

# INSTRUCTIONS

## For Field Assembly and Installation

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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.

These instructions are for field assembly and installation of the S&C Grounding Switch for S&C Series 2000 Circuit-Switcher Model 2010—With Horizontal Interrupters and Vertical-Break Power-Operated Disconnect, in ratings of 161 kv and 230 kv.

This accessory consists of a manual, three-pole group-operated grounding switch rated 64,000 amperes

momentary, with flexible straps for current transfer at the hinge end of the grounding-switch blades, and with blades parallel to the pole-unit channel bases when in open position. When furnished as original equipment with the Circuit-Switcher, inclusion of the accessory is designated by the addition of a suffix to the Circuit-Switcher catalog number, as indicated below.

Suffix	Application
--------	-------------

- |     |   |
|-----|---|
| -G2 | For grounding jaw-contact terminal pads     |
| -G4 | For grounding interrupter-end terminal pads |

Grounding switch components already installed on the Circuit-Switcher have been carefully adjusted at the factory and, under normal circumstances, readjustment should not be necessary. If the grounding switch is to be added to an *existing* Circuit-Switcher installation, the components should be assembled in accordance with the special drawings provided.

Install the grounding switch only after the Circuit-Switcher has been completely installed.



**INSTALLATION**

**PIERCING SET SCREWS**

To assure the integrity of the operating mechanism, it is imperative that careful attention be given to the correct installation of the piercing set screws provided on operating-pipe couplings and pipe clamps. Before installing operating pipe in any coupling or clamp, make certain that the cutting tip of the piercing set screw does not protrude through the body of the coupling or clamp. Tighten each piercing set screw as directed in the step-by-step instructions that follow, but in each case, *only* after the associated clamp bolts have been torqued to final tightness.

**Step 1**

Loosen the  $\frac{3}{8}$ "—16×1" hex-head galvanized steel cap screws, flat washers, and nuts which retain the bearings for the grounding-switch interphase shaft, located on the Circuit-Switcher pole-unit channel bases. See Figure 1 or Figure 2, Detail C.

**Step 2**

Insert the longer of the two interphase shaft sections through the bearings and, at the same time, slip the stop levers, spacers, and grounding-switch blade clamps over the shaft section, positioned as shown on the catalog option drawing and Figure 1 or Figure 2, front view. Reposition the bearings, as necessary, to facilitate insertion of the shaft section. Note that one end of the interphase shaft section is pre-drilled with a through-hole; this is the end which will be attached to the counterbalance assembly shown in Figure 1 or Figure 2, Detail B.

Insert the shorter of the two interphase shaft sections through the third bearing and, at the same time, slip the remaining grounding-switch blade clamp and *on Catalog Number Suffix "-G4" grounding switches* the remaining stop lever and spacer over the shaft section, positioned as shown on the catalog option drawing and Figure 1 or Figure 2, front view. Reposition the third bearing, as necessary, to facilitate insertion of the shaft section. Again, note that one end of the interphase shaft section is pre-drilled with a through-hole; this is the end which will be attached to the counterbalance assembly shown in Figure 1 or Figure 2, Detail F.

Loosely connect the two interphase shaft sections using the straight coupling, as shown in Figure 1 or Figure 2, front view, but *do not* tighten the piercing set screws on the straight coupling.

Retighten the  $\frac{3}{8}$ "—16×1" hex-head galvanized steel cap screws which retain the bearings but *do not* tighten the clamp bolts on the blade clamps or the piercing set screws on the stop levers.

**Step 3**

Attach the counterbalance assembly mounting bracket shown in Figure 1 or Figure 2, Detail B to the appropriate pole-unit channel base, using two  $\frac{1}{2}$ "—13×1 $\frac{3}{4}$ " hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Securely tighten the screws. Slide the interphase shaft over the counterbalance assembly, align the hole in the shaft with the matching hole in the counterbalance assembly, and couple them using the  $\frac{3}{8}$ " stainless-steel pin and cotter pin furnished.

Now attach the counterbalance assembly mounting bracket shown in Figure 1 or Figure 2, Detail F to the appropriate pole-unit channel base, using two  $\frac{3}{8}$ "—11×2" hex-head galvanized steel cap screws, flat washers, and hex nuts furnished. Securely tighten the screws. Slide the interphase shaft over the counterbalance assembly, align the hole in the shaft with the matching hole in the counterbalance assembly, and couple them using the  $\frac{3}{8}$ " stainless-steel pin and cotter pin furnished.

Securely tighten the clamp bolts on the straight coupling. Then tighten the piercing set screws on the straight coupling, piercing the interphase shaft sections, and continue turning until a firm resistance is felt.

**Step 4**

*For Catalog Number Suffix "-G2" grounding switches:* Attach a blade stop mounting angle to each pole-unit channel base using two  $\frac{1}{2}$ "—13×2" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. See Figure 1, Detail G. Securely tighten the screws.

*For Catalog Number Suffix "-G4" grounding switches:* Attach a blade stop to each pole-unit channel base using two  $\frac{1}{2}$ "—13×2" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. See Figure 2, Detail C. Securely tighten the screws.

**Step 5**

Insert a blade assembly into the socket of the blade clamp adjacent to the center pole-unit channel base. Rotate the blade assembly to the closed position and at the same time slide the blade clamp along the interphase shaft so that the blade-contact assembly enters the jaw contact on center. Adjust the blade assembly as follows:

- (a) Position the blade assembly in the blade clamp so that, with the spring-loaded blade-contact assembly held in the straight (in-line) position, it enters the jaw contact with a 1/2-inch clearance between the end of the blade-contact assembly and the jaw-contact housing. See Figure 1 or Figure 2, Detail D. Simultaneously, rotate the blade assembly in the blade clamp until the sides of the blade-contact assembly are parallel to the jaw-contact fingers. Then tighten equally the clamp bolts on the section of blade clamp which fastens the clamp to the blade assembly, so that the clamp pulls down evenly.
- (b) Tighten equally the clamp bolts on the section of blade clamp which fastens the clamp to the interphase shaft, so that the clamp pulls down evenly. *Do not* tighten the piercing set screw at this time.
- (c) *For Catalog Number Suffix “-G2” grounding switches rated 230 kv:* Attach a grounding strap mounting angle to two of the three pole-unit channel bases as shown in Figure 1, Detail E, using two 5/8”-11×2” hex-head galvanized steel cap screws, flat washers, and hex nuts furnished. Securely tighten the screws. *For Catalog Number Suffix “-G4” grounding switches:* Attach a grounding strap mounting angle to two of the three pole-unit channel bases as shown in Figure 2, Detail E, using two 5/8”-11×2” hex-head galvanized steel cap screws, flat washers, and hex nuts furnished. Securely tighten the screws.
- (d) Thoroughly wire-brush each end of the flexible strap used for current transfer at the hinge end of the grounding switch blade. See the catalog option drawing and Figure 1 or Figure 2, Detail E. Also thoroughly wire-brush the strap’s mating surfaces on the blade clamp and on the grounding strap mounting angle, counterbalance assembly mounting bracket, or on *Catalog Number Suffix “-G2” grounding switches rated 161 kv* the Circuit-Switcher support arm channel assembly, as appropriate. Immediately apply a liberal coating of Penetrox® A (available from Burndy Corporation) or other suitable aluminum connector compound to each brushed surface. Attach one end of the flexible strap to the blade clamp using two 1/2”-13×1 1/2” hex-head stainless-steel cap screws and Belleville washers. Then attach the other end using two 1/2”-13×2” hex-head galvanized steel cap screws, flat washers, Belleville washers, and self-locking hex nuts furnished.

*Do not* install the other two blade assemblies until so directed in Step 16.

### Step 6

*For Catalog Number Suffix “-G2” grounding switches:* Tighten the piercing set screw at each stop lever, piercing the interphase shaft, and continue turning until a firm resistance is felt. See Figure 1, Detail C.

*For Catalog Number Suffix “-G4” grounding switches:* Rotate the installed blade assembly to the fully open position (approximately 90 degrees from the closed position). With the blade assembly in this position, place the stop lever against its stop. See Figure 2, Detail C. Then tighten the piercing set screw, piercing the interphase shaft, and continue turning until a firm resistance is felt.

### Step 7

Attach the drive lever assembly bearing mounting plate to the center pole-unit channel base using two 1/2”-13×1 3/4” hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. See Figure 1 or Figure 2, top view.

### Step 8

Loosely attach one end of the drive lever assembly support angle to the Circuit-Switcher cross base using two 1/2”-13×1 1/2” hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. See Figure 1 or Figure 2, top view. Now loosely attach the other end of the drive lever assembly support angle to the Circuit-Switcher support arm channel assembly using a 1/2”-13×1 1/2” hex-head galvanized steel cap screw, flat washer, and self-locking hex nut furnished. Insert the end of the drive lever assembly having the 7-inch-long drive lever (the end without clevis coupling) into the bearing mounting plate. Then insert the end of the assembly having the 6 7/16-inch-long drive lever (the end with clevis coupling) into the bearing of the drive lever assembly support angle. Now securely tighten the 1/2”-13×1 1/2” hex-head galvanized steel cap screws.

### Step 9

Attach the pinned end of the horizontal linkage assembly to the 7-inch-long drive lever of the drive lever assembly and secure it with the 1/2-inch stainless-steel pin, spacer, flat washer, and cotter pin furnished. See Figure 1 or Figure 2, Detail A. Then, with the installed blade assembly in the fully open position, remove the 5/8”-11 galvanized steel hex nuts from the U-bolt at the crank-arm end of the horizontal linkage assembly and attach the crank arm to the grounding-switch interphase shaft.



**INSTALLATION — Continued**

**Step 10**

*For Catalog Number Suffix “-G2” grounding switches:* Rotate the crank arm to a 45-degree angle, as shown in Figure 1, Detail A, then tighten equally the  $\frac{5}{8}$ ”-11 hex nuts, so that the clamp pulls down evenly. Tighten the piercing set screw at the crank-arm end of the horizontal linkage assembly, piercing the interphase shaft, and continue turning until a firm resistance is felt.

*For Catalog Number Suffix “-G4” grounding switches:* Rotate the crank arm to a 57-degree angle, as shown in Figure 2, Detail A, then tighten equally the  $\frac{5}{8}$ ”-11 hex nuts, so that the clamp pulls down evenly. Tighten the piercing set screw at the crank-arm end of the horizontal linkage assembly, piercing the interphase shaft, and continue turning until a firm resistance is felt.

**Step 11**

*For Catalog Number Suffix “-G2” grounding switches:* With the installed blade assembly still in the fully open position, verify that the 7-inch-long drive lever of the drive lever assembly is positioned at a 45-degree angle, as shown in Figure 1, Detail A. If necessary, loosen the  $\frac{1}{2}$ ”-13×1 $\frac{1}{4}$ ” hex-head galvanized steel cap screw at one or both of the pipe couplings of the horizontal linkage assembly and reposition the pipe coupling(s) so that the 7-inch-long drive lever is at 45 degrees. Retighten the  $\frac{1}{2}$ ”-13×1 $\frac{1}{4}$ ” hex-head galvanized steel cap screw(s). Then tighten the piercing set screw at each pipe coupling, piercing the horizontal linkage assembly pipe, and continue turning until a firm resistance is felt.

*For Catalog Number Suffix “-G4” grounding switches:* With the installed blade assembly still in the fully open position, verify that the 6 $\frac{7}{16}$ -inch-long drive lever of the drive lever assembly is positioned at a 45-degree angle, as shown in Figure 2, Detail A. If necessary, loosen the  $\frac{1}{2}$ ”-13×1 $\frac{1}{4}$ ” hex-head galvanized steel cap screw at one or both of the pipe couplings of the horizontal linkage assembly and reposition the pipe coupling(s) so that the 6 $\frac{7}{16}$ -inch-long drive lever is at 45 degrees. Retighten the  $\frac{1}{2}$ ”-13×1 $\frac{1}{4}$ ” hex-head galvanized steel cap screw(s). Then tighten the piercing set screw at each pipe coupling, piercing the horizontal linkage assembly pipe, and continue turning until a firm resistance is felt.

**Step 12**

Attach the operating-handle assembly to the center mounting pedestal using two  $\frac{1}{2}$ ”-13×14” hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. See Figure 1 or Figure 2, side view.

**Step 13**

Thread the lower end of the vertical operating pipe into the operating-handle pipe coupling. Approximately  $\frac{1}{4}$  inch of thread should extend through the coupling. See Figure 1 or Figure 2, side view. Secure with 1 $\frac{1}{4}$ ” galvanized locknut.

**Step 14**

Rotate the installed blade assembly to the fully closed position and tie it to its jaw-contact housing. Insert the upper end of the vertical operating pipe into the clevis coupling of the drive lever assembly. Make certain that the cutting tip of the piercing set screw does not protrude through the body of the coupling clamp. Then, while holding the operating handle at a point approximately 20 degrees from the closed position, tighten the  $\frac{1}{2}$ ”-13×1 $\frac{1}{4}$ ” hex-head galvanized steel cap screw of the clevis coupling. *Do not* tighten the associated piercing set screw at this time; it will be tightened in Step 18.

Now remove the tie holding the installed blade assembly closed. Move the handle to the fully closed position. A definite resistance should be felt at the end of the stroke, indicating that all slack in the operating linkage has been taken up.

If this is not the case, the above procedure should be repeated except that the operating handle should be moved *more* than 20 degrees in the opening direction before tightening the  $\frac{1}{2}$ ”-13×1 $\frac{1}{4}$ ” hex-head galvanized steel cap screw of the clevis coupling. Conversely, if it is necessary to use considerable force to move the handle to the fully closed position or if the operating handle does not swing 180 degrees to the fully open position, loosen the  $\frac{1}{2}$ ”-13×1 $\frac{1}{4}$ ” hex-head galvanized steel cap screw of the clevis coupling and then retighten it with the operating handle at *less* than the 20-degree position.

### Step 15

Attach the end of the grounding strap having the eye-bolt connector to the operating-handle assembly, using a ½"–13×1¼" hex-head galvanized steel cap screw, flat washers, and self-locking hex nut furnished. See Figure 1 or Figure 2, side view. Then attach the eye-bolt connector to a suitable earth ground.★

Fasten the free end of the grounding strap to the vertical operating pipe a few inches above the operating-handle assembly, using the U-bolt connector provided for this purpose.

### Step 16

Using the operating-handle assembly, rotate the grounding switch to the fully closed position and install the other two blade assemblies in the manner described in Step 5.

### Step 17

With the grounding switch fully closed, check for proper blade closure by manually pulling each 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. If necessary, loosen the blade clamp bolts and rotate the blade clamp on the interphase shaft. Retighten equally the blade clamp bolts, so that the clamp pulls down evenly. Then tighten the piercing set screw, piercing the interphase shaft, and continue turning until a firm resistance is felt.

### Step 18

If any adjustments were performed in Step 17, repeat the procedure for setting the operating linkage described in Step 14. Then tighten the piercing set screw

of the clevis coupling at the upper end of the vertical operating pipe, piercing the pipe, and continue turning until a firm resistance is felt.

### Step 19

If a key interlock for the grounding switch has been specified—as designated by the addition of the suffix "L4" to the Circuit-Switcher catalog number—a Superior key interlock (or equivalent) will be mounted on the operating-handle assembly. This key interlock locks the grounding switch open and works in conjunction with a key interlock located inside the Series 2000 Circuit-Switcher operator—designated by the addition of the suffix "L1" to the Circuit-Switcher catalog number—to guard against operating the grounding switch with the disconnect blades or interrupters closed. Verify that with the grounding switch open, the interlock bolt, when extended, engages a slot in the operating-handle assembly.

## IMPORTANT

**Key interlocks are intended for proper sequencing of switching operations; they are not intended to provide security. The operating-handle assembly includes provisions for padlocking the grounding switch in either the open or closed position.**

★ 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.



**INSTALLATION — Continued**

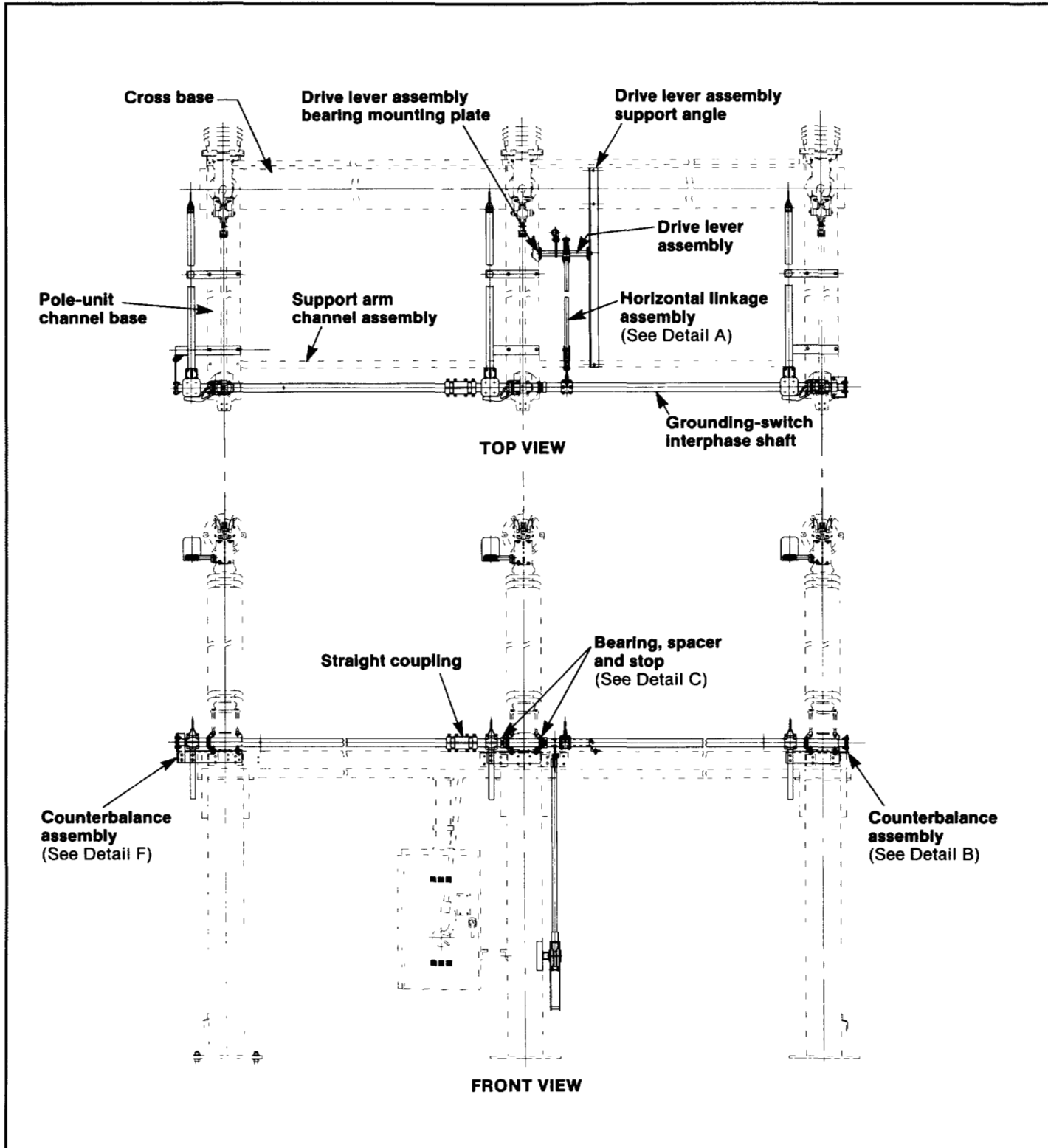
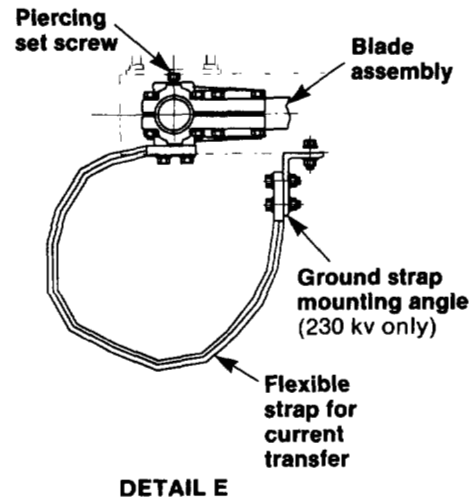
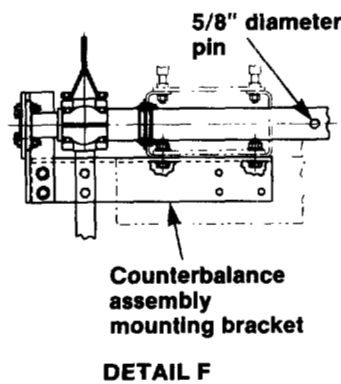
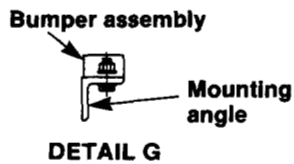
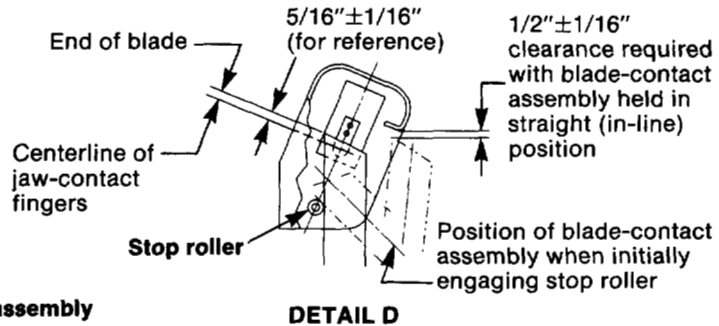
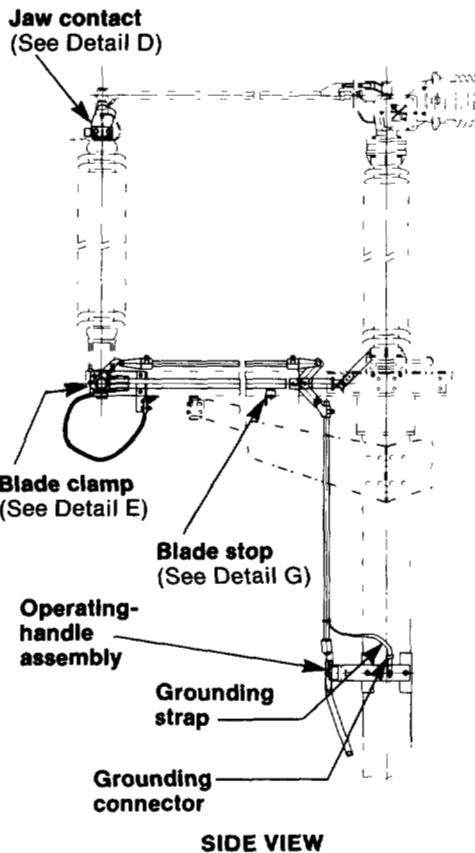
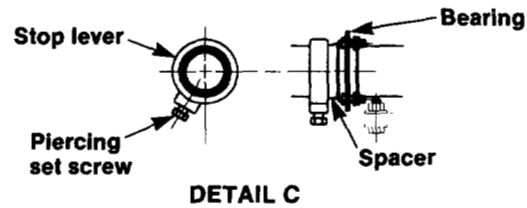
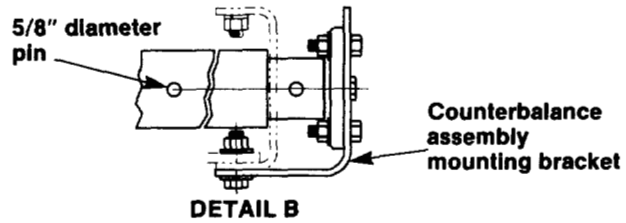
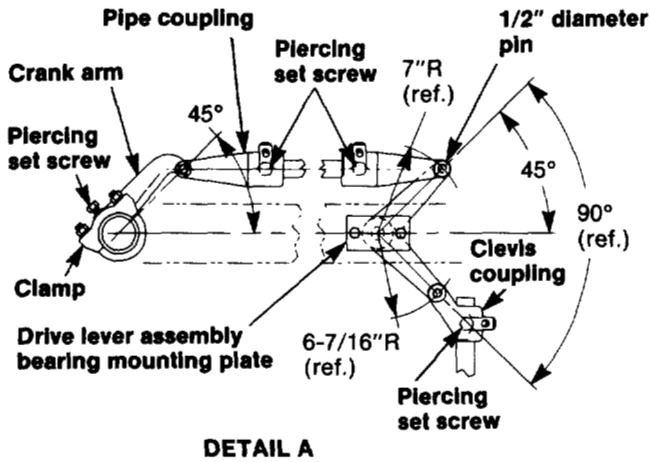


Figure 1. Typical configuration of three-pole grounding switch for grounding Circuit-Switcher jaw-contact terminal pads.

**716-523 INSTRUCTION SHEET**



**INSTALLATION — Continued**



**INSTALLATION — Continued**

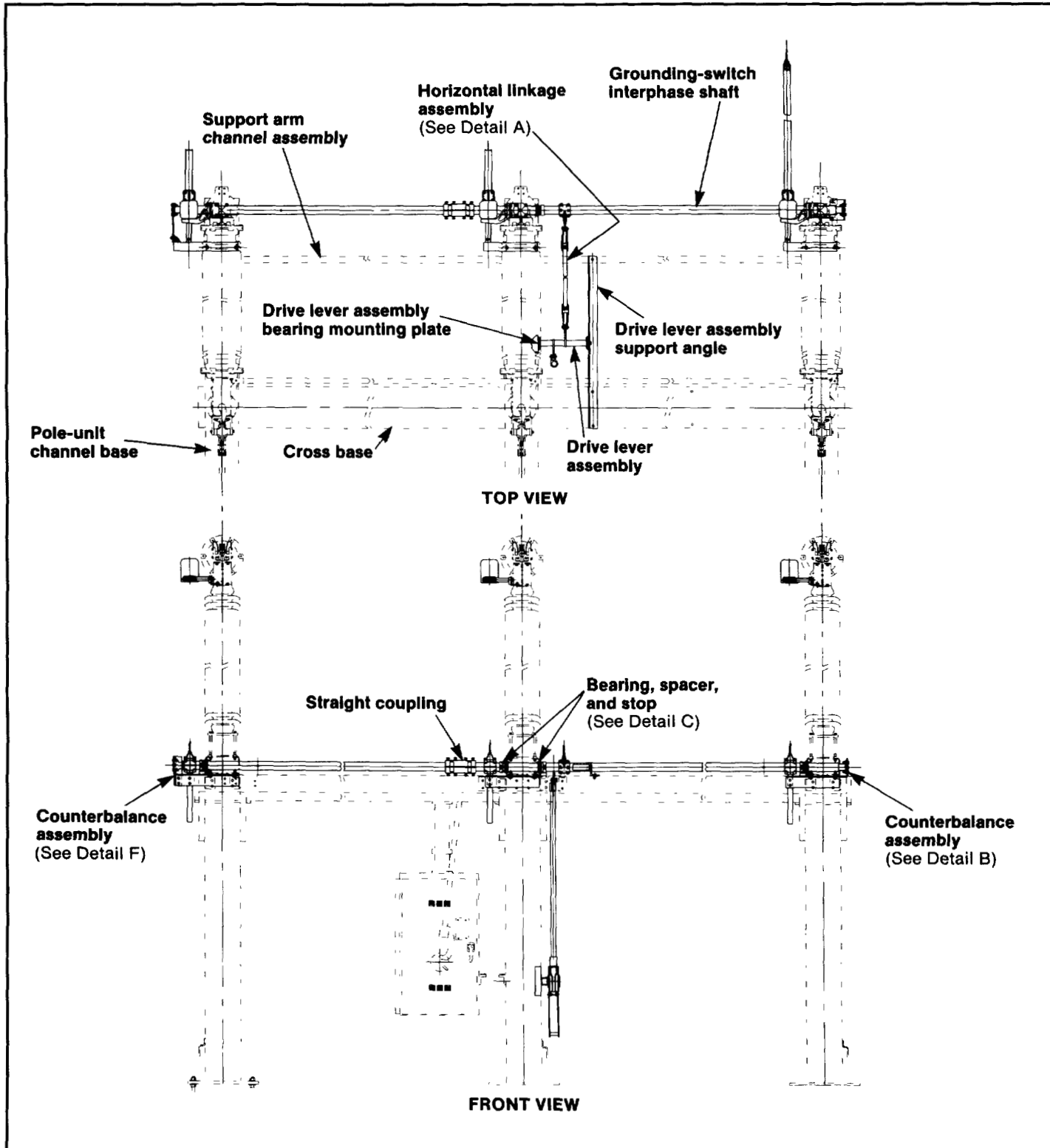
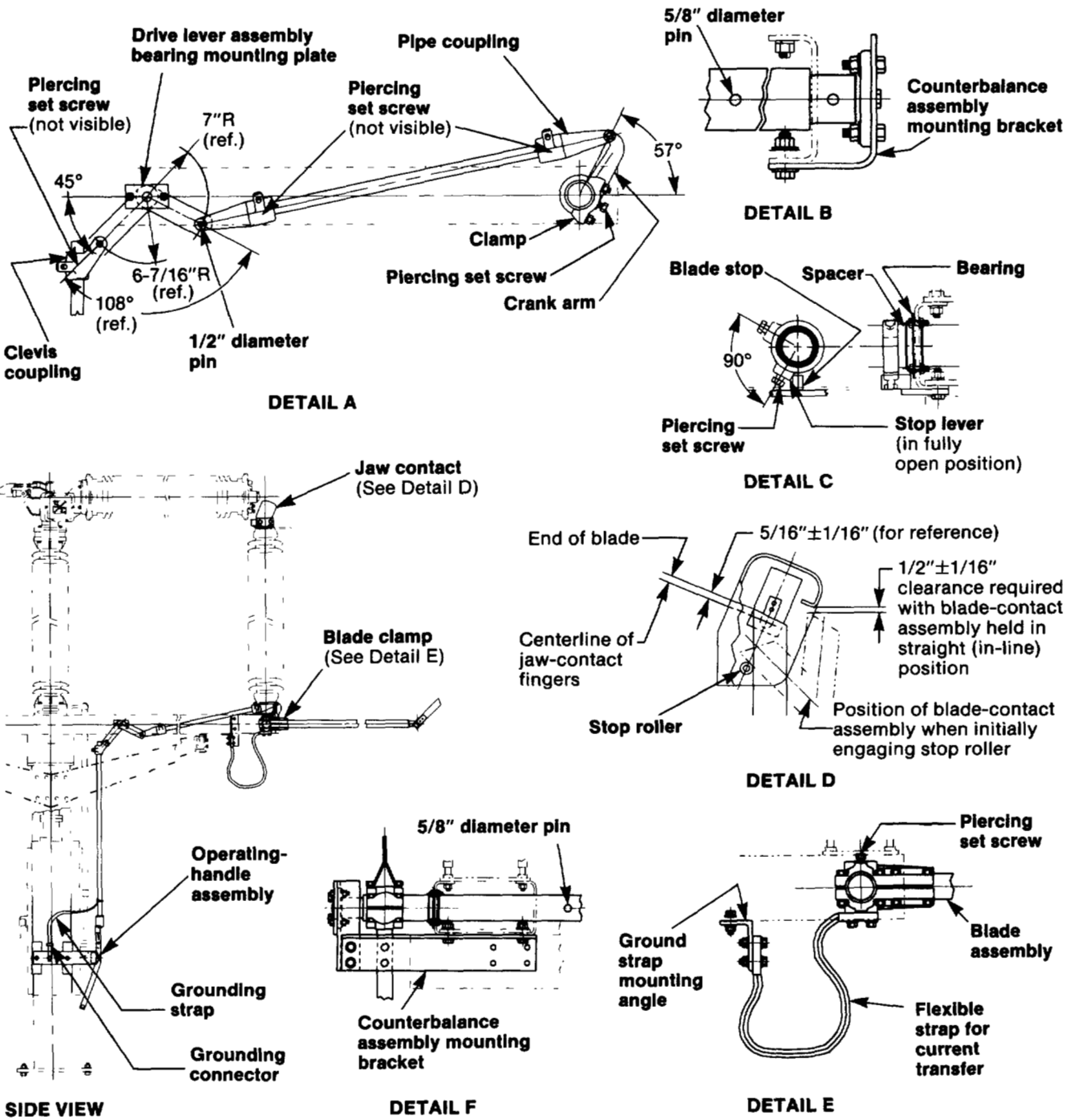


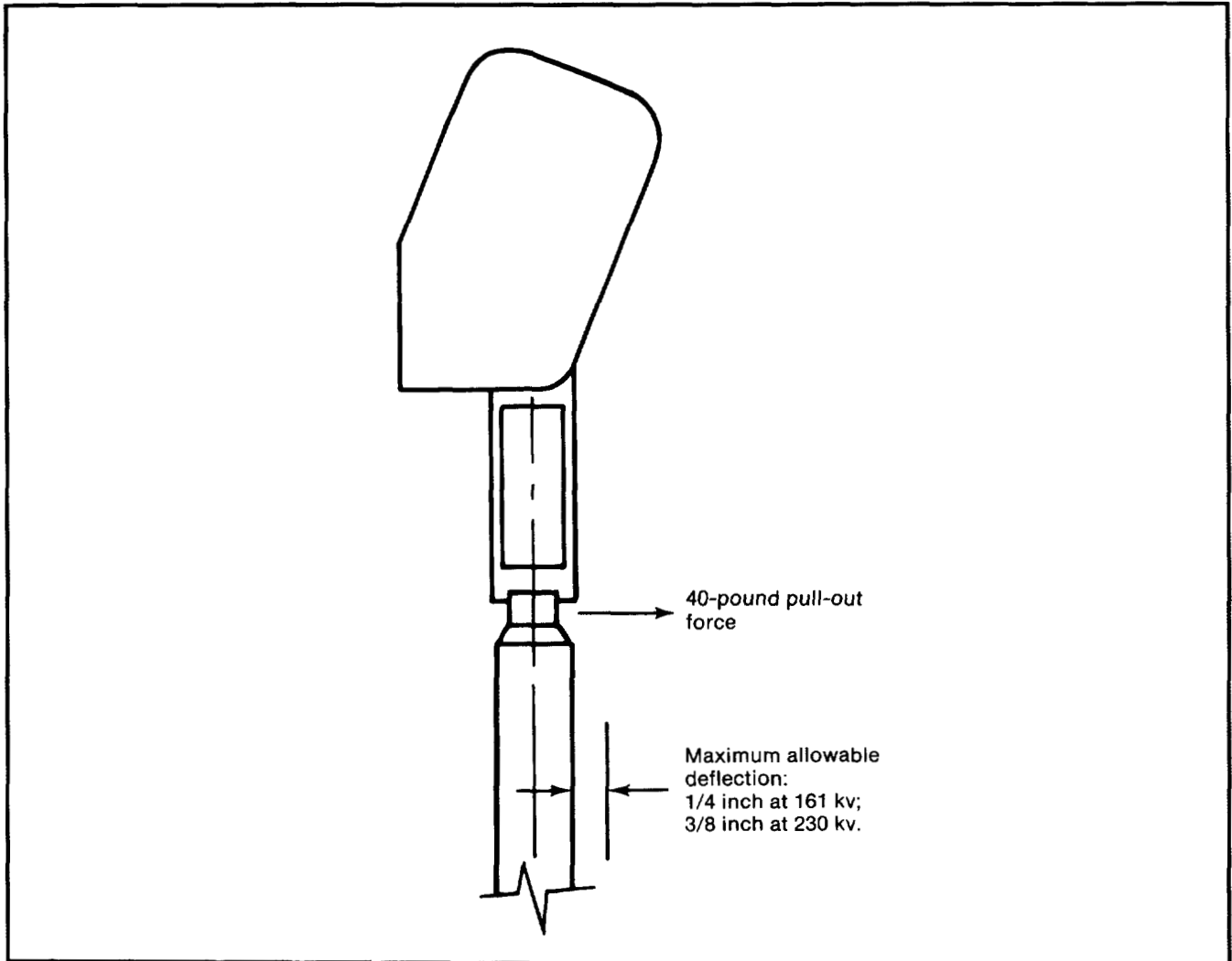
Figure 2. Typical configuration of three-pole grounding switch for grounding Circuit-Switcher interrupter-end terminal pads.



**INSTALLATION — Continued**



**INSTALLATION — Continued**



**Figure 3. Blade closure verification.**

**INSPECTION SCHEDULE AND PROCEDURES**

To assure 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 716-590.

**716-523 INSTRUCTION SHEET**

