

Installation

Table of Contents

Introduction	2	Safety Precautions	4
Qualified Persons	2	Shipping and Handling	5
Read This Instruction Sheet	2	Inspection	5
Retain This Instruction Sheet	2	Packing	5
Proper Application.....	2	Storage	5
Safety Information	3	Installation	6
Understanding Safety-Alert Messages	3	Before Starting	6
Following Safety Instructions.....	3	Installing the Grounding Switch.....	6
Replacement Instructions and Labels	3	Inspection Recommendations	14

★ The instructions in this document are also applicable to grounding switches for equivalent models of S&C Line-Rupter™ Switches.



Introduction

Qualified Persons

WARNING

Only qualified persons knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution and transmission equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed
- The proper use of special precautionary techniques, personal protective equipment, insulated and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read This Instruction Sheet

NOTICE

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing the grounding switch on an S&C Mark V Circuit-Switcher. Become familiar with the Safety Information on page 3 and Safety Precautions on page 4. The latest version of this publication is available online in PDF format at sandc.com/en/contact-us/product-literature/.

Retain This Instruction Sheet

This instruction sheet is a permanent part of the S&C Mark V Circuit-Switcher. Designate a location where users can easily retrieve and refer to this publication.

Proper Application

WARNING

The equipment in this publication is only intended for the installation of grounding switches on Mark V Circuit-Switchers rated 230 kV. The application must be within the ratings furnished for the equipment. Ratings for the S&C Mark V Circuit-Switcher are listed in the ratings table in Specification Bulletin 711-31. The ratings are also on the nameplate affixed to the product.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the product. Become familiar with these types of messages and the importance of these signal words:

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


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

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

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

Following Safety Instructions

If any portion of this instruction sheet is unclear and assistance is needed, contact the nearest S&C Sales Office or S&C Authorized Distributor, or call the S&C Global Support and Monitoring Center at 1-888-762-1100. Telephone numbers are also listed on S&C’s website, sandc.com.

NOTICE	
Read this instruction sheet thoroughly and carefully before installing the grounding switch.	

Replacement Instructions and Labels

If additional copies of instruction sheet are required, contact the nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

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

DANGER



S&C Mark V 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.

1. **QUALIFIED PERSONS.** Access to Mark V Circuit-Switchers must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **OPERATING MECHANISM AND BASE.** Mark V Circuit-Switchers contain fast-moving parts that can severely injure fingers. Do not remove or disassemble operating mechanisms or remove access panels unless directed by S&C Electric Company.
6. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded. Voltage levels can be as high as the peak line-to-ground voltage last applied to the unit. Units that have been energized or installed near energized lines should be considered live until tested and grounded.
7. **GROUNDING.** The Mark V Circuit-Switcher must be connected to a suitable earth ground at the base of the utility pole, or to a suitable building ground for testing, before energizing the switch and at all times when energized.
The ground wire(s) must be bonded to the system neutral, if present. If the system neutral is not present, proper precautions must be taken to ensure the local earth ground, or building ground, cannot be severed or removed.
8. **SWITCH POSITION.** Always confirm the **Open/Closed** position of each switch.
 - Switches and terminal pads may be energized from either side.
 - Switches and terminal pads may be energized with the switches in any position.
9. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.
10. **GROUNDING SWITCH.** Only operate the grounding switch when the Mark V Circuit-Switcher is in the **Open** position. The grounding switch is operated via an S&C Manual Geared Operating Handle installed near the base of the grounding switch. "Partway" opening or closing is undesirable. Once the associated circuit-switcher is in the **Open** position, operate the grounding switch until the grounding switch blades are 90 degrees parallel to the pole-unit bases.

Inspection

Examine the shipment for external evidence of damage as soon after receipt as possible, preferably before removal from the carrier's conveyance. Check the bill of lading to make sure all shipping skids, crates, and containers listed thereon are present.

If there is visible loss and/or damage:

1. Notify the delivering carrier immediately.
2. Ask for a carrier inspection.
3. Note condition of shipment on all copies of the delivery receipt.
4. File a claim with the carrier.

If concealed damage is discovered:

1. Notify the delivering carrier within 15 days of receipt of shipment.
2. Ask for a carrier inspection.
3. File a claim with the carrier.

Also notify S&C Electric Company in all instances of loss and/or damage.

Packing

An S&C erection drawing will be found in a water-resistant envelope attached to one of the three pole-units. The inclusion of a grounding switch is designated by the addition of a suffix to the circuit-switcher catalog number as follows:

- Suffix “-G2” designates grounding switch with 90-degree opening blades parallel to the circuit switcher bases when in the **Open** position and with flexible straps at the hinge end of the blades for current transfer to ground.

If the switch is supplied with the catalog option “-A” for pre-assembly, the jaw-contact housing may be pre-installed. Handle the skid carefully. A crane is required to remove the crated switch from its conveyance.

Grounding switch components already installed on the circuit-switcher pole-units have been carefully adjusted at the factory and, under normal circumstances, readjustment should not be necessary.

When ordered with a circuit-switcher, grounding switch components may be shipped on the same skid as the pole-units or S&C Mounting Pedestals if furnished. Supplemental dimensional details for the grounding switch installation are included on the erection drawing furnished for the applicable circuit-switcher.

Storage

If the grounding switch components must be stored before installation, keep them in a clean, dry, corrosion-free area to protect them from damage. Make sure each skid rests firmly on the ground and is reasonably level. Shoring under the skids may be necessary if the ground is uneven.

Before Starting

NOTICE

Installing Couplings with Piercing Set Screws

This equipment uses piercing set screws to couple the operating handle to the operating pipe, to secure the interphase operating-pipe sections, and to provide stability to couplings joining one or more lengths of pipe.

Before assembling a coupling joint, back the piercing set screws out of the coupling so the tips do not protrude into the body of the coupling. This ensures the coupling's clamp screws can be fully tightened.

These instructions are for field assembly (erection) and installation of manually operated S&C Grounding Switches, rated 61,000 amperes momentary, when furnished as original equipment for circuit-switchers rated 230 kV. Supplemental dimensional details for the grounding switch installation are included on the erection drawing furnished for the applicable circuit-switcher.

Install the grounding switch only after the circuit-switcher and its power train have been completely installed and adjusted.

Note: If a grounding switch is to be added to an existing circuit-switcher installation, the components should be assembled in accordance with the special drawings provided.

Note: An S&C Manual Geared Operating handle is used to operate the grounding switch. A nongear handle is not available.

Installing the Grounding Switch

Proceed with the following steps:

STEP 1. Mount the outboard bearing assembly in the position shown on the erection drawing.

STEP 2. Mount the S&C Manual Geared Operating Handle in the position shown on the erection drawing.

Attach a flexible coupling to the output shaft of the geared operating handle. See Figure 1 on page 7. Thread the attachment bolts through the flexible coupling plate and through the coupling flange on the output shaft.

Tighten the bolts to draw the flexible plate flush against the flange; this will deform the threads in the flexible plate, resulting in a binding, nonslip connection. Install and tighten the self-locking nuts. Do not use lockwashers with the attachment bolts.

STEP 3. Install the vertical operating-pipe section (or sections) and, if required, the guide bearing assembly (or assemblies) between the universal coupling at the outboard bearing assembly and the flexible coupling at the handle. Work from the outboard bearing assembly downward. See Figure 2 on page 8 and Figure 3 on page 9.

If more than one vertical operating-pipe section is specified, a universal coupling is used to join the upper pipe section to the next pipe section. Any additional pipe sections are joined with rigid couplings.

Torque the clamp bolts to final tightness. Then tighten the piercing set screws, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 4. Install the interphase operating shaft sections through the bearings attached to the pole-unit bases, as shown on the erection drawing. It may be necessary to loosen the bolts which fasten the bearing support brackets to achieve alignment with the interphase operating shaft. At the same time, slip the interphase shaft drive lever, stop levers, collars, and blade drive-linkage levers onto the interphase operating shaft, positioned as shown on the erection drawing. The stop levers must be positioned to correspond with the stop tabs on the back sides of the appropriate bearing support brackets. Do not tighten the U-bolts or piercing set screws associated with these components until so directed in the following steps.

If the interphase operating shaft is comprised of more than one section of pipe, join the sections using the straight coupling(s) furnished. Securely tighten the coupling clamp-bolts, then tighten the associated piercing set screws, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 5. Connect the outboard bearing assembly lever and inter phase drive lever using the interphase drive linkage furnished. Refer to the erection drawings to determine the relative angular positioning of the outboard bearing assembly lever and the interphase drive lever which will allow the required rotation.

The pipe section of the interphase drive linkage is precut to the correct length. The interphase drive linkage includes an adjustable pipe coupling which may be shortened or lengthened as required to achieve the proper relative positioning of the levers. Do not cut the pipe section. Tighten the associated U-bolts

securely but do not tighten the piercing set screws at this time

STEP 6. At the pole-unit farthest from the interphase drive linkage, insert a blade assembly into the socket of the blade clamp. The blade clamp must be pulled toward the **Open** position, against the force of the counterbalance spring, so the blade can be inserted facing the jaw contact.

- (a) Raise the blade assembly toward the **Closed** position and adjust as follows:
- (b) Rotate the blade assembly in the blade clamp until the sides of the blade-contact assembly are parallel to the jaw-contact fingers.

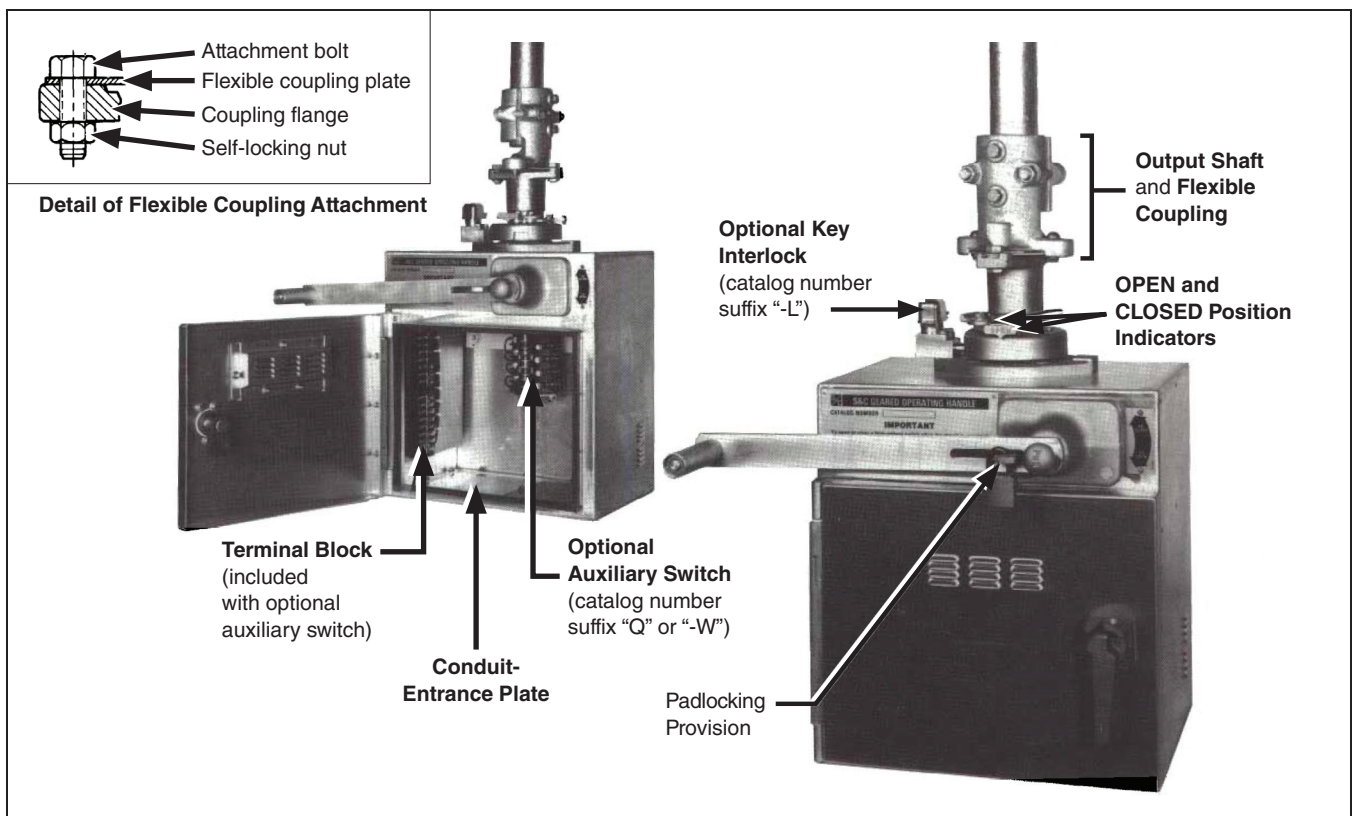


Figure 1. S&C Manual Geared Operating Handle.

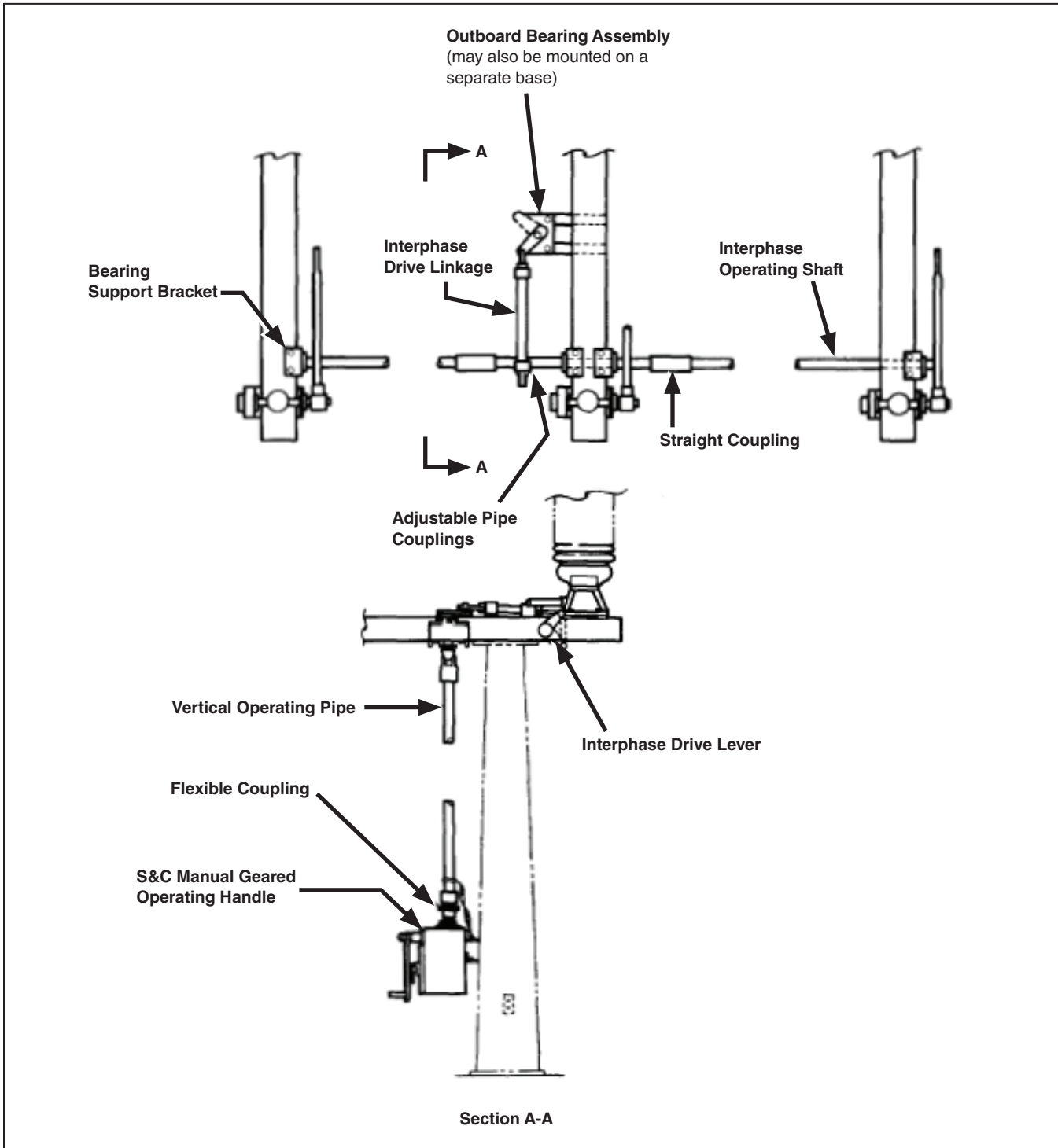


Figure 2. Typical grounding switch arrangement, shown for identification purposes. For the actual application refer to the erection drawing furnished.

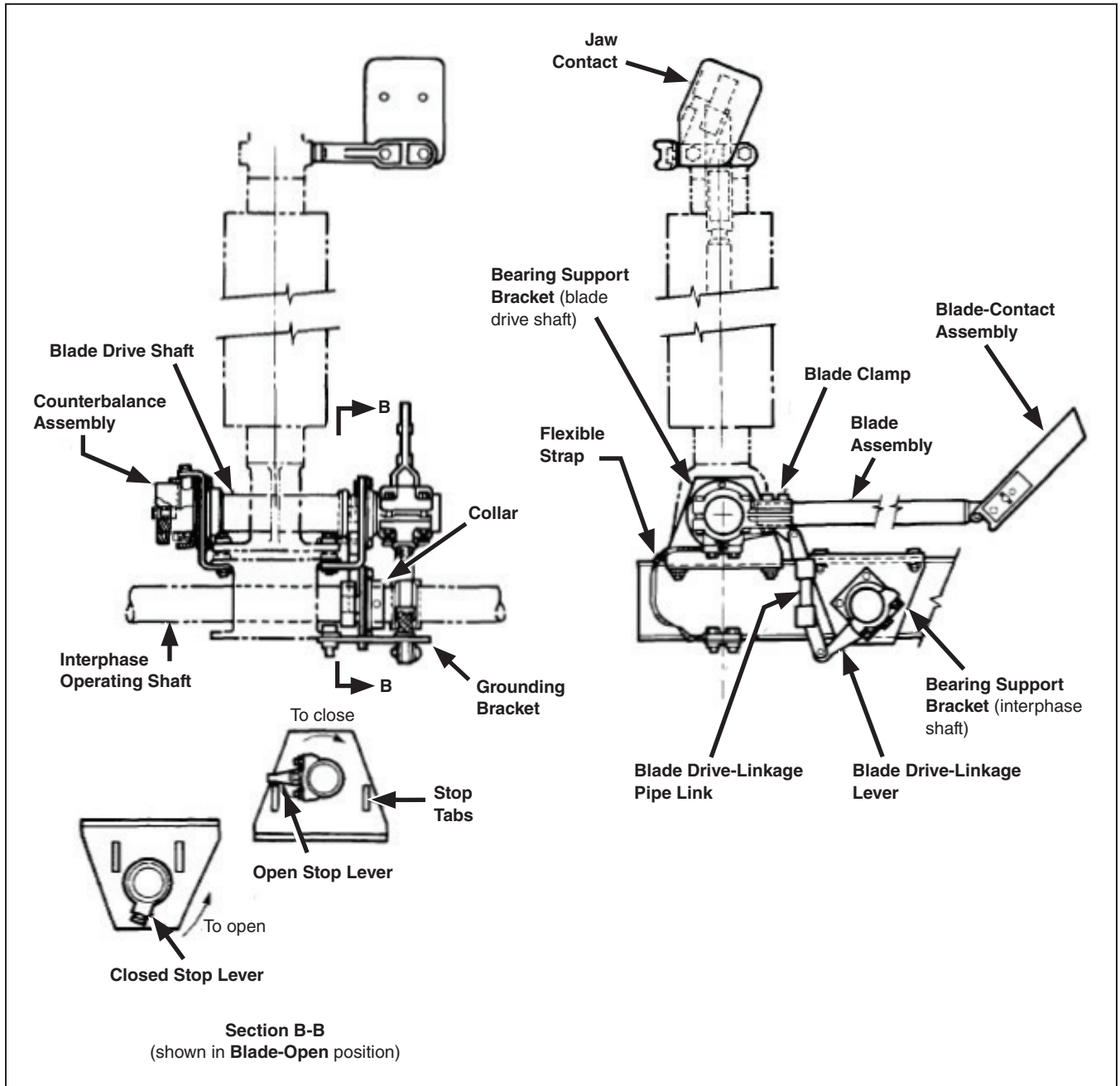


Figure 3. Typical grounding switch pole-unit blade assembly detail, shown for identification purposes. Arrangement may be opposite-hand to that shown. For the actual application, refer to the erection drawing furnished.

Installation

- (c) Raise or lower the blade assembly in the blade clamp so with the blade-contact assembly held in the straight (in-line) position, it enters the jaw contact with a $\frac{1}{2}$ -inch (12.7 mm) clearance between the end of the blade contact assembly and the upper lip of the jaw-contact housing. See Figure 4. Securely tighten the blade clamp bolts but do not tighten the piercing set screws at this time.
- (d) If the blade-contact assembly does not enter the jaw contact on center, loosen the bolts which fasten the blade drive-shaft bearing to the bearing support adjacent to the blade clamp. Shift the blade assembly to center it on the jaw contact. If necessary, loosen the bolts which fasten the blade drive-shaft bearing to the bearing support adjacent to the counterbalance assembly. Then re-tighten the blade drive-shaft bearing fastening bolts. Do not use shims for adjustment of any energized part.

Do not install the other two blade assemblies until so directed in Step 12 on page 12.

STEP 7. Each spring-loaded counterbalance assembly is factory adjusted to offset the weight of its associated blade assembly at a point approximately 45 degrees from the **Open** position.

In the unlikely event readjustment is required, close the blade to reduce the spring load. Mark the position of the spring housing. Then loosen the locking bolt at the end of the counterbalance assembly. Rotate the spring housing in the blade-closing direction to increase the spring loading, or in the blade-opening direction to decrease the spring loading. Re-tighten the locking bolt at the end of the counterbalance assembly.

STEP 8. Attach the blade assembly to the blade drive-linkage lever by connecting the blade drive-linkage pipe link to its mating coupling. Tighten the coupling clamp-bolts, but do not tighten the piercing set screw at this time.

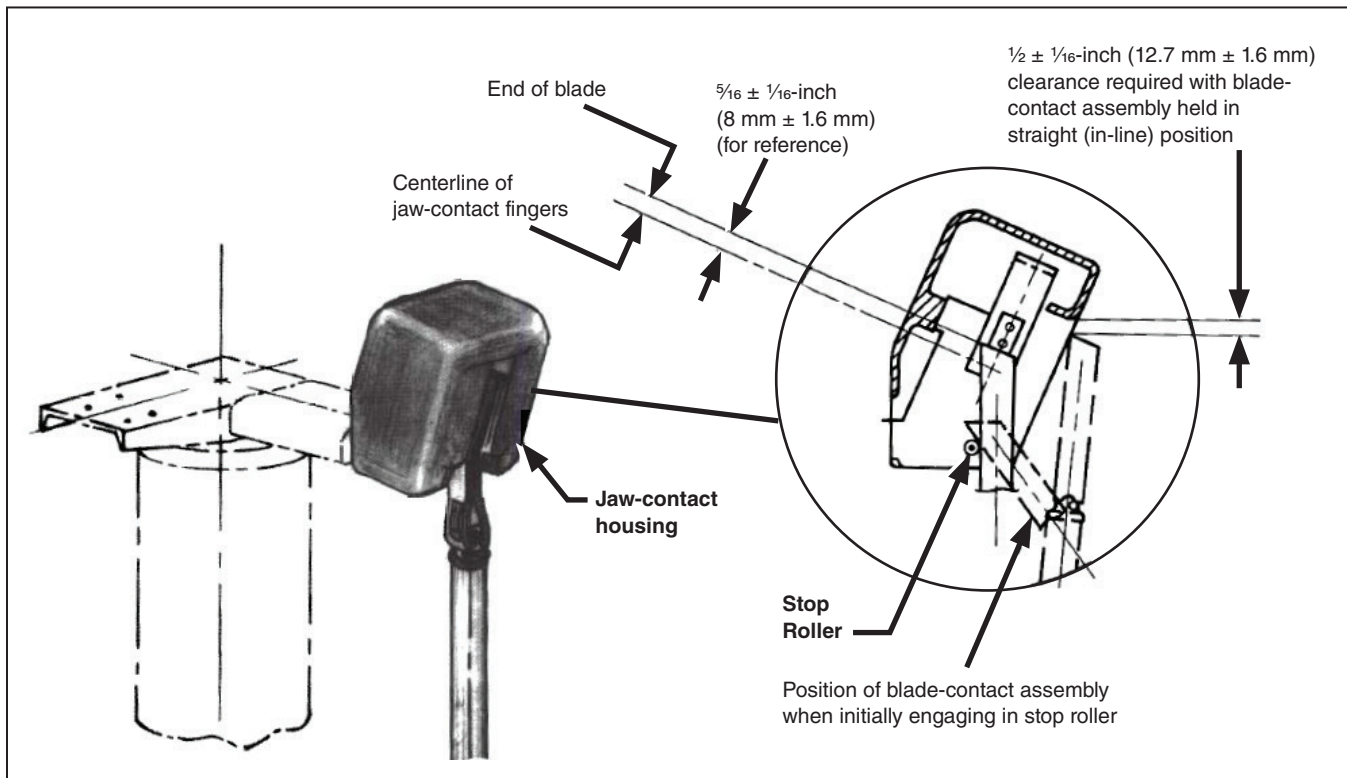


Figure 4. Jaw-contact detail.

STEP 9. Using the manual geared operating handle, crank the out board bearing assembly lever to its fully **Open** position, at the angle indicated on the erection drawing. Then, while holding the blade assembly against its Open stop, securely tighten the U-bolts to clamp the interphase drive lever to the interphase operating shaft. Do not tighten the piercing set screws at this time.

STEP 10. Using the manual geared operating handle, crank the grounding switch to its fully **Closed** position. Make sure, with the blade contact firmly against its stop roller (see Figure 4 on page 10), the blade drive linkage is in a positive-toggle condition—approximately 5 degrees over center. It may be necessary to change the effective length of the drive linkage by repositioning the blade drive-linkage pipe link in its coupling and/or repositioning the blade drive-linkage lever on the interphase operating shaft, to achieve full 90-degree blade travel and positive toggle.

Set the blade-assembly Closed stop lever, located behind the bearing support bracket for the interphase operating shaft. Tighten the piercing set screw, piercing the pipe, and continue turning until a firm resistance is felt.

Check for proper blade closure by manually pulling the blade assembly away from its **Closed** position. See Figure 5. With a pull-out force of approximately 40 pounds applied at the point indicated, no more than $\frac{3}{8}$ inch (9.5 mm) of blade deflection should occur. If necessary, increase the effective length of the drive linkage to achieve positive closure.

STEP 11. Using the manual geared operating handle, crank the grounding switch to its fully **Open** position. Check and reset, if necessary, the blade-assembly Open stop lever located behind the bearing support bracket for the blade drive shaft. Tighten the U-bolt but do not tighten the piercing set screw at this time.

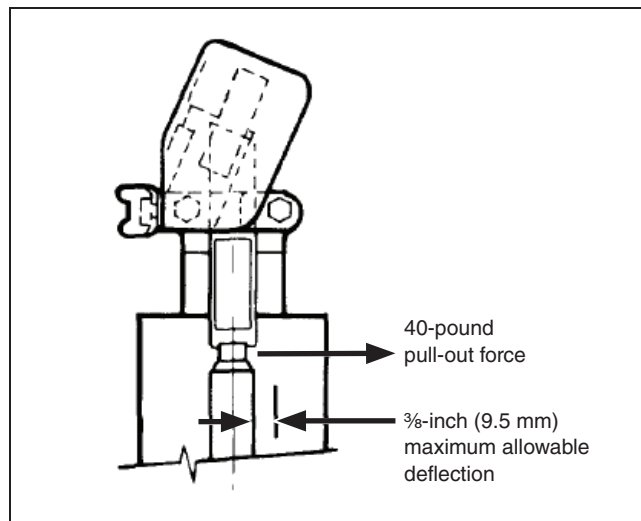


Figure 5. Blade closure verification.

Installation

STEP 12. Install the other two blade assemblies in the manner described in Step 6 on page 7 through Step 8 on page 10 and Step 10 on page 11 and Step 11. Note it is usually necessary, when closing, the blade assembly farthest from the outboard bearing slightly lead the blade assemblies nearer to the outboard bearing assembly, to compensate for lost motion in the interphase linkage.

STEP 13. Open and close the grounding switch to check for correct entry, positive toggle, and complete closure of all three blade assemblies. Make any necessary readjustments, and re-tighten all clamp bolts and U-bolts to final tightness. Then tighten each piercing set screw in the blade clamps, interphase drive lever, and drive linkage pipe couplings, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 14. For current transfer to ground, connect a flexible strap from each blade clamp to the grounding bracket on its associated circuit-switcher base. Then connect each grounding bracket to a suitable earth ground.●

STEP 15. If a key interlock is not specified, omit Step 15.

The key interlock group includes a Superior Key Interlock, Type B-4003-1, with stainless steel locking bolt, zero bolt projection, and 3/4-inch bolt travel; a hinged dust cover; an interlock adapter; and an interlock collar which is bolted to the output shaft of the manual geared operating handle. The interlock collar is provided with a slot to accept the key interlock bolt. If “provision only” for a key interlock is specified, the interlock will not be included. Proceed as follows:

- (a) Using the manual geared operating handle, crank the grounding switch to its fully **Open** position.
- (b) Remove the bolts which fasten the interlock collar to the output shaft.
- (c) Rotate the interlock collar to the position where the key interlock bolt, when extended, will be centered in the slot in

the collar. Then replace and tighten the bolts to fasten the interlock collar in that position. Note these same bolts are also used for the OPEN and CLOSED position indicators which are to be set as described in the following step.

STEP 16. Using the manual geared operating handle, crank the grounding switch to its fully **Open** position and set the OPEN position indicator on the output shaft of the manual geared operating handle so this indicator is visible from the front of the handle. Then fully close the grounding switch and set the CLOSED position indicator on the output shaft of the manual geared operating handle so this indicator is visible from the front of the handle.

STEP 17. Ground the vertical operating pipe as follows. Fasten the end of the flexible strap having the shorter ferrule to the vertical operating-pipe section, a few inches above the manual operating handle, using the connector provided. Then connect the free end of the flexible strap to a suitable earth ground, using the grounding connector at that end of the strap.●

STEP 18. If the S&C Manual Geared Operating Handle is furnished with an auxiliary switch, catalog number suffix “-Q” or “-W,” the switch will be mounted inside the operating-handle enclosure, along with a terminal block for user’s connections. Each auxiliary-switch contact is operated by a cam-actuated roller. A contact is closed if its roller is disengaged from a cam and, conversely, a contact is open if its roller is engaged by a cam. The cams are individually adjustable in 4.5-degree increments. Adjustment of the cams is accomplished as follows:

- (a) Raise (or lower) the cam toward its adjacent spring until the cam is separated from the teeth of the inner gear. See Figure 6 on page 13.
- (b) Rotate the cam to advance or retard engagement with its roller.
- (c) Lower (or raise) the cam making sure the teeth are in mesh with the inner gear.

● The grounding recommendations herein 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.

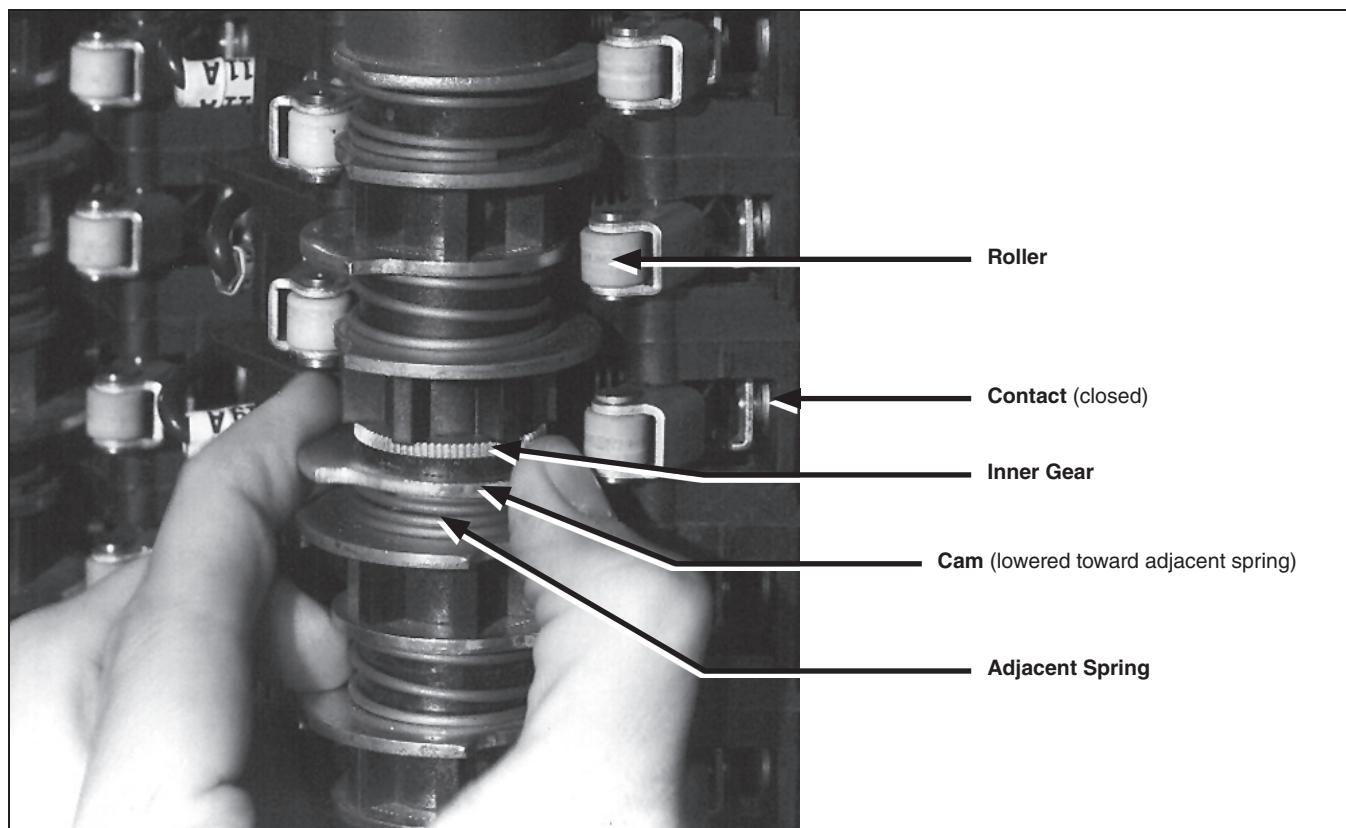


Figure 6. Adjustment of cams on auxiliary switch.

Inspection Recommendations

To ensure the grounding switch's continued proper performance, it should be inspected in accordance with S&C's recommended schedule and procedures contained in S&C Instruction Sheet 711-590.