Installation

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★ The instructions in this document are also applicable to grounding switches for equivalent models of Mark IV Circuit-Switchers, as well as S&C Line-Rupter™ Switches.

February 2, 2026

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 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 34.5 kV through 161 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 or manual nongeared 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, depending on the circuit-switcher rating, 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 and installation of manually operated S&C Grounding Switches, rated 61,000 amperes momentary, when furnished as original equipment for ail vertical-break style circuit-switchers and for all center-break style circuit-switchers rated 115 kV through 161 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.

Installing the Grounding Switch

Proceed with the following steps:

STEP 1. Insert each grounding switch blade assembly into its blade clamp, oriented as shown in Figure 1. Do not completely tighten the clamp bolts until the blade has been adjusted as described below. (Circuit-switchers rated 34.5 kV and 46 kV are shipped with the grounding switch blades already installed. However, the blades should be checked for proper positioning and adjusted if necessary. For this reason the piercing set screws on the blade clamps have been left loose.)

Position each blade assembly in its clamp so, with the spring-loaded blade-contact assembly held in the straight (in-line) position, it enters the jaw contact with a ½-inch (13-mm) clearance between the end of the blade-contact assembly and the jaw-contact housing. See Figure 1 on page 7. At the same time, rotate the blade in the blade damp until the sides of the blade-contact assembly are parallel to the jaw-contact fingers. Then tighten the blade clamp bolts equally so the clamp pulls down evenly.

The blade-contact assembly must enter the jaw contact on center. To adjust, loosen the clamp bolts on the section of the blade clamp which fastens the blade clamp to the drive shaft. Slide the blade assembly into correct alignment and re-tighten the clamp bolts. The radial position of the blade clamp on the drive shaft must be maintained (for 45-degree orientation of the blade relative to the drive shaft lever). Alignment marks on the drive shaft and the blade clamp are provided for this purpose.

Now torque to final tightness all the clamp bolts which fasten the blade to the drive shaft. Then tighten the piercing set screws, piercing the drive shaft, and continue turning until a firm resistance is felt.

STEP 2. Grounding switches for circuit-switchers rated 69 kV through 161 kV include a spring-loaded counterbalance assembly which is factory adjusted to offset the weight of each blade 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. See Figure 1 on page 7. 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 3. A flexible strap for current transfer to ground is attached to each blade clamp (except for grounding switches with braidless contacts for current transfer). Connect the free end of each flexible strap to a suitable earth ground.●

STEP 4. Mount the outboard bearing assembly in the position shown on the erection drawing.

STEP 5. Attach an adjustable pipe coupling to the drive-shaft lever(s) of each grounding switch pole-unit and to the lever of the outboard bearing assembly, as shown on the erection drawing.

STEP 6. With all three of the grounding switch blades in the fully **Closed** position and the lever of the outboard bearing assembly against its Closed stop, install the horizontal pipe sections to interconnect the grounding switch poles and the outboard bearing, as shown on the erection drawing.

Pipe sections are precut to the correct lengths. The adjustable pipe couplings may be shortened or lengthened as required to accept the pipe sections furnished. Do not cut the pipes themselves. For each pipe coupling, 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. Then, tighten the piercing set screws, piercing the pipe, and continue turning until a firm resistance is felt. Adjust the stop bolt on the outboard bearing assembly to allow the outboard bearing lever to travel approximately 5 degrees over center to provide a positive toggle condition with the switch blades fully closed. See Figure 2 on page 8.

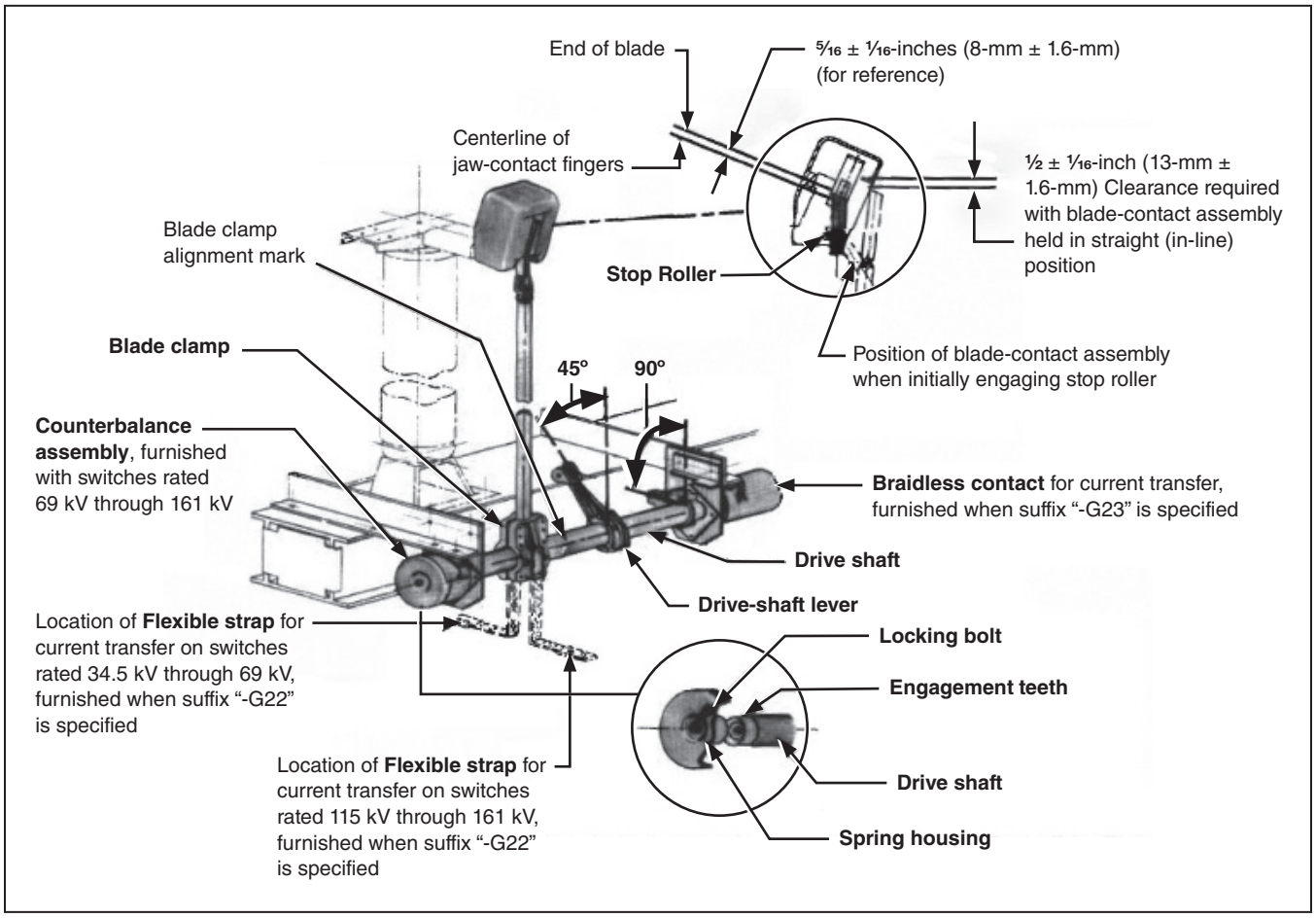

Figure 1. Pole-unit in Closed position.

● 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.

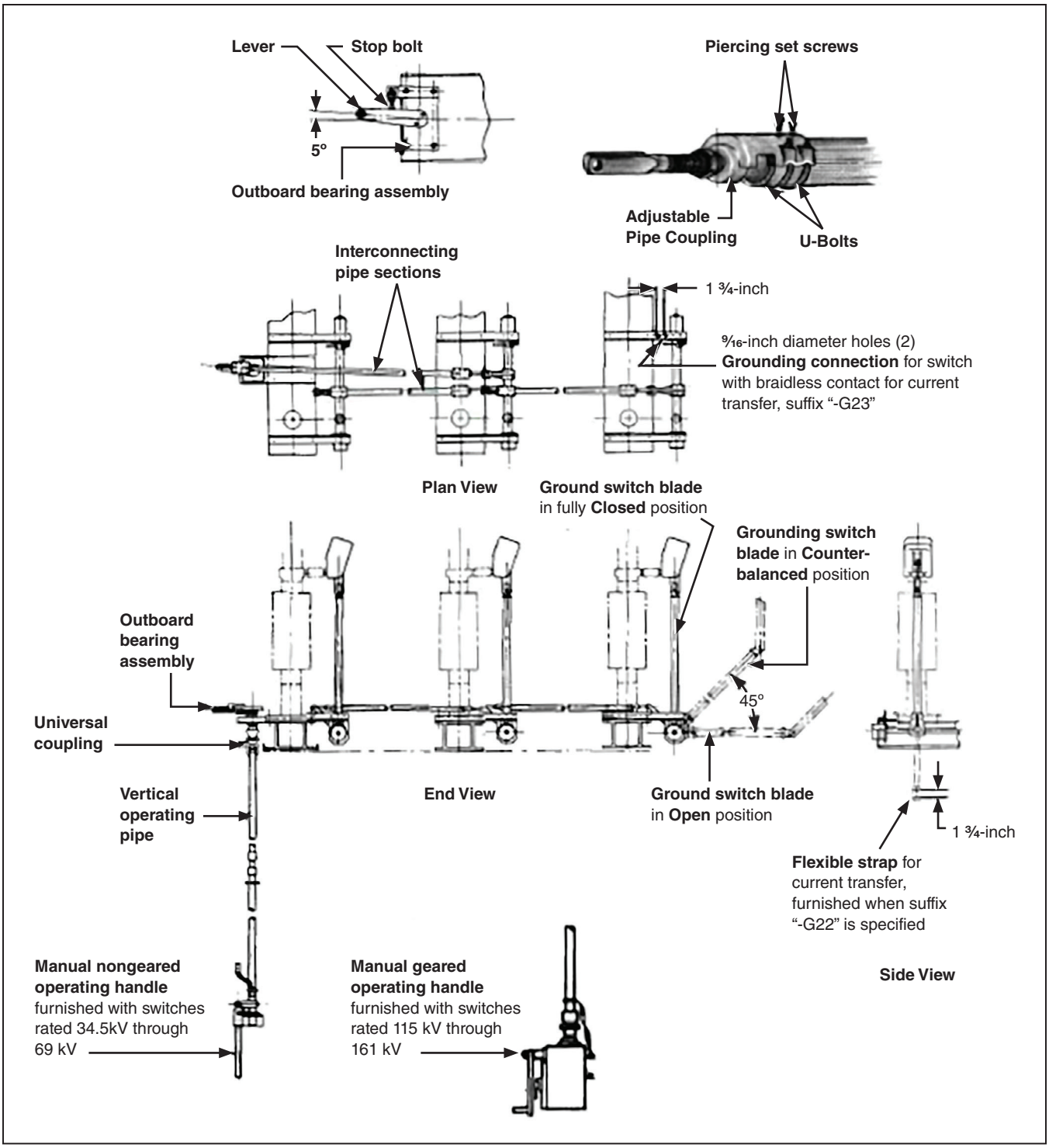

Figure 2. Typical three-pole configuration. Mount the outboard bearing assembly in the position shown on the erection drawing.

Turn the take-up nuts of the adjustable pipe couplings to remove all play in the interconnecting linkage. Then, tighten the nuts to lock the couplings in position. See Figure 2 on page 8. Make sure the grounding switch blades remain fully closed and the outboard bearing lever remains against its Closed stop.

STEP 7. Check for proper blade closure by manually pulling the blade assembly away from its **Closed** position. See Figure 3. With a pull-out force of approximately 40 pounds applied at the position indicated, blade deflection should be no more than indicated.

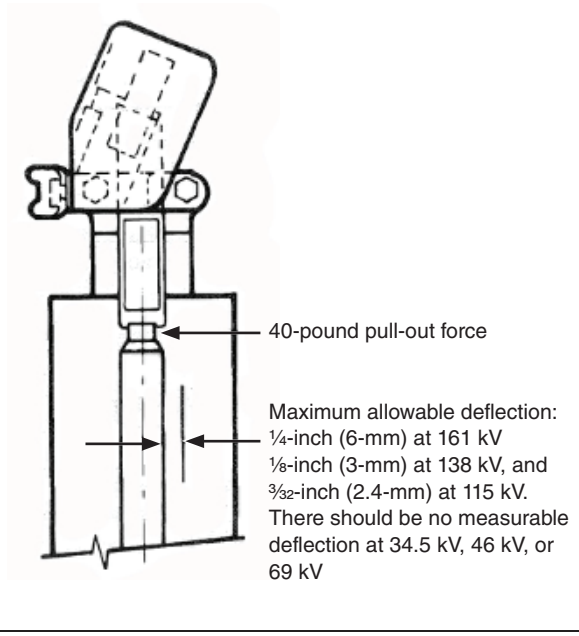

Figure 3. Blade closure verification.

Installing the Manual Nongeared Operating Handle

If a manual geared operating handle is to be installed, skip to "Installing the S&C Manual Geared Operating Handle" on page 13.

Complete the following steps to install the manual nongeared operating handle:

STEP 1. Install the vertical operating-pipe section (or sections) and, if required, the guide bearing assembly (or assemblies) in accordance with the dimensions shown on the erection drawing. Work from the outboard bearing assembly downward.

One of the pipe sections furnished will be pre-drilled with through-holes near one end to accept the manual operating handle. Install this pipe section last, with the holes at the lower end.

It is advisable to clamp the couplings on each pipe section as work progresses. However, do not clamp the section of vertical operating pipe to which the manual operating handle is to be attached until so directed (after connection has been made to the handle).

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 2. Position the through-holes at the lower end of the lowest vertical operating-pipe section, referred to above, to provide operation of the handle in the desired quadrant. (The handle will be at 90 degrees to the holes.) Torque the clamp bolt in the coupling on the upper end of the lowest vertical operating pipe section to final tightness. Then tighten the associated piercing set screw, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 3. ***If a key interlock is to be used, skip*** Step 3 ***and*** Step 4**.**

Using the ½-inch-diameter stainless steel pin furnished, fasten the operating handle assembly to the lowest vertical operating-pipe section. (The pin should engage the through-hole in the vertical operating pipe nearest the position shown on the erection drawing.) Using one of the through-holes provided in the handle flange, secure the ½-inch-diameter pin to the handle with the ⅛-inch-diameter Groov-Pin provided. Tighten the piercing set screw on the operating handle assembly, piercing the pipe, and continue turning until a firm resistance is felt. See Figure 5.

STEP 4. Slide the foot bearing assembly onto the lowest vertical operating-pipe section and bolt it to the pedestal or structure at the position shown on the erection drawing. Adjust the guide bearings toward or away from the pedestal or structure, if necessary, to keep the vertical operating-pipe sections aligned and plumb. Alignment slots are provided for this purpose.

STEP 5. ***If a key interlock is not specified, skip*** Step 5.

The interlock group includes a Superior Key Interlock, Type B-6003-1 Mk II single or multiple key (or equivalent), with ⅛-inch bolt projection and ¾-inch (19-mm) bolt travel, locking disc, and interlock bracket. If “provision only” for a key interlock is specified, the interlock will not be included. Assemble with the operating handle assembly as follows:

(a) Slide the interlock bracket, locking disc, operating handle assembly, and foot bearing assembly onto the lowest vertical operating-pipe section with the locking disc and the operating handle assembly between the interlock bracket and the foot bearing assembly. Bolt the foot bearing assembly to the pedestal or structure at the position shown on the erection drawing. Adjust the guide bearings toward or away from the pedestal or structure, if necessary, to keep the vertical operating-pipe sections aligned and plumb. Alignment slots are provided for this purpose.

(b) Using the ½-inch-diameter stainless steel pin furnished, fasten the operating handle assembly to the lowest vertical

operating-pipe section. (The pin should engage the through-hole in the pipe nearest the position shown on the erection drawing.) Using one of the through-holes provided in the handle flange, secure the ½-inch-diameter pin to the handle with the ⅛-inch-diameter Groov-Pin provided. Tighten the piercing set screw on the operating handle assembly, piercing the pipe, and continue turning until a firm resistance is felt.

(c) Attach the interlock bracket to the foot bearing assembly, using the ½-13 × 1-inch screws and lock washers furnished.

(d) Attach the key interlock to the interlock bracket and extend the bolt.

(e) With the grounding switch in the **Open** position as seen in Figure 4, use the interlock bolt to position the locking disc so the bolt enters the Open-position slot in the disc. Hold the locking disc ⅜-inch (9.5 mm) below the interlock bracket (See Figure 6 on page 12) and drill 7⁄16-inch holes through the vertical operating,-pipe section, using the holes in the locking-disc collar as pilots. Attach the locking disc to the pipe, using the ⅜-16 × 3-inch bolt, nut, and lockwasher furnished.

Note: Key interlocks are intended for proper sequencing of switching operations; they are not intended to provide security. The operating handle assembly includes swing-away hasps for padlocking the grounding switch in either the **Open** or **Closed** position.

STEP 6. Loosen the bolts which secure the adjustable stop-plates to the foot-bearing support plate. See Figure 5 on page 12. Place the switch in the fully **Open** position and adjust the Open-position stop-plate so the handle, when lowered, fits into the Open-position slot. Mark, on the support plate, the location of the Open-position stop-plate.

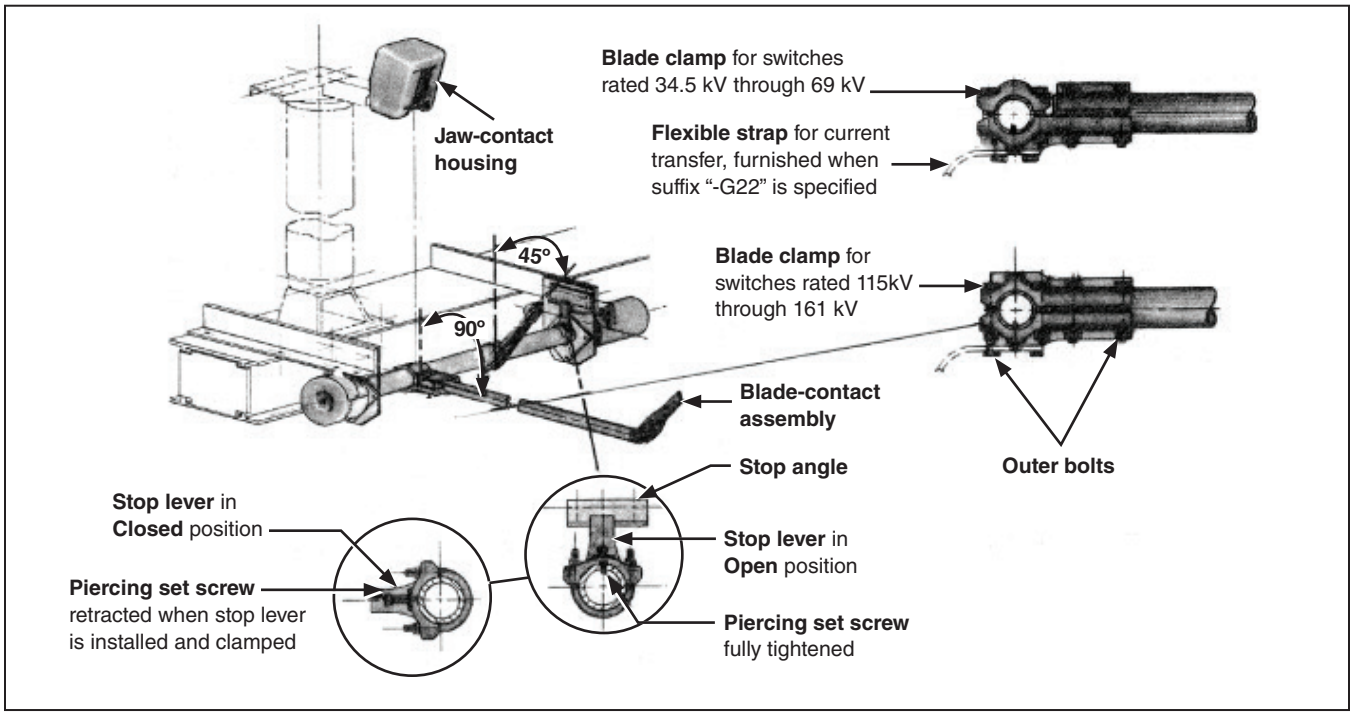

Figure 4. Pole-unit in Open position.

Fully close the switch and apply sufficient pressure to the handle in the closing direction to remove all play in the operating-pipe linkage. Now adjust the Closed-position stop-plate so the handle will require even greater pressure to force it into the Closed-position slot. Mark, on the support plate, the location of the Closed-position stop-plate.

While holding both stop-plates in the previously marked positions, torque the bolts to secure the stop-plates to the support plate. Move the handle to the **Switch-Open** position and verify the handle, when lowered, fits into the Open-position slot.

Then, move the handle to the switch-**Closed** position. Verify all play in the operating-pipe linkage has been taken up *before* the handle can be lowered into the Closed-position slot and 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.

The operating handle assembly includes swing-away hasps for padlocking the grounding switch in either the **Open** or **Closed** position.

STEP 7. Place the grounding switch blades in their fully **Open** position and check the stop levers on the drive shafts. For this blade position (approximately 90 degrees from the fully **Closed** position) each stop lever should lie against its Open stop. See Figure 4 on page 11. For any stop lever requiring adjustment, loosen the U-bolt on the stop lever, position the lever against the Open stop, and re-tighten the U-bolt to final tightness. Then tighten the piercing set screw, piercing the pipe, and continue turning until a firm resistance is felt.

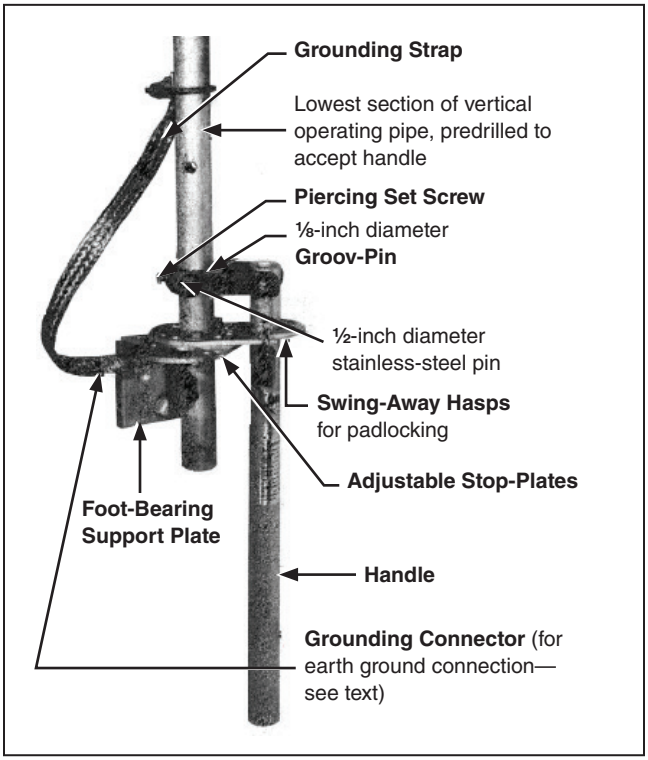

Figure 5. Foot bearing assembly and operating handle assembly.

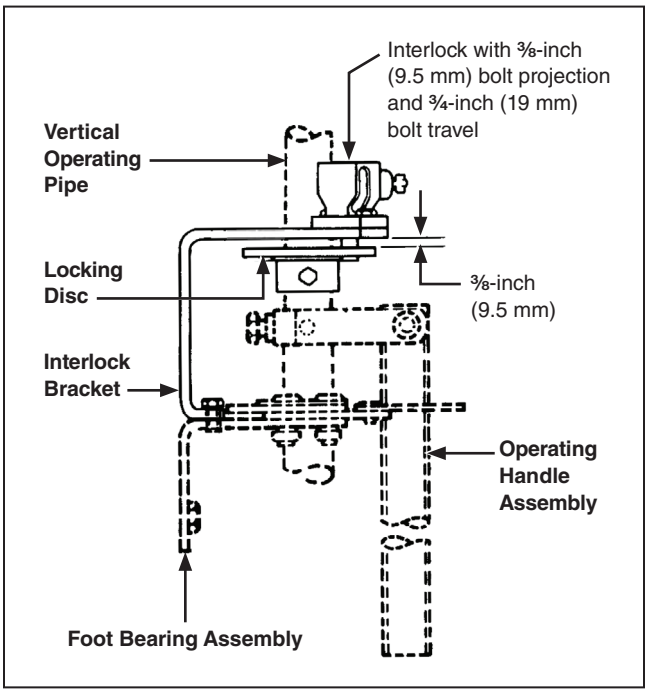

Figure 6. Key Interlock group detail.

Installing the S&C Manual Geared Operating Handle

To install the S&C Manual Geared Operating Handle, complete the following steps:

STEP 1. 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 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 2. 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.

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.

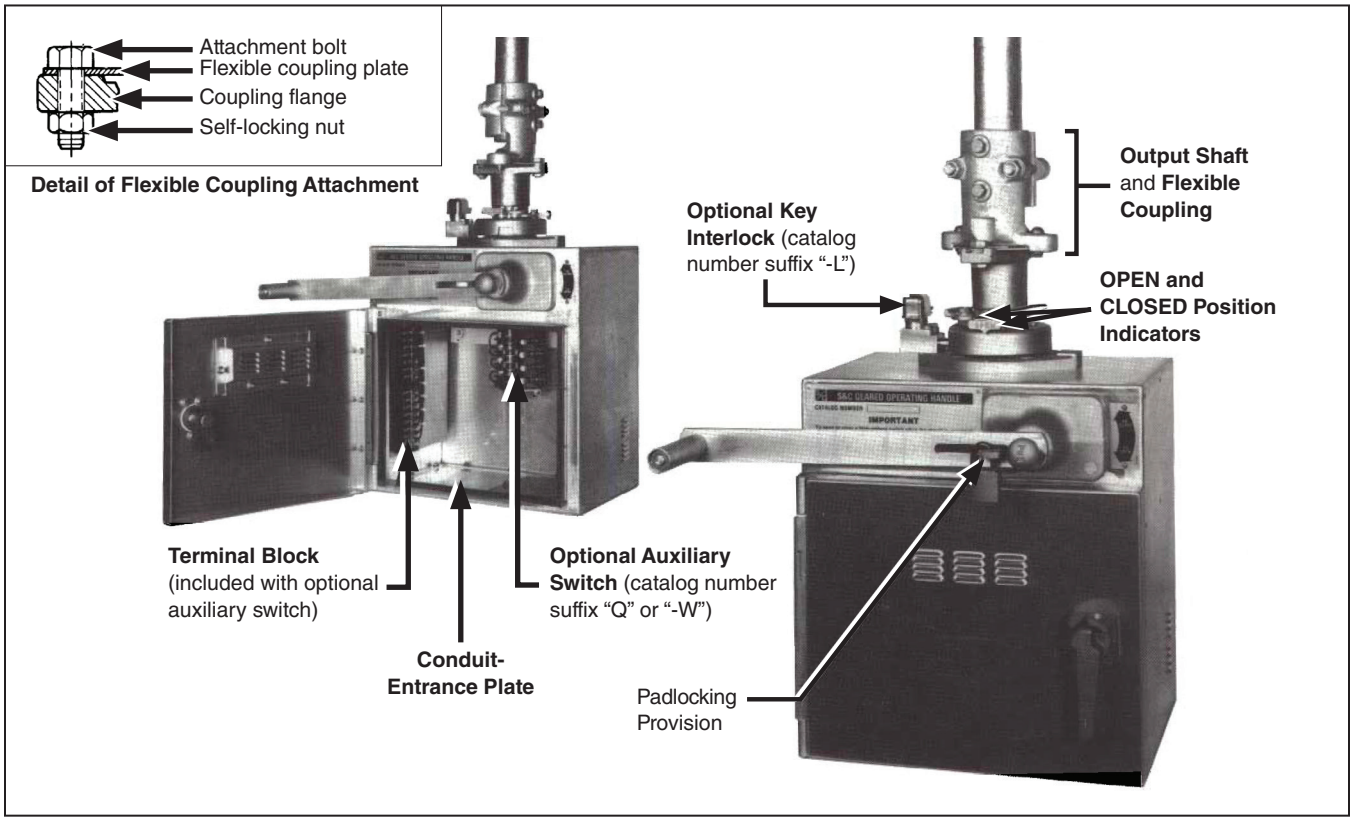

Figure 7. S&C Manual Geared Operating Handle.

STEP 3. ***If a key interlock is not specified, omit*** Step 3.

The key interlock group includes a Superior Key Inter lock, Type B-4003-1, with stainless steel locking bolt, zero bolt projection, ¾-inch (19 mm) 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. These same bolts are also used for the OPEN and CLOSED position indicators.

STEP 4. Place the grounding switch blades in their fully **Open** position and check the stop levers on the drive shafts. For this blade position (approximately 90 degrees from the fully **Closed** position) each stop lever should lie against its Open stop. See Figure 4 on page 11. For any stop lever requiring adjustment, loosen the U-bolt on the stop lever, position the lever against the Open stop, and retighten the U-bolt to final tightness. Then tighten the piercing set screw, piercing the pipe, and continue turning until a firm resistance is felt.

STEP 5. With the grounding switch in the fully **Open** position, 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 6. 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.●

● 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.

STEP 7. If the S&C Manual Geared Operating Handle is furnished with an auxiliary switch, catalog number suffix "-Q" or "-W," it 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 45-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 8.

(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.

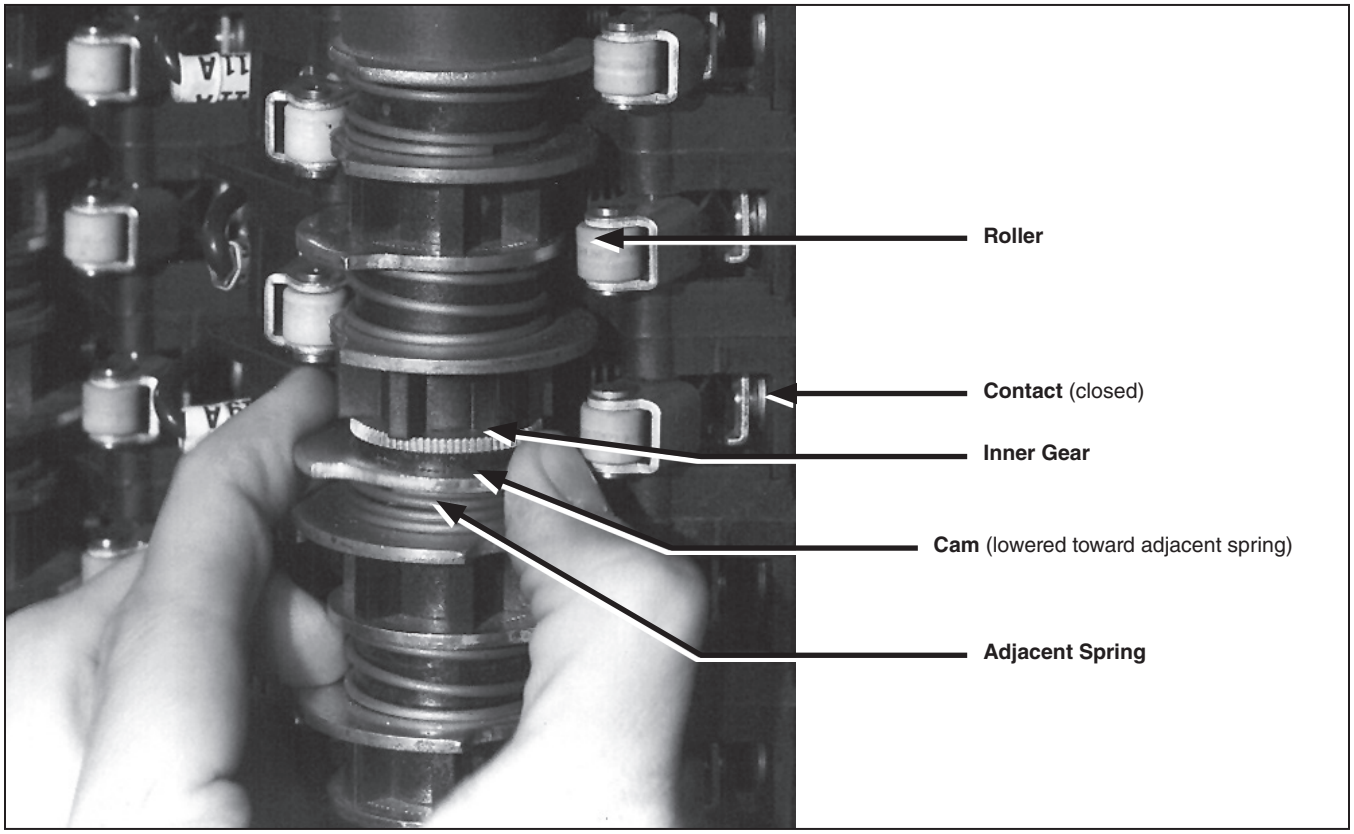

Figure 8. Adjustment of cams on auxiliary switch.

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.