# INSTRUCTIONS

## For Replacement of Live Parts

## INTRODUCTION

**CAUTION: The equipment covered by this publication must be selected for a specific application and it must be installed, operated, and maintained by qualified persons who are thoroughly trained and who understand any hazards that may be involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.**

### General

The following instructions are for replacement and adjustment of live parts for S&C Alduti-Rupter Switches—Outdoor Distribution, Three-Pole Double-Break Style in ratings of 23 kv through 46 kv and Three-Pole Double-Break Integer Style rated 34.5 kv. These instructions apply only to switches manufactured after 1960; such switches bear a catalog number supplement of "R8" or "R9" (e.g., 320304R9). For live parts replacement on switches manufactured prior to 1960, refer to the nearest S&C Sales Office.

These instructions, further, apply only to live parts replacement. For adjustments to the switch itself and to its operating mechanism, refer to the instruction sheet and the erection drawing that were furnished with the switch. Additional copies of the instruction sheet and erection drawing, for the applicable switch style, rating, and mounting configuration, may be obtained from the nearest S&C Sales Office.

Note: If *only* the blade assembly or *only* the set of stationary contact assemblies is to be replaced (i.e., not the complete set of live parts), disregard any of the following instructions that obviously do not apply. However, it is generally expected that if either the blade assembly or the set of stationary contact assemblies requires replacement, both assemblies should be changed out.

Indicated herein are the critical dimensional relationships which must be maintained to ensure proper sequencing of the interrupters with respect to their associated blade. Such relationships include those between the blade shunt contact and the interrupter housing, between the blade closing cam and interrupter

closing lever, and between the blade opening cam and interrupter opening lever; the importance of these relationships to proper switch performance is as follows.

### Blade Shunt-Contact and Interrupter-Housing Clearance

When the switch is in the fully closed position, there must be adequate clearance between the blade shunt contact and the interrupter housing to prevent load current from being carried continuously by the interrupter.

### Blade Closing-Cam and Interrupter Closing-Lever Clearance

When the switch is in the fully closed position, the clearance between the blade closing cam and the interrupter closing lever must be sufficiently close to prevent any tendency of the interrupter to inadvertently open. There must, however, be physical clearance between the blade closing cam and the interrupter closing lever when the switch is in the fully closed position to prevent load current from being carried continuously by the interrupter.

### Blade Opening-Cam and Interrupter Opening-Lever Clearance

During switch opening, as the blade opening cam passes the opening lever on the (already opened) interrupter, the cam-to-lever clearance must be sufficiently close to prevent any tendency of the interrupters to inadvertently close.

During switch closing, there must be sufficient clearance between the blade opening cam and the interrupter opening lever to prevent mechanical interference.

If any of the specified dimensional relationships cannot be attained, contact the nearest S&C Sales Office.

## BEFORE STARTING REPLACEMENT OF LIVE PARTS

The following procedures‡ should be observed before attempting any work on S&C Alduti-Rupter Switches:

1. At all times adhere to the prescribed safety rules which are applicable to such devices as circuit breakers, fuses, interrupter switches, power switching equipment, and their mechanisms.
2. Make certain that any such device is disconnected from all power sources and all control sources before being inspected or serviced.
3. Always assume both sets of power terminals on any device to be energized unless proved otherwise by visual evidence of open-circuit conditions on both terminal ends or by test using appropriate high-voltage test equipment.
4. Test for voltage. Qualified persons should be certain that they have, and know how to operate, the correct test equipment for determining the voltage on both sets of power terminals in any circuit breaker, power fuse, or interrupter-switch equipment.
5. After the switch has been completely disconnected from all sources of power, properly connect grounding leads to both sides of the equipment—that is, to the source- and load-side power terminals or contacts of each phase of the equipment to be maintained.

‡ These procedures may differ from the standard operating and safety procedures of certain electric utility companies. Where a discrepancy exists, the operating procedures of the electric utility apply.

## LIVE PARTS REPLACEMENT

**Step 1**

Place the switch in the open position and, for each switch pole applicable, remove the existing live parts as follows. See Figure 1.

**Step 2**

Disconnect the switch pole by removing the ½" stainless-steel attachment pin from the toggle arm. Discard the pin, cotter pin, brass washer, and two spacers. (If two interphase couplings are attached to the toggle arm, a single spacer is used.)

**Step 3**

Detach the blade assembly by removing the four ½"—13 X 2½" hex-head galvanized steel cap screws and ½" galvanized lockwashers used to secure the upper and lower blade clamps to the center (rotating) insulator. Discard the old blade assembly and associated mounting hardware.

**Step 4**

Detach the two contact and terminal castings by removing the four ½"—13 X 1¼" hex-head galvanized steel cap screws, ½" galvanized steel lockwashers, and ½" galvanized steel flat washers used to secure each casting to its respective stationary insulator. Discard this hardware.

If the stationary contact assemblies are to be reused, detach them from the contact and terminal castings by removing the two ½"—13 X 1¼" hex-head Everdur cap screws, ½" stainless-steel lockwashers, ½" serrated washers, and nut plate used to secure each stationary contact assembly to its respective contact and terminal casting; retain this hardware. Similarly, if the interrupters are to be reused, detach them from the contact and terminal castings by removing the two ⅜"—16 X 1¼" hex-head stainless-steel bolts, ⅜" stainless-steel lockwashers, and ⅜" serrated flat washers used to secure each interrupter to its respective contact and terminal casting; retain this hardware.

**Step 5**

Attach a replacement contact and terminal casting to each of the stationary insulators, using four ½"—13 X 1¼" hex-head galvanized steel cap screws, ½" galvanized steel lockwashers, and ½" galvanized steel flat washers furnished. Verify that the contact mounting surfaces on the two contact and terminal

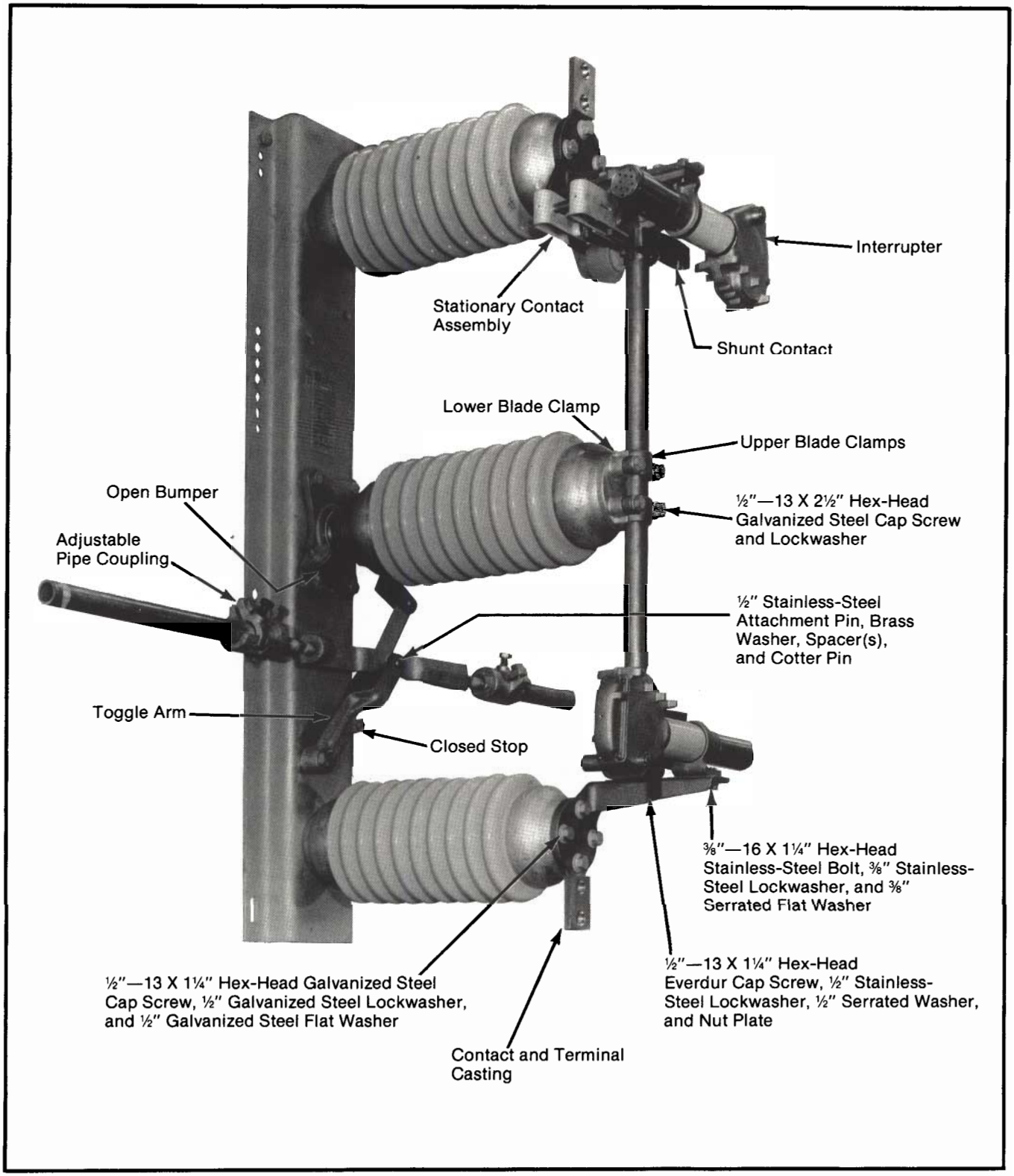


**Figure 1. One switch pole of Three-Pole Double-Break Style Alduti-Rupter Switch.**

## LIVE PARTS REPLACEMENT — Continued

castings are flush and parallel with each other, then securely tighten the cap screws.

**Step 6**

Attach the replacement blade assembly to the center insulator in the blade-closed position, using the four ½"—13 X 2½" hex-head galvanized steel cap screws and ½" galvanized steel lockwashers furnished. Align the blade so that it parallels the switch-pole base and the blade tips are equidistant between the contact and terminal castings; then securely tighten the cap screws.

If necessary, use steel wool to clean the contact surfaces. Then wipe with a dry cloth and apply a thin coating of the contact lubricant furnished.

**Step 7**

Attach a stationary contact assembly to each contact and terminal casting using two ½"—13 X 1¼" hex-head Everdur cap screws, ½" stainless-steel lockwashers, ½" serrated washers, and nut plate furnished.

If necessary, use steel wool to clean the contact surfaces. Then wipe with a dry cloth and apply a thin coating of the contact lubricant furnished.

Adjust the stationary contact assemblies so that each moving contact assembly engages its respective stationary contacts on-center and—when the blade assembly is fully closed—each blade-tip bumper engages its respective stationary-contact support frame. See Figure 2 (upper). Then securely tighten the cap screws.

**Step 8**

Move the blade assembly to an open position and attach an interrupter to each contact and terminal casting, using two ⅜"—16 X 1¼" hex-head stainless-steel bolts, lockwashers, and serrated flat washers furnished. The serrated flat washers are to be placed next to the contact and terminal casting with the serrated surface against the casting. Tighten the bolts snugly, but loose enough to permit later adjustment.

Make sure that each interrupter is in the open position to correspond with the blade position—the interrupter operating levers may be actuated by hand.

**Step 9**

Close and open the blade assembly slowly several times and check its operation. The following conditions must be met:

- The interrupters must lie in a plane parallel to the sweep of the blade.
- As the blade moves in the *closing* direction, each blade closing cam must make positive engagement with its respective interrupter closing lever. Also, when the blade assembly is in the fully closed position, each blade closing cam must overlap its respective interrupter closing lever so as to prevent inadvertent opening of the interrupter, and clearance between the tail of each blade closing cam and its respective interrupter closing lever must be within the limit shown in Figure 3 (upper).
- As the blade 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 3 (middle). 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.
- 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 3 (lower). Then move the blade in the opening direction and verify that each blade shunt contact firmly engages its respective interrupter housing before the blade disengages from the jaw contacts. (The shunt contacts may be bent as required to conform to these conditions.)

If the conditions described above are not met, adjust as follows. Loosen the two bolts which fasten the interrupter to the contact and terminal casting. Shift the interrupter as required (the holes in the contact and terminal casting are slotted for this purpose). Tighten the interrupter mounting bolts and recheck for adherence to the conditions outlined above. Readjust if required. Finally, make certain that the interrupter mounting bolts are torqued to final tightness.

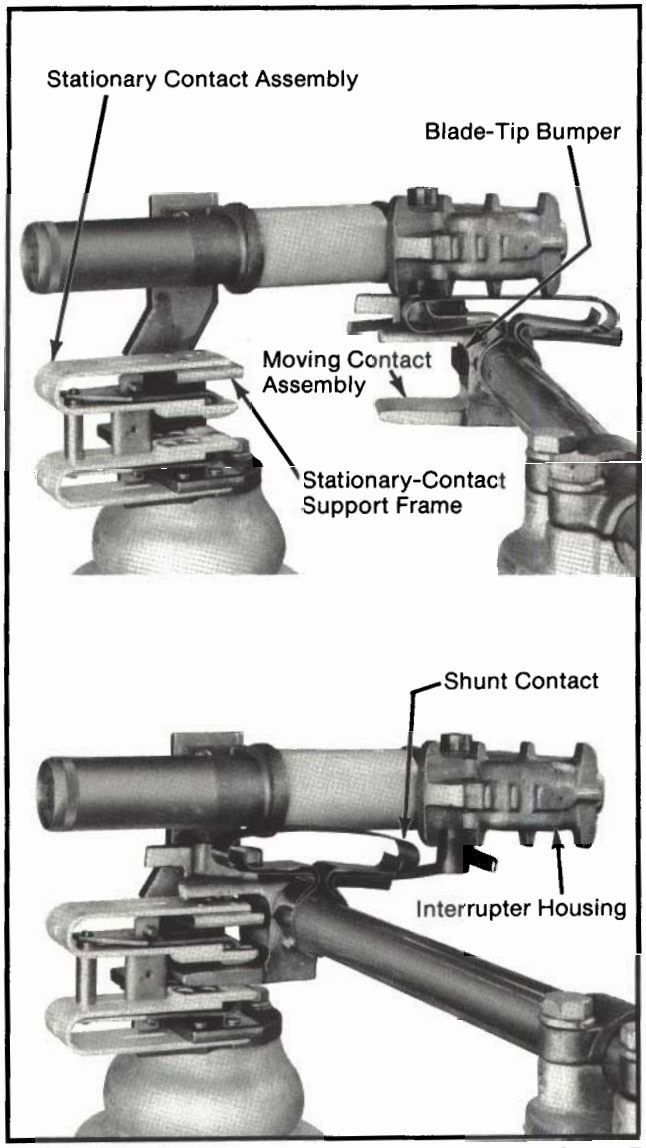


**Figure 2. Adjusting the stationary contact. See Steps 7 and 13.**

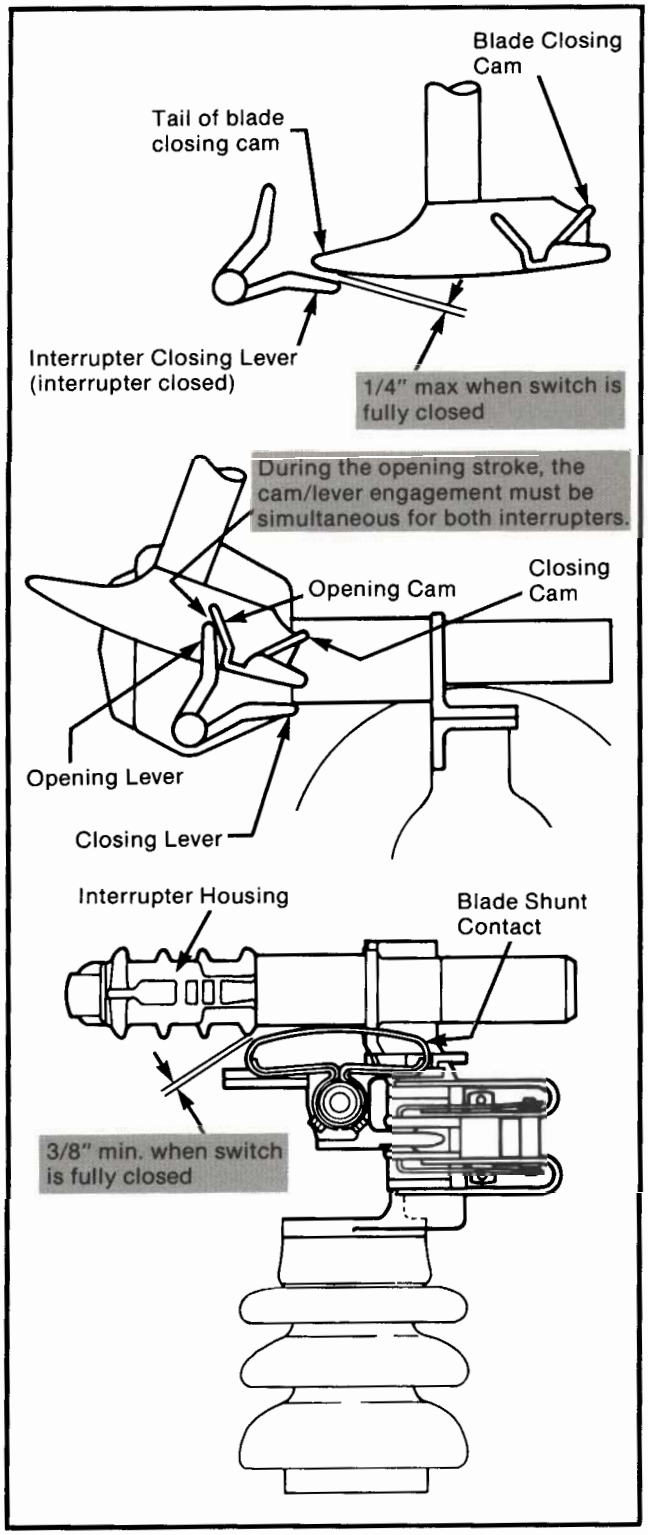


**Figure 3. Operating checkpoints. See Step 9.**

LIVE PARTS REPLACEMENT — Continued

**Step 10**

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

**Step 11**

When satisfactory operation has been attained, place the blade assembly in an intermediate position and reconnect the switch pole by installing the new ½" stainless-steel attachment pin, brass washer, spacers, and cotter pin furnished.

**Step 12**

Place the interrupter switch in the fully open position and adjust the open bumper so that it rests upon the toggle arm.

**Step 13**

Open and close the interrupter switch by swinging the handle *slowly* through its full travel. *Check to be sure that the following conditions exist:*

- With the operating handle as far as it will go in the closing direction, both of the main contacts of each switch pole are fully closed with the blade-tip bumpers against the stationary-contact support frames as shown in Figure 2 (lower). Each switch-pole toggle arm should lie against its closed stop, as shown in Figure 1. The outboard bearing crank-arm(s) should be in the over-center toggle position and lie against the stop-bolt(s). See Figures 3, 4, and 5 of S&C Instruction Sheet 761-500 or 761-505, furnished with the switch.

  If only one or two switch poles are fully closed, it is necessary to readjust the take-up screw(s) on the adjustable pipe coupling(s) at the switch pole to increase or decrease the effective length(s) of the interphase operating pipe(s).

  The factory settings of the outboard bearing crank-arm length and the stop-bolt may require readjustment in order to provide the correct amount of stroke and toggle action. If more stroke is required, lengthen the outboard bearing crank-arm (in increments of 1/8 inch) until the blades are fully home in the closed position. See Figures 3, 4, and 5 of S&C Instruction Sheet 761-500 or 761-505. Conversely, shorten the outboard bearing crank-arm to provide less stroke.

  It is recommended that the outboard bearing crank-arm be set to overstroke slightly to provide positive-drive closure and a definite feel of a locking action at the operating handle. See the note on the erection drawing for the amount of toggle to be obtained. *Caution:* Be sure to retighten the locknut on the stop-bolt and the clamping bolts on the outboard bearing crank-arm after adjusting.

- Further, when an S&C Switch Operator—Type AS-1A is used, verify that, with the switch fully closed, there is a clearance of approximately 1/8 inch between the outboard bearing crank-arm and its stop-bolt. This clearance is essential to prevent bending of the stop-bolt during power operation. Adjust the stop-bolt to provide this clearance *after* any other adjustments made to achieve full closure, stroke, or toggle action. Be sure to retighten the locknut when adjustment is completed.

**Step 14**

When replacement of the live parts has been completed for all applicable switch poles, use the switch operating handle to slowly close and open the switch a number of times and check for full closure of all three poles.

*For switches having rotating operating mechanisms,* also verify that all play in the operating-pipe linkage has been taken up *before* the handle can be lowered into the closed-position stop-plate and, further, that substantial pressure is required to force the handle into the closed-position slot; attainment of this "windup" tension in the operating linkage is essential to ensure positive switch closure. *For switches having reciprocating operating mechanisms,* also verify that when the handle is moved to its fully closed position, a definite resistance is felt at the end of the stroke; this indicates that all slack in the operating linkage has been taken up—which is essential to ensure positive switch closure. If adjustment of the operating mechanism is required, refer to the section headed "Checking Operation" in S&C Instruction Sheet 761-500 or 761-505, furnished with the switch.