

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 2020—With Vertical Interrupters and Side-Break Power-Operated Disconnect, in ratings of 69 kv through 138 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 the suffix “G2” to the Circuit-Switcher catalog number. This device grounds the jaw-contact terminal pads of the Circuit-Switcher.

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 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.

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

Attach the counterbalance assembly mounting plate, three bearing assembly mounting plates, and the stop plate to the pole-unit channel bases using $\frac{5}{8}$ "-11×1½" hex-head galvanized steel cap screws, flat washers, and hex nuts furnished. See Figure 1, Detail C, Detail D, and Detail E. Securely tighten the screws.

Step 2

Note which end of the interphase shaft is pre-drilled with a through-hole; this is the end which will be attached to the counterbalance assembly. Insert the interphase shaft through the bearings and, at the same time, slip the stop levers, spacers, and grounding-switch blade clamps over the shaft, positioned as shown on the catalog option drawing and Figure 1, front view and top view. If necessary, loosen the $\frac{3}{8}$ "-16×1" hex-head galvanized steel cap screws, flat washers, and nuts which retain the bearings on the bearing assembly mounting plates and reposition the bearings to facilitate insertion of the interphase shaft.

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 $\frac{5}{8}$ " stainless-steel pin and cotter pin furnished. See Figure 1, Detail D.

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 three flexible strap mounting angles to the pole-unit channel bases using $\frac{1}{2}$ "-13×2" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. See Figure 1, Detail D and Detail F. On switches rated 138 kv, it will first be necessary to remove the existing $\frac{1}{2}$ "-13×1½" hex-

head galvanized steel cap screws, flat washers, and self-locking hex nuts from the pole-unit channel bases, at the positions where the flexible strap mounting angles will be attached; discard the existing hardware.

Step 4

Attach the jaw-contact assembly to each pole-unit as follows. See Figure 1, top view and Detail E.

- (a) *For Circuit-Switchers rated 69 kv:* Remove, at the top of the jaw-contact support insulator, the two existing $\frac{5}{8}$ "-11×2" hex-head galvanized steel cap screws, flat washers, and hex nuts indicated in Detail E. Discard the hardware. *For Circuit-Switchers rated 115 kv and 138 kv:* Remove, at the top of the jaw-contact support insulator, the two existing $\frac{5}{8}$ "-11×1½" hex-head galvanized steel cap screws and flat washers indicated in Detail E. Discard the hardware.
- (b) *For Circuit-Switchers rated 69 kv:* Loosely attach the jaw-contact assembly mounting angle to the jaw-contact support insulator using two $\frac{5}{8}$ "-11×2¼" hex-head galvanized steel cap screws, flat washers, and hex nuts furnished. *For Circuit-Switchers rated 115 kv and 138 kv:* Loosely attach the jaw-contact assembly mounting angle to the jaw-contact support insulator using two $\frac{5}{8}$ "-11×1¾" hex-head galvanized steel cap screws and flat washers furnished.
- (c) Loosely attach the jaw-contact support to the jaw-contact assembly mounting angle using two $\frac{5}{8}$ "-11×2" hex-head galvanized steel cap screws, serrated washers, flat washers, and hex nuts furnished.

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 ½-inch clearance between the end of the blade-contact assembly and the jaw-contact housing. See Figure 1, Detail B. 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 the 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) Securely tighten the two $\frac{5}{8}$ "—11×2¼" or $\frac{5}{8}$ "—11×1¾" hex-head galvanized steel cap screws which fasten the jaw-contact assembly mounting angle to the jaw-contact support insulator. Then securely tighten the two $\frac{5}{8}$ "—11×2" hex-head galvanized steel cap screws which fasten the jaw-contact support to the jaw-contact assembly mounting angle.
- (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, Detail F. Also thoroughly wire-brush the strap's mating surfaces on the blade clamp and on the flexible strap mounting angle. 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 $\frac{1}{2}$ "—13×1½" hex-head stainless-steel cap screws and Belleville washers. Then attach the other end to the flexible strap mounting angle, using two $\frac{1}{2}$ "—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 21.

Step 6

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 located adjacent to the stop plate against the blade stop. See Figure 1, Detail C. Then tighten the piercing set screw, piercing the interphase shaft, and continue turning until a firm resistance is felt. Slide the interphase shaft as necessary to eliminate any end play, then tighten the piercing set screw on the other stop lever, piercing the interphase shaft, and continue turning until a firm resistance is felt.

Step 7

For Circuit-Switchers rated 69 kv, with 48-inch phase spacing only. Attach the drive lever assembly mounting plate to the center pole-unit channel base using two $\frac{1}{2}$ "—13×1½" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. See Figure 1, top view.

Step 8

Remove the existing $\frac{1}{2}$ "—13×1¼" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts from the Circuit-Switcher cross base at the position(s) where the drive lever assembly support angle(s) will be attached. See Figure 1, top view. Discard the hardware.

Loosely attach the two drive lever assembly support angles (one support angle for Circuit-Switchers rated 69 kv, with 48-inch phase spacing) to the Circuit-Switcher cross base using $\frac{1}{2}$ "—13×1½" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. On switches rated 115 kv and 138 kv, also attach the drive lever assembly support angles to the support brace using $\frac{1}{2}$ "—13×1½" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished.

Insert the end of the drive lever assembly having the 7-inch-long drive lever (the end *without* clevis coupling) into the bearing of the drive lever assembly support angle closest to the center pole-unit channel base. Then insert the end of the assembly having the 6⁷/₁₆-inch-long drive lever (the end *with* clevis coupling) into the bearing of the other drive lever assembly support angle (or into the bearing mounting plate on Circuit-Switchers rated 69 kv, with 48-inch phase spacing). Now securely tighten the $\frac{1}{2}$ "—13×1½" hex-head galvanized steel cap screws.

Step 9

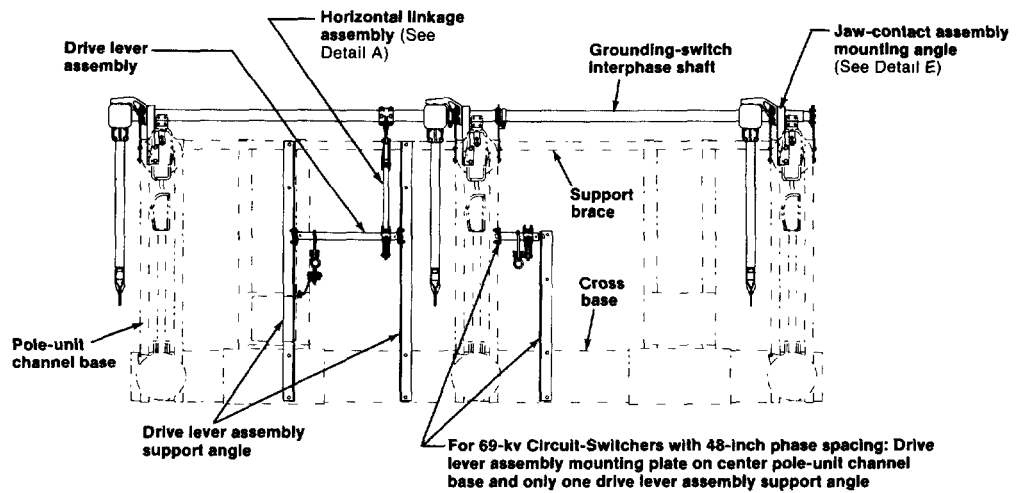
Attach the pinned end of the horizontal linkage assembly to the 7-inch-long drive lever assembly and secure it with the ½-inch stainless-steel pin, spacer, flat washer, and cotter pin furnished. See Figure 1, Detail A. Then, with the installed blade assembly in the fully open position, remove the $\frac{5}{8}$ "—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.

Step 10

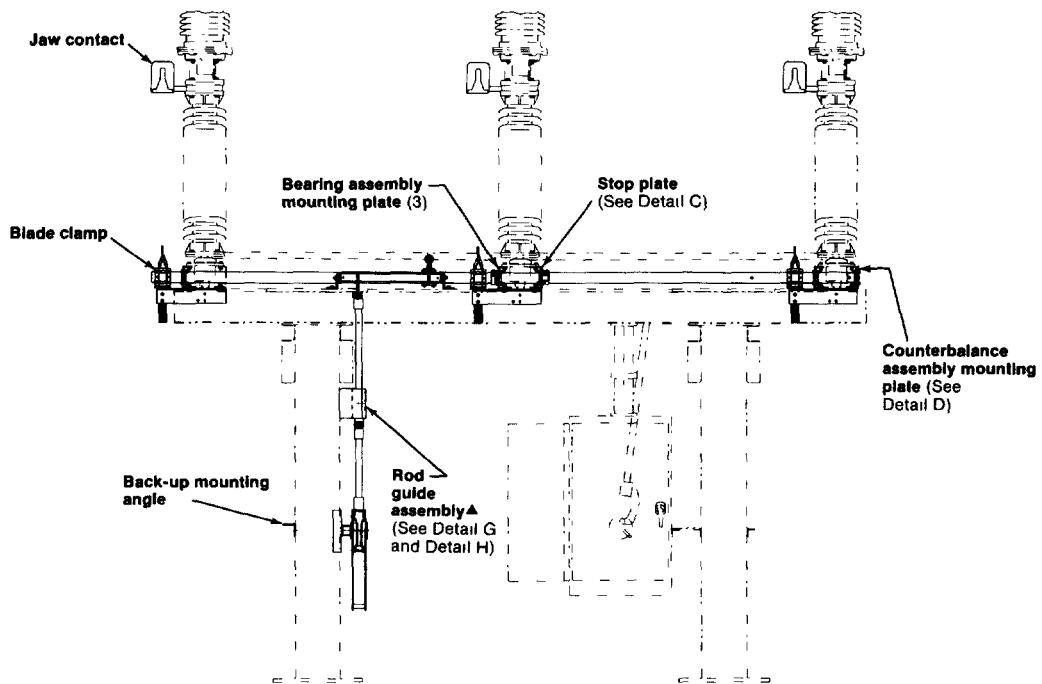
Rotate the crank arm to a 45-degree angle, as shown in Figure 1, Detail A, then tighten equally the $\frac{5}{8}$ "—11 hex nuts, so that the clamp pulls down evenly. Tighten the piercing set screw at the crank-arm end of the horizontal linkage assembly, piercing the interphase shaft, and continue turning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



INSTALLATION — Continued



TOP VIEW



FRONT VIEW

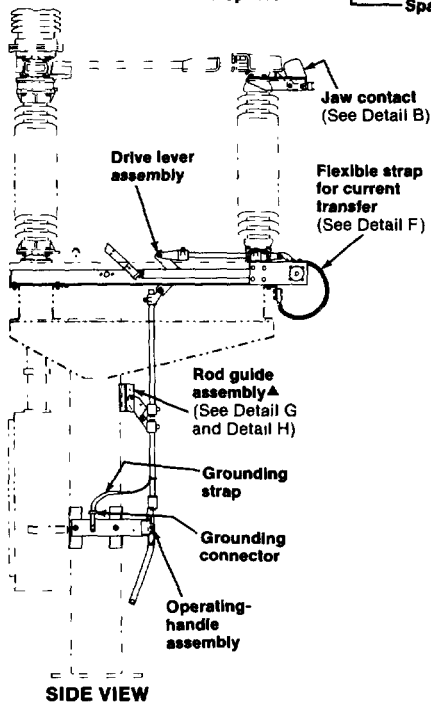
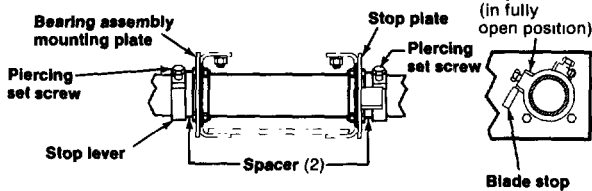
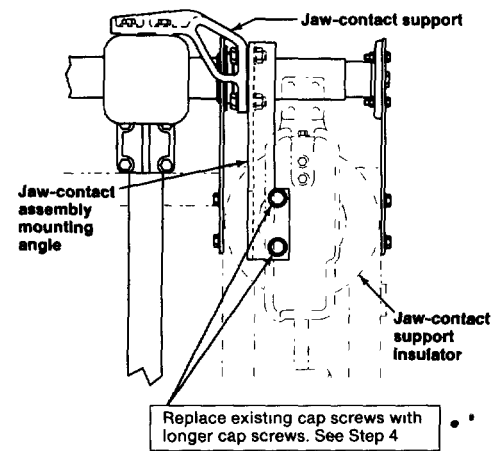
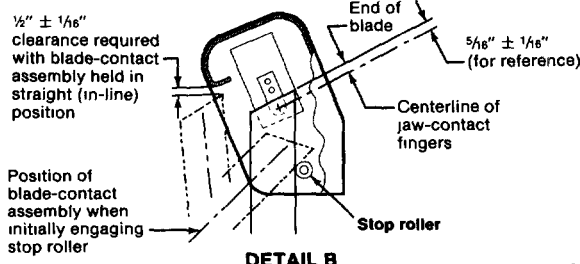
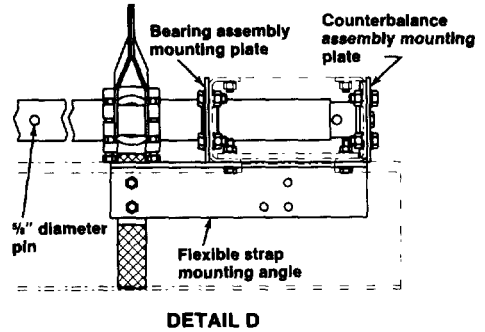
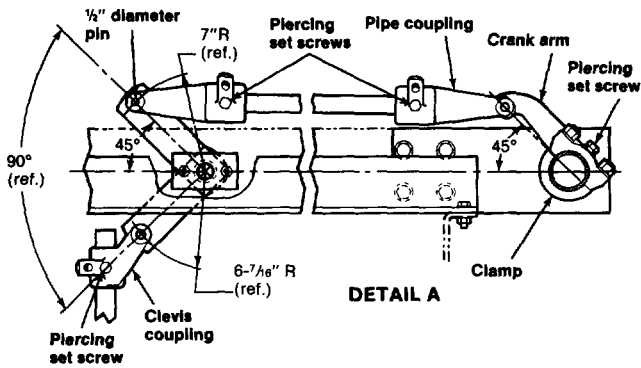
▲ Applicable only for Circuit-Switchers having 168- through 240-inch mounting pedestals.

Figure 1. Typical configuration of three-pole grounding switch.

716-525 INSTRUCTION SHEET

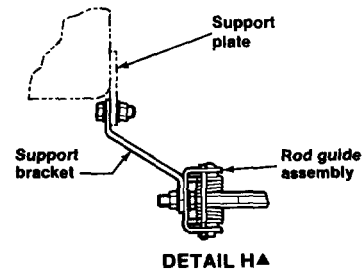
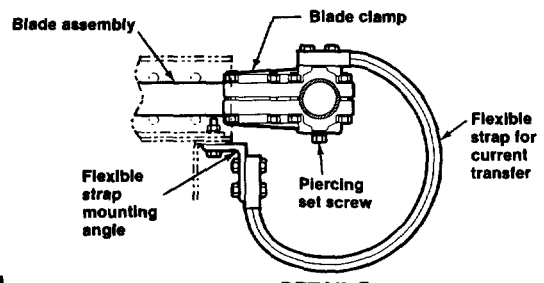
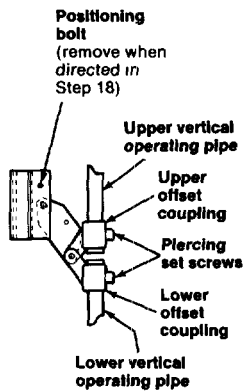


INSTALLATION — Continued



DETAIL C

DETAIL E



INSTALLATION — Continued

Step 11

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 $\frac{1}{2}$ "—13×1¼" 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 $\frac{1}{2}$ "—13×1¼" 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 and back-up mounting angle to the appropriate mounting pedestal using two $\frac{1}{2}$ "—13×14" hex-head galvanized steel cap screws, four flat washers, and two self-locking hex nuts furnished. (On 69-kv Circuit-Switchers with 48-inch phase spacing, a back-up mounting angle is not furnished. The operating-handle assembly is attached to the mounting pedestal using the same two $\frac{1}{2}$ "—13×14" cap screws used to attach the operator support angle.) *For Circuit-Switchers having 96-through 144-inch mounting pedestals (Catalog Number Suffix "-E8" through "-E12"), proceed to Step 13. For Circuit-Switchers having 168- through 240-inch mounting pedestals (Catalog Number Suffix "-E14" through "-E20"), proceed to Step 15.*

Step 13

For Circuit-Switchers having 96- through 144-inch mounting pedestals: 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, side view. Secure with 1¼" galvanized locknut.

Step 14

For Circuit-Switchers having 96- through 144-inch mounting pedestals: 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 $\frac{1}{2}$ "—13×1¼" hex-head galvanized steel cap screw of the clevis coupling clamp. *Do not* tighten the associated piercing set screw at this time; it will be tightened in Step 23. Proceed to Step 19.

Step 15

For Circuit-Switchers having 168- through 240-inch mounting pedestals: Attach the support bracket to the rod guide assembly using two $\frac{1}{2}$ "—13×1½" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts. See Figure 1, Detail H. Now attach the support bracket to the support plate welded to the Circuit-Switcher mounting pedestal using two $\frac{1}{2}$ "—13×1½" hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts. See Figure 1, Detail H.

Step 16

For Circuit-Switchers having 168- through 240-inch mounting pedestals: Insert one end of the upper vertical operating pipe (the shorter of the two sections furnished) into the upper offset coupling of the rod guide assembly. See Figure 1, Detail G. Make certain that the cutting tip of the piercing set screw does not protrude through the body of the coupling clamp. With approximately $\frac{1}{2}$ inch of pipe extending through the upper offset coupling, tighten the $\frac{1}{2}$ "—13×1¼" hex-head galvanized steel cap screw of the upper offset coupling clamp. *Do not* tighten the associated piercing set screw at this time; it will be tightened in Step 23.

Step 17

For Circuit-Switchers having 168- through 240-inch mounting pedestals: Rotate the installed blade assembly to the fully closed position and tie it to its jaw-contact housing. Insert the upper end of the upper 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 rod guide lever against the positioning bolt, tighten the $\frac{1}{2}$ "—13×1¼" hex-head galvanized steel cap screw of the clevis coupling clamp. *Do not* tighten the associated piercing set screw at this time; it will be tightened in Step 23.

Step 18

For Circuit-Switchers having 168- through 240-inch mounting pedestals: Thread the end of the lower vertical operating pipe (the longer of the two sections furnished) into the operating-handle pipe coupling. Approximately $\frac{1}{4}$ inch of thread should extend through the coupling. See Figure 1, side view. Secure with 1¼" galvanized locknut.

Insert the upper end of the lower vertical operating pipe into the lower offset coupling of the rod guide assembly. See Figure 1, Detail G. Make certain that the cutting tip of the piercing set screw does not protrude through the body of the coupling clamp. Then, while

INSTALLATION — Continued

holding the operating handle at a point approximately 20 degrees from the closed position, tighten the $\frac{1}{2}$ "—13×1¼" hex-head galvanized steel cap screw of the clevis coupling clamp. *Do not* tighten the associated piercing set screw at this time; it will be tightened in Step 23.

Remove the positioning bolt from the rod guide assembly. See Figure 1, Detail G.

Step 19

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, hold the operating handle at a point *more* than 20 degrees from the closed position before tightening the $\frac{1}{2}$ "—13×1¼" 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 $\frac{1}{2}$ "—13×1¼" 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 20

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

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

Step 21

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 22

With the grounding switch fully closed, check for proper blade closure by manually pulling each blade assembly away from its closed position. See Figure 2. With a pullout force of approximately 40 pounds applied at the position indicated, blade deflection should be no more than that 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.

▲ 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.

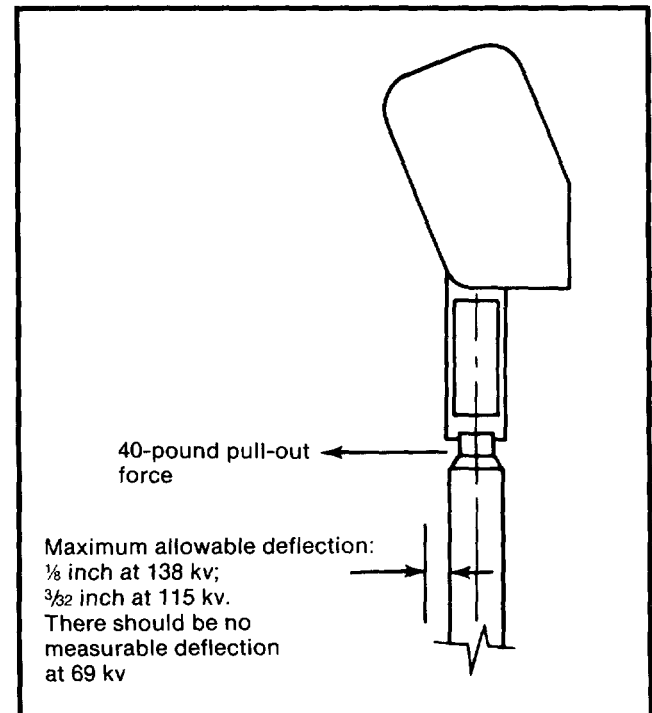


Figure 2. Blade closure verification.



INSTALLATION — Continued**Step 23**

If any adjustments were performed in Step 22, repeat the procedure for setting the operating linkage described in Step 19. 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. *For Circuit-Switchers having 168- through 240-inch mounting pedestals:* Also tighten the piercing set screws in the upper and lower offset couplings of the rod guide assembly, piercing the pipe, and continue turning until a firm resistance is felt.

Step 24

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 switch 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.

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.

