

Installation

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★ The instructions herein are also applicable to grounding switches for 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 a grounding switch on a 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 this 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



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 perpendicular 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 “-G22” designates grounding switch with 90-degree opening blades perpendicular 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.
- Suffix “-G23” designates grounding switch with 90-degree opening blades perpendicular to the circuit-switcher bases when in the **Open** position and with braidless contacts 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 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 provided as original equipment for circuit-switchers rated 230 kV. Supplemental dimensional details for the grounding switch installation are included on the erection drawing 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.

Note: Certain circuit-switcher configurations use a gearbox instead of an outboard bearing assembly. In these instances, the erection drawing will show how the gearbox is to be positioned.

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. Tighten the piercing set screws, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 4. Attach an adjustable clevis assembly to each blade jackshaft drive lever and to the interphase drive lever. The pins and spacers required for the connection are provided on the levers. The levers have been correctly positioned at the factory and should require no adjustment.

STEP 5. Install the interphase operating-pipe sections in the adjustable clevis assembly couplings as shown on the erection drawing. All pipe is provided pre-cut to the correct length. The adjustable clevis assembly couplings may be shortened or lengthened as required to accept the pipe sections. Do not cut the pipes themselves. For each adjustable clevis assembly, make sure the cutting tips of the piercing set screws do not protrude through the body of the pipe coupling clamp. Torque the U-bolts to final tightness. Tighten the piercing set screws, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 6. Install the interphase drive link between the adjustable coupling attached to the outboard bearing assembly drive lever and the adjustable coupling attached to the interphase drive lever clevis assembly. Torque the U-bolts to final tightness. Tighten the piercing set screws, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 7. Using the manual geared operating handle, crank the power train to its fully **Open** position. Then, at the pole-unit farthest from the outboard bearing assembly, insert a blade assembly into the socket of the blade clamp.

Then, using the manual geared operating handle, crank the grounding switch toward the **Closed** position and adjust as follows:

- (a) Rotate the blade assembly in the blade clamp until the sides of the blade-contact assembly are parallel to the jaw-contact fingers.
- (b) 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 1/2-inch (13-mm) clearance between the end of the blade-contact assembly and the upper lip of the jaw contact housing. See Figure 4 on page 10. Securely tighten the blade clamp bolts but do not tighten the piercing set screws at this time.

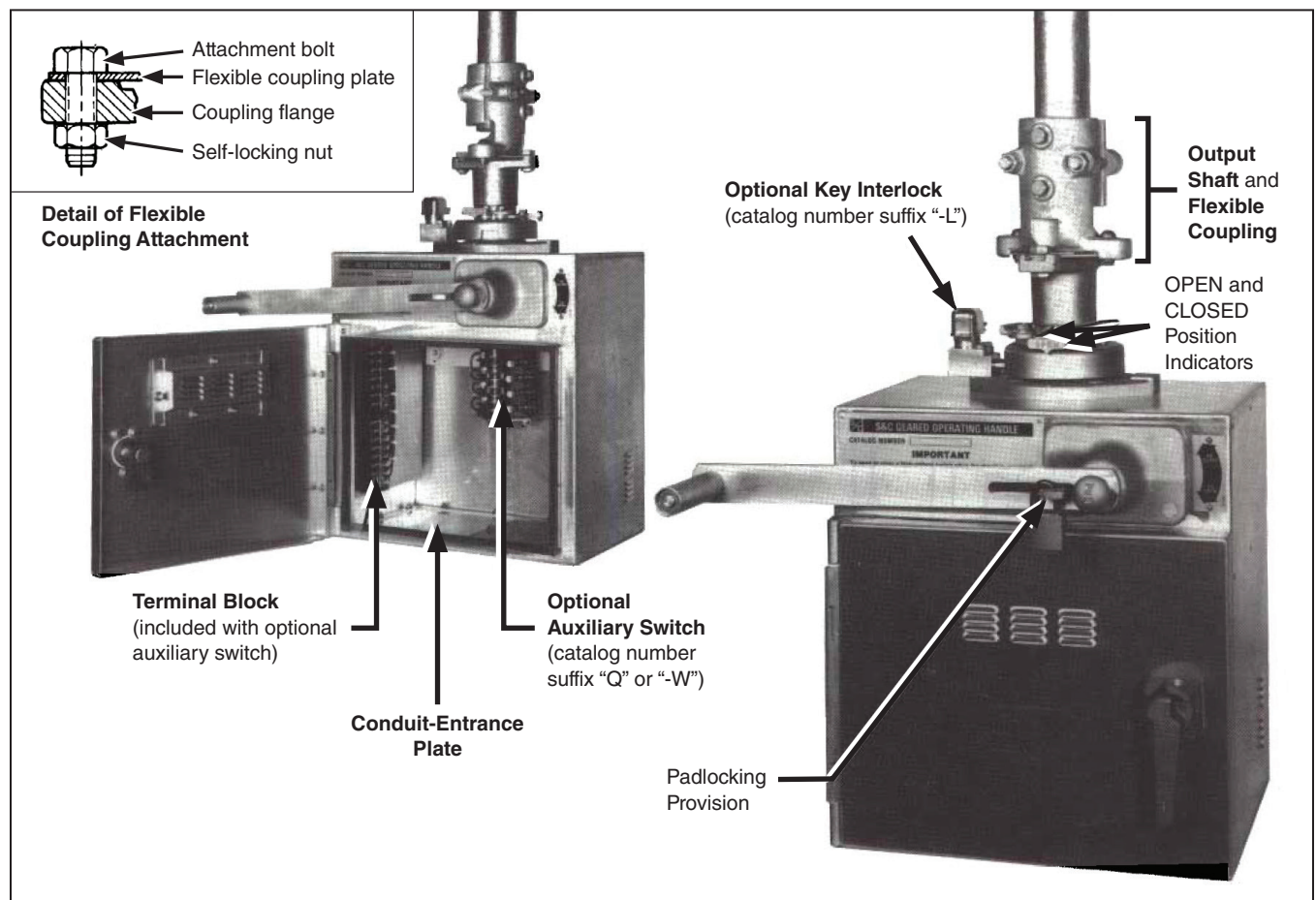


Figure 1. Manual Geared Operating Handle.

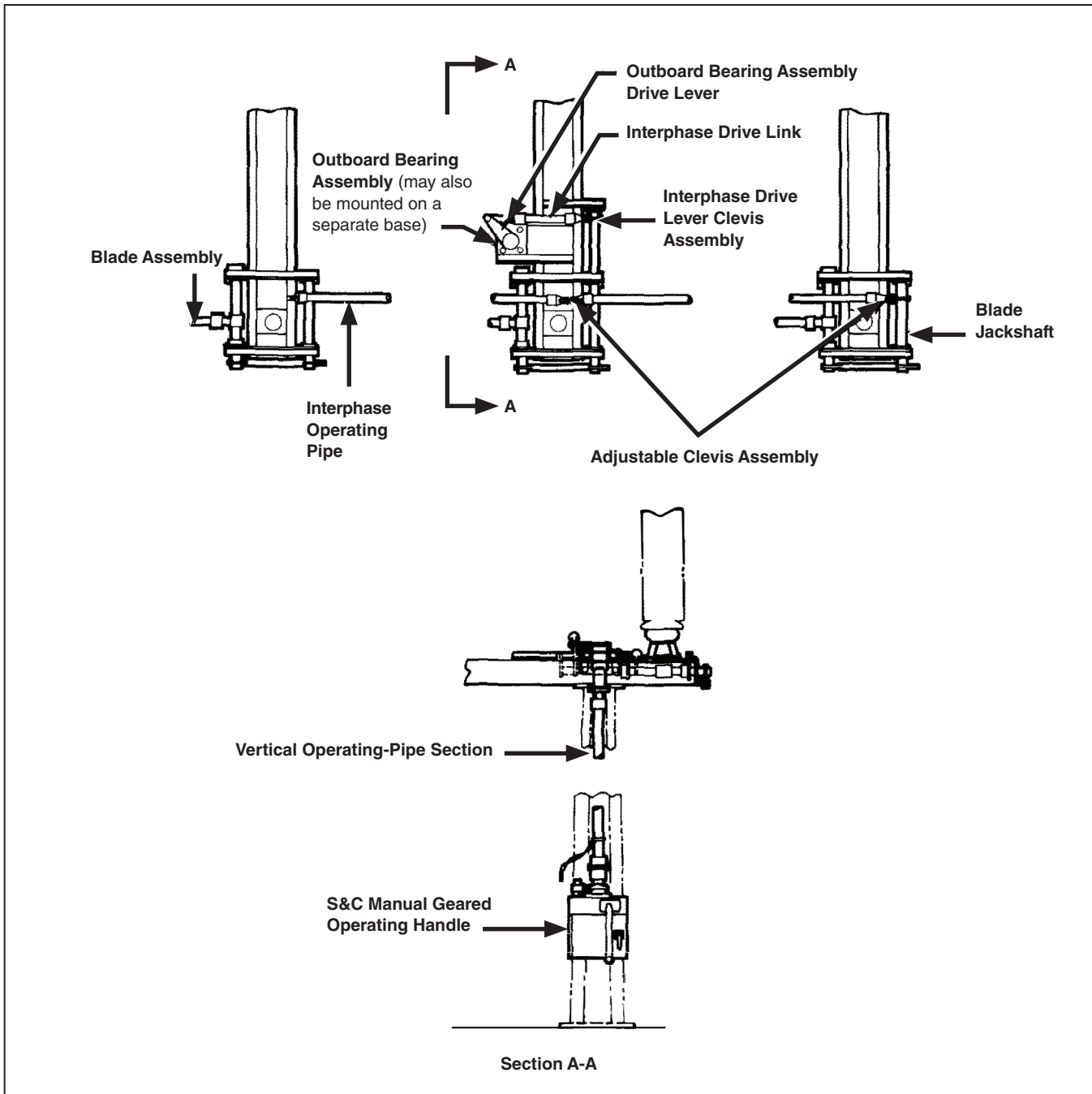


Figure 2. Typical grounding switch arrangement, shown for identification purposes. For the actual application, refer to the erection drawing.

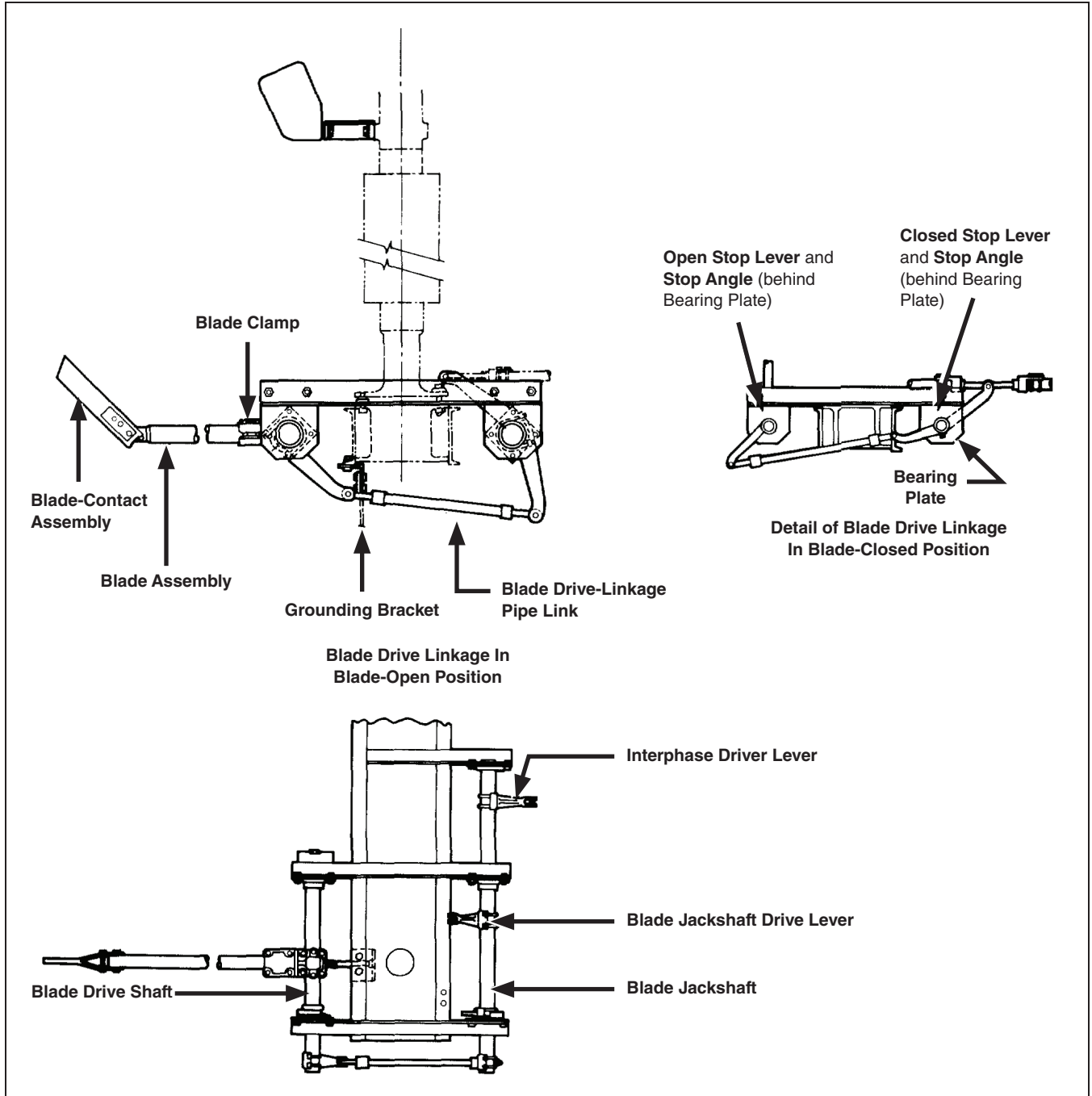


Figure 3. Typical grounding switch pole-unit blade assembly detail, shown for identification purposes. Arrangement may be opposite to that shown. For the actual application, refer to the erection drawing.

Installation

- (c) If the blade-contact assembly does not enter the jaw contact on center, adjust by marking the position of the blade clamp on the blade drive shaft so its radial position relative to the shaft can be retained. Loosen the clamp bolts fastening the blade clamp to the blade drive shaft. Slide the blade assembly into alignment, making sure its radial position, as previously marked, is retained. Securely tighten the clamp bolts. Do not tighten the piercing set screws as this time.

STEP 8. Using the manual geared operating handle, crank the grounding switch to its fully **Closed** position. Make sure, with the blade drive linkage at the end of the base in a positive-toggle condition, approximately 5 degrees over center, the blade contact is driven firmly against its stop roller.

Check for proper blade closure by manually pulling the blade assembly away from its **Closed** position. See Figure 5 on page 11. With a pull-out force of approximately 40 pounds applied at the point indicated, no more than $\frac{3}{8}$ inch (10 mm) of blade deflection should occur.

STEP 9. If greater or lesser travel in the closing direction is needed, increase or decrease the effective length of the interphase drive link by means of the adjustable couplings attached to either end of the interphase drive link.

If greater or lesser toggle force is needed, increase or decrease the effective length of the blade drive-linkage pipe link by means of the adjustable couplings at either end of the pipe link.

STEP 10. Install the other two blade assemblies in the manner described in Step 7 on page 7 and Step 8. If greater or lesser travel in the closing direction is needed for these blade assemblies, increase or decrease the effective length of the appropriate interphase operating-pipe section by means of the adjustable clevis assembly couplings at either end of the interphase operating pipe.

If greater or lesser toggle force is needed, increase or decrease the effective length of the blade drive-linkage pipe link by means of the adjustable couplings at either end of the pipe link.

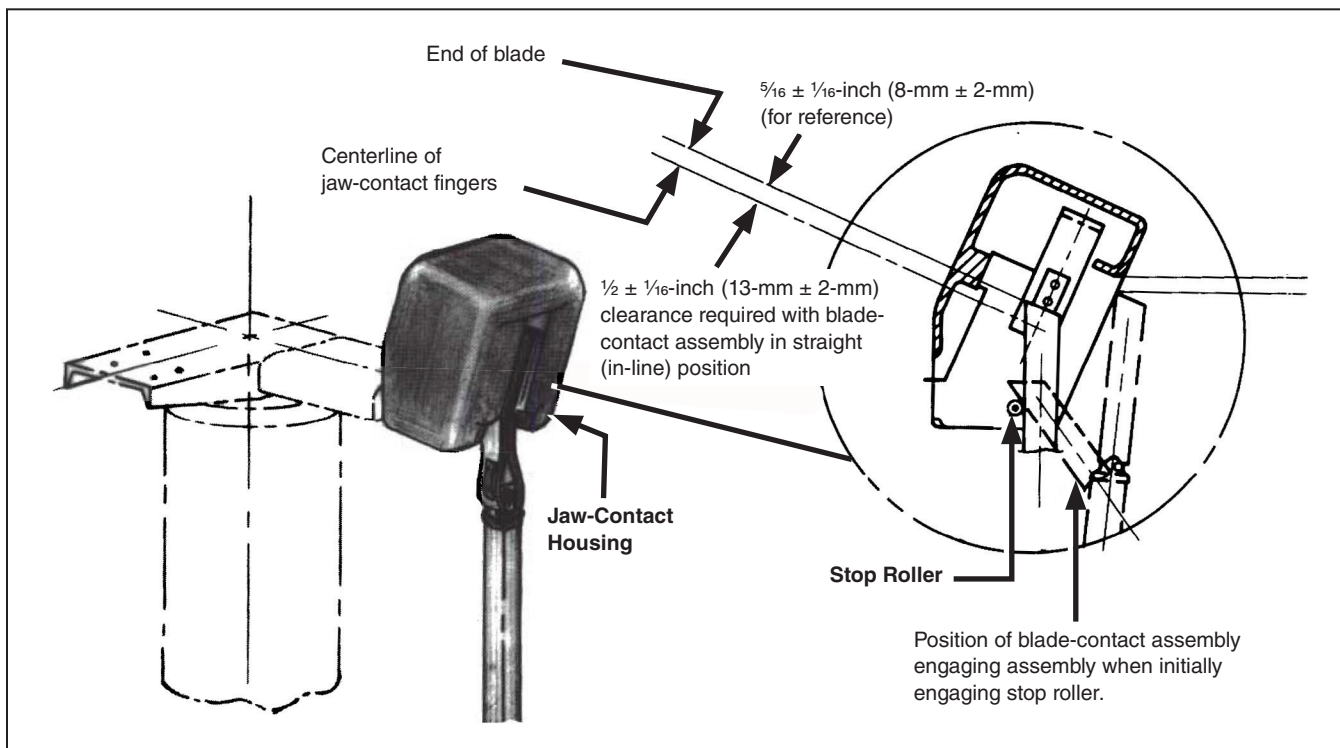


Figure 4. Jaw-contact detail.

STEP 11. 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.

Reset any Open or Closed stop levers which do not lie against their respective stationary stop angles. The stop levers and angles are located behind the bearing plates supporting the blade drive linkage. Refer to the grounding switch assembly drawing.

When operation is satisfactory, re-tighten all clamp bolts and U-bolts to final tightness. Then, tighten all piercing set screws, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 12. 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.

If the grounding switch is provided with braidless contacts for current transfer to ground, they will be factory installed at the end of the blade drive shaft. (The counterbalance spring, in this case, will be positioned at the end of the blade jackshaft.)

STEP 13. *If a key interlock is not specified, omit Step 13.* The key interlock group includes a Superior Key Interlock, Type B-4003-1, with stainless steel locking bolt, zero bolt projection, and $\frac{3}{4}$ -inch (19-mm) bolt travel; a hinged dust cover; an interlock adapter; and an interlock collar 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 fastening the interlock collar to the output shaft.

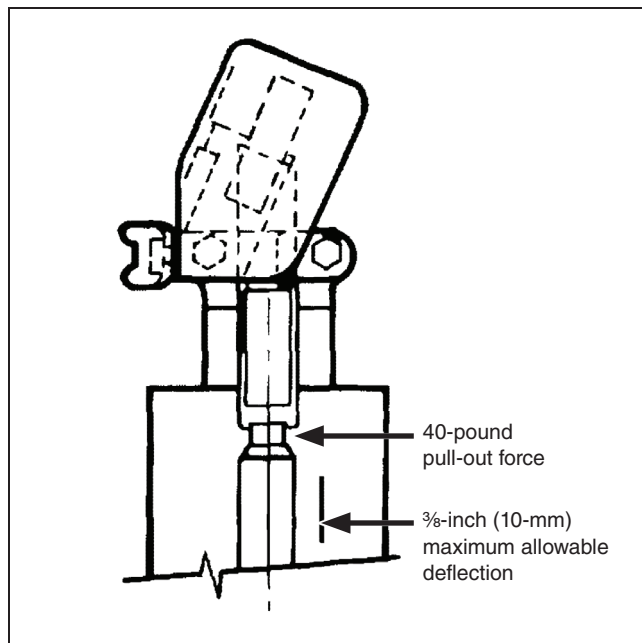


Figure 5. Blade closure verification.

Installation

- (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. These same bolts are used for the OPEN and CLOSED position indicators which are set as described in Step 14.

STEP 14. 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.

Fully close the grounding switch and set the CLOSED position indicator on the output shaft of the manual geared operating handle so it is visible from the front of the handle.

STEP 15. 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. Connect the free end of the flexible strap to a suitable earth ground using the grounding connector at that end of the strap.●

STEP 16. If the S&C Manual Geared Operating Handle is provided 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 the 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 limit engagement with its roller.
- (c) Lower (or raise) the cam, making sure the teeth mesh with the inner gear.

● These grounding recommendations 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.

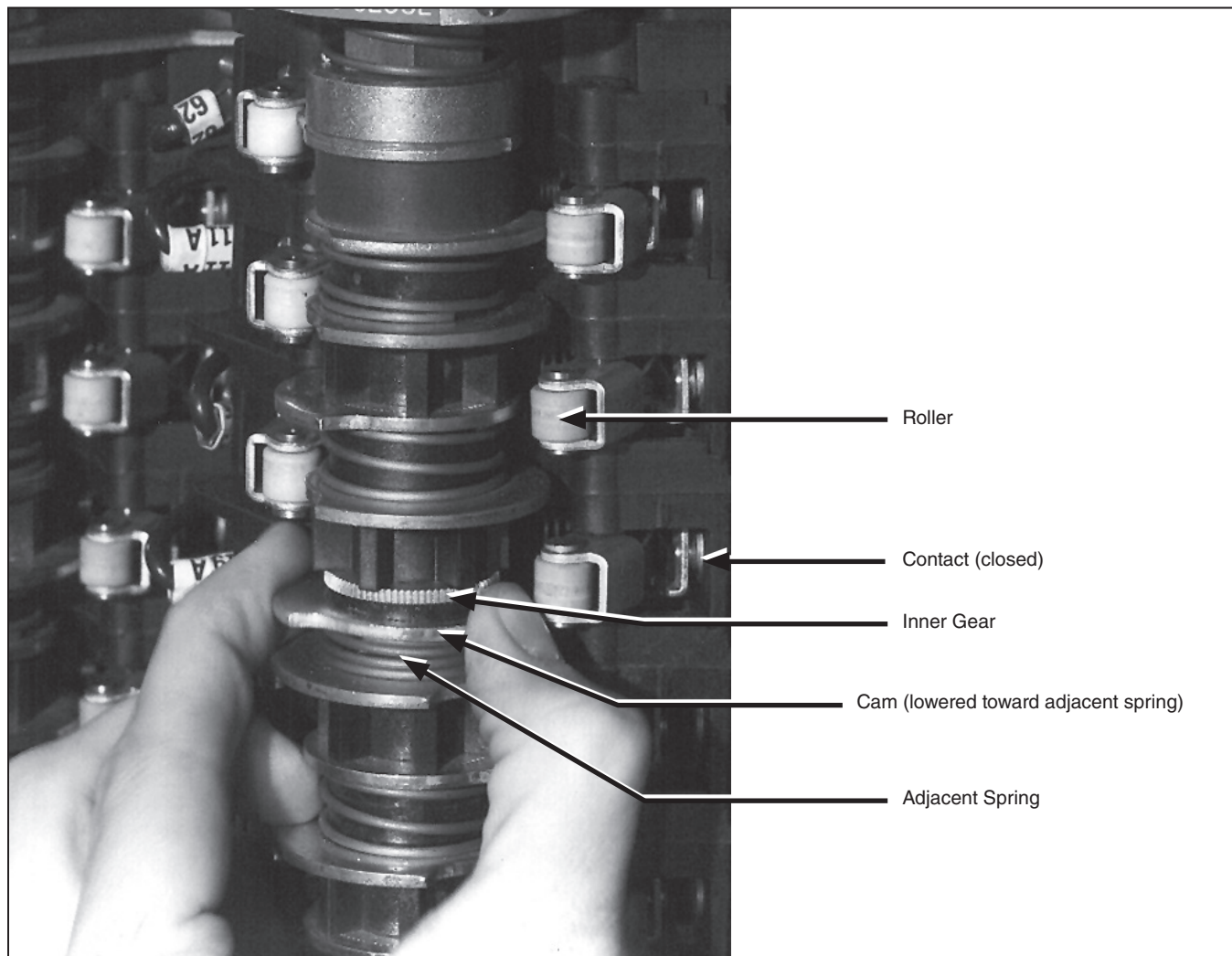


Figure 6. Adjustment of cams on auxiliary switch.

Inspection Recommendations

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