INSTRUCTIONS

For Replacement of Interrupters

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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 interrupters for S&C Alduti-Rupter Switches—Indoor and Outdoor Distribution; as well as for S&C Regulator Bypass Switches—Outdoor Distribution, Type XL and Type NL. The instructions apply only to interrupter replacement. For adjustments to the switch itself and to its operating mechanism, refer to the instruction sheet that was furnished with the switch. Additional copies of three-pole switch instruction sheets, for the style and rating applicable, may be obtained from the nearest S&C Sales Office.

S&C Alduti-Rupter Switches and Regulator Bypass Switches utilize a variety of different interrupter models. For purposes of this publication, however, the interrupters can be categorized as follows:

- Interrupters equipped with a single bolt for attachment to the switch. See page 2 for such models applied on outdoor switches; or page 9 for such models applied on indoor switches.
- Interrupters equipped with two bolts for attachment to the switch. See page 4.
- Interrupters equipped with four bolts for attachment to the switch. See page 7.
- Interrupters equipped with two integral threaded studs for attachment to the switch. See page 7 for such models applied on outdoor switches; or page 9 for such models applied on indoor switches.

Instructions for replacement of interrupters of the above categories are contained herein, beginning on the pages referenced. In each instance, the instructions indicate the critical dimensional relationships which must be maintained to ensure proper sequencing of the interrupter with respect to its 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—which is designed for intermittent duty only.

During switch opening, the blade shunt contact must engage the interrupter housing (or the contact rivets in the case of Cypoxylated™▲ interrupters) before the blade disengages from the jaw contact to ensure proper current transfer.

▲ *Cypoxylated* is the S&C trademark for devices employing the S&C Cypoxy® cycloaliphatic epoxy resin system for multipurpose use as an assembly, encapsulation, and insulation medium

★ The instructions herein are also applicable to S&C Regulator Bypass Switches—Type XL and Type NL

Supersedes Instruction Sheet 761-600 dated 10-17-83

INTRODUCTION — Continued

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—which is designed for intermittent duty only.

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

The following procedures should be observed before attempting any work on S&C Alduti-Rupter Switches or Regulator Bypass 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. SPECIAL NOTE: In the case of Alduti-Rupter Switches installed in high-voltage bays or vaults, it is essential that all voltage transformers be disconnected when external voltage is used to test any secondary-side wiring or devices, to avoid energizing the high-voltage conductors through the voltage transformers. Draw out the voltage transformers completely if drawout type transformers are provided. Otherwise, remove the primary fuses of the voltage transformers and disconnect the secondaries by removing the secondary fuses or by disconnecting the secondary connections to the transformers. If secondary connections are disconnected, tape the ends of the leads to prevent inadvertent short circuits or contact with the transformer secondary terminals.
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.

INTERRUPTER REPLACEMENT — OUTDOOR SWITCHES

Interrupters Utilizing a Single Attachment Bolt

Step 1

Refer to Figure 1.

Place the switch in the open position and, for each switch pole applicable, remove the existing interrupter.

Replacement interrupters are furnished with a $\frac{1}{2}$"—13 × $\frac{7}{8}$" stainless-steel bolt and an internal-tooth lockwasher, both held in place by a plastic retaining washer. Discard the retaining washer and bolt the replacement interrupter in place on the switch.

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

Step 2

Close and open the switch slowly several times and check the operation of the affected poles. The following conditions must be met:

- The interrupter must lie in a plane parallel to the sweep of the blades, and the blades must pass over the interrupter with approximately equal clearance on both sides.

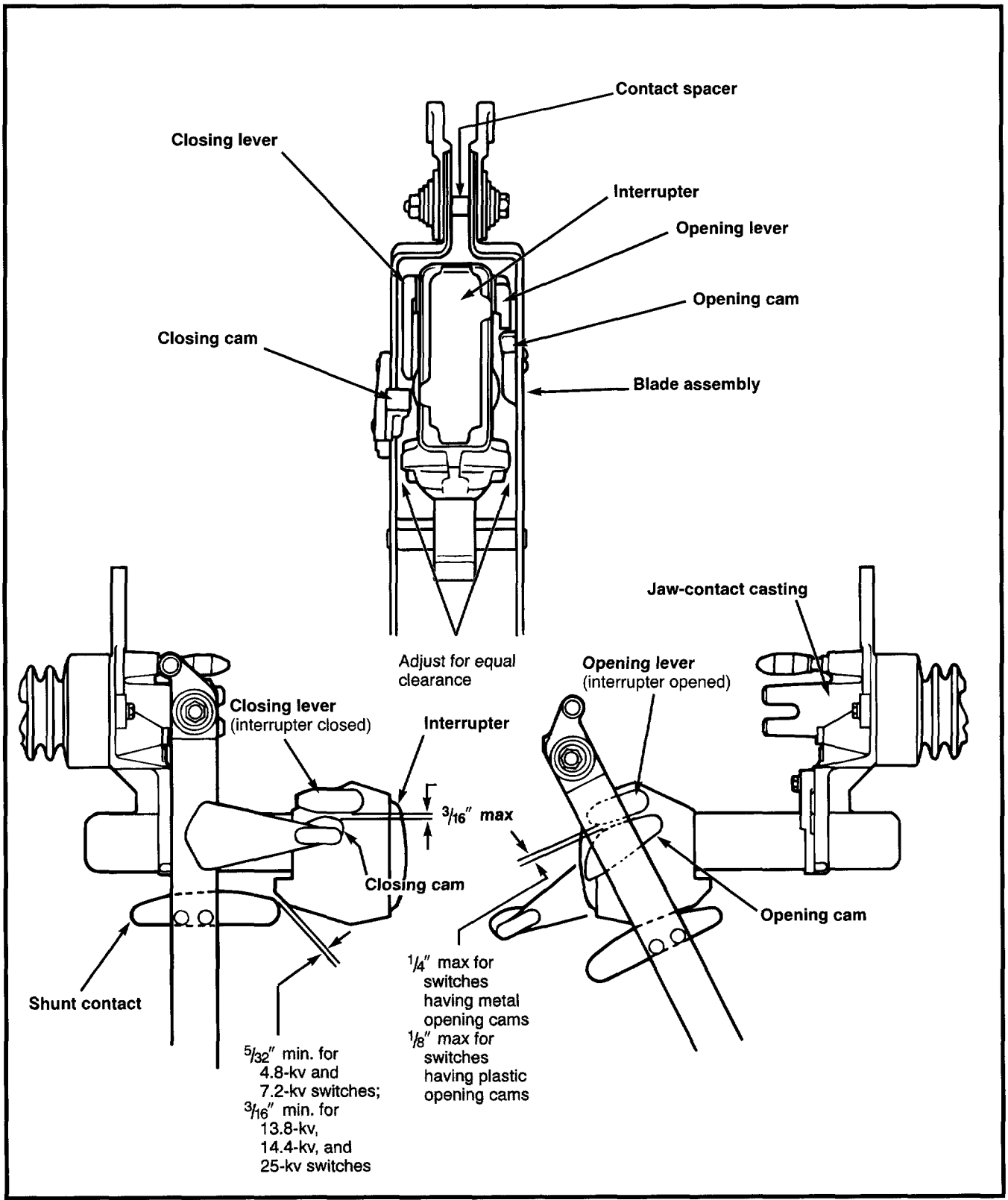

Figure 1. Operation checkpoints for replacement interrupters utilizing a single bolt for attachment to the switch.

- As the blade moves in the *closing* direction, clearance between the blade opening cam and the interrupter opening lever must be within the limit shown.
- In the fully closed position, clearance between the blade closing cam and the interrupter closing lever must be within the limit shown.

If adjustment is required, loosen the bolts that fasten the jaw-contact casting to its insulator and slightly rotate the entire contact-and-interrupter assembly to achieve the necessary clearances. Retighten the bolts. Make sure that such adjustment does not disturb the main-contact alignment—the blade contact spacer must enter the slot in the jaw-contact casting and be centered in the slot when the blade is fully closed, and the blade must engage the stationary contact on-center.

(For switches manufactured since mid-1976, the blades are provided with multiple holes for the opening cams so that, in the unlikely event it becomes necessary, the opening cams may be repositioned.)

Step 3

With the switch in the fully closed position, verify the minimum clearance between the blade shunt contact and the interrupter housing, as shown. Then, move the blade in the opening direction and verify that the blade shunt contact firmly engages the interrupter housing before the blade disengages from the jaw contact. (The shunt contact may be bent as required to conform to these conditions.)

Step 4

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

Interrupters Utilizing Two Attachment Bolts

Interrupters utilizing two attachment bolts are used for both Side-Break Style Alduti-Rupter and Double-Break Style Alduti-Rupter Switches. Because these styles are quite dissimilar, they will be treated separately. Instructions for installing interrupters on Double-Break Style Alduti-Rupter Switches begin on page 6.

For Side-Break Style and Side-Break Integer Style Alduti-Rupter Switches

Step 1

Refer to Figure 2.

Place the switch in the open position and, for each switch pole applicable, remove the existing interrupter.

Replacement interrupters are furnished with two each $\frac{3}{8}$"–16 × $\frac{3}{4}$" stainless-steel bolts, lockwashers, and brass retaining angles. Bolt the replacement interrupter in place on the switch. The brass angles are to be placed next to the jaw-contact casting—overlapping the edge and covering the slotted holes of the casting—and the lockwashers are to be placed between the brass angles and the bolt heads.

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

Step 2

Close and open the switch slowly several times and check the operation of the affected poles. The following conditions must be met:

- The interrupter must lie in a plane parallel to the sweep of the blades, and the blades must pass over the interrupter with approximately equal clearance on both sides.
- As the blade moves in the *closing* direction, clearance between the blade opening cam and the interrupter opening lever must be within the limit shown in View A-A.
- In the fully closed position, clearance between the blade closing cam and the interrupter closing lever must be within the limit shown.

If adjustment is required, loosen the bolts that fasten the interrupter to the jaw-contact casting and reposition the interrupter. It may be necessary, as well, to loosen the bolts that fasten the jaw-contact casting to its mounting bracket and slightly rotate the casting in order to achieve the necessary clearances. Retighten the bolts, making sure that the blade engages the stationary contact on-center.

Step 3

With the switch in the fully closed position, verify the minimum clearance between the blade shunt contact and the interrupter housing, as shown. Then, move the blade in the opening direction and verify that the blade shunt contact firmly engages the interrupter housing before the blade disengages from the jaw contact. (The shunt contact may be bent as required to conform to these conditions.)

Step 4

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

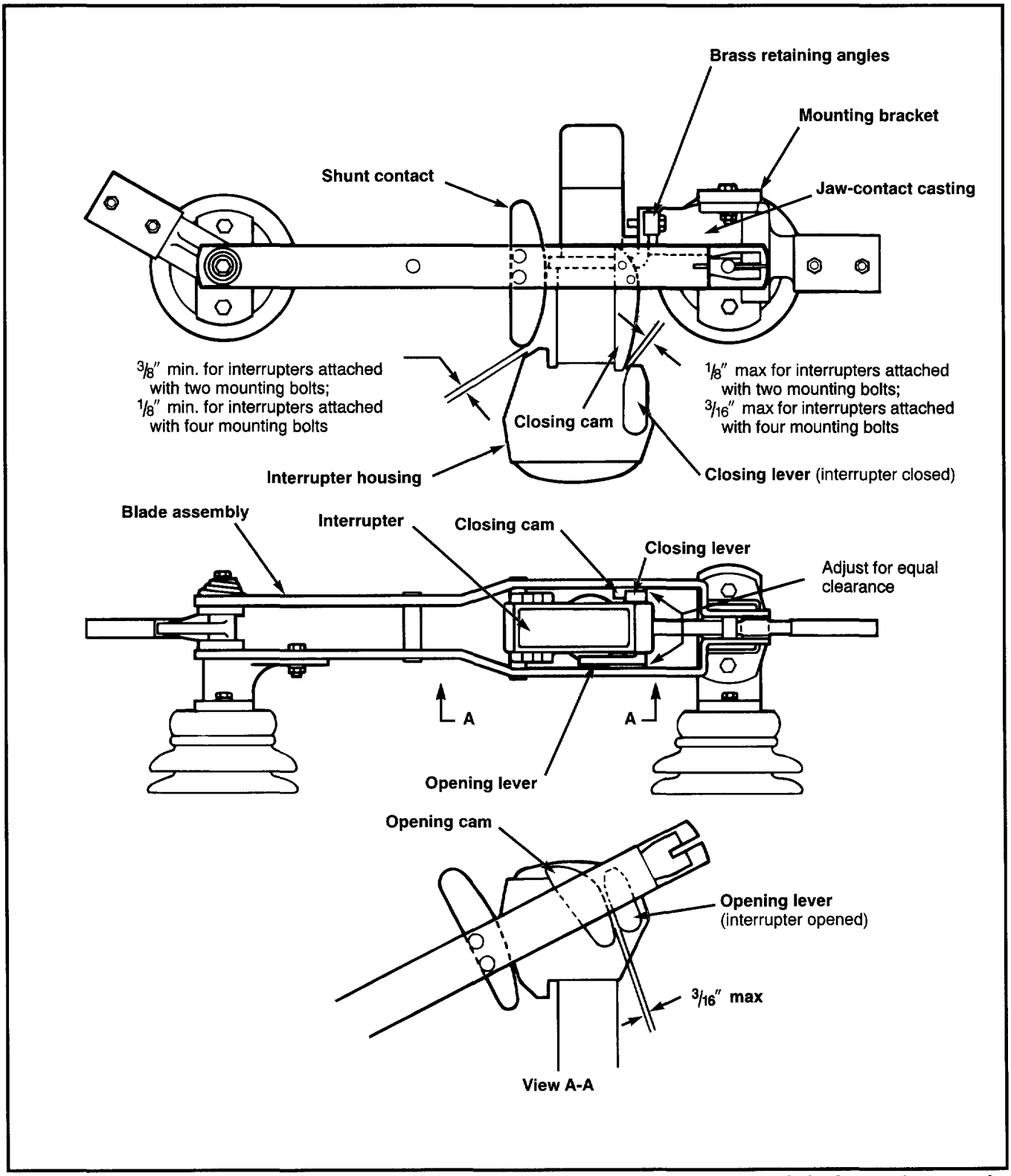

Figure 2. Operation checkpoints for replacement interrupters utilizing either two bolts or four bolts for attachment to the switch.

INTERRUPTER REPLACEMENT — OUTDOOR SWITCHES — Continued

For Double-Break Style and Double-Break Integer Style Alduti-Rupter Switches

Step 1

Refer to Figure 3.

Place the switch in the open position and, for each switch pole applicable, remove the two existing interrupters.

Replacement interrupters are furnished with two each $^3/_8$"–16 × 1 $^1/_4$" stainless-steel bolts, lockwashers, and serrated flat washers. For each interrupter, the serrated washers are to be placed next to the jaw-contact casting with the serrated surface against the casting. Install the replacement interrupters with the bolts tightened snugly, but loose enough for later adjustment.

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

Step 2

Close and open the switch slowly several times and check the operation of the affected poles. For each affected switch pole, adjust the mounting positions of both interrupters so that the following conditions are 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 switch 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.
- As the blade moves in the *opening* direction, the blade opening cams must simultaneously make positive engagement with their respective interrupter opening levers. 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.

Securely tighten the interrupter mounting bolts.

Step 3

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

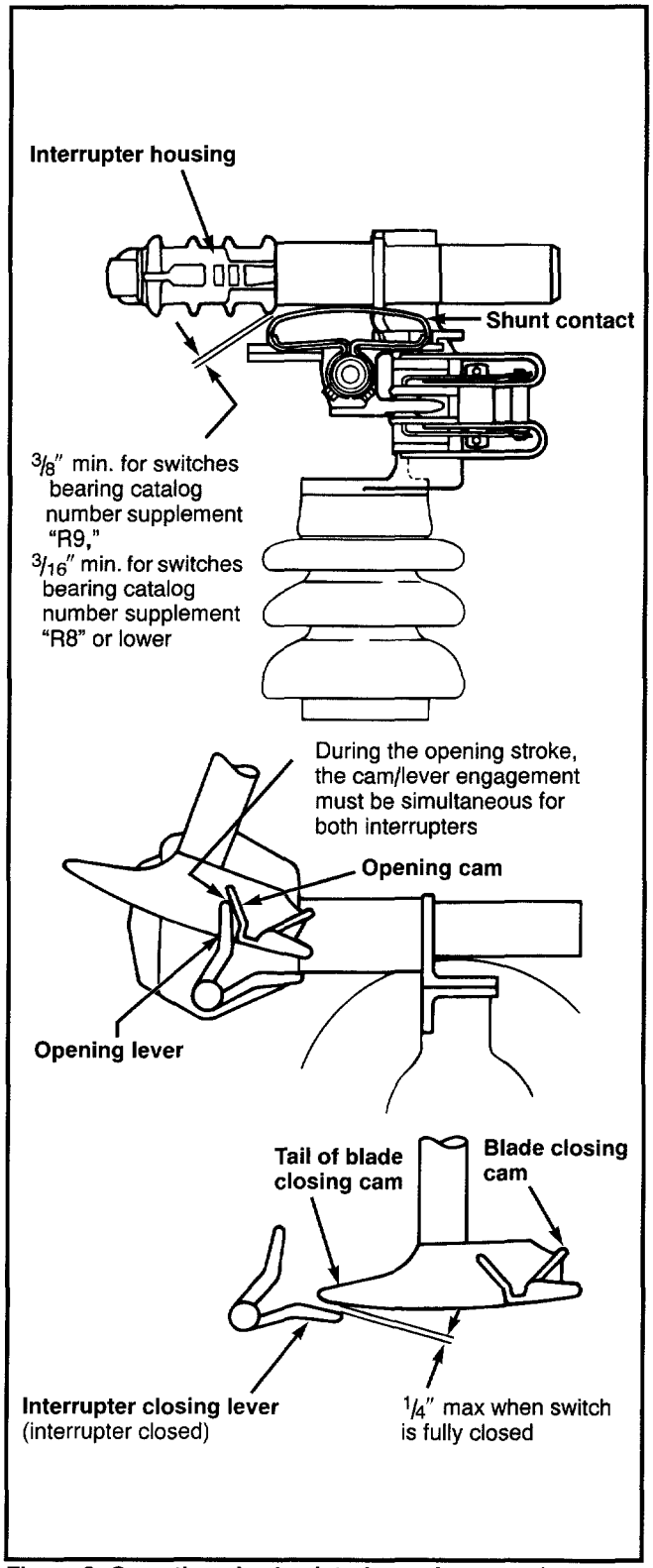

Figure 3. Operation checkpoints for replacement interrupters utilizing two bolts for attachment to the switch.

Step 4

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

Interrupters Utilizing Four Attachment Bolts

These replacement interrupters are furnished with four each $\frac{1}{4}$"–20 × $\frac{7}{8}$" stainless-steel filister-head screws and lockwashers. With this exception, these interrupters are essentially the same as the two-attachment-bolt interrupters utilized on Side-Break Style and Side-Break Integer Style Alduti-Rupter Switches. Thus, the installation procedures and specified dimensional relationships for Side-Break Style and Side-Break Integer Style Alduti-Rupter replacement interrupters should be followed. See page 4.

Interrupters Utilizing Two Integral Threaded Attachment Studs

Step 1

Refer to Figure 4.

Place the switch in the open position and, for each switch pole applicable, remove the existing interrupter.

Replacement interrupters are furnished with two $\frac{3}{8}$"–16 stainless-steel nuts and lockwashers plus a $1\frac{1}{4}$" × 2" × $\frac{1}{16}$" tinned plate. The latter is to serve as an interface between the aluminum mounting surface of the interrupter and the copper contact assembly of the switch, to inhibit galvanic corrosion. Place the tinned plate over the attachment studs of the replacement interrupter. Then mount the interrupter on the switch using the nuts and lockwashers provided.

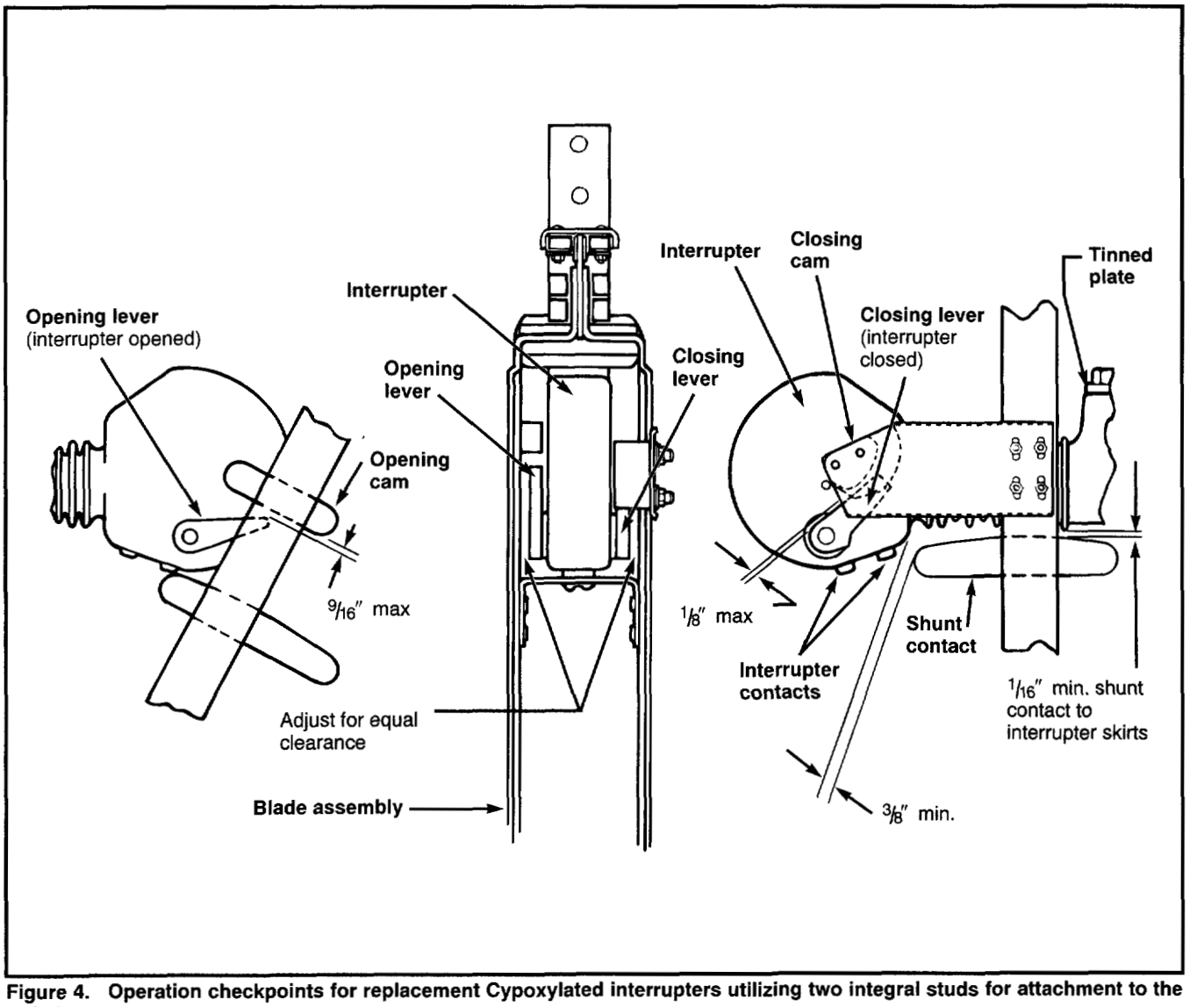

Figure 4. Operation checkpoints for replacement Cypoxylated interrupters utilizing two integral studs for attachment to the switch.

INTERRUPTER REPLACEMENT — OUTDOOR SWITCHES — Continued

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

Step 2

Close and open the switch slowly several times and check the operation of the affected poles. The following conditions must be met:

- The interrupter must lie in a plane parallel to the sweep of the blades, and the blades must pass over the interrupter with approximately equal clearance on both sides.
- As the blade moves in the *closing* direction, clearance between the blade opening cam and the interrupter opening lever must be within the limit shown.
- In the fully closed position, clearance between the blade closing cam and the interrupter closing lever must be within the limit shown.

If adjustment is required, loosen the nuts that fasten the interrupter to the jaw-contact assembly and shift the interrupter, within the confines of the mounting holes, to achieve the necessary alignment. Retighten the nuts.

Although unlikely to be needed, a separate adjustment is provided for the closing cam. The mounting holes for the closing-cam support arm are slotted, and detents are provided in the mounting surface, allowing for incremental repositioning of the cam.

Step 3

With the switch in the fully closed position, verify the minimum clearances between the blade shunt contact and the interrupter—measured to the interrupter housing as well as to the interrupter skirts—as shown. Then move the blade in the opening direction and verify that the blade shunt contact firmly engages the interrupter contact rivets before the blade disengages from the jaw contact. (The shunt contact may be bent as required to conform to these conditions.)

Step 4

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

INTERRUPTER REPLACEMENT — INDOOR SWITCHES

⚠ IMPORTANT

While interrupter replacements and adjustments are being made to indoor three-pole Alduti-Rupter Switches, the switches *must not* be subjected to the normal high-speed stored-energy operation of the integral quick-make, quick-break mechanism.

After the interrupters have been replaced and the adjustment procedures have been completed, verify that their installation is satisfactory by operating the switch in its normal manner.

⚠ CAUTION

Because the switch blades are driven at high speed by a release of stored energy, make sure that no person is near the blades when the switch is opened or closed by means of the quick-make, quick-break mechanism.

NOTE: The following interrupter replacement and adjustment instructions, though written for indoor three-pole Alduti-Rupter Switches, are also applicable for indoor single-pole Alduti-Rupter Switches. However, as the latter are hookstick operated and are not equipped with an integral quick-make, quick-break mechanism, any procedures which are clearly intended for three-pole switches should be ignored.

Step 1

Open the switch in the normal manner, using the manual operating handle or switch operator as applicable. Then padlock the manual operating handle or remove the control-source fuses from the switch operator to prevent interim use of the quick-make, quick-break mechanism. Do not use the mechanism again to close the switch until Step 14, after interrupter replacement and adjustment have been completed.

Step 2

Review the precautionary procedures on page 2, under the section headed "BEFORE STARTING," and conform as applicable.

Step 3

To facilitate access to switch components, the interphase insulating barriers—if furnished—should be removed. (There is no need, however, to remove the side barriers.) Switches manufactured prior to mid-1981 are furnished with ¼-inch thick Benelex®◆ barriers. Later-production switches are furnished with $^3/_{16}$-inch thick glass-polyester barriers.

◆ Benelex is a registered trademark of Masonite Corporation.

To remove a 1/4-inch Benelex barrier: With a suitable implement, pry the top end of the barrier out of its upper mounting clip, using a piece of wood to protect the barrier edge from being gouged. Then, using a block of wood behind the lower end of the barrier as a pivot, rotate the top of the barrier forward to lever the barrier out of its lower mounting clip.

To remove a 3/16-inch glass-polyester barrier: First, remove the nylon drive rivets and plastic barrier retainers which lock the glass-polyester barrier stiffeners in place. The drive rivets may be knocked out by means of a small diameter drift pin or nail. Then, remove the barrier stiffeners. Using a 7/16-inch hex wrench, loosen the barrier fastener bolts; the bolt threads are staked to hold the bolts captive. Finally, unseat the barrier fastener discs from the barrier holes and lift the barrier away from the fastener bolts.

Step 4

For each interrupter to be replaced, Steps 4 through 13 apply.

To permit blade opening and closing by hand, disconnect the insulated blade-operating rod from the lever arm on the switch operating shaft by removing the connecting pin. (As a precaution during this procedure, hold the blade and operating rod to prevent their being damaged.) See Figure 5. Note the positioning of the Coroprene and brass flat washers relative to the clevis.

If the switch utilizes interrupters equipped with two integral threaded studs for attachment to the switch (that is, interrupters of Cypoxylated construction), proceed to Step 9. If the switch utilizes interrupters equipped with a single mounting bolt, proceed to Step 5.

Interrupters Utilizing a Single Attachment Bolt

Step 5

Refer to Figure 1.

For each switch pole applicable, remove the existing interrupter.

Replacement interrupters are furnished with a 1/2"–3 × 7/8" stainless-steel bolt and an internal-tooth lockwasher, both held in place by a plastic retaining washer. Discard the retaining washer and bolt the replacement interrupter in place on the switch.

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

Step 6

Use care to prevent damage to the insulated blade-operating rod. Close and open the switch blade by hand and check its operation. The following conditions must be met:

- The interrupter must lie in a plane parallel to the sweep of the blades, and the blades must pass over the interrupter with approximately equal clearance on both sides.
- As the blade moves in the *closing* direction, clearance between the blade opening cam and the interrupter opening lever must be within the limit shown.
- In the fully closed position, clearance between the blade closing cam and the interrupter closing lever must be within the limit shown.

If adjustment is required, loosen the bolts that fasten the jaw-contact casting to its insulator and slightly rotate the entire contact-and-interrupter assembly to achieve the necessary clearances. Retighten the bolts. Make sure that such adjustment does not disturb the main-contact alignment—the blade contact spacer must enter the slot in the jaw-contact casting and be centered in the slot when the blade is fully closed, and the blade must engage the stationary contact on-center.

(For switches manufactured since mid-1976, the blades are provided with multiple holes for the opening cams so that, in the unlikely event it becomes necessary, the opening cams may be repositioned.)

Step 7

With the switch in the fully closed position, verify the minimum clearance between the blade shunt contact and the interrupter housing, as shown. Then, move the blade in the opening direction and verify that the blade shunt contact firmly engages the interrupter housing before the blade disengages from the jaw contact. (The shunt contact may be bent as required to conform to these conditions.)

Step 8

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

Proceed to Step 13.

Interrupters Utilizing Two Integral Threaded Attachment Studs

Step 9

Refer to Figure 4.

For each switch pole applicable, remove the existing interrupter.

Replacement interrupters are furnished with two 3/8"–16 stainless-steel nuts and lockwashers plus a 1 1/4" × 2" × 1/16" tinned plate. The latter is to serve as an interface between the aluminum mounting surface of the interrupter and the copper contact assembly of the switch, to inhibit galvanic corrosion. Place the tinned plate over the attachment studs of the replacement inter-

INTERRUPTER REPLACEMENT — INDOOR SWITCHES — Continued

rupter. Then mount the interrupter on the switch using the nuts and lockwashers provided.

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

Step 10

Use care to prevent damage to the insulated blade operating rod. Close and open the switch blade by hand and check its operation. The following conditions must be met:

- The interrupter must lie in a plane parallel to the sweep of the blades, and the blades must pass over the interrupter with approximately equal clearance on both sides.
- As the blade moves in the *closing* direction, clearance between the blade opening cam and the interrupter opening lever must be within the limit shown.
- As the blade continues movement in the *closing* direction, clearance between the interrupter housing and the blade closing cam must be within the limits shown in View X-X. This critical dimension is required so that the raised portion of the cam (along the actuating surface) rides against the inner side of the closing lever of the interrupter during the closing stroke.
- In the fully closed position, clearance between the blade closing cam and the interrupter closing lever must be within the limit shown.

If adjustment is required, loosen the nuts that fasten the interrupter to the jaw-contact assembly and shift the interrupter, within the confines of the mounting holes, to achieve the necessary alignment. Retighten the nuts. It may be necessary, as well, to loosen the bolts that fasten the jaw-contact casting to its insulator and slightly rotate the entire contact-and-interrupter assembly to achieve the necessary clearances. Retighten the bolts.

Step 11

With the switch in the fully closed position, verify the minimum clearance between the blade shunt contact and the interrupter—measured to the interrupter housing as well as to the interrupter skirts—as shown. Then move the blade in the opening direction and verify that the blade shunt contact firmly engages the interrupter contact rivets before the blade disengages from the jaw contact. (The shunt contact may be bent as required to conform to these conditions.)

Step 12

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

Step 13

When alignment is determined to be correct, reconnect the insulated blade-operating rod to the lever arm on the operating shaft. Make sure also to reposition the Coroprene washers against the clevis, backed up with the brass flat washers. Secure with the cotter pin.

Step 14

Close the switchgear door and unlock the manual operating handle or replace the control-source fuses in the switch operator. Perform several opening and closing operations in the normal manner, using the manual operating handle or switch operator, as applicable. Verify that operation is satisfactory.

Step 15

Open the switch and relock the manual operating handle or switch operator to prevent interim use of the quick-make, quick-break mechanism. Then open the switchgear door and reinstall the interphase insulating barriers as described below.

To reinstall a ¼-inch thick Benelex barrier: Note that the barrier has narrow cutaway sections along one edge which fit over the flanges on the switch frame. It is important, to prevent possible damage to the barrier during

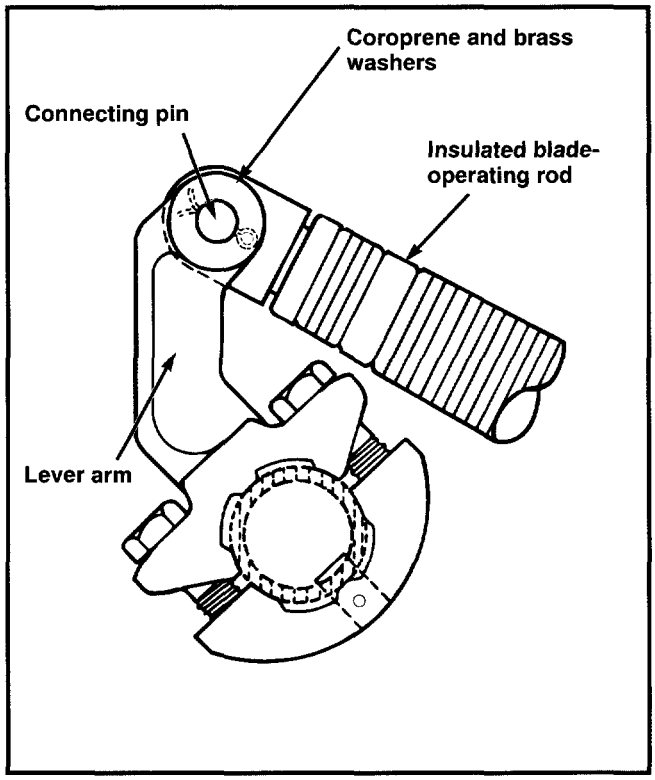

Figure 5. Lever arm and insulated blade-operating rod.

installation, that the barrier be positioned against the barrier clips with the narrow cutaway sections aligned with the flanges on the switch frame. Then, using a rubber or plastic mallet (or, if not available, with a piece of lumber placed on the edge of the barrier), alternately tap at points opposite each barrier clip, gradually inserting the barrier into each clip. Alternate tapping at the top and bottom clip position is required to prevent the barrier from binding against the flanges on the switch frame.

To reinstall a 3/16-inch glass-polyester barrier: Note that one edge of the barrier has slots leading into one-inch diameter holes. Slide the barrier onto the barrier fasteners so that the dished part of each fastener disc seats into its corresponding one-inch diameter hole. Tighten each fastener bolt to pull the dished portion of the disc into the hole. To ensure proper positioning, attach the glass-polyester interbarrier stiffeners by interlocking their notches with matching notches in the barriers. Replace the plastic stiffener retainers and nylon drive rivets.

Step 16

Before the switchgear is re-energized, restore any connections previously removed; replace the voltage transformers' primary fuses; and remove any temporary grounds.

Close the switchgear door.