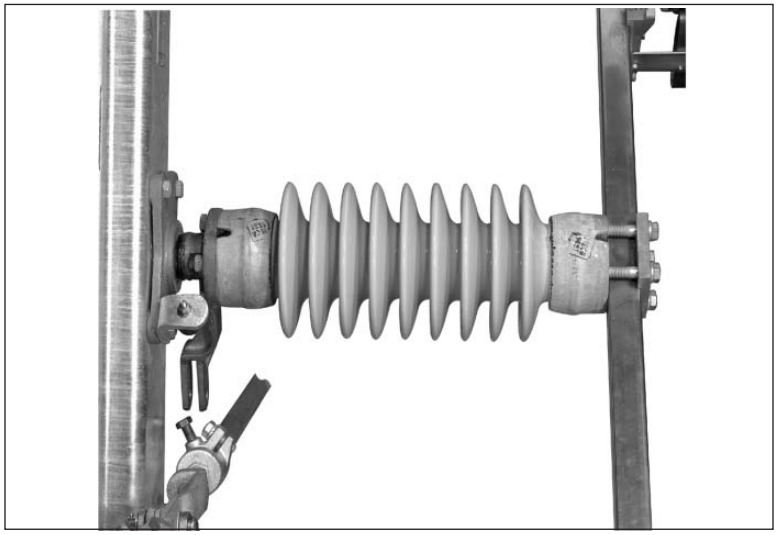


Figure 14. Checking that blade parallels switch-pole base.

Installing Replacement Terminal Base Casting

Step 12

Attach the replacement terminal base casting to its stationary insulator, using four ½″—13 × 1¼″ hex-head galvanized steel cap screws and ½″ galvanized steel lockwashers furnished. See Figure 15.

Tighten the bolts snugly, but loose enough to permit later adjustment.

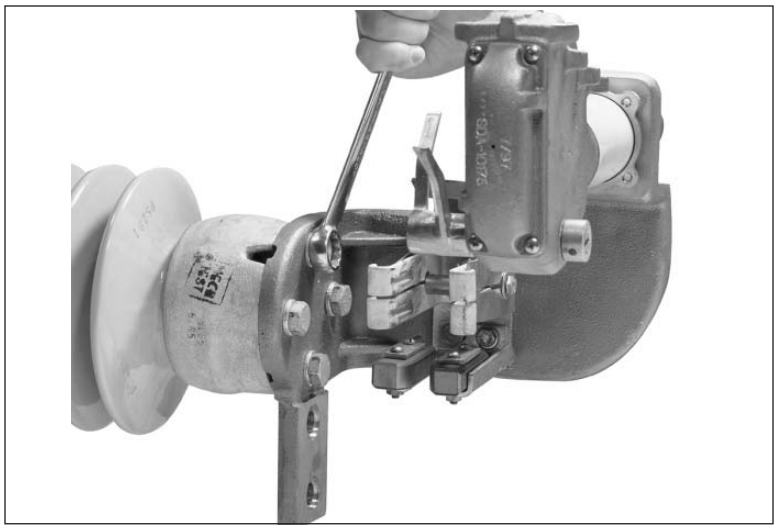


Figure 15. Attaching replacement terminal base casting.

Step 13

Make certain that the interrupter is in the open position. The interrupter operating lever can be actuated by hand.

Move the blade assembly to the open position and attach the interrupter to the terminal base casting using four ¼″—20 × 1″ hex-head stainless-steel cap screws and ¼″ stainless-steel lockwashers. Securely tighten the cap screws. See Figure 16.

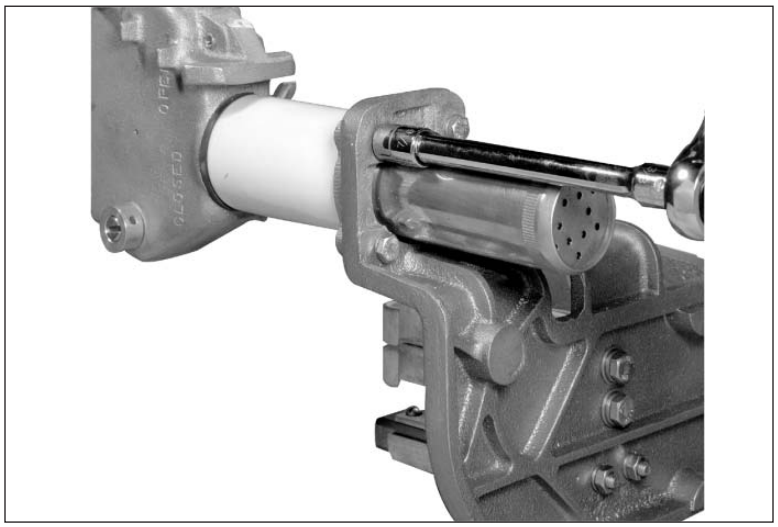


Figure 16. Attaching interrupter.

Step 14

Move the blade assembly *slowly* towards the closed position until the blade assembly is under the interrupter lever shaft. Verify that, for each interrupter, the gap between the end of the interrupter lever shaft and the blade assembly is between 3⁄16″ and 9⁄32.″ See Figure 17.

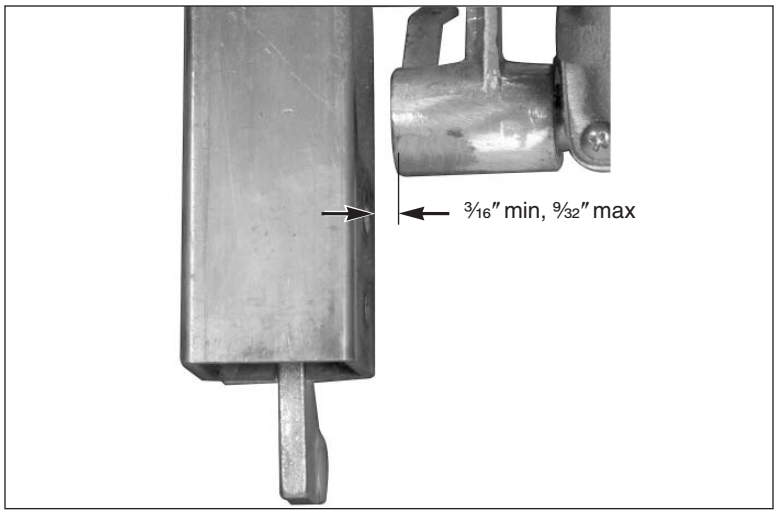


Figure 17. Verifying gap between end of interrupter lever shaft and blade assembly.

Step 15

If one gap measurement is much larger than the other, loosen the four ½″—13 × 2½″ hex-head galvanized steel cap screws used to attach the blade assembly to the center insulator. Install 0.30″ shims as required, between the blade assembly and the center insulator cap, on the side with the larger gap. Retorque —in a diagonal pattern—the blade assembly cap screws to final tightness (35 ft.-lbs.). See Figure 18.

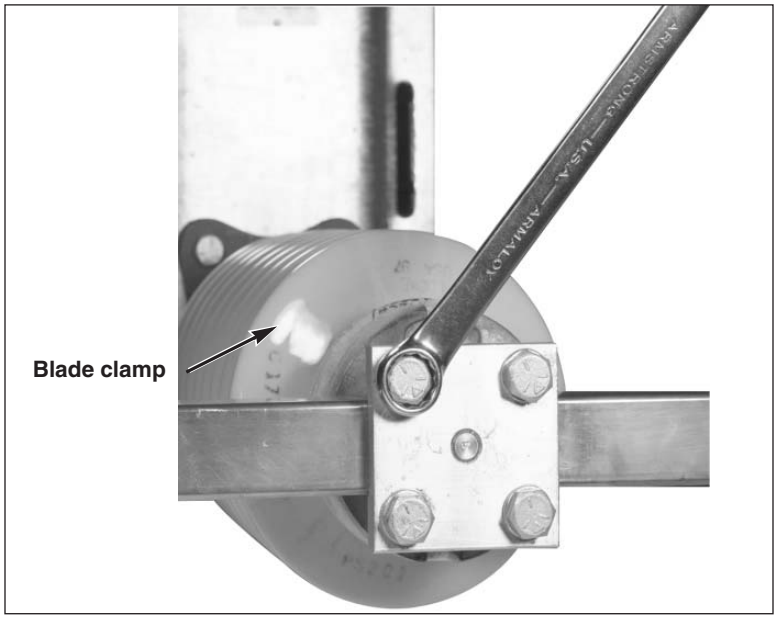


Figure 18. Retorquing blade assembly cap screws with shims installed.

Step 16

If the two gap measurements are nearly the same and only minor adjustment is needed, loosen the four ½″—13 × 1¼″ hex-head galvanized steel cap screws used to attach each terminal base casting to its stationary insulator. Install 0.30″ shims as required, between the terminal base casting and the stationary insulator cap, on the side with the larger gap. See Figure 19.

Retighten the bolts snugly, but loose enough to permit later adjustment.

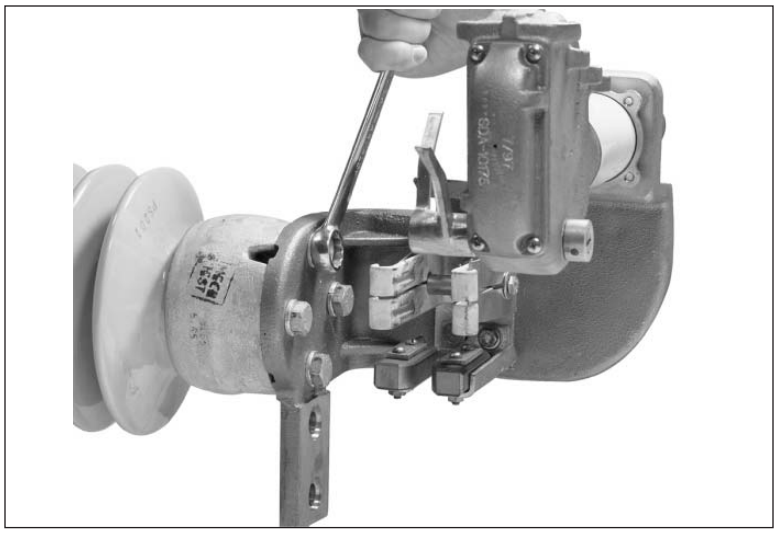


Figure 19. Attaching replacement terminal base casting with shims installed.

Step 17

Open and close the switch *slowly* several times.

⚠ CAUTION

The switch should be opened and closed slowly only when checking for alignment and complete closure.

When opening or closing the switch in service, *do not* slow down or stop part way. Arcing can occur if the switch is partially open or partially closed.

Check to be sure that the following conditions exist:

The interrupters must lie in a plane parallel to the sweep of the blade. See Figure 20.

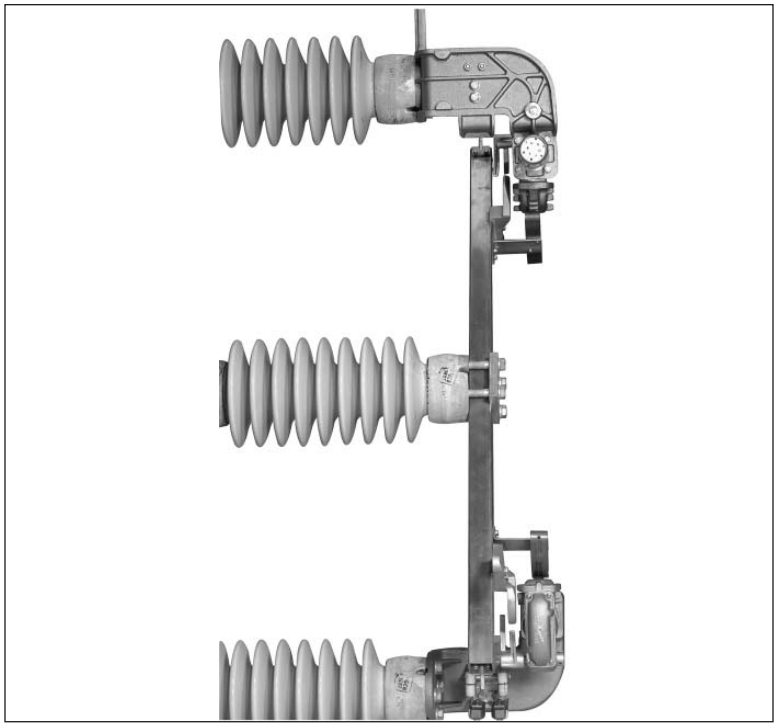


Figure 20. Checking interrupter alignment.

As the blade assembly moves in the *closing* direction, each blade closing cam must make positive engagement with its respective interrupter closing lever. See Figure 21.

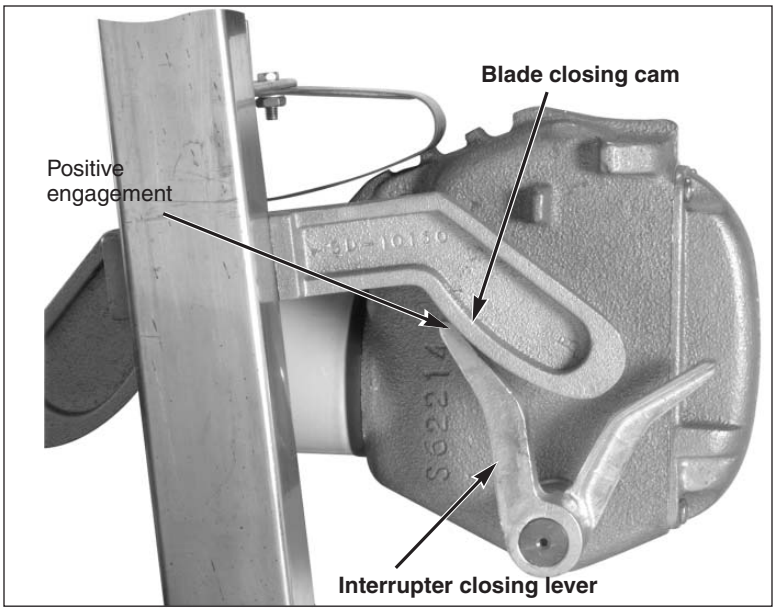


Figure 21. Verifying blade closing cam engages interrupter closing lever.

When the blade is in the fully closed position, each blade closing cam must overlap its respective interrupter closing lever to prevent inadvertent opening of the interrupter, and clearance between the blade closing cam and its respective interrupter closing lever must be within the limit shown in Figure 22.

Adjust the terminal base casting position to obtain the required gap.

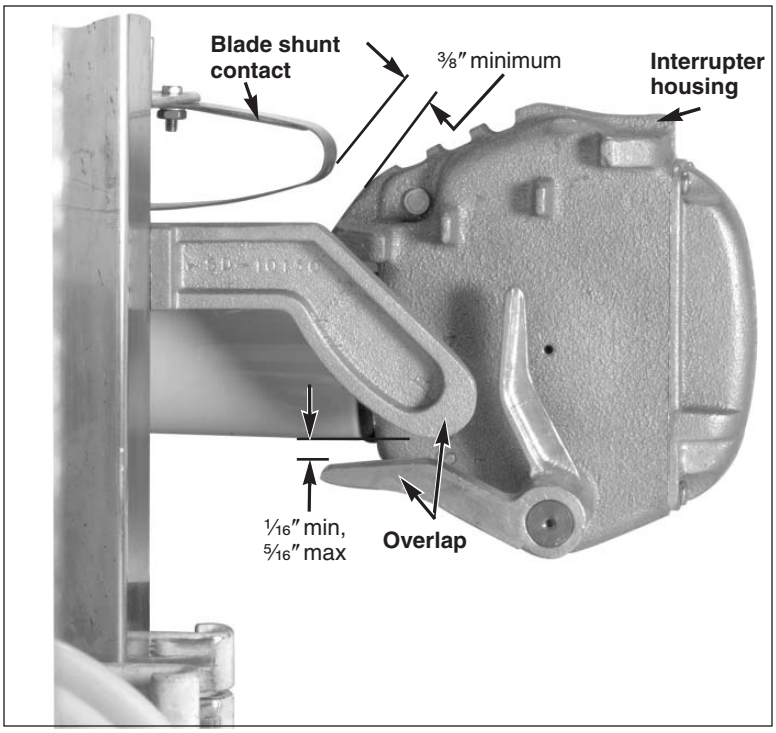


Figure 22. Verifying blade closing cam overlaps interrupter closing lever.

As the blade assembly moves in the *opening* direction, the two blade opening cams must simultaneously make positive engagement with their respective interrupter opening levers as shown in Figure 23. Simultaneity is essential to ensure that both interrupters share the interrupting duty. The opening lever on one or both interrupters may be bent slightly to attain opening simultaneity.

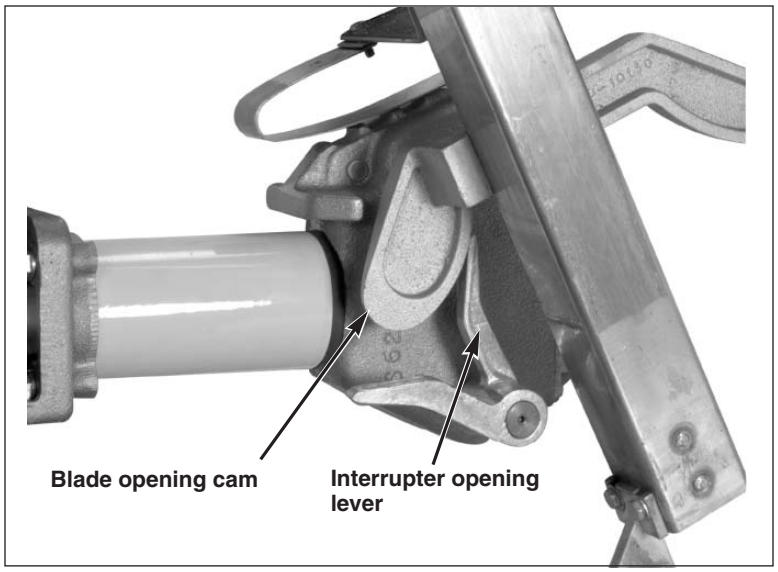


Figure 23. Verifying blade opening cams simultaneously engage interrupter opening levers.

After opening the blade fully, *slowly* close the blade and verify that the two opening cams do not hit the interrupter opening levers. See Figure 24.

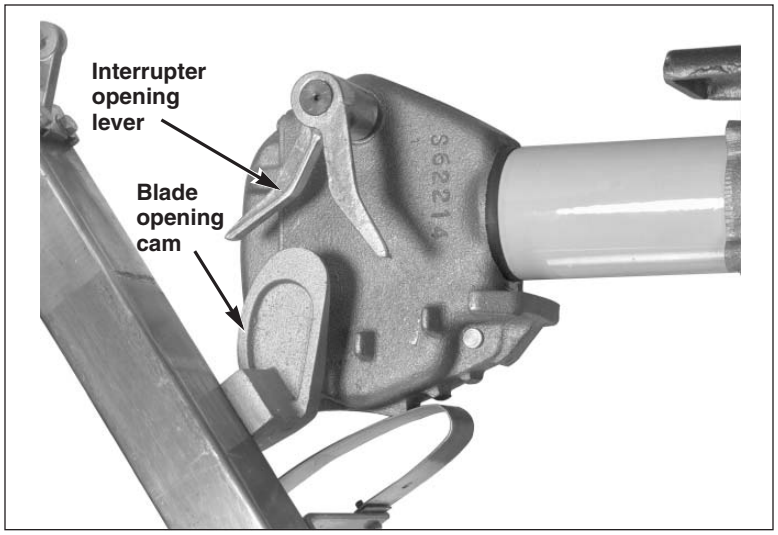


Figure 24. Verifying blade opening cams do not hit interrupter opening levers on closing.

If the conditions described above are not met, adjust as follows. Loosen the four ½″—13 × 1¼″ hex-head galvanized steel cap screws which fasten the terminal base castings to the stationary insulators. See Figure 25. Shift the terminal base castings as required. Tighten the terminal base casting cap screws and recheck for conformance to the conditions outlined above. Readjust if required. Make certain that the terminal base casting cap screws are tightened to final tightness (55 ft.-lbs.)

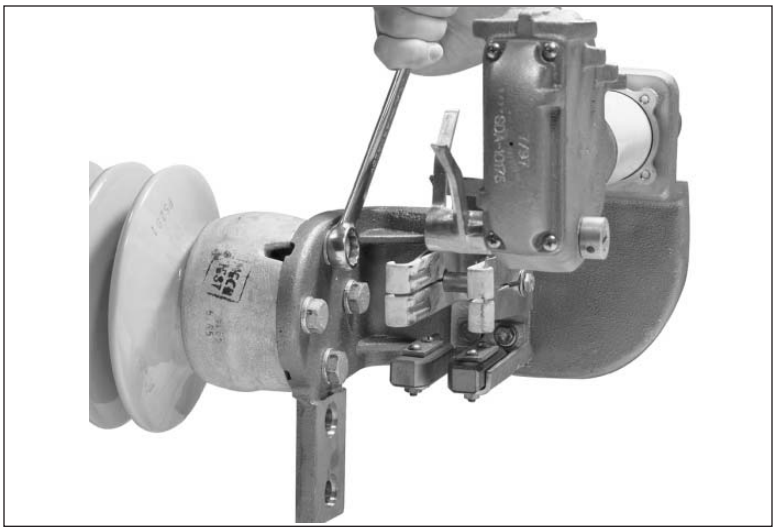


Figure 25. Shifting position of terminal base casting.

Installing Replacement Stationary Contact Assembly

Step 18

Attach the current-carrying contact assembly to the terminal base casting using two 5⁄16″—18 × 1¼″ hex-head stainless-steel cap screws, 5⁄16″ stainless-steel lockwashers, 5⁄16″ stainless-steel flat washers, and nut plate. See Figure 26.

Adjust the current-carrying contact assembly so that the blade assembly enters the contacts on-center ± 1⁄16″.

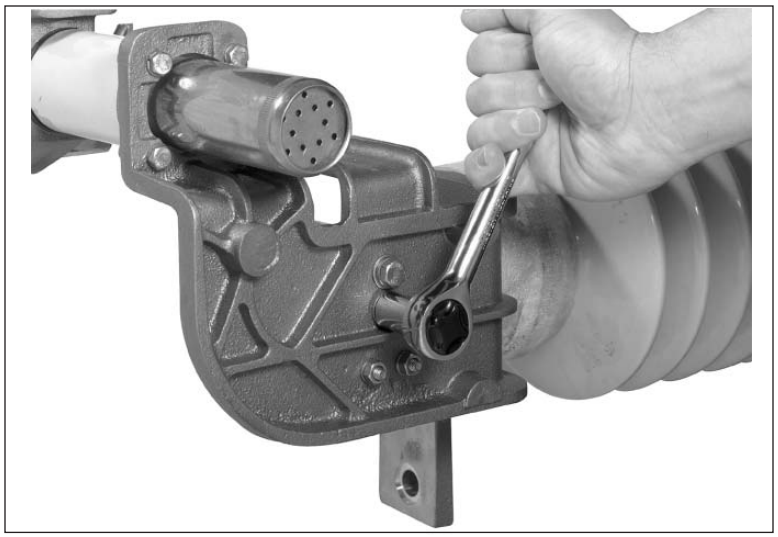


Figure 26. Attaching current-carrying contact assembly.

Step 19

Also adjust the current-carrying contact assembly so that the silver-nickel contact buttons on the blade assembly engage their respective current-carrying contact fingers on-center ± 1⁄16″. See Figure 27.

Then torque the cap screws to final tightness.

NOTICE

Stationary contacts are greaseless and self-lubricating. **DO NOT** apply lubricant to the stationary contacts.

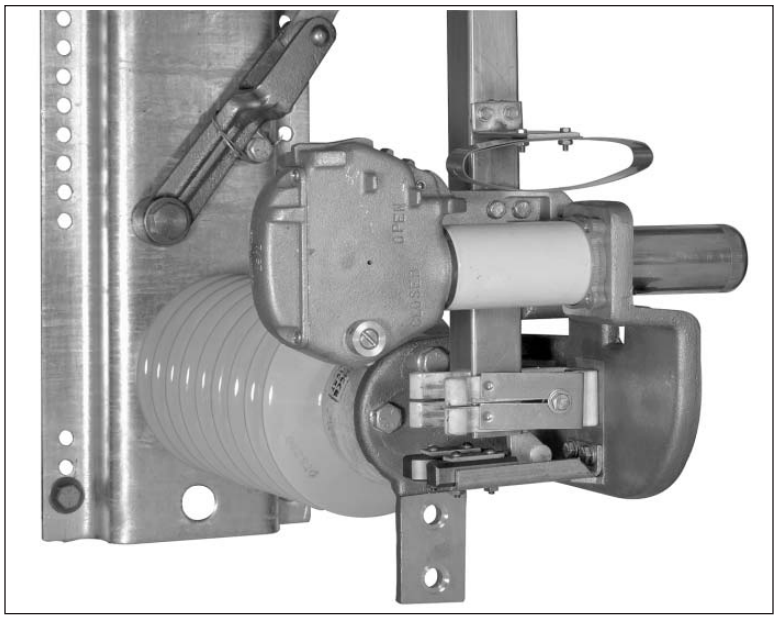


Figure 27. Adjusting current-carrying contact assembly.

Step 20

With the blade assembly in the fully closed position, verify the minimum clearance between each blade shunt contact and its respective interrupter housing, as shown in Figure 28.

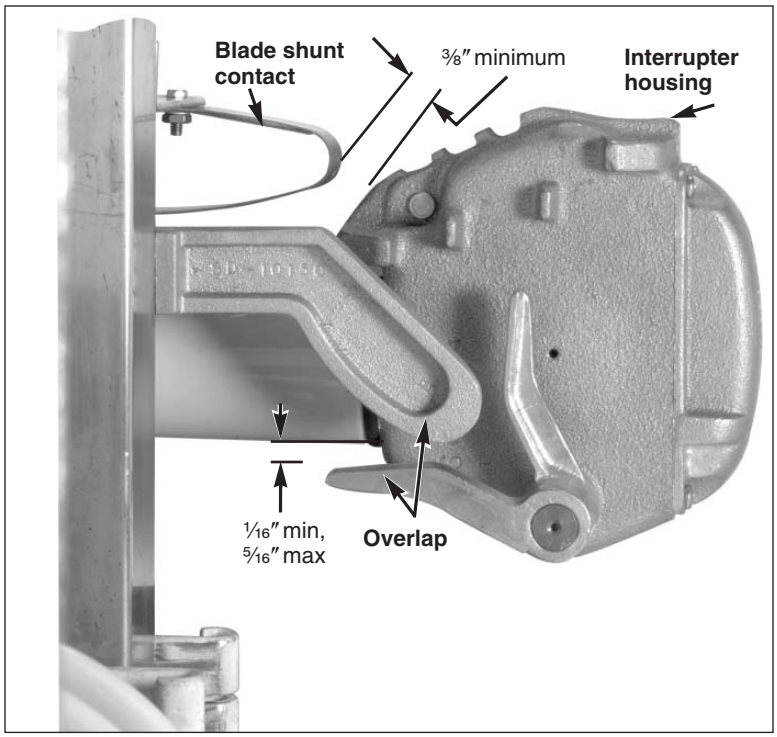


Figure 28. Verifying clearance between blade shunt contact and interrupter housing.

Step 21

Move the blade in the opening direction and verify that each blade shunt contact firmly engages its respective interrupter housing before the blade contacts disengage from the stationary main contact assemblies, as shown in Figure 29. The shunt contacts may be bent as required to conform to these conditions.

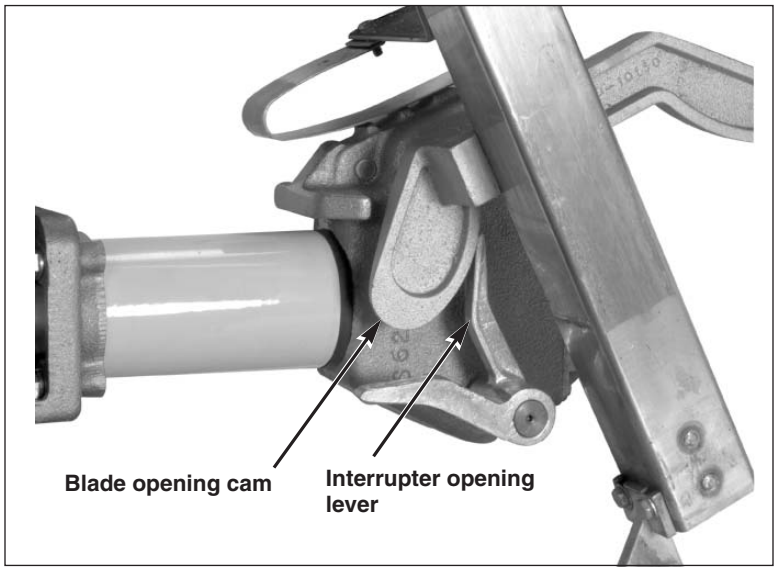


Figure 29. Verifying blade shunt contact engages interrupter housing.

Step 22

With the blade assembly in the fully closed position, verify that the blade is within ⅛-inch of the stop on the terminal base casting. See Figure 30.

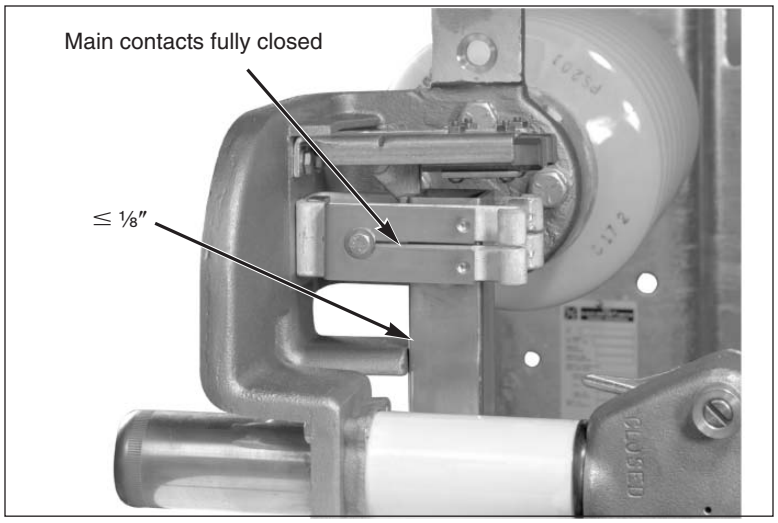


Figure 30. Checking that blade is fully closed and within ⅛″ of the stop on the terminal base casting.

Step 23

Attach the arcing contact assembly to the terminal base casting using two ¼″—20 × ¾″ hex-head stainless-steel cap screws, ¼″ stainless-steel lockwashers, ¼″ stainless-steel flat washers, and ¼″ stainless-steel nuts. See Figure 31.

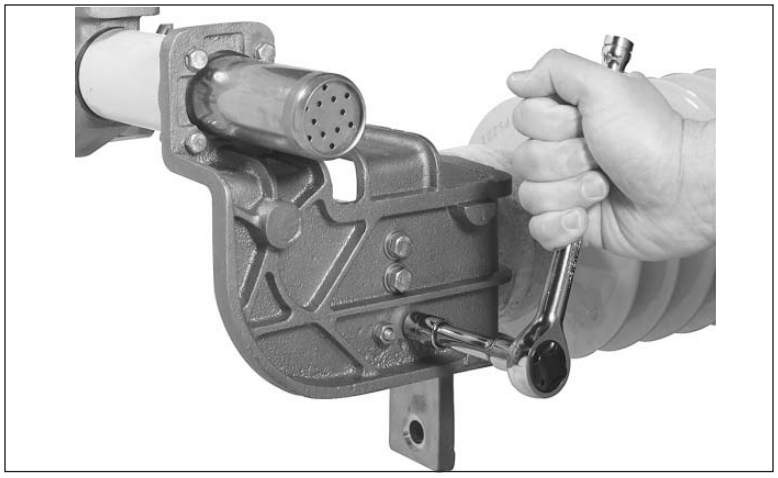


Figure 31. Attaching arcing contact assembly.

Step 24

Adjust the arcing contact assembly so that the blade assembly enters the contacts on-center ± 1/16″. See Figure 32.

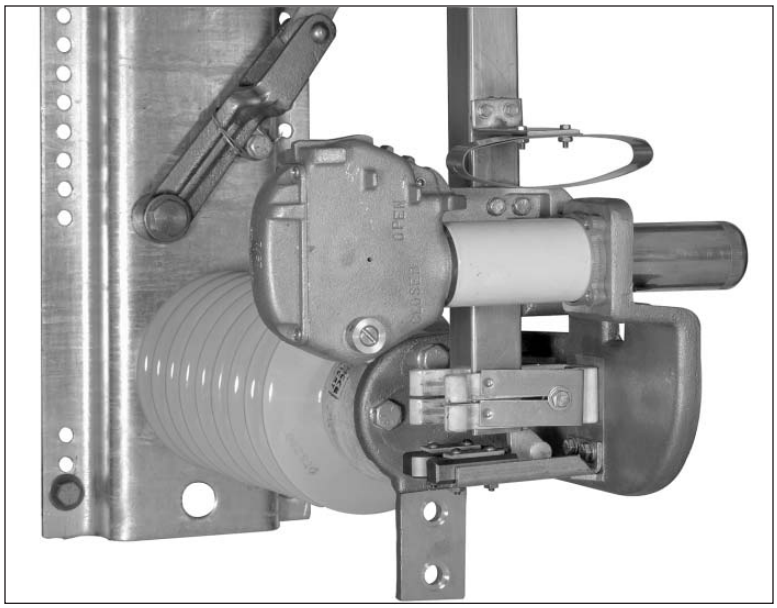


Figure 32. Adjusting arcing contact assembly so contacts enter on-center.

Step 25

Also adjust the arcing contact assembly so that there is a .015″ gap between the blade arcing tip and the arcing contact—on each side—when the blade assembly is in the closed position. See Figure 33.

Then torque the cap screws to final tightness.

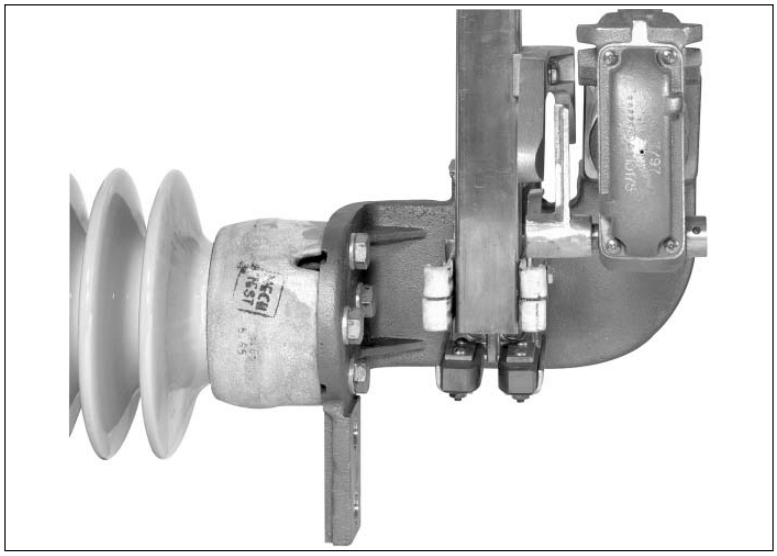


Figure 33. Adjusting arcing contact assembly to achieve gap between blade arcing tip and arcing contact.

Reconnecting Switch Pole or Switch

Step 26

Perform several opening and closing operations. Then verify that the critical dimensions discussed above have been retained.

⚠ CAUTION

The switch should be opened and closed slowly only when checking for alignment and complete closure.

When opening or closing the switch in service, *do not* slow down or stop part way. Arcing can occur if the switch is partially open or partially closed.

For Double-Break Style Switches

When satisfactory operation has been attained, place the blade assembly in an intermediate position and reconnect the switch pole using the ½″ stainless-steel attachment pin, flat washer, spacer(s), and cotter pin removed earlier. See Figure 34.

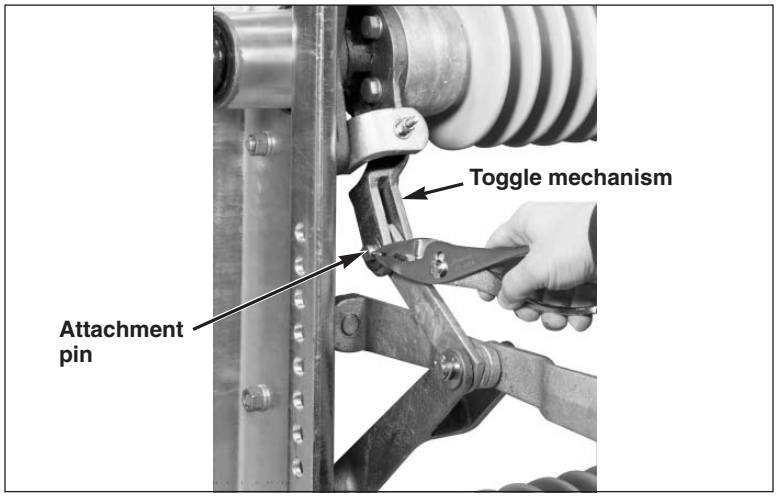


Figure 34. Reconnecting switch pole.

Place the switch in the fully open position and adjust the open bumper so that it rests on the operating lever. See Figure 35.

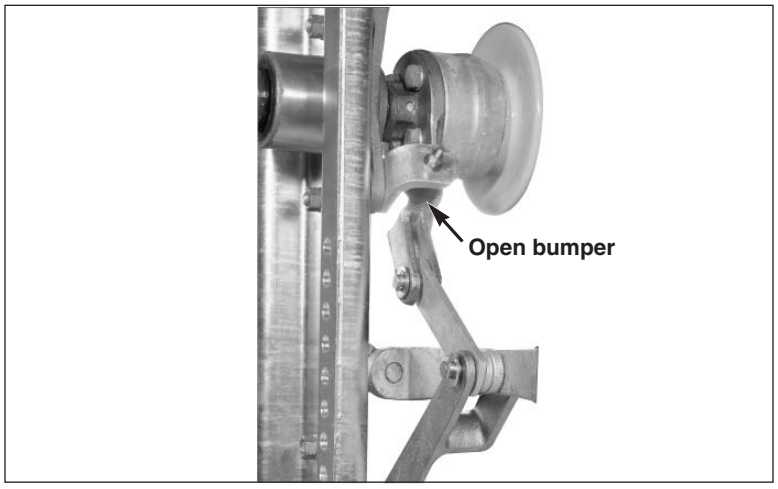


Figure 35. Adjusting open bumper.

For Double-Break Integer Style Switches

When satisfactory operation has been attained, place the switch in an intermediate position and reconnect the pipe coupling attaching vertical operating pipe to the switch drive shaft or drive lever, using the ½″ stainless-steel attachment pin, flat washer, and cotter pin removed earlier. See Figures 36 and 37.

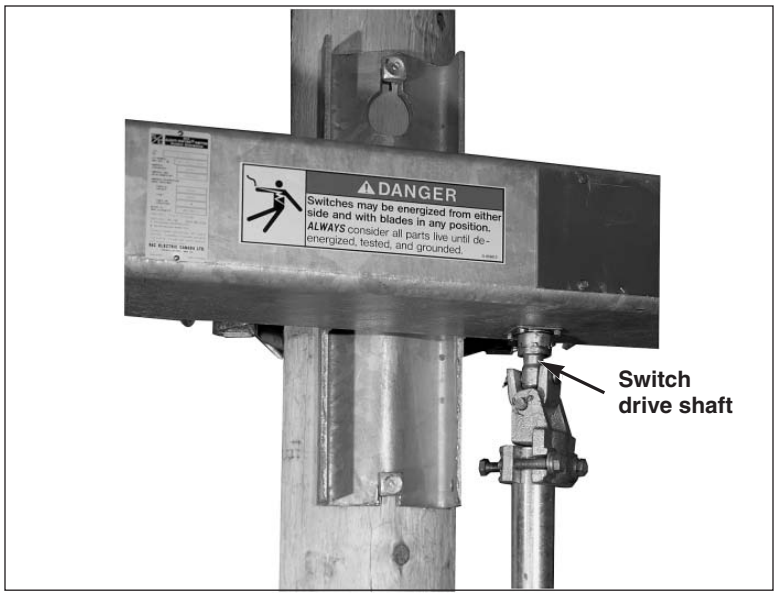


Figure 36. Reconnecting switch with rotating operating mechanism.

Checking Operation on Switches with Rotating Operating Mechanism

Step 27

For Double-Break Style Switches

Refer to S&C Instruction Sheet 761-500 and complete the procedures described under the "Checking Alignment" and "Checking Operation" sections.

For Double-Break Integer Style Switches

Refer to S&C Instruction Sheet 761-506 and complete the procedures described under the "Checking Alignment" and "Checking Operation" sections.

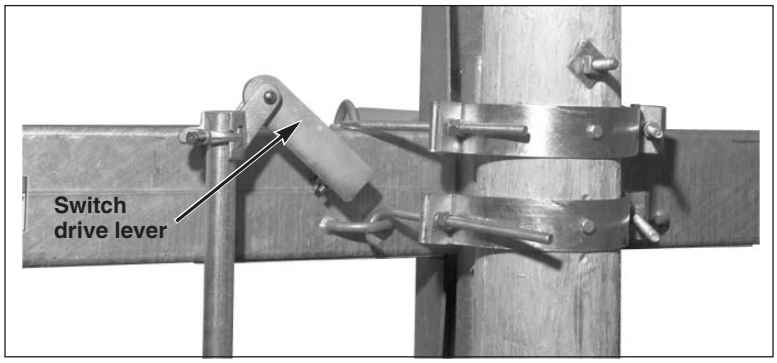


Figure 37. Reconnecting switch with reciprocating operating mechanism.

Checking Operation on Switches with Reciprocating Operating Mechanism

Step 28

For Double-Break Style Switches

Refer to S&C Instruction Sheet 761-505 and complete the procedures described under the "Checking Alignment" and "Checking Operation" sections.

For Double-Break Integer Style Switches

Refer to S&C Instruction Sheet 761-507 and complete the procedures described under the "Checking Alignment" and "Checking Operation" sections.

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