

Installation and Operation

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Introduction

Qualified Persons

WARNING

Only qualified persons knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution 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 or operating a Model 2020 Series 2000 Circuit-Switcher. Become familiar with the Safety Information on pages 4 through 6 and Safety Precautions on page 7. 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 a Model 2020 Series 2000 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 a specific application. The application must be within the ratings furnished for the equipment. Ratings for the Model 2020 Series 2000 Circuit-Switcher are listed in the ratings table in Specification Bulletin 716-31. The ratings are also on the nameplate affixed to the product.

Usual Operating Conditions

Series 2000 Circuit-Switchers will perform as intended at temperatures within the range of -40°C to $+40^{\circ}\text{C}$ (-40°F to $+104^{\circ}\text{F}$), at altitudes of up to 5000 feet (1524 m), and at wind loadings of up to 90 miles (145 km) per hour. Further, Series 2000 Circuit-Switchers, when installed with the recommended S&C anchor bolts and with flexible-conductor connections at all six terminal pads, are capable of withstanding seismic loading of 0.2 g ground acceleration in any direction as well as performing as intended during such loading and afterward. For applications at temperatures not within the specified range, at higher altitudes, at higher wind loadings, or where higher seismic withstand capabilities are required, refer to the nearest S&C Sales Office.

Special Warranty Provisions

The standard warranty contained in the seller's standard conditions of sale, as set forth in Price Sheet 150, applies to S&C Series 2000 Circuit-Switchers and associated options, except that the first paragraph of said warranty is replaced by the following:

(1) General: The seller warrants to the purchaser for a period of five years from the date of shipment that the equipment delivered will be of the kind and quality specified in the contract description and will be free of defects of workmanship and material. Should any failure to conform to this warranty appear under proper and normal use within five years after the date of shipment the seller agrees, upon prompt notification thereof and confirmation that the equipment has been stored, installed, operated, inspected, and maintained in accordance with recommendations of the seller and standard industry practice, to correct the nonconformity either by repairing any damaged or defective parts of the equipment or (at seller's option) by shipment of necessary replacement parts.

Replacement parts provided by the seller under the warranty for the original equipment will be covered by the original-equipment warranty for its duration. Replacement parts purchased separately will be covered by the warranty contained in the seller's standard conditions of sale, as set forth in Price Sheet 150.

Warranty Qualifications

Warranty of Series 2000 Circuit-Switchers is contingent upon both of the following:

- Installation and adjustment of Series 2000 Circuit-Switchers in accordance with S&C's applicable instruction sheets
- Conformance with the inspection recommendations defined in S&C Instruction Sheet 716-590

Safety Information

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 various 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. Their telephone numbers are listed on S&C’s website sandc.com, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE

Read this instruction sheet thoroughly and carefully before installing a Model 2020 Series 2000 Circuit-Switcher.



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 that 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.

Location of Safety Labels

CAUTION
Transition box contains a stop bracket and spacer which must be removed during installation, in the manner described in the SAC instruction sheet furnished with this Circuit-Switcher. Failure to do so can result in damage to the Circuit-Switcher when operated.

CAUTION
REMOVE the interrupter operating-rod holding bracket, stop bracket and spacer during installation. These packing parts are used to secure the switch during shipping and installation. Instructions for when to remove the packing are in the Series 2000 Circuit-Switcher installation instruction sheet. Failure to remove the packing may result in equipment damage or injury.

CAUTION
Do not apply control voltage to the drive or interphase drive until installation has been completed and interlocking has been verified. Refer to the Series 2000 Circuit-Switcher installation instruction sheet for details.

CAUTION
Do not attempt to close Circuit-Switcher using manual FIP lever. Damage to mechanism may result.

IMPORTANT
Access shutter is interlocked with interrupter. Trip interrupter, open access shutter, and engage operating shaft. Then rotate shaft clockwise only to open integral disconnect.

CAUTION
Do not apply control voltage to the drive or interphase drive until installation has been completed and interlocking has been verified. Refer to the Series 2000 Circuit-Switcher installation instruction sheet for details.

WARNING
DO NOT LIFT SWITCH WITH THIS BRACKET. BRACKET MAY ONLY BE USED TO LIFT INTERRUPTER AND SUPPORT COLUMN. DAMAGE TO EQUIPMENT OR PERSONAL INJURY MAY RESULT.

WARNING
DO NOT remove steel outer wrapper until installation is complete. Interrupter contains gas under pressure. Injury or damage to equipment may result.

WARNING
DO NOT remove steel outer wrapper until installation is complete. Interrupter contains gas under pressure. Injury or damage to equipment may result.

CAUTION
CONNECT the insulated operating rod to the interphase drive in the cross base using the attached pin. Instructions for making the connection are in the Series 2000 Circuit-Switcher installation instruction sheet. Failure to connect interphase drive pin may result in equipment damage or injury.

CAUTION
CONNECT the interphase drive lever to the operator uni-ball coupling with the attached pin. An adjustable locking rod is provided to assist in making the connection. The locking rod must be removed after installation. The locking rod is used to secure the switch during shipping and installation. Instructions for when to remove the locking rod and how to connect the interphase drive are in the Series 2000 Circuit-Switcher installation instruction sheet. Failure to properly install the drive lever may result in equipment damage or injury.

INSTRUCTION FOR FUSE SLUGS
For Series 2000 Operators
When the Circuit-Switcher is ready to be placed in service, the motor-and-closing circuit fuses can—at the user's option—be replaced with the enclosed slug. This practice is recommended for increased reliability (because one integral fuse can be damaged by the repeated small current experienced during normal Circuit-Switcher opening and closing operations) and can thus break out, leaving the Circuit-Switcher inoperable. Before replacing Fuse Slugs with slugs, make certain that the control-access battery is adequately protected to prevent discharge, using fuses or circuit breakers located at the battery end.

Connecting-Pin Installation
Link, connecting pin, and pin retaining clip must be positioned as shown. **IMPORTANT:** After connecting link for coupling, remove 5/16" screw, stop bracket, and spacer before operating Circuit-Switcher.

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Safety Information

Reorder Information for Safety Labels

Location	Safety Alert Message	Description	Part Number
A	⚠ CAUTION	Transition box contains a stop bracket and spacer...	G-5807●
B	⚠ CAUTION	Remove the interrupter operating-rod holding bracket and spacer...	G-5951●
C	INSTRUCTION	Connecting-Pin Installation	G-5685■
D	INSTRUCTION	Attaching Operator Connecting Link	G-5792●
E	INSTRUCTION	Instructions-Operation, Gas Pressure Indicator, and Manual Handle	G-5670 ■
F	⚠ CAUTION	"C"-Shaped Clevis at lower end...	G-6082
G	INSTRUCTION	Access Shutter	G-5675■
H	⚠ CAUTION	Control Voltage	48 Vdc G-5948-1
			125 Vdc G-5948-2
			115 V 60 Hz G-5948-3
J	INSTRUCTION	Fuse Slugs	G-5939●
K	⚠ CAUTION	Do not apply control voltage or insert motor-and-closing circuit fuseholder.	G-5959▲
L	⚠ CAUTION	Do not apply control voltage to this device...	G-5947▲
M	⚠ CAUTION	Do not attempt to close Circuit-Switcher using manual trip lever...	G-6222
N	INSTRUCTION	Coupling Preparation	G-5684●
P	⚠ WARNING	Do not lift switch with this bracket...	G-5713▲
Q	⚠ WARNING	Do not remove steel over wrapper until installation is complete...	G-5699▲
R	⚠ WARNING	Do not remove...	G-5993▲
S	⚠ CAUTION	Connect the interphase locking rod...	G-5949●
T	⚠ CAUTION	Connect the interphase operating rod...	G-5950●

- This tag is to be removed and discarded after the switch is installed and adjusted.
- This label contains important instructions and should be promptly replaced if illegible or missing.
- ▲ This label is affixed to the shipping package and will be removed and discarded after the switch is installed and adjusted.

⚠ DANGER



Series 2000 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 substation switching equipment 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, fall protection, and flash clothing in accordance with safe operating procedures and rules.
4. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded.
5. **CIRCUIT-SWITCHER POSITION.** Always confirm the circuit-switcher **Open/Close** position by visually observing the position of the switch position indicator located on the high-speed base. Switches may be energized from either side.
6. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.
7. **OPERATION.** Circuit-making and circuit-breaking are involved in the normal operation of this interrupter switch. To operate, follow the operating procedure as outlined on page 34.

Shipping and Handling

Inspection

Examine the shipment for 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 are present.

If there is visible loss and/or damage:

1. Notify the delivering carrier immediately.
2. Ask for a carrier inspection.
3. Note the 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 damage.

Packing

An S&C catalog drawing is located in a water-resistant envelope attached to the wrapper around one of the insulating support columns. Study this drawing carefully and check the bill of material to verify all parts are available. The Model 2020 Series 2000 Circuit-Switcher shipment should include the items shown in Figure 1 on page 10 and Figure 2 on page 11.

CAUTION

DO NOT mix components from different installations.

The Series 2000 Circuit-Switcher is completely factory-assembled and thoroughly tested. To speed installation and maintain the proper adjustment of the circuit-switcher and switch operator made in the factory, components belonging to a specific circuit-switcher installation must not be intermixed with components belonging to a different installation.

Each Series 2000 Circuit-Switcher is serially numbered. This serial number appears on the circuit-switcher high-speed base, pole units, mounting pedestals, and the operator.

Mixing parts from different circuit-switchers will result in significant damage to the switch operator and misoperation of the circuit-switcher, which could cause personal injury.

S&C maintains a historical record, by serial number, of every circuit-switcher produced. This record lists information pertinent to each installation, such as application, date of shipment, and any service performed by S&C factory service specialists. This record is an invaluable reference for future maintenance, modifications, or replacements.

The shipment contains:

- Three pole-unit assemblies (Each pole-unit contains one stationary support insulator, one rotating insulating support column, and a blade and contact assembly.)
- Three interrupters, mounted to the high-speed base for shipping

- A high-speed base enclosing the high-speed power train
- The appropriate number of mounting pedestals:
 - A single pedestal is used for circuit-switchers rated 69 kV (with 48-inch [122-cm] phase spacing).
 - Two pedestals are used for circuit-switchers rated 69 kV (with 84-inch [213-cm] phase spacing), 115 kV and 138 kV
- A Series 2000 Circuit-Switcher operator
- A container of miscellaneous operating-mechanism components and hardware, all individually identified
- Any optional features or accessories specified, such as a grounding switch

An S&C catalog drawing is located in a water-resistant envelope attached to the wrapper around one of the insulating support columns. Study this drawing carefully and check the bill of material to verify all parts are available. The Model 2020 Series 2000 Circuit-Switcher shipment should include the items shown in Figure 1 on page 10 and Figure 2 on page 11.

⚠ WARNING

Do not disassemble or modify the interrupters. The interrupters are pressurized at 75 PSIG. **Serious personal injury can result.**

Storage

NOTICE

Connect control power to the switch operator when storing it outdoors. The switch operator is equipped with a space heater that must be energized during storage to prevent condensation and corrosion within the operator enclosure.

If the circuit-switcher must be stored before installation, keep it in a clean, dry, and corrosion-free area to protect it 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. If storing outdoors or in a non-climate controlled area, connect control power to the space heater inside the Series 2000 Switch Operator per the wiring diagram furnished. Inspect the circuit-switcher regularly when storing for prolonged periods.

NOTICE

Complete and mail the circuit-switcher registration card (enclosed in a vinyl envelope located inside the operator) after the circuit-switcher has been installed. The information requested on this card is vital to ensure prompt notification should field modifications be needed.

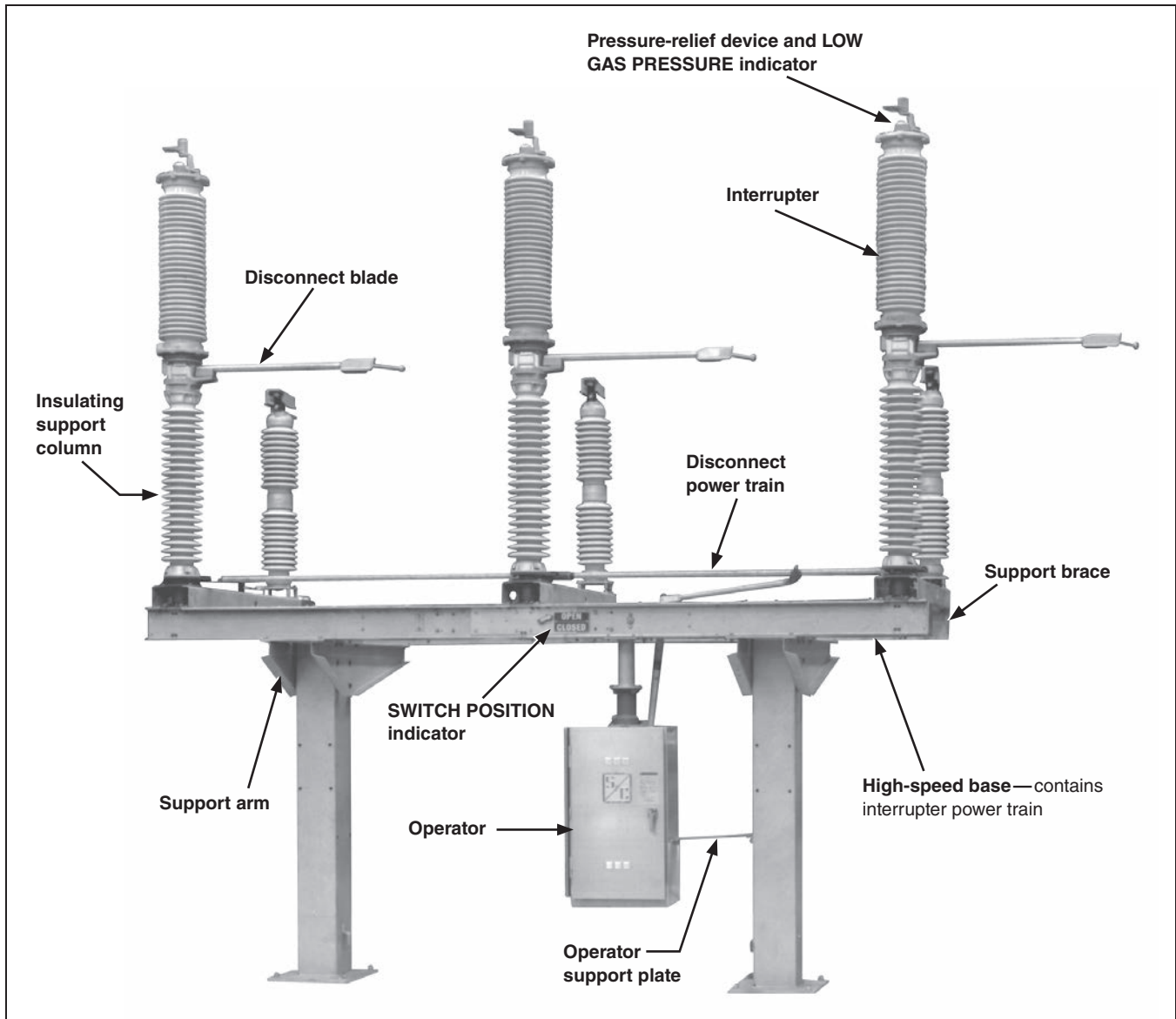


Figure 1. A Model 202 Series 2000 Circuit-Switcher rating 138 kV.

Before Starting

WARNING

Do not remove the containers from the interrupters or the plastic bubble wrap from the insulating support columns until the installation is complete.

Equipment damage or personal injury may result.

NOTICE

Bolted and Pinned Connections: A typical bolted connection requires a flat washer underneath the cap screw and one under the nut. When self-locking hex nuts are specified, the threads of the associated cap screw must be lubricated with a general-purpose grease to facilitate tightening. All pins and cotter pins used in field assembly should also be lubricated to facilitate insertion.

Before starting installation, complete these steps:

- STEP 1.** Use a steel strapping cutter to cut the steel straps binding the mounting pedestals and support arms to the high-speed base. Also cut the straps binding the container of operating mechanism components and hardware and the straps that bind the pole-units. See Figure 2.
- STEP 2.** Remove the wood bracing between the pole-unit terminal pads.

CAUTION

The foundations and anchor bolts for S&C Mounting Pedestals must be designed to meet the loading limits specified in S&C Data Bulletin 716-61. **Failure to meet these loading limits can result in personal injury or equipment damage.**

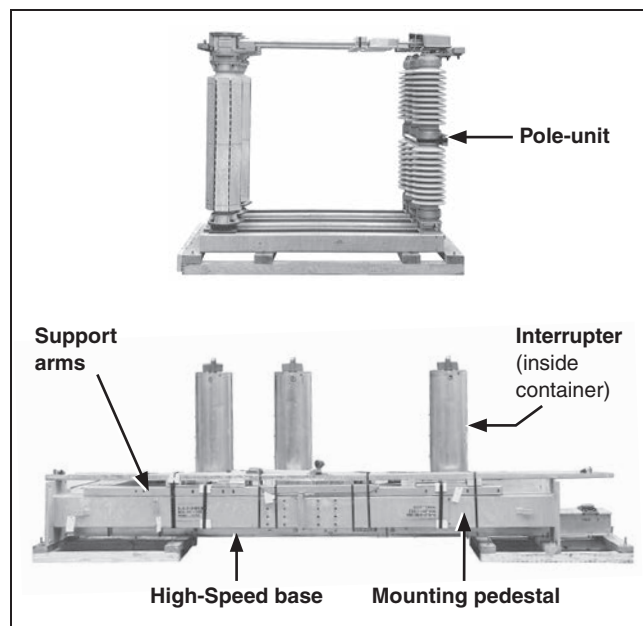


Figure 2. A typical shipment of a Model 2020 Series 2000 Circuit-Switcher. The operator is shipped on a separate skid.

Installation

Installing the Mounting Pedestals and High-Speed Base

Install each pedestal as follows:

- STEP 1.** Install the lower set of anchor-bolt nuts and flat washers onto the pre-installed anchor bolts. Level all anchor bolts to the same height, leaving space below and above the bolt for leveling. See Figure 3.
- STEP 2.** Install the temporary eyebolts into the holes provided at the top of the mounting pedestal. Attach the lifting slings to the eyebolts. Figure 4.
- STEP 3.** Lift the pedestal over the anchor bolts. Before lowering, make sure the grounding pad is positioned properly for the installation. Refer to the accompanying catalog drawing for details. Figure 4.
- STEP 4.** Lower the pedestal onto the anchor-bolt nuts and flat washers. Loosely secure a flat washer and nut to each anchor bolt. See Figure 3. Remove the lifting slings and eyebolts.
- STEP 5.** Adjust the lower set of anchor-bolt nuts to plumb and level the pedestal. The upper set of anchor-bolt nuts should remain loosely attached. See Figure 3.
- STEP 6.** Attach the support arms to the mounting pedestals as shown on the catalog drawing using $\frac{5}{8}$ -11 \times 1 $\frac{1}{4}$ -inch hex-head galvanized steel cap screws and flat washers furnished. Torque the cap screws to 75 ft-lbs (101.7 Nm). See Figure 1 on page 10.
- STEP 7.** Install the covers to the tops of each mounting pedestal using $\frac{1}{2}$ -13 \times 2-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. (Not applicable to 69-kV circuit-switchers with 48-inch (122-cm) phase spacing.) Securely tighten the cap screws.
- STEP 8.** Attach the supplied lifting angles to the high-speed base using the $\frac{1}{2}$ -12 \times 1 $\frac{1}{4}$ -inch hex-head galvanized steel cap screws furnished. See Figure 5. Securely tighten the cap screws, and then attach four suitable lifting slings to the lifting angles.

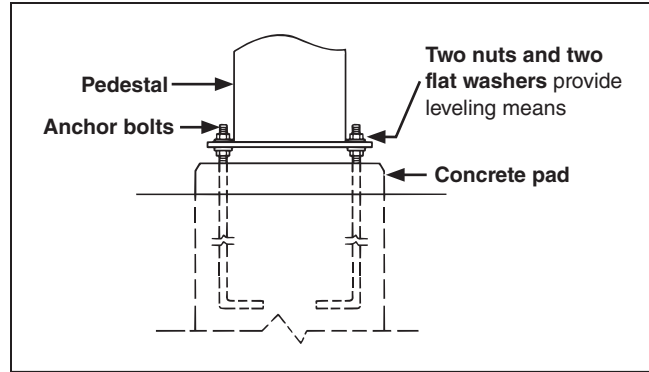


Figure 3. Pedestal anchor-bolt mounting detail.

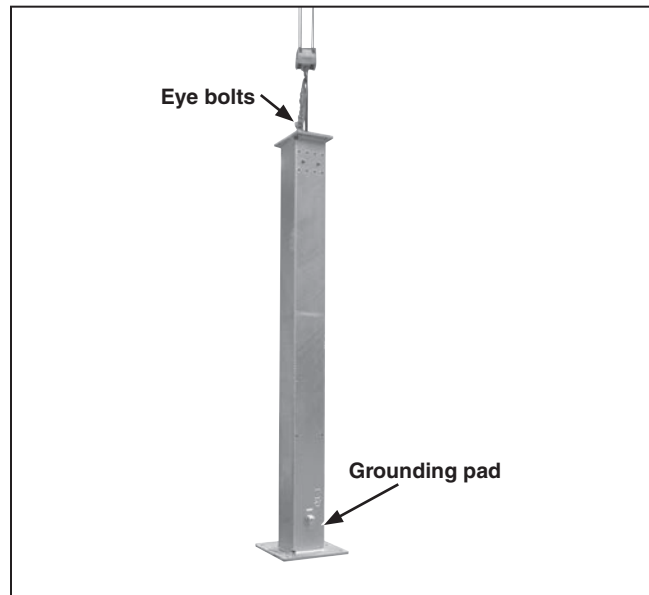


Figure 4. Lifting the pedestal into position.

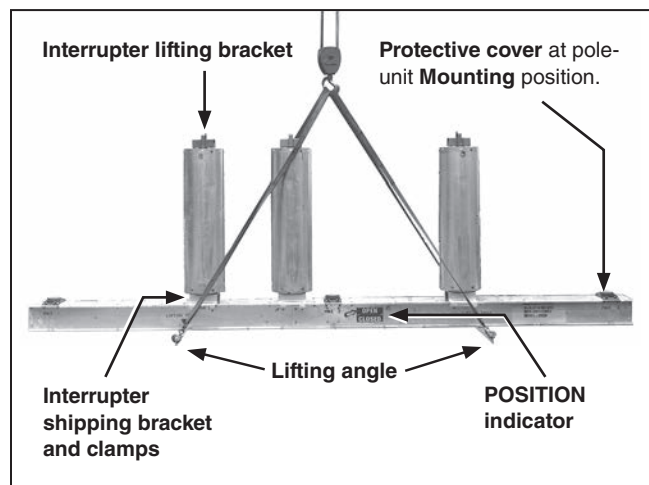


Figure 5. Hoisting the high-speed base using a crane.

Unbolt the high-speed base from the shipping skids and lift the high-speed base, with interrupters attached, atop the support arm gussets, as shown on the catalog drawing. Avoid sudden starts and stops. Verify the SWITCH POSITION indicator on the base is visible on the desired side (this is also the side on which the operator door will open.)

On the 69-kV circuit-switchers with 48-inch (122-cm) phase spacing: Support arm gussets are not used; the high-speed base is attached atop the mounting pedestal using $\frac{5}{8}$ -11 \times 2 $\frac{1}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking nuts.

 **CAUTION**

The operator directly drives the interrupters open and closed through a simple high-speed power train leading from the top of the operator, through a horizontal interphase linkage enclosed in a steel-sheathed high-speed base and to reciprocating-action insulated operating rods passing through the center of the insulating support columns. Permanently lubricated bearings are used throughout the power train. The high-speed base has been fully pre-assembled and adjusted at the factory. Do not disassemble the high-speed base or high-speed power train.

Damage to the high-speed base and personal injury may result.

- STEP 9.** Loosely bolt the high-speed base to the support arms using the $\frac{1}{2}$ -12 \times 2-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished.

Lubricate the bolts to facilitate tightening. Use a level to verify the high-speed base is horizontal, both lengthwise and sideways. Adjust the lower set of anchor-bolt nuts at the pedestals to achieve level. See Figure 3 on page 12.

If necessary, loosen the $\frac{5}{8}$ -11 \times 1 $\frac{1}{4}$ -inch hex head galvanized steel cap screws attaching the support arms to the mounting pedestals, reposition the support arms, and retighten the cap screws.

Installation

STEP 10. Examine the bottom of the high-speed base where it comes in contact with the support arms. If necessary, install shims between the high-speed base and the support arms to compensate for any gaps greater than $\frac{1}{8}$ -inch (3 mm) between the mating surfaces. See Figure 6.

Tighten the bolts on the high-speed base to 75 ft-lbs (101.7 Nm).

On 69-kV circuit-switchers with 48-inch (122-cm) phase spacing: Support arm gussets are not used; the high-speed base is attached atop the mounting pedestal using $\frac{5}{8}$ -11 \times 2 $\frac{1}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts. Shim between the high-speed base and the pedestal if necessary.

STEP 11. Refer to the catalog drawing and attach the support brace to the support arms using the spacers, $\frac{1}{2}$ -12 \times 2-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Securely tighten the associated cap screws.

Installing the Switch Operator

Complete the following steps to install the operator:

STEP 1. Loosen the $\frac{1}{2}$ -13 \times 1 $\frac{1}{4}$ -inch galvanized steel cap screws, flat washers, and nuts used to attach the bottom plates and lifting angles to the underside of the high-speed base. Remove the plates and place them and their hardware aside on a clean surface. Discard the lifting angles. See Figure 7.

Remove the $\frac{3}{4}$ -inch stainless-steel pin and cotter pin from the inter-phase drive lever enclosed in the high-speed base. See Figure 8. Retain for re-use in Step 1 page 21.

CAUTION

Do not attempt to set the operator upright by slinging to the skid. The skid is not designed to carry the weight of the switch operator. **Damage to the operator and minor personal injury may result.**

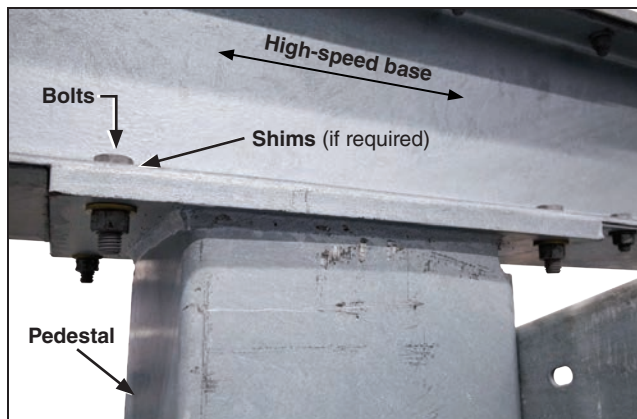


Figure 6. Shimming under the high-speed base for gaps of more than $\frac{1}{8}$ -inch (3 mm). (69-kV shown, 115- and 138-kV are similar.)

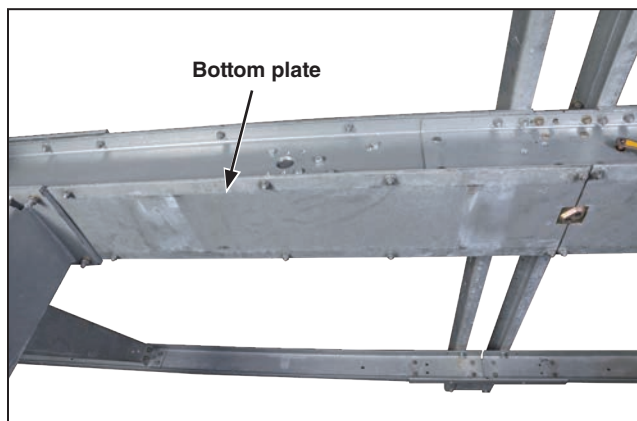


Figure 7. Removing the bottom plates from the high-speed base.

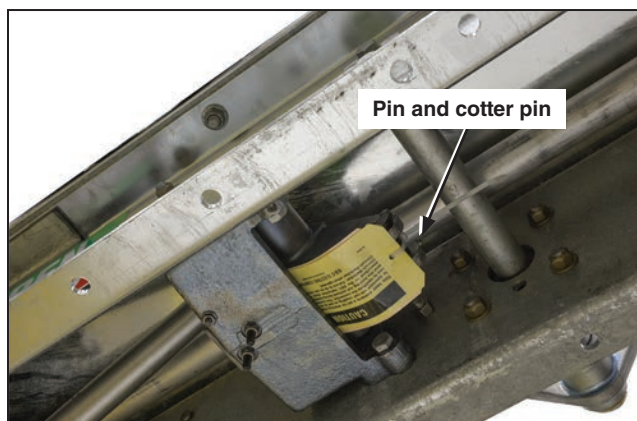


Figure 8. Removing the $\frac{3}{4}$ -inch (19-mm) stainless steel pin and cotter pin from the interphase drive lever inside the high-speed base.

STEP 2. Wrap a lifting sling around the stored-energy housing of the operator, as shown in Figure 9. Carefully raise the operator to the upright position so it rests on its skid.

⚠ CAUTION

Do not remove the lifting sling around the stored-energy housing. The operator is top-heavy and must be adequately supported until it is attached to the circuit-switcher. **Damage to the operator or minor personal injury may result.**

STEP 3. Remove the skid and bracing running the length of the operator, stored-energy housing, and operator support tube. See Figure 9. Also remove the protective packing on top of the operator support tube as well as the protective covers on the operator enclosure louvers. See Figure 9 and Figure 10.

STEP 4. Reposition the lifting sling around the front of the stored-energy housing and wrap another lifting sling around the back of the stored-energy housing, as shown in Figure 10. Face the operator door the same direction as the SWITCH POSITION indicator on the high-speed base. Hoist the operator into place.

NOTICE

Do not damage the uni-ball coupling on the operator connecting link during hoisting and attachment of the operator. The uni-ball coupling cannot be replaced in the field. **Damage will necessitate returning the operator for replacement.**

STEP 5. Attach the operator support tube mounting plate to the underside of the high-speed base using four 1/2-13x1 3/4-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts. Lubricate the bolts to facilitate tightening. Tighten all four screws securely.

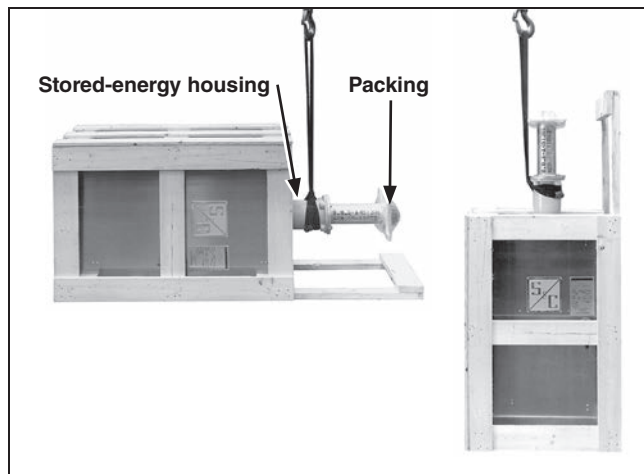


Figure 9. (Right and Left) A typical shipment of a Series 2000 operator. Wrap lifting slings around the stored-energy housing to raise the operator to the Upright position.

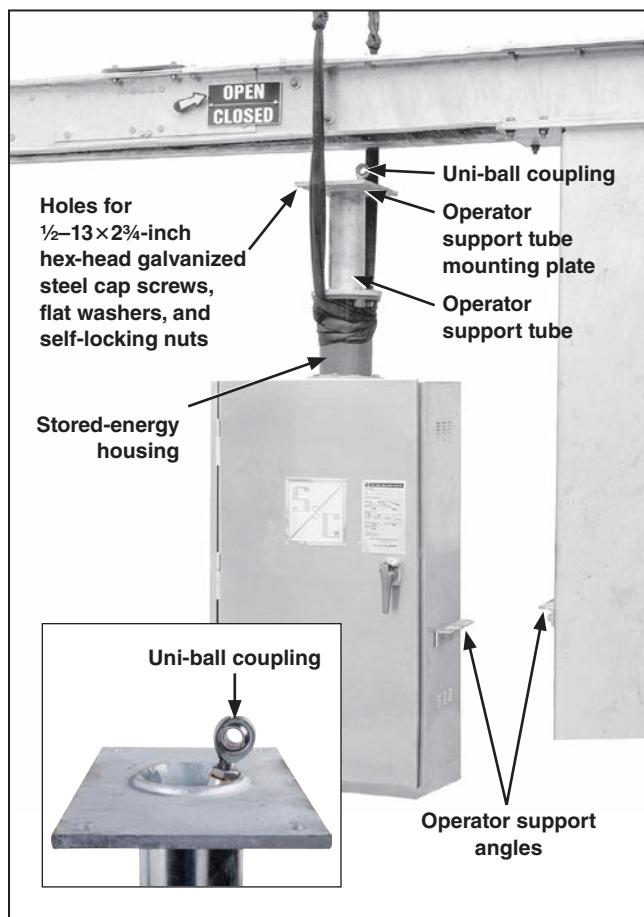


Figure 10. Hoisting the operator into position below the high-speed base using a lifting crane.

Installation

STEP 6. Attach the operator support angle to the appropriate mounting pedestal using two $\frac{5}{8}$ -11×14-inch hex-head galvanized steel cap screws, four flat washers, and two self-locking hex nuts. Refer to the catalog drawing for exact placement. See Figure 10 on page 15.

Attach the operator support plate to the angle on the operator and the angle on the mounting pedestal using four $\frac{1}{2}$ -13×1½-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Lubricate the bolts to facilitate tightening.

Securely tighten the screws. On circuit-switchers with two mounting pedestals, insert the hole plugs furnished into all unused holes in the pedestals.

Installing the Disconnect Pole-Units

NOTICE

The pole-units are numbered “Pole 1,” “Pole 2,” and “Pole 3.” Make sure to install the pole-units in the order marked on the catalog drawing. The pole numbers do not have to correspond with your system’s phase designations.

NOTICE

Do not disassemble the insulating support columns. The insulating support columns, are filled with lubricated dielectric filler that prevents contamination from affecting the dielectric integrity of the column or the insulated operating rod. An aerator is used at the upper end of each support column to prevent water from being pumped in because of pressure differentials caused by temperature cycling. **Disassembling the insulating support column will cause the lubricated filler to evacuate.**

WARNING

Lift the pole-unit by the pole-unit base only. Do not attempt to lift the pole-unit by the interrupter or other live parts. **Lifting the pole-unit by any other means can cause damage to the pole-unit or personal injury.**

Complete the following steps to install the disconnect pole-units:

STEP 1. For 69-kV circuit-switchers with 48-inch (122-cm) phase spacing: Level the support brace to the same elevation as the high-speed base. If necessary, loosen the cap screws used to attach the outboard pole-unit channel bases to the high-speed base and support brace, and shift the pole-units to level the support brace. Securely tighten the cap screws.

For 69-kV to 138kV circuit-switchers with all other phase spacings:

- (a) Install four eyebolts on each pole-unit base. See Figure 11.
- (b) Attach four suitable lifting slings to the channel base of the pole-unit to be mounted at the center of the high-speed base—marked “Pole 2”—as shown in Figure 11. Attach an additional sling around the support insulator as shown in Figure 11. This sling is required to maintain stability during lifting.
- (c) Make sure the rigging does not stress the disconnect. Unbolt the base from the skid. Raise the pole-unit a few feet, and then remove the two $\frac{1}{2}$ – $13 \times 1\frac{3}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and hex nuts which attach the shipping bracket to the bottom of the pole-unit channel base. Discard the shipping bracket and associated hardware.
- (d) Remove the $\frac{1}{2}$ -inch silicon-bronze pin and cotter pin from the insulated operating rod. Retain these pins for re-use in Step 4(g) on page 20.
- (e) Remove the protective cover on the high-speed base at the pole-unit **Mounting** position. See Figure 5 on page 12. Continue to raise the pole-unit to its mounting position at the center of the high-speed base, as shown on the catalog drawing. Carefully guide the pole-unit to avoid damaging the insulated operating rod.

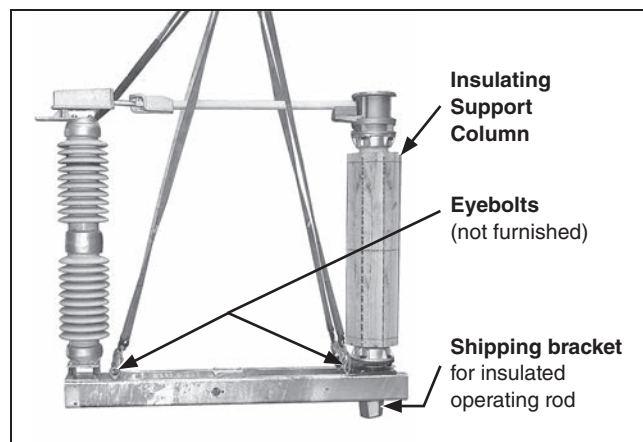


Figure 11. Hoisting the pole-unit.

Installation

- (f) Attach the pole-unit base to the high-speed base using the $\frac{1}{2}$ -12 \times 1 $\frac{3}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Lubricate the cap screws to facilitate tightening.
- (g) Attach the pole-unit channel base to the support brace using the $\frac{1}{2}$ -13 \times 1 $\frac{1}{2}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Securely tighten all cap screws.
- (h) Shims are furnished. Install them as necessary between the pole-unit channel base and the disconnect-end support arm channel assembly to compensate for any irregularities between the mating surfaces.

STEP 2. Repeat Steps 1(a) through 1(h) for the two outboard pole-units marked "Pole 1" and "Pole 3."

Installing the Interrupters

NOTICE

Interrupters and disconnect pole-units are numbered "Pole 1," "Pole 2," and "Pole 3." Make sure to install the interrupter to its corresponding pole-unit.

Complete the following steps to install the interrupters:

- STEP 1.** Attach a lifting sling to the lifting bracket on one of the interrupters. Remove and discard the clamps and associated $\frac{1}{2}$ -inch galvanized steel hardware that fasten the interrupter shipping bracket to the high-speed base and carefully lift the interrupter slightly higher than the top of the transition box of its associated insulating support column. See Figure 13.
- STEP 2.** Remove the four $\frac{1}{2}$ -13-inch stainless steel hex nuts and Belleville washers used to attach the interrupter shipping bracket to the threaded studs on the interrupter. See Figure 12. Discard the shipping bracket but retain the Belleville washers and nuts for re-use in Step 4(f) on page 20.

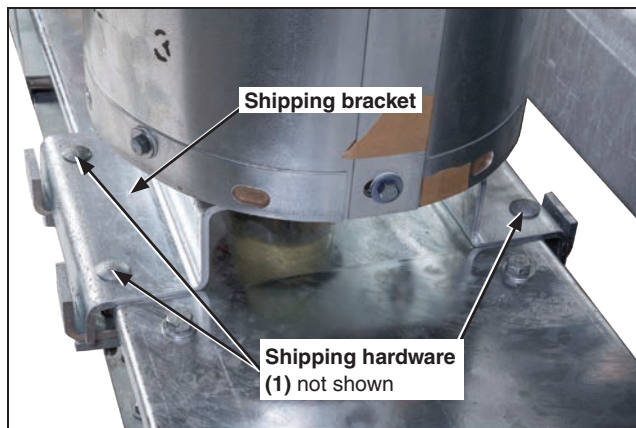


Figure 12. Shipping clamps for the Series 2000 Circuit-Switcher interrupters.

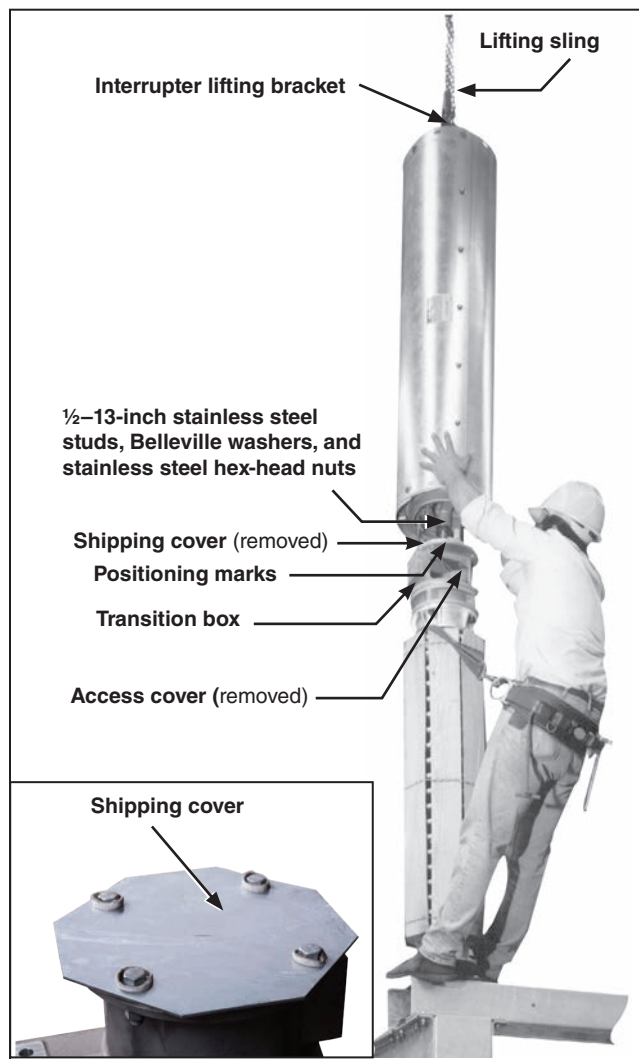


Figure 13. Attaching the interrupter to the insulating support column.

STEP 3. Prepare the interrupter for attachment to its insulating support column as follows:

- (a) Remove and discard the two #10–32 screws that connect the operating-rod holding bracket (marked with a black/yellow-striped label) for shipment. See Figure 14.

⚠ CAUTION
The operating rod is under pressure. Removal of the bracket may result in the operating rod quickly moving down approximately $\frac{3}{8}$ -inch (9.5 mm). Keep hands clear of the operating rod when removing the shipping bracket. Injury to hands may result.

- (b) Pull the holding bracket to move the operating rod to its fully **Open** position. See Figure 14.
- (c) Remove the connecting pin used to attach the holding bracket to the coupling. Retain the connecting pin for re-use in Step 4(h) on page 20). Discard the holding bracket. See Figure 14.

STEP 4. Attach the interrupter to its insulating support column as follows:

- (a) Remove and discard the shipping cover on top of the transition box. See Figure 13 on page 18, inset.
- (b) Thoroughly wire-brush the top of the transition box and mating surface on the interrupter, and immediately apply a liberal coating of Burndy Penetrox[®] A or an equivalent aluminum-connector compound to the brushed surfaces.
- (c) Remove the four $\frac{5}{16}$ –18 \times $\frac{3}{4}$ -inch hex-head stainless steel cap screws used to attach the access cover to the side of the transition box. Remove the cover and place it and the hardware on a clean surface. See Figure 13 on page 18. Also remove the cloth bag containing the hardware that will be used to connect the interrupter coupling to the operating rod link in Step 4(g).
- (d) Make sure the positioning mark stamped on the bottom of the interrupter is aligned with the position mark stamped on the top of the transition box. See Figure 15.

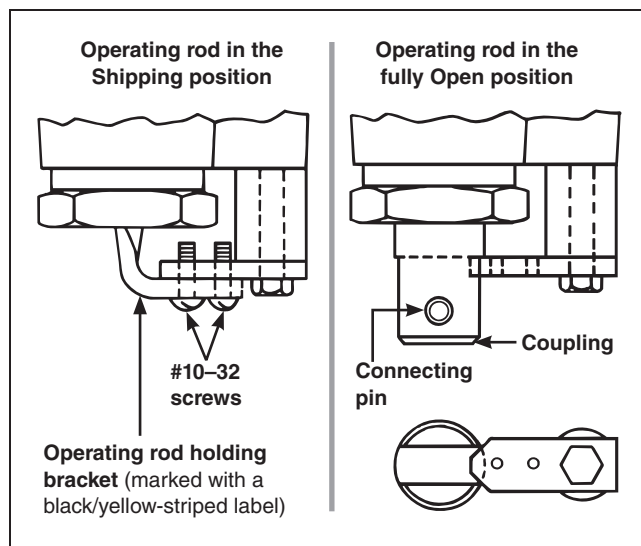


Figure 14. Preparing the interrupter for attachment to the insulating support column.

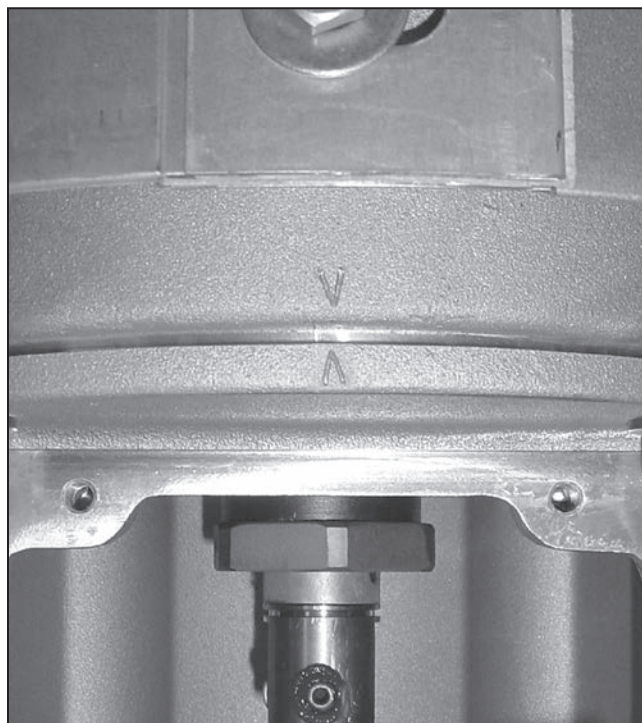


Figure 15. Aligning the positioning mark on the interrupter with the mark on the transition box.

Installation

- (e) Lower the interrupter onto the transition box. One of the $\frac{1}{2}$ -13-inch stainless steel studs on the interrupter is longer than the other three to aid in aligning the interrupter with the transition box.
- (f) Reattach a $\frac{1}{2}$ -inch Belleville washer and a $\frac{1}{2}$ -12-inch stainless steel hex nut, retained from Step 1 on page 18, to each of the four studs. Lubricate the nuts to facilitate tightening. Tighten each nut securely.
- (g) Attach the insulated operating rod end links to the interphase drive linkage lever in the high-speed base using the $\frac{1}{2}$ -inch silicon-bronze pin and cotter pin retained from Step 1(d) on page 17. See Figure 16. The insulated operating rod may be moved up or down, as required, to make the connection.
- (h) Insert the connecting pin retained from Step 3(c) on page 19 into the coupling and operating rod link. See Figure 17. Loosen the $\frac{5}{16}$ -18 \times 2 $\frac{1}{4}$ -inch hex-head stainless steel screw indicated in Figure 17 and withdraw it approximately $\frac{1}{8}$ -inch (3 mm) so the connecting pin can be inserted. **Do not remove the stop bracket screw at this time.**
- (i) Insert the pin retaining clip as indicated in Figure 17. Make sure the clip is positioned as shown.
- (j) Remove and discard the $\frac{5}{16}$ -18 \times 2 $\frac{1}{4}$ -inch hex head stainless steel screw, stop bracket (marked with a black/yellow-striped label), and spacer (marked with a black/yellow-striped label) illustrated in Figure 17.

STEP 5. Remove the interrupter lifting bracket and associated $\frac{1}{2}$ -inch stainless steel hardware from on top of the interrupter. See Figure 18. Discard the lifting bracket but retain the hardware.

STEP 6. Thoroughly wire-brush the indicator end-casting where the upper terminal pad is to be attached as well as the mating surface on the upper terminal pad, and immediately apply a liberal coating of Penetrox A or other suitable aluminum-connector compound. See Figure 19 on page 21.

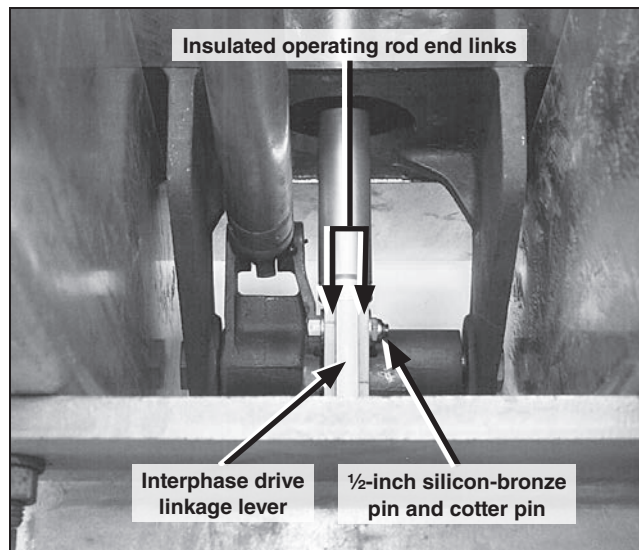


Figure 16. Attaching the insulated operating rod to the interphase drive.

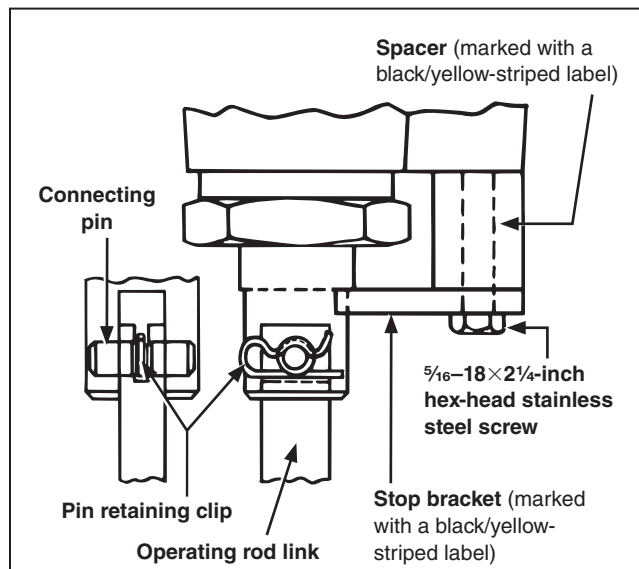


Figure 17. Connecting the interrupter to the operating rod link.

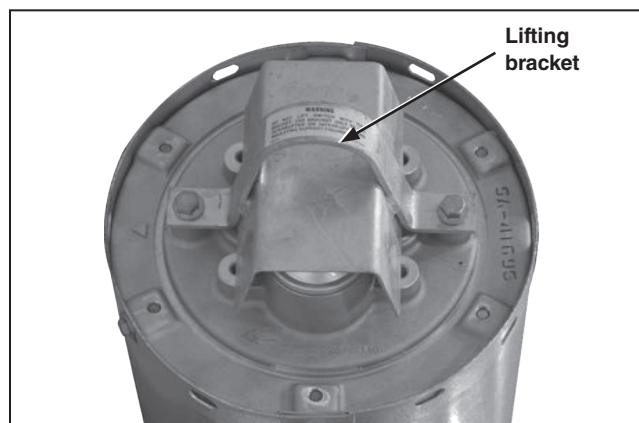


Figure 18. Removing the interrupter lifting bracket.

- STEP 7.** Attach the upper terminal pad using three $\frac{1}{2}$ -13 \times 1 $\frac{1}{4}$ -inch hex-head stainless steel cap screws and Belleville washers. See Figure 20.
- STEP 8.** Repeat Step 1 on page 18 through Step 7 for the other two interrupters.

Connecting the Operator and Pole-Units to the High-Speed Power Train

Complete the following steps to connect operator and pole-units to the high-speed power train:

- STEP 1.** Attach the uni-ball coupling on the operator connecting link to the interphase drive lever in the high-speed base using the $\frac{3}{4}$ -inch stainless steel pin and cotter pin retained from Step 1 on page 14. See Figure 21. An adjustable locking rod (marked with a black/yellow-striped label) is furnished factory-connected to the interphase drive lever. Turn the associated $\frac{1}{4}$ -20 locknuts as required to raise or lower the interphase drive lever and thus facilitate insertion of the stainless steel pin.
- STEP 2.** Remove the lower $\frac{1}{4}$ -20 locknut that retains the adjustable locking rod, and remove and discard the adjustable locking rod and locknuts. See Figure 21.

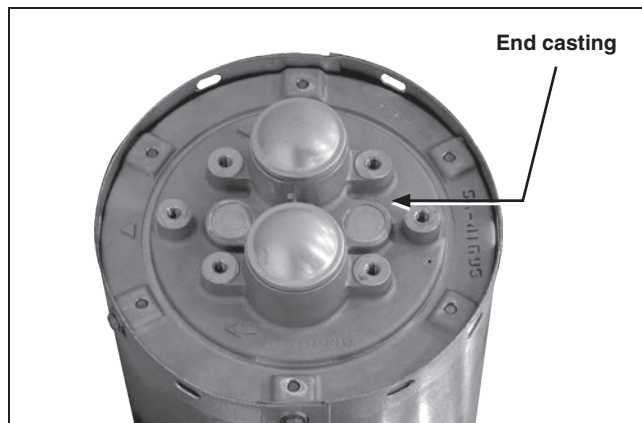


Figure 19. Wire-brushing the surface of the end casting and preparing with aluminum-connector compound.

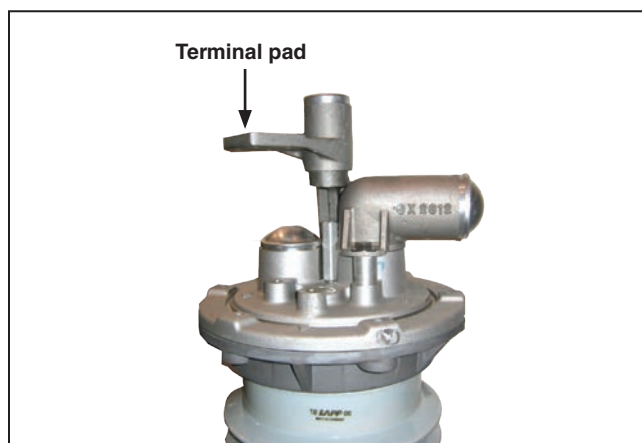


Figure 20. Attaching the terminal pad. Shown with option “-N” enhanced-visibility low-pressure indicator.

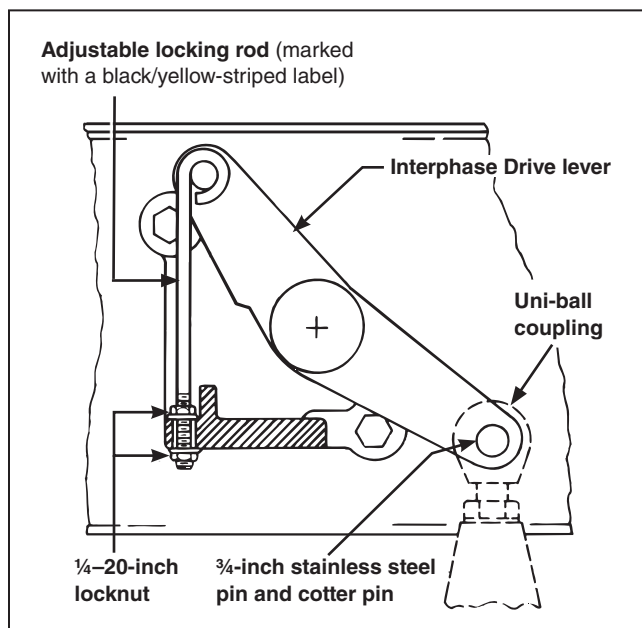


Figure 21. Attaching the Uni-ball coupling to the interphase drive lever.

Installation

STEP 3. Open the disconnect blade on each pole-unit. When the disconnect-blade corona-ball contact is clear of its jaw contact fingers as indicated in Figure 22 (top view), make sure the blade centerline has not shifted up or down by more than 1/4-inch (6 mm), as measured to the centerline of the jaw contact. Figure 22 (side view).

If the blade centerline has shifted by more than 1/4-inch, loosen the leveling locknuts located under the associated jaw-contact support insulator. See Figure 23. Adjust the locknuts as necessary to shift the jaw-contact centerline to correspond to that of the blade centerline, within 1/4-inch, and tighten the locknuts.

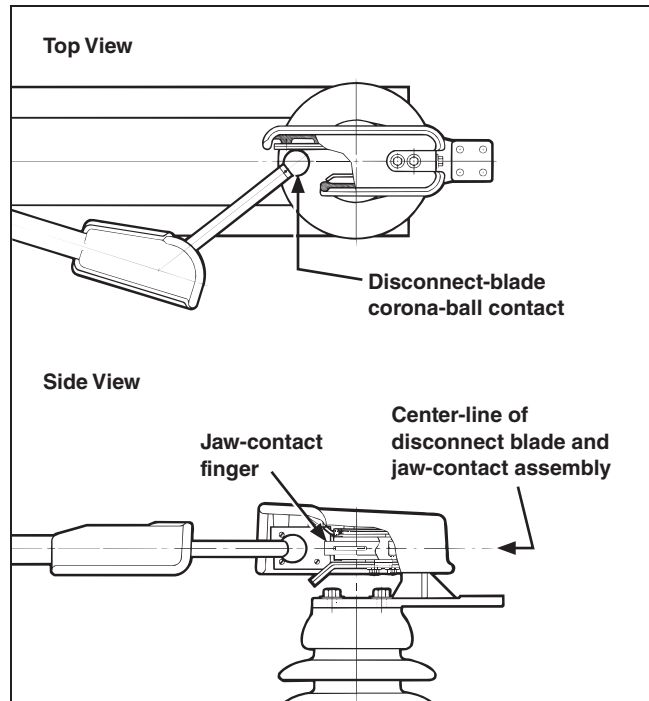


Figure 22. Checking the alignment of the disconnect blade and jaw contact.

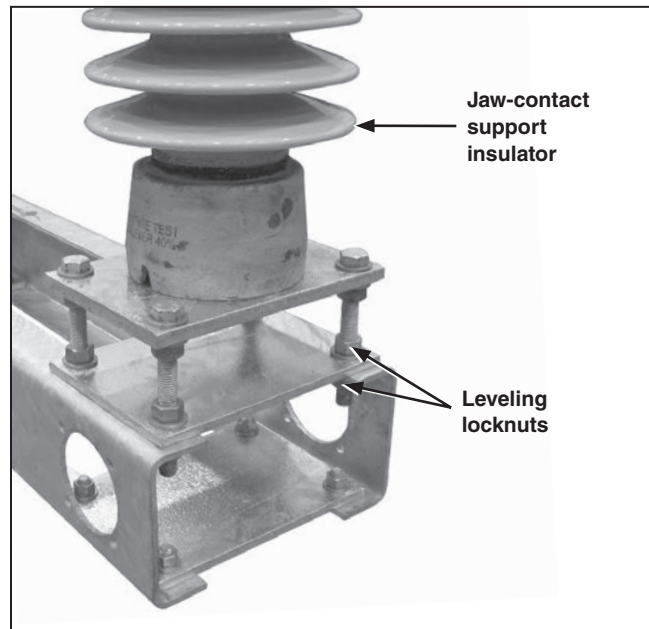


Figure 23. Adjusting the leveling-screw locknuts.

STEP 4. Close the disconnect blade on each pole-unit. The disconnect-blade corona-ball contact must be centered on its jaw-contact fingers, and the blade must touch its stop as indicated in Figure 24.

Connect the factory-adjusted interphase pipe assembly to the center pole-unit insulating support column drive lever using the ½-inch stainless steel pin, two galvanized steel spacers, and two stainless steel “X” washers furnished. See Figure 26 on page 24. Attach the interphase pipe assembly to the two outboard pole-unit insulating support column drive levers.

If the interphase pipe assembly cannot be connected to an outboard pole-unit insulating support column drive lever, loosen the appropriate locknut at the adjustable coupling and rotate the affected interphase pipe section so the connection can be made, and tighten the locknut. See Figure 27 on page 25.

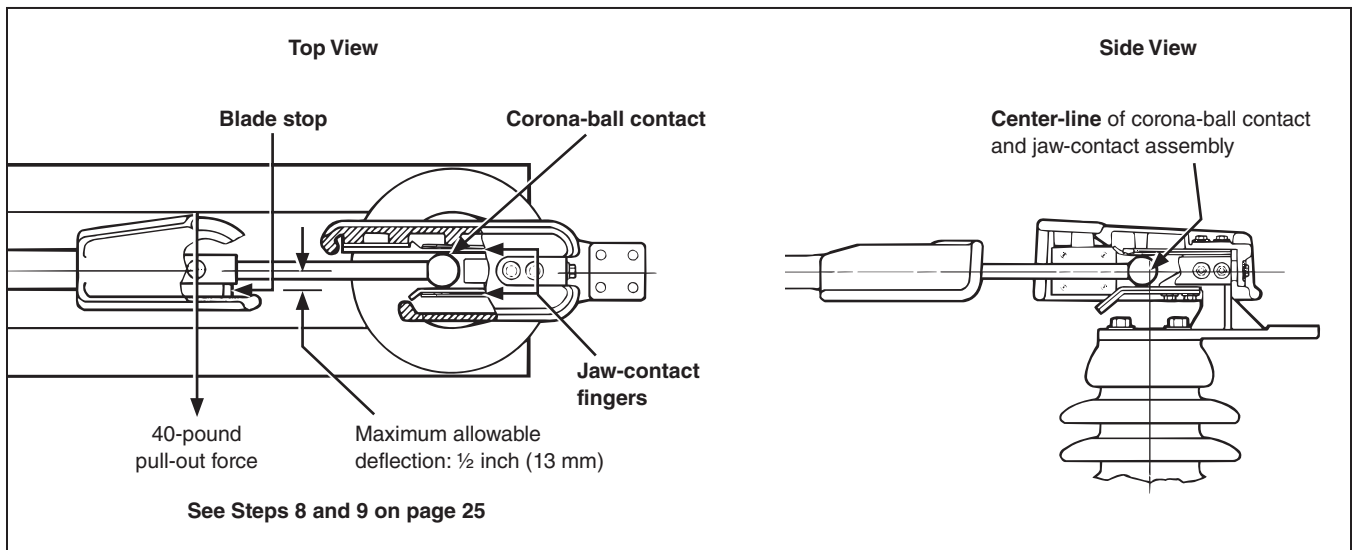


Figure 24. Checking the engagement of the disconnect-blade corona-ball contact with the jaw-contact fingers.

Installation

- STEP 5.** Attach the clevis end of the interphase drive link to the longer arm of the bell-crank on the high-speed base using a ½-inch stainless steel pin and cotter pin furnished. See Figure 26.
- STEP 6.** Connect the interphase drive to the switch operator as follows:
- Attach the “C”-shaped clevis at the lower end of the vertical-operating-pipe assembly to the take-off shaft on the rear of the operator using a ⅝-inch stainless steel pin and stainless steel “X” washer furnished. See Figure 25.
 - Attach the straight clevis at the upper end of the vertical-operating-pipe assembly to the shorter of the bell-crank arms on the high-speed base using the ⅝-inch stainless steel pin and cotter pin furnished. See Figure 26. If necessary, loosen the locknuts at the top and bottom of the vertical operating pipe and rotate the pipe so the connection can be made.
 - Tighten the locknuts.

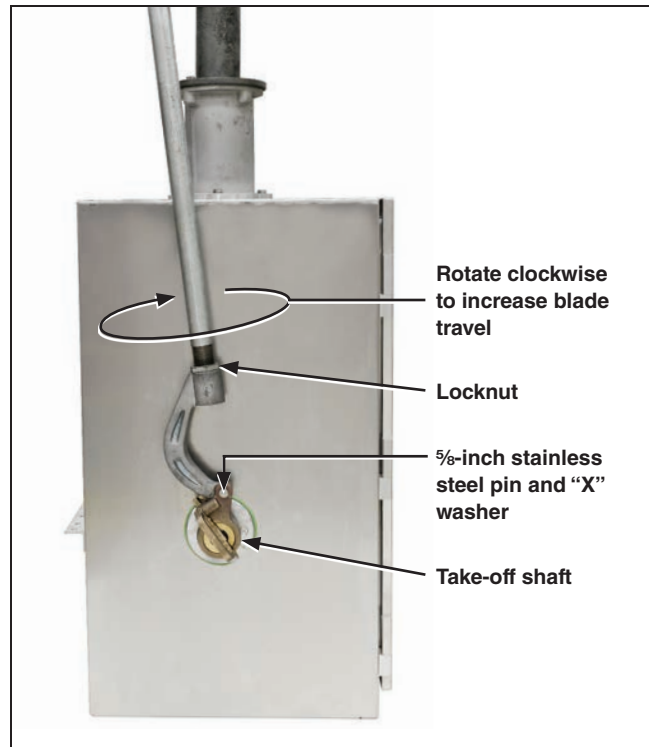


Figure 25. The rear of switch operator.

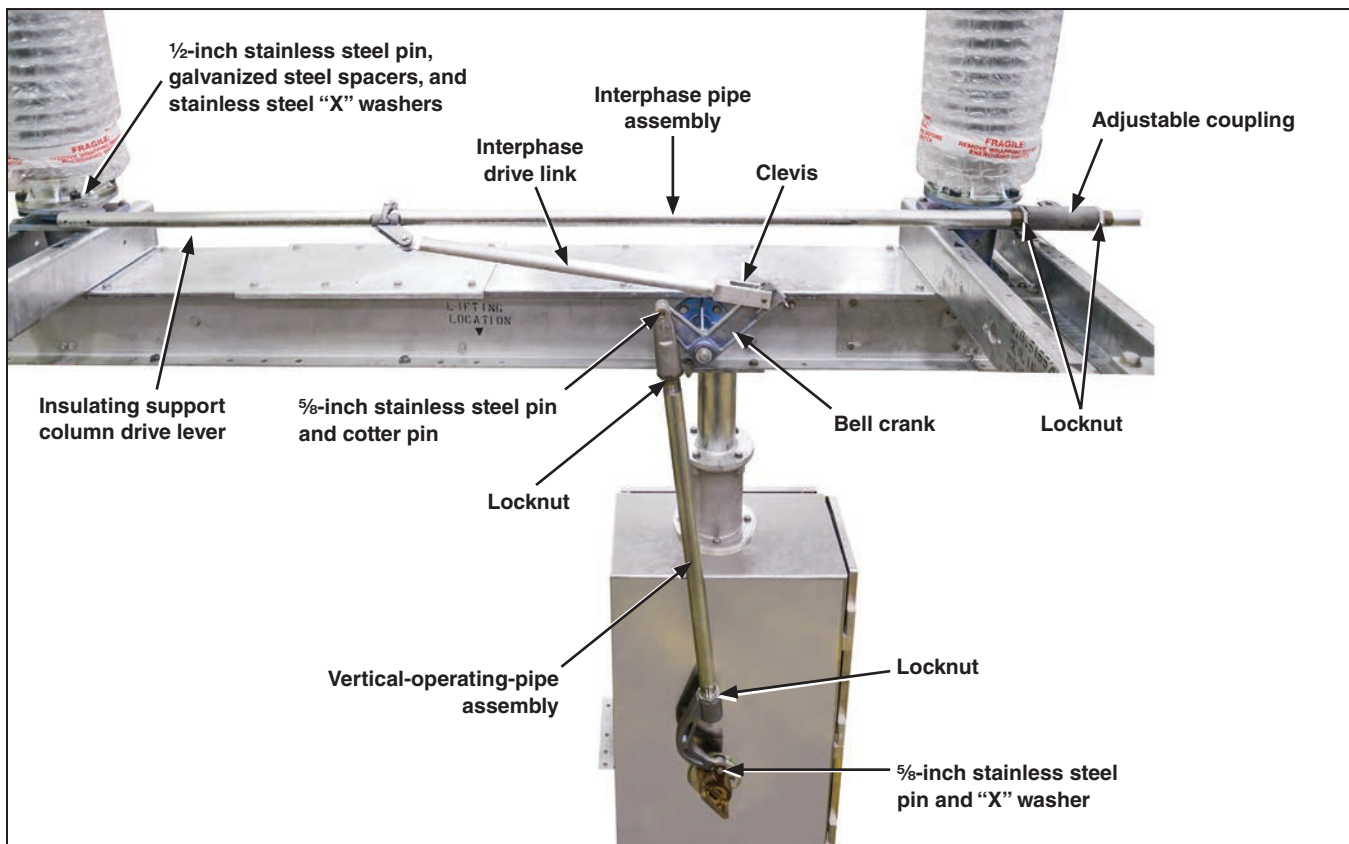


Figure 26. Connecting the interphase pipe assembly and vertical operating pipe assembly. Attachment of the interphase drive link to interphase pipe is different on circuit-switchers rated 69 kV (with 48-inch [125-cm] phase spacing). Refer to the catalog drawing for details.

STEP 7. Check for proper blade closure at the center pole-unit marked “Pole 2.” With a pull-out force of approximately 40 pounds applied at the position indicated in Figure 24 on page 23, the blade deflection should be no more than ½-inch (13 mm).

If necessary, loosen the locknuts at the top and bottom of the vertical operating pipe, and rotate the pipe *counterclockwise* (as viewed from the top) to increase blade travel. Tighten the locknuts. See Figure 25 on page 24.

STEP 8. Check for proper blade closure at the two outboard pole-units marked “Pole 1” and “Pole 3.” With a pull-out force of approximately 40 pounds applied at the position indicated in Figure 24 on page 23, the blade deflection should be no more than ½ inch (13 mm).

If necessary, loosen the four ½–13×1½-inch hex-head stainless steel cap screws that attach the blade clamp to the transition box, and rotate the blade counterclockwise (as viewed from the top) to increase blade travel. Tighten the cap screws. See Figure 29.

STEP 9. Use the manual charging handle furnished with the operator to check the functioning of the disconnect power train by completing the following steps. Refer to Figure 30 on page 26 and Figure 31 on page 27.

- (a) Open the access shutter and place the manual charging handle on the manual charging shaft.
- (b) Rotate the shaft, clockwise only, until feeling a firm resistance. At this point, the disconnect blades should be open approximately 90 degrees.

If the disconnect blades are not open to this extent, loosen the locknuts at the top and bottom of the vertical operating pipe and rotate the pipe clockwise (as viewed from the top) to increase blade travel, and tighten the locknuts. See Figure 25 on page 24.

- (c) Remove the manual charging handle from the manual charging shaft and replace it in its holder on the operator door. See Figure 30 on page 26.

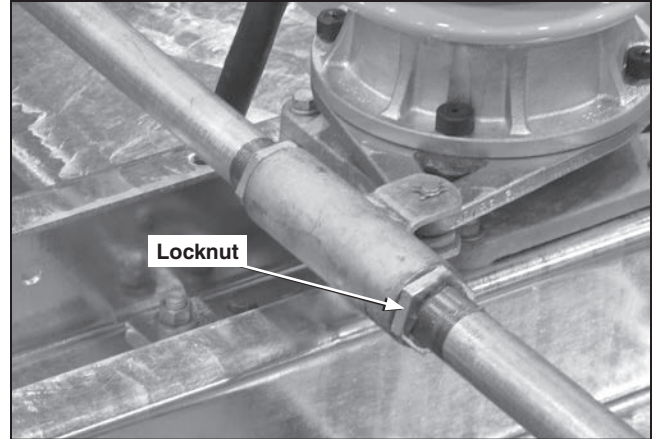


Figure 27. Loosening the locknut and rotating to adjust the pipe length.

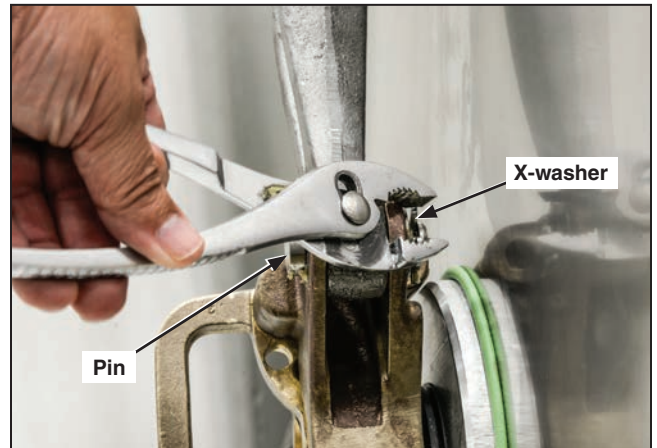


Figure 28. The “C”-shaped clevis on the rear of the operator connects the vertical operating pipe to the back of the operator. Attaching the “C”-shaped clevis to the operator using a 5/8-inch steel pin and X-washer.

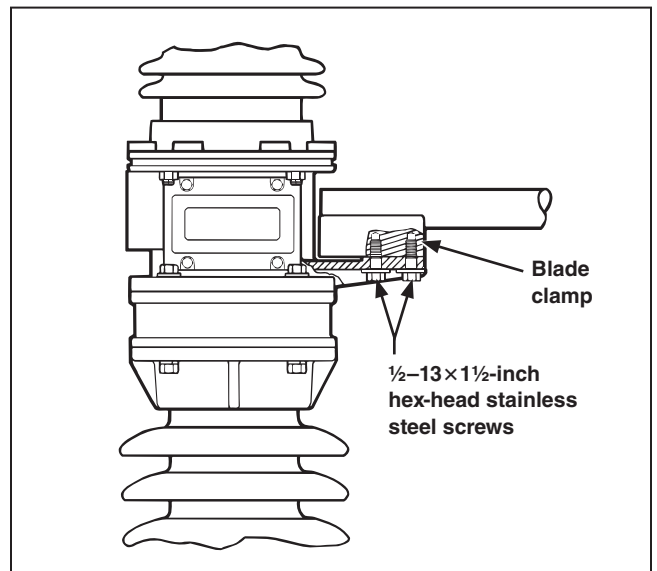


Figure 29. Adjusting the blade at the outboard pole-unit to attain specified blade deflection.

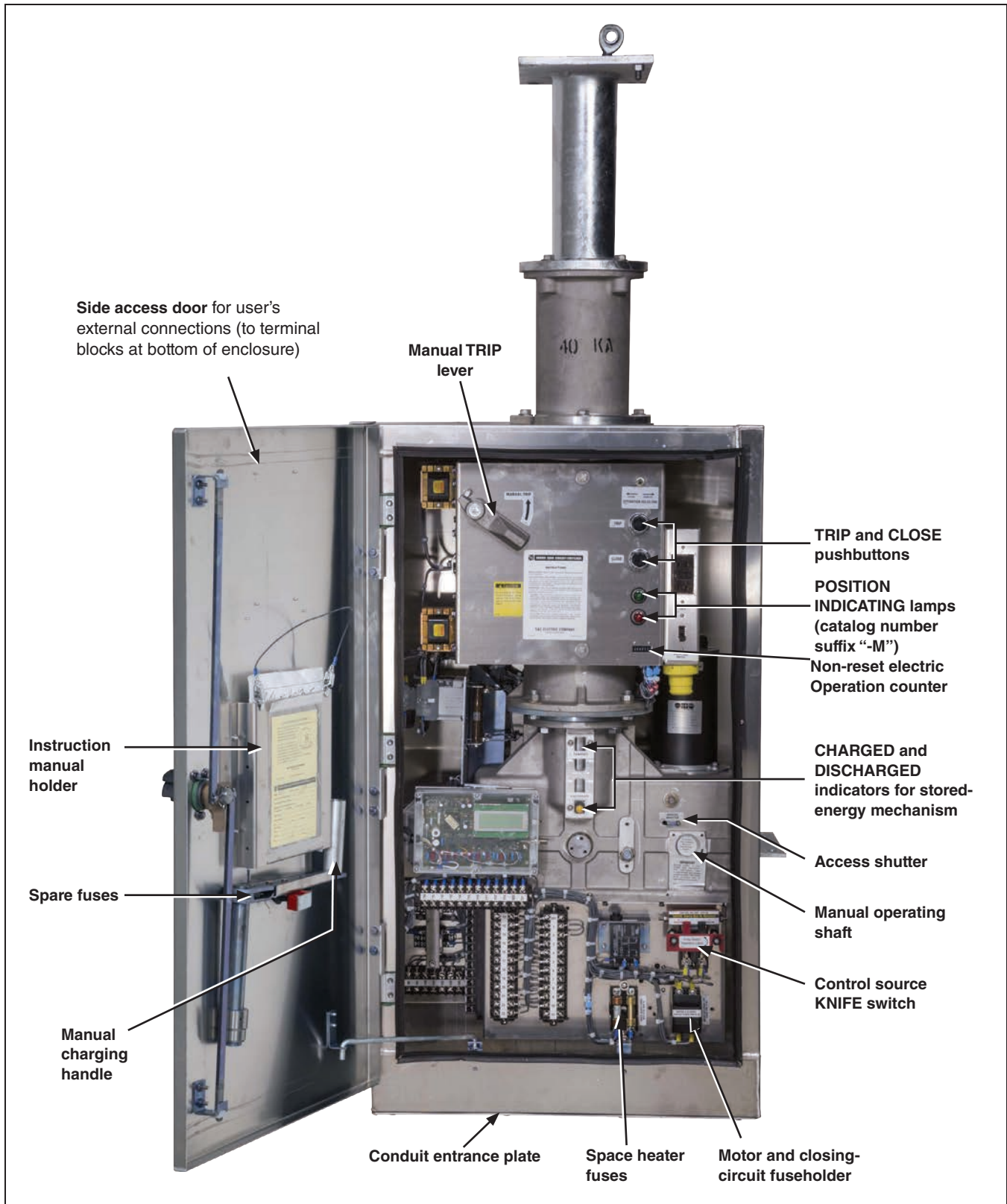


Figure 30. Interior of the switch operator.

Connecting Conductors

DANGER

Conductors must be de-energized and grounded in accordance with standard system operating practice. **Failure to do so will result in serious injury or death.**

Complete the following steps to connect the conductors:

- STEP 1.** Attach the high-voltage conductors to the terminal pads using flexible-conductor connections. Observe the terminal-pad loading limits specified on the catalog drawing.
- STEP 2.** Use the following procedure for attachment:
- Thoroughly wire-brush the current-transfer surfaces of each connector and immediately apply a liberal coating of Penetrox[®] A or other suitable aluminum-connector compound to the brushed surfaces.
 - Wire-brush each circuit-switcher terminal pad and apply a coating of aluminum-connector compound, and then bolt the connectors to the terminal pads.
 - Prepare the conductors using established procedures and clamp them in their respective connectors.

Remove the Interrupter Containers

Remove the container from each interrupter as follows.

- STEP 1.** Remove and discard the $\frac{3}{8}$ -16-inch zinc-plated serrated hex nuts that run the length of the container.
- STEP 2.** Remove and discard the two $\frac{3}{8}$ -16 \times 1-inch and two $\frac{3}{8}$ -16 \times $\frac{7}{8}$ -inch zinc-plated hex-head cap screws and flat washers that attach the two container-halves to the coupling end casting of the interrupter.
- STEP 3.** Remove and discard the two $\frac{3}{8}$ -16 \times 1-inch and one $\frac{3}{8}$ -16 \times $\frac{7}{8}$ -inch zinc-plated hex-head cap screws and flat washers that attach one of the container halves to the indicator end casting of the interrupter. Do not remove the remaining $\frac{3}{8}$ -16 \times $\frac{7}{8}$ -inch cap screw; it's needed to temporarily retain the other container-half.

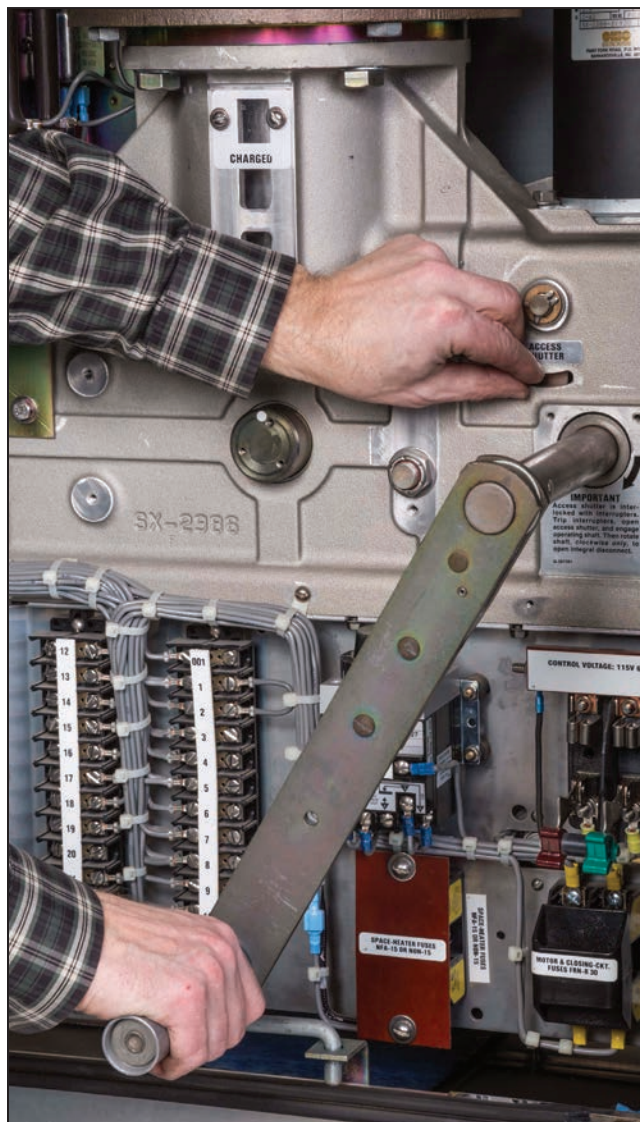


Figure 31. Using the manual charging handle to recharge the opening and closing springs and the open disconnect.

Installation

- STEP 4.** Pry the container halves apart with a flat-head screwdriver or other pry tool. One of the container halves can now be removed and discarded. Slotted holes are provided so a rope or lifting sling can be attached and the container safely lowered to the ground.
- STEP 5.** Remove and discard the remaining $\frac{3}{8}$ -16 \times $\frac{7}{8}$ -inch hex-head cap screw and flat washer that attach the other container half, and discard this container half.
- STEP 6.** Remove and discard the foam-core inner liner wrapped around the interrupter.
- STEP 7.** Remove and discard the protective wrappers from each insulating support column.

Setting up the Operator and Checkout

CAUTION

Unauthorized changes should not be made in the wiring of the operator. Should a control-circuit revision appear desirable, it should be made only on the authority of a revised wiring diagram that has been approved by both the user and S&C Electric Company. **Damage to the switch operator and minor injury could result. Do not apply control voltage to the operator at this time.**

Perform the following set-up procedure on the operator. See Figure 30 on page 26, Figure 31 on page 27, Figure 32, and Figure 33 on page 29.

- STEP 1.** To avoid accidentally energizing the operator after the external connections have been completed, open the control power KNIFE switch. Swing the KNIFE switch retainer arm out of the way by putting pressure on the red insulated retainer and the black nylon retainer nut. The KNIFE switch retainer arm will “pop up” and can then be swung out of the way. Figure 33 on page 29.
- STEP 2.** Mark the conduit-entrance location for the control-circuit wiring on the conduit-entrance plate in the bottom of the operator enclosure. Figure 30 on page 26.

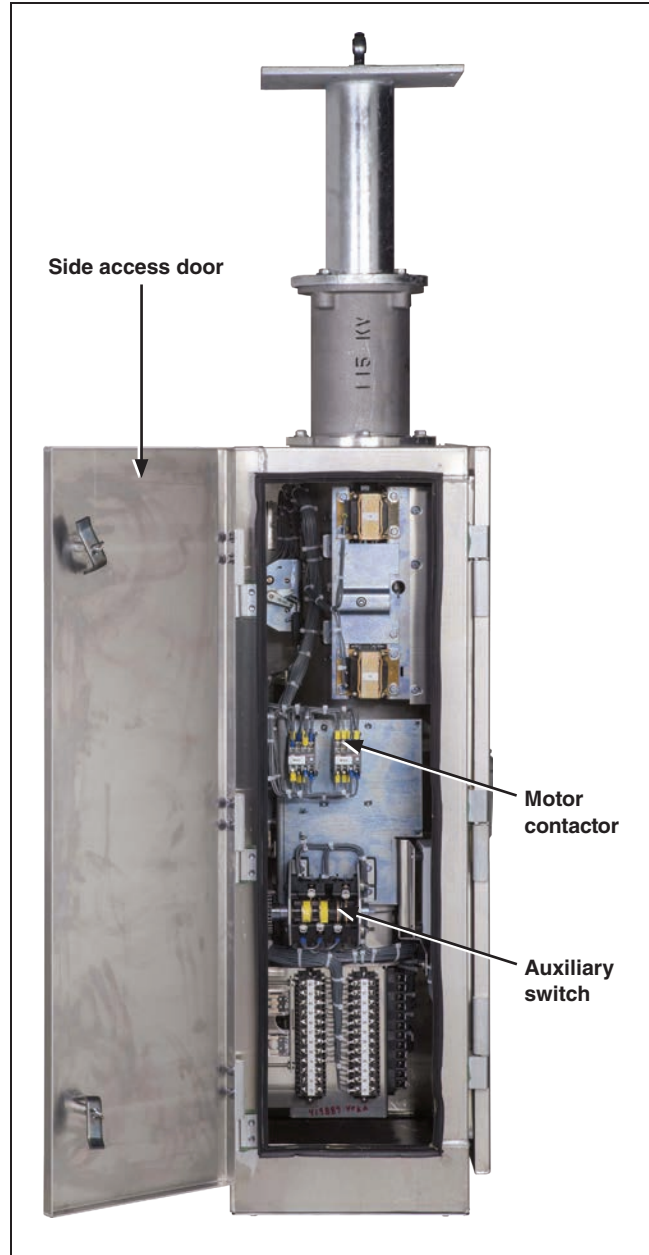


Figure 32. The side-access panel of the switch operator.

- STEP 3.** Remove the plate and cut out the necessary opening. Apply the sealant furnished and replace the plate. Install the entrance fittings. Verify the entrance fittings are properly sealed to prevent water ingress.

NOTICE

Make sure the polarity of the control circuit is correct on dc-control voltage models.
Energizing the switch operator with polarity reversed will cause damage to the operator control circuit and will require repair or replacement of the operator.

- STEP 4.** Connect the external control-circuit wiring (including the space heater source leads) to the terminal blocks at the bottom of the enclosure in accordance with the wiring diagram furnished. Observe the correct polarity on dc-control voltage models.

NOTICE

Trip-circuit conductors and motor and closing-circuit conductors must be adequately sized for the ampacities indicated on the wiring diagram.

Do not apply control voltage to the operator at this time.

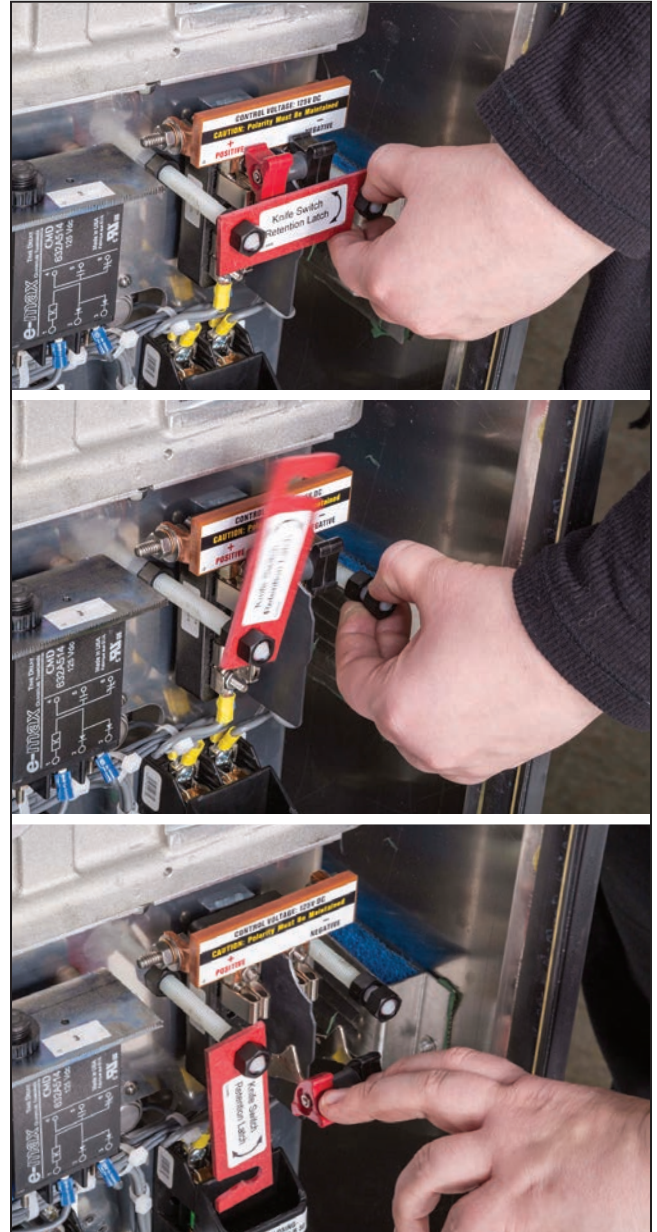


Figure 33. The KNIFE switch retainer and KNIFE switch.

Installation

STEP 5. Perform final checkout as detailed below:

NOTICE

Check the following. **Failure to do so can result in damage to the circuit-switcher when operated.**

- (a) At each transition box, make sure:
 - The operating rod holding bracket, stop bracket, and spacer have been removed from the interrupter (See Figure 34.)
 - The interrupter coupling has been connected to its insulated operating rod link (See Figure 17 on page 20.)
 - When the optional remote gas-density monitor is present (catalog number suffix “-R”) the connections are made according to S&C Instruction Sheet 716-530
- (b) At each interrupter, make sure:
 - Both interrupter container halves and all associated packing and hardware have been removed
- (c) In the high-speed base, make sure:
 - Each insulated operating rod is connected to the interphase drive (See Figure 35.)
 - The interphase drive lever has been connected to the operator uni-ball coupling (See Figure 36 on page 31.)
 - The adjustable locking rod attached to the interphase drive lever has been removed (See Figure 34 and Figure 36 on page 31.)
- (d) In the switch operator, make sure:
 - Correct polarity has been observed on dc-control-voltage models (Figure 38 on page 31.)
 - On the open and close motor contactors and surge suppressor all electrical connections are secure and all contactors and surge suppressors are fully seated in their mounts (See Figure 37 on page 31.)
 - Any optional “ice-cube” style relays (used for catalog option “-P” and “-T2”) are fully seated (See Figure 39 on page 32.)
- (e) All other pinned connections have been made and all bolted connections have been securely tightened

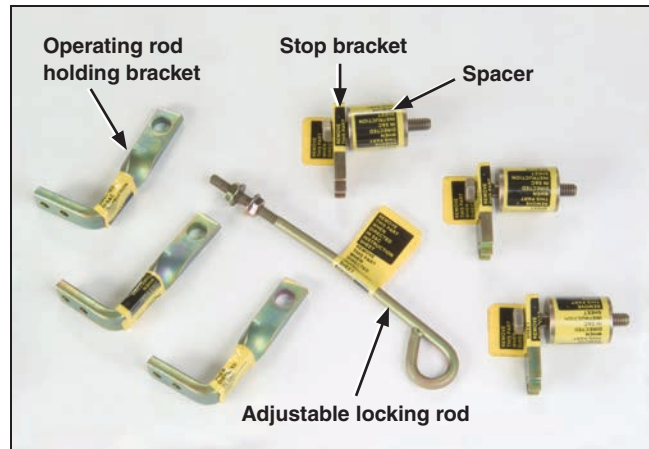


Figure 34. Checking the transition box and high-speed base for these shipping parts.

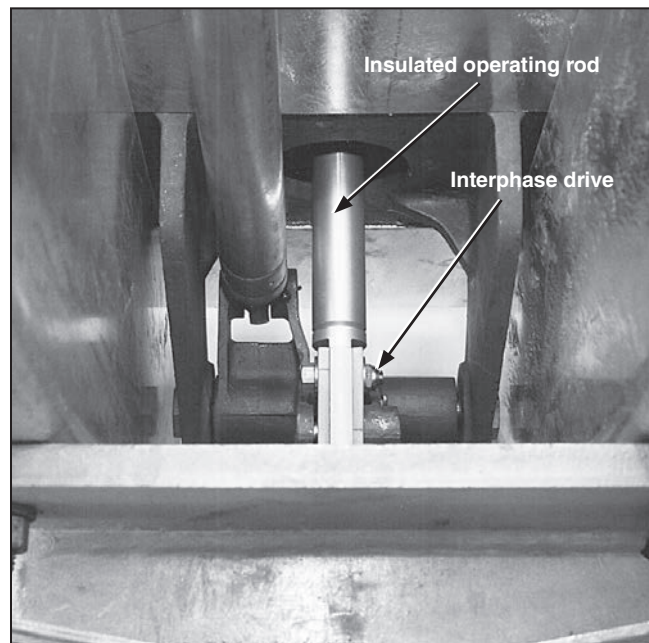


Figure 35. Making sure each insulated operating rod has been connected to the interphase drive.

- STEP 6.** Replace the access cover on the side of each transition box and securely tighten the associated $\frac{5}{16}$ -18 \times $\frac{3}{4}$ -inch hex-head stainless steel cap screws.
- STEP 7.** Replace the bottom plates to the underside of the high-speed base and securely tighten the associated $\frac{1}{2}$ -13 \times 1 $\frac{1}{4}$ -inch galvanized steel cap screws, flat washers, and nuts. See Figure 7 on page 14.
- STEP 8.** Insert the motor and closing-circuit fuse holders. Then, close the control power KNIFE switch. Figure 37.

The disconnect blades should be in the **Open** position attained in Step 9 on page 25.

- STEP 9.** Press the CLOSE pushbutton or send a “Close” signal to the switch operator. See Figure 30 on page 26. (TRIP and CLOSE pushbuttons are not included on operators specified with catalog number suffix “-J.” In such instances, momentarily jumper terminals 1 and 3 to close the circuit-switcher.)

The motor-driven cam in the stored-energy mechanism will immediately start retracting. Simultaneously, the take-off shaft at the rear of the operator housing will turn to drive the interphase pipe assembly, closing the disconnect.

When the disconnect has completely closed, the closing latch will release, discharging the closing springs. This action closes the interrupters. The SWITCH POSITION indicator on the high-speed base will move to the **Closed** position. See Figure 41 on page 33. If the POSITION INDICATING lamp option has been specified, the red lamp will light. See Figure 30 on page 26.

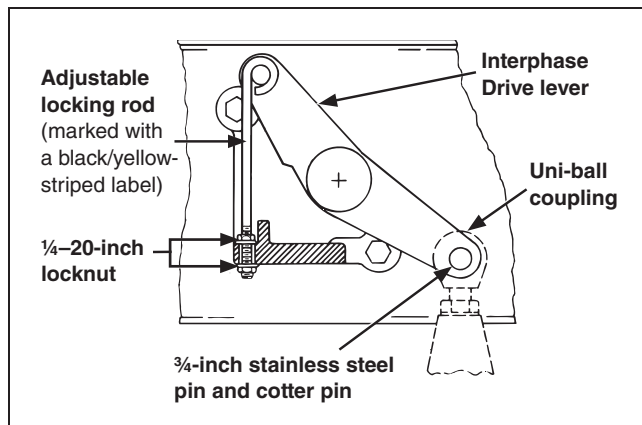


Figure 36. Making sure the interphase drive lever has been connected to the uni-ball coupling and the adjustable locking rod has been removed.

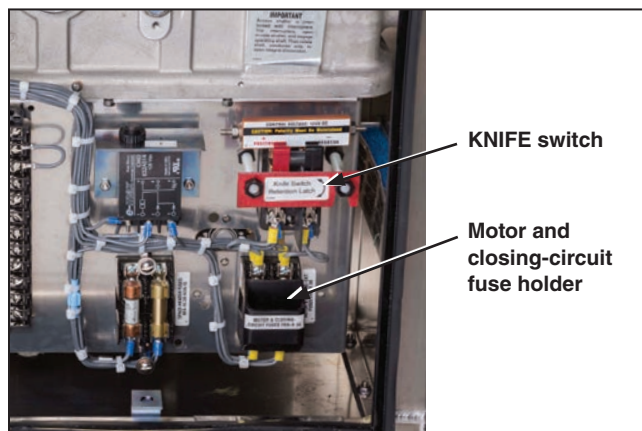


Figure 37. The motor and closing-circuit fuse holders and the control source KNIFE switch.

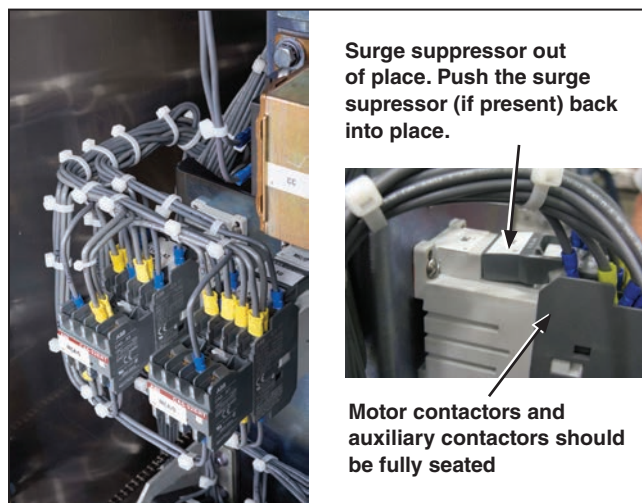


Figure 38. Checking the open and close motor contactors, auxiliary contact blocks, and surge suppressors behind the operator side panel.

Installation

STEP 10. When the circuit-switcher is ready to be placed in service, the motor and closing-circuit fuses can—at the user’s option—be replaced with the slugs furnished. S&C recommends this practice for increased reliability because low-voltage fuses can be damaged by the repeated inrush current experienced during normal opening and closing operations and can “sneak out,” leaving the circuit-switcher inoperable.

NOTICE

Before replacing these fuses with slugs, make sure the control-source battery is adequately protected to prevent discharge using fuses or circuit breakers located at the battery bus.

STEP 11. Please complete and mail the circuit-switcher registration card. The information requested on this card is vital to ensure prompt notification in the event field modifications are needed.

Adjusting Auxiliary-Switch Contacts

Two individually adjustable auxiliary-switch contacts are furnished in the operator. These contacts follow the position of the disconnect-blade power train and operator when the power train is coupled and the position of the operator when the power train is decoupled.

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 with a cam. The cams are individually adjustable in 4.5-degree increments.

STEP 1. To adjust the contacts:

- (a) Push the cam toward its adjacent spring until the cam is separated from the teeth of the inner gear. See Figure 40.
- (b) Rotate the cam to advance or delay engagement with its roller.
- (c) Release the cam, making sure the teeth are engaged with the inner gear.

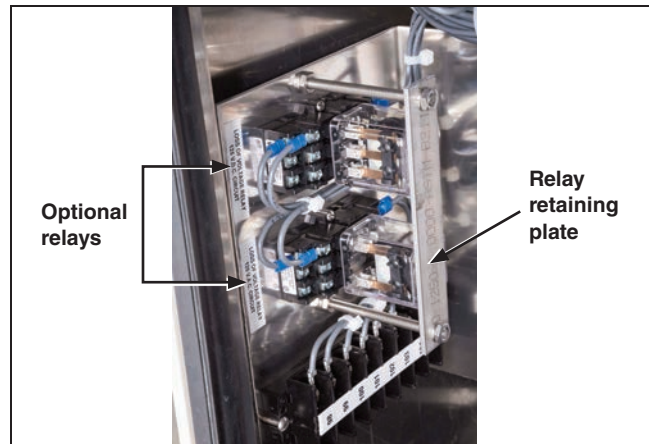


Figure 39. Making sure all optional “ice-cube” style relays are fully seated and the retaining plate is in place.

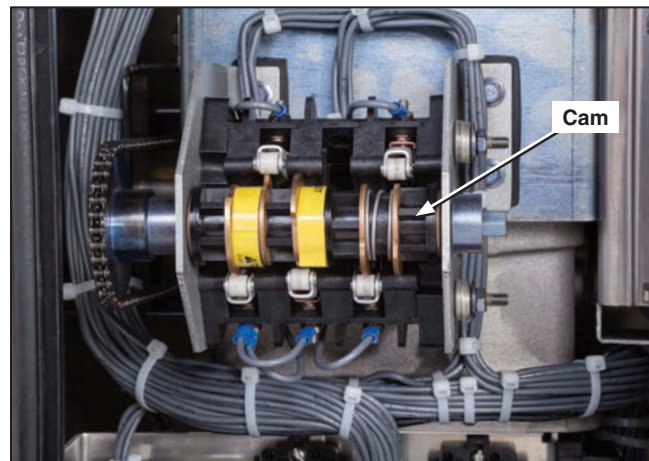


Figure 40. Adjusting the cams on the auxiliary switch.

Understanding Trip-Free Operation

The stored-energy mechanism has an instantaneous trip-free capability. If the Series 2000 Circuit-Switcher is closed into a fault sensed by the user-furnished relaying, the mechanism will immediately trip.

To accomplish trip-free operation, the stored-energy mechanism uses two spring assemblies: one for closing and one for opening. Both springs are charged by the operator motor before the circuit-switcher can be closed.

Recharging time after a trip operation is approximately 5 seconds for Model 2020 circuit-switchers rated 69-kV through 138-kV.

Electrical Operation

To open: Press the TRIP pushbutton or send a remote trip signal to the switch operator. See Figure 30 on page 26.

The opening latch in the stored-energy mechanism will release, discharging the opening spring. This action opens the interrupters and forces the opening and closing pistons in the stored-energy mechanism downward. The STORED ENERGY indicator will travel to the Discharged window. See Figure 42 on page 34.

The SWITCH POSITION indicator on the high-speed base will move to the **Open** position. See Figure 41. If the position-indicating lamp option (catalog number suffix “-M”) has been specified, the green lamp will light. See Figure 30 on page 26.

After opening, the motor-driven cam in the stored-energy mechanism will immediately start rising, charging both the opening and closing springs. When the opening spring latches, the indicator will be visible in the Charged window. See Figure 42 on page 34. Simultaneously, the take-off shaft at the rear of the operator housing will turn to drive the interphase pipe assembly, opening the disconnect.

The total opening time for the circuit is six cycles.

To close: Press the CLOSE pushbutton or send a remote close signal to the switch operator. See Figure 30 on page 26.

The motor-driven cam in the stored-energy mechanism will retract. Simultaneously, the take-off shaft at the rear of the operator housing will turn to drive the interphase pipe assembly, closing the disconnect.

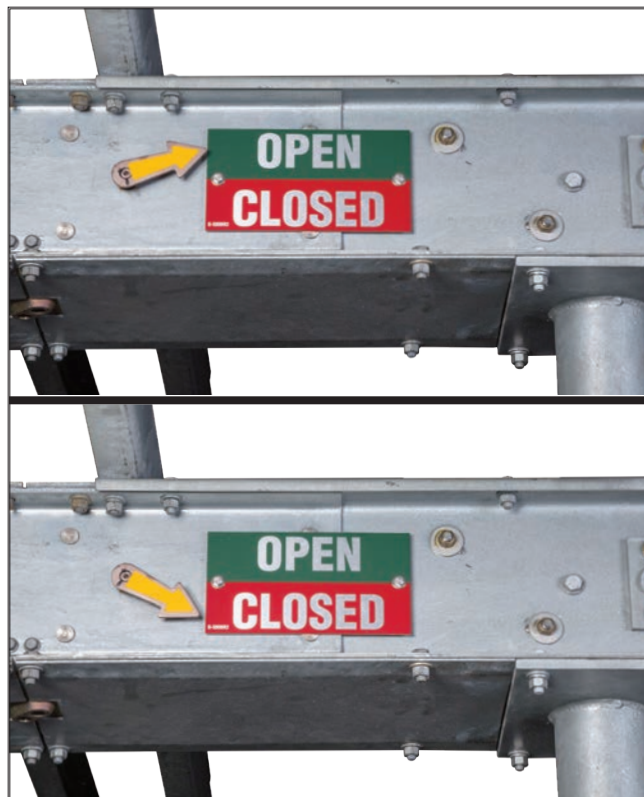


Figure 41. The SWITCH POSITION indicator in the Open position (top). The SWITCH POSITION indicator in the Closed position (bottom).

Operation

When the disconnect has closed, the closing latch will release, discharging the closing spring and closing the interrupters. The SWITCH POSITION indicator on the high-speed base will move to the **Closed** position. See Figure 41 on page 33. (The window will continue to show the CHARGED indicator. See the “Understanding Trip-Free Operation” section on page 33.)

If the POSITION INDICATING lamp option has been specified, the red lamp will light.

The circuit-switcher may also be electronically operated via remotely located control switches. No instructions are included for remote control because control schemes vary with the installation and specific application of the switch.

The total closing time for the circuit is 6 cycles.

Manual Operation

To open, push the MANUAL TRIP lever counter-clockwise.

The opening latch in the stored-mechanism will release, discharging the opening spring. See Figure 30 on page 26.

This action opens the interrupters and forces the opening and closing pistons in the mechanism down. The stored-energy mechanism indicator will show “Discharged” in the window and the SWITCH POSITION indicator on the high-speed base will move to the **Open** position. See Figure 41 on page 33 and Figure 42. If the POSITION INDICATING lamp option has been specified—and operator control voltage is available—the green lamp will light.

If operator control voltage is available: The motor-driven cam in the stored-energy mechanism will start rising, charging both the opening and closing springs. When the opening spring latches, the indicator on the stored-energy mechanism will move to the Charged window.

Simultaneously, the take-off shaft at the rear of the operator housing will turn to drive the interphase pipe assembly, opening the disconnect. At the end of the charging operation, the motor return indicator will reappear in the viewing window.

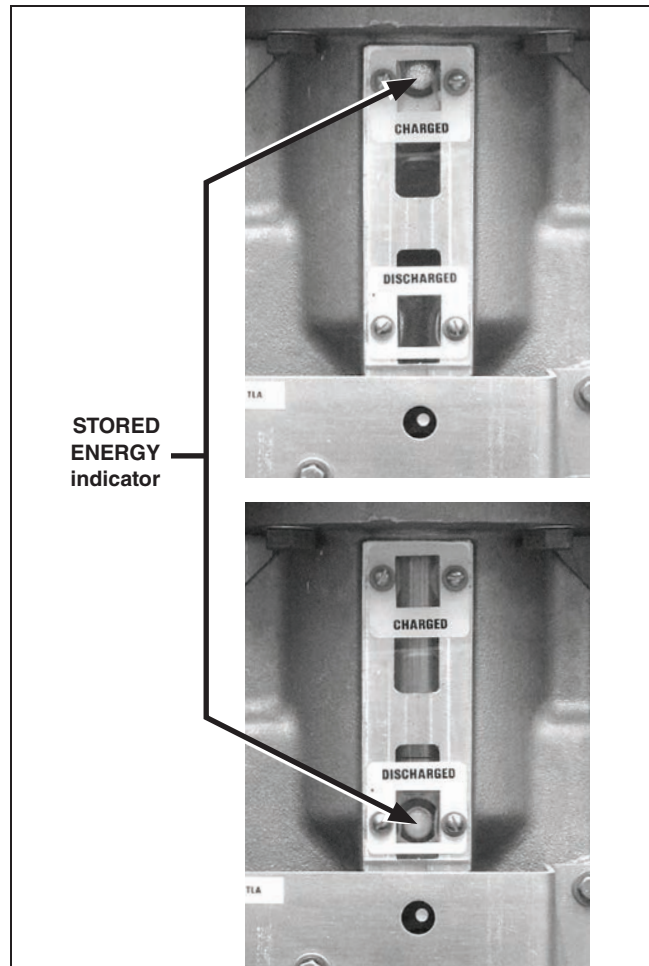


Figure 42. A close up view of the DISCHARGED and CHARGED position indicator.

If operator control voltage is not available:

The opening and closing springs can be charged and the disconnect opened using the manual charging handle. Figure 43.

To manually open the disconnect:

- STEP 1.** Open the access shutter and place the manual charging handle on the manual operating shaft.
- STEP 2.** Rotate the shaft, clockwise only, until the disconnect opens fully and the mechanism reaches its open stop.
- STEP 3.** Remove the manual charging handle from the manual operating shaft and replace it in the holder on the inside of the operator door.

Manual closing of the interrupters cannot be performed. When control power returns, if the disconnect has not been opened manually, the motor-driven cam in the stored-energy mechanism will charge the opening and closing springs, and the take-off shaft will turn to drive the interphase pipe assembly, opening the disconnect.

Decoupling

The disconnect-blade power train may be decoupled in the **Open** position, permitting the interrupter to be tripped and closed for inspection purposes.

To decouple: Open the circuit-switcher electronically or manually, and disengage the decoupling handle on the rear of the operator by pivoting it outward. See Figure 44 (right). The disconnect-blade power train may now be padlocked open. In addition, the interrupters may now be closed and opened as desired, either electronically or manually. The disconnect will remain open.

To recouple: Open the circuit-switcher electronically or manually, and engage the decoupling handle on the rear of the operator by pivoting it inward. See Figure 44 (left). The disconnect-blade power train may now be padlocked coupled.

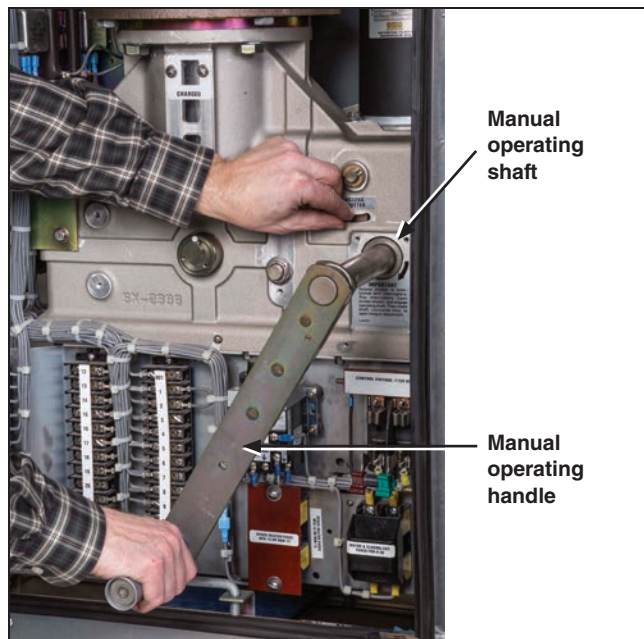


Figure 43. Engaging the manual operating handle with the manual operating shaft, turning clockwise until disconnects open.

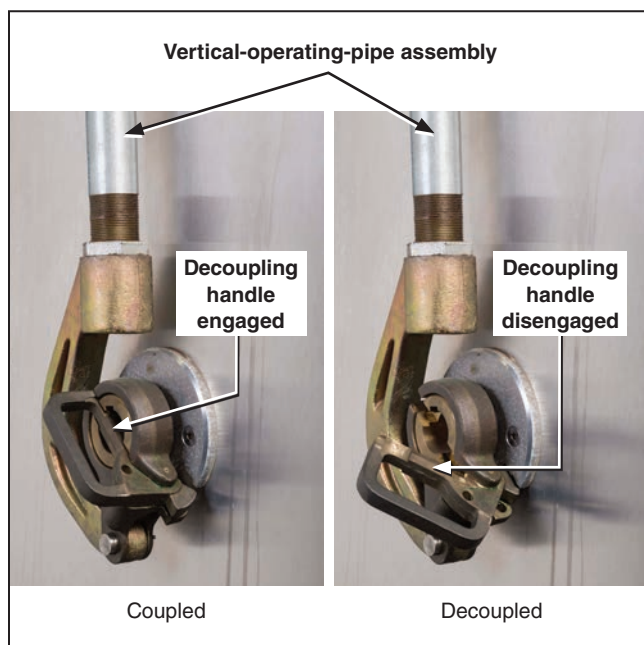


Figure 44. Decoupling the disconnect-blade power train.

Understanding the GAS PRESSURE Indicator and Safety Relief Device

Series 2000 Circuit-Switchers have sealed interrupters containing gas under pressure. Loss of gas pressure may result in improper interrupting action. Low gas pressure is signaled by a red target in the GAS PRESSURE indicator at the upper terminal end of the interrupter.

Figure 45 illustrates a GAS PRESSURE indicator with acceptable gas pressure.

Figure 46 illustrates a GAS PRESSURE indicator with a red target semaphore, signaling a loss in gas-pressure.

Understanding the Optional Remote Gas-Density Monitor

The remote gas-density monitor provides local and remote indication of the gas density in each interrupter in terms of percent full. The system can be wired to provide remote indication of the gas density of each interrupter via three analog 0 to 1.0 mA dc outputs.

The LCD provides indication of gas density and alarms for each interrupter. The remote gas density monitor transmits updated measurements approximately once per hour.

The remote gas-density monitor has three available alarm contacts. The system provides both local and remote indication of alarms.

A **Level 1 Alarm** indicates an interrupter is leaking. The circuit-switcher can still be operated, but the leaking interrupter should be replaced promptly.

A **Level 2 Alarm** indicates an interrupter has lost enough SF₆ gas that it can no longer clear faults properly.

A **System Trouble Alarm** indicates a problem with the monitoring system. A **System Trouble** alarm will activate when the receiver fails to receive a signal for more than 24 hours. The **System Trouble** alarm will also activate when there are approximately three months or less of battery life remaining. At first, a **Low Battery** alarm will appear locally. After the battery has completely discharged, an **Error** message will appear in place of the percent-gas-density information, and the **System Trouble** alarm will signal remotely.

For complete instructions on installing, operating, and troubleshooting the optional remote gas-density monitor, refer to S&C Instruction Sheet 716-530.

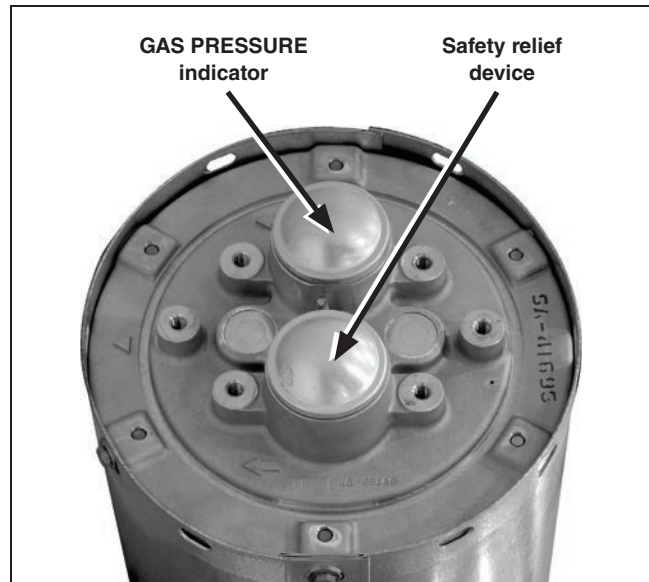


Figure 45. The normal GAS PRESSURE indicator and relief device.

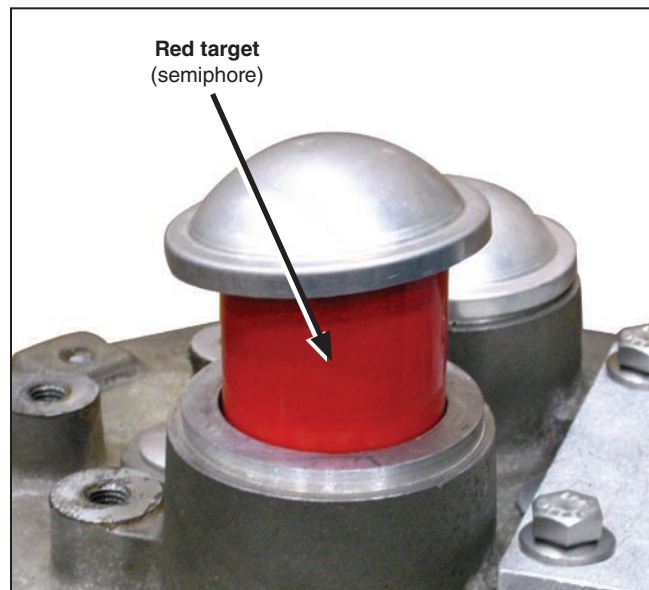


Figure 46. The visible “red target” GAS PRESSURE indicator.

Inspection Recommendations

To ensure the continued proper performance, Series 2000 Circuit-Switcher should be inspected in accordance with the S&C-recommended schedule and procedures contained in S&C Instruction Sheet 716-590.