

Installation and Operation

Table of Contents

Introduction	2	Installation	10
Qualified Persons	2	Before Starting	11
Read this Instruction Sheet	2	Installing the Mounting Pedestals and High-Speed Base	12
Retain this Instruction Sheet	2	Installing the Switch Operator.....	14
Proper Application.....	2	Installing the Pole Units	17
Operating Considerations.....	2	Connecting the Pole-Units to the High-Speed Power Train.....	20
Safety Information	3	Connecting the Operator to the High-Speed Power Train	22
Understanding Safety-Alert Messages	3	Connecting Conductors	27
Following Safety Instructions.....	3	Removing the Interrupter Containers	27
Replacement Instructions and Labels	3	Setting up the Operator and Checkout.....	28
Location of Safety Labels	4	Adjusting Auxiliary-Switch Contacts.....	34
Safety Precautions	7	Operation	35
Shipping and Handling	8	Understanding Trip-Free Operation	35
Inspection	8	Electrical Operation	35
Packing.....	8	Manual Operation	36
Storage.....	9	Decoupling	37
		Understanding the Gas-Pressure Indicator and Safety Relief Device.....	38
		Understanding the Optional Remote Gas-Density Monitor	38
		Inspection Recommendations	39



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 2010 Series 2000 Circuit-Switcher. Become familiar with the Safety Information on pages 3 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 the Model 2010 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 this circuit-switcher are listed on the nameplate on the front of the switch operator. Additional application information can be found in S&C Specification Bulletin 716-31.

Operating Considerations

Series 2000 Circuit-Switchers will perform as intended at temperatures within the range of -40°C (-40°F) to $+40^{\circ}\text{C}$ (104°F), or -35°C (-31°F) to $+40^{\circ}\text{C}$ (104°F) for 161-kV and 230-kV models, at altitudes of up to 5000 feet (1524 m) and at wind loadings of up to 90 miles per hour (145 kmph). 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.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the product. Become familiar with these types of messages and the importance of these signal words:

⚠ DANGER
“DANGER” identifies the most serious and immediate hazards that will likely result in serious personal injury or death if instructions, including recommended precautions, are not followed.


⚠ WARNING
“WARNING” identifies hazards or unsafe practices that can result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ CAUTION
“CAUTION” identifies hazards or unsafe practices that can result in minor personal injury if instructions, including recommended precautions, are not followed.

NOTICE
“NOTICE” identifies important procedures or requirements that can result in product or property damage if instructions are not followed.

Following Safety Instructions

If any portion of this instruction sheet is unclear and assistance is needed, contact the nearest S&C Sales Office or S&C Authorized Distributor. 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 2010 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

This shield must be removed during installation—but only when indicated in the S&C instruction sheet furnished with this Circuit-Switcher.

S&C ELECTRIC COMPANY
CHICAGO, ILLINOIS
G-6949 Rev. 001 MADE IN U.S.A.

WARNING

DO NOT remove steel outer wrapper until installation is complete.

Interrupter contains gas under pressure.

Injury or damage to equipment may result.

S&C ELECTRIC COMPANY
CHICAGO, ILLINOIS
G-5993 REV. 003 MADE IN U.S.A.

WARNING

INTERRUPTER PRESSURIZED TO 75 PSI.
INSTALL PROTECTIVE SHIELDS PRIOR TO REMOVAL.

G-9021

CAUTION

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

G-5987 Rev. 003 S&C ELECTRIC COMPANY CHICAGO, ILLINOIS MADE IN U.S.A.

Not visible in photo

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.

S&C ELECTRIC COMPANY
CHICAGO, ILLINOIS 60638 MADE IN U.S.A.
G-6949 Rev. 001

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.

S&C ELECTRIC COMPANY
CHICAGO, ILLINOIS
G-5950 Rev. 001 MADE IN U.S.A.

Instructions for Attaching Operator Connecting Link to Interphase Drive Lever

1. Turn the 1/2"-20 locking nuts on the adjustable locking rod, as required, to raise or lower the interphase drive lever. Then attach the uni-ball coupling on the operator connecting link to the interphase drive lever, using the 1/4"-inch stainless steel pin and cotter pin.

2. Remove the screw 1/2"-20 locking nut which retains the adjustable locking rod. Then remove and discard the adjustable locking rod and locking nuts.

S&C ELECTRIC COMPANY
CHICAGO, ILLINOIS 60601 MADE IN U.S.A.

CAUTION

Do not attempt to close Circuit-Switcher using manual trip lever.

Damage to mechanism may result.

S&C ELECTRIC COMPANY
CHICAGO ILLINOIS
G-6222 Rev. 001

S&C Series 2000 Circuit-Switcher Model 2000

CAUTION

Do not apply control voltage to this device or manually operate it until installation has been completed and the required safety tests have been checked. Damage to the Circuit-Switcher can result.

- At each installation site:
 - Check operating and locking voltage levels, control and closing characteristics from the interphase lever.
 - The interphase lever must be returned to its normal operating position.
- At the Circuit-Switcher level:
 - The interphase lever must be held in the normal operating position.
 - The adjustable locking rod must be checked to be in the correct position.

Control polarity has been observed on all control voltage circuits.

Refer to the S&C instruction sheet furnished with this Circuit-Switcher.

CONTROL VOLTAGE: 48V DC

CAUTION: Polarity Must Be Maintained

+	+	-
1	POSITIVE	NEGATIVE

CONTROL VOLTAGE: 125V DC

CAUTION: Polarity Must Be Maintained

+	+	-
2	POSITIVE	NEGATIVE

CONTROL VOLTAGE: 115V 60 HZ

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 slugs. This practice is recommended for increased reliability because low-voltage fuses can be damaged by the repeated inrush current experienced during normal Circuit-Switcher opening and closing operations and can thus break out, leaving the Circuit-Switcher inoperable.

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

S&C ELECTRIC COMPANY
CHICAGO, ILLINOIS 60601 MADE IN U.S.A.

CAUTION

Do not apply control voltage or insert motor-and-closing circuit fuseholder until installation has been completed and items listed above have been checked. Damage to Circuit-Switcher can result.

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	This shield must be removed during installation...	G-6043-Rev.001■
C	⚠ WARNING	Do not remove...	G-5993■
D	⚠ WARNING	Interrupter pressurized to 75 PSI...	G-9621
E	INFORMATION	Attaching Operator Connecting Link	G-5792●
F	INFORMATION	Instruction – Operation, Gas Pressure Indicator, and Manual Handle	G-5670R1▲
G	⚠ CAUTION	Control Voltage	48 Vdc
			125 Vdc
			115 V 60 Hz
H	INFORMATION	Instructions for Fuse Slugs	G-5939●
J	⚠ CAUTION	Do not apply control voltage or insert motor-and-closing circuit fuseholder.	G-5959■
K	⚠ CAUTION	Do not apply control voltage to this device...	G-5945■
L	⚠ CAUTION	Do not attempt to close Circuit-Switcher using manual trip lever...	G-6222
M	⚠ CAUTION	Connect the interphase drive lever...	G-5949●
N	⚠ CAUTION	Connect the insulated operating rod...	G-5950●

● This tag is to be removed and discarded after the switch is installed and adjusted.

■ This label is affixed to the shipping package and will 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.

⚠ 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.

- | | |
|--|---|
| <ol style="list-style-type: none"> 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, and flash clothing, in accordance with safe operating procedures and rules. 4. SAFETY LABELS. Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels and tags. Remove tags ONLY if instructed to do so. | <ol style="list-style-type: none"> 5. ENERGIZED COMPONENTS. Always consider all parts live until de-energized, tested, and grounded. 6. 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. 7. MAINTAINING PROPER CLEARANCE. Always maintain proper clearance from energized components. 8. OPERATION. Circuit-making and circuit-breaking are involved in the normal operation of this interrupter switch. To operate, follow the operating procedure as outlined in your model's instruction sheet. |
|--|---|

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 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.

Notify S&C Electric Company in all instances of loss and damage.

Packing

An S&C catalog drawing will be found 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 materials to verify all parts are at hand. The Model 2010 Series 2000 Circuit-Switcher shipment should include the following items, as 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 that was 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 mis-operation of the circuit-switcher.

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-units each consisting of an interrupter, an insulating support column, a support insulator, and a base – all factory-assembled and adjusted
- A single high-speed base, enclosing the high-speed power train which drives the interrupters
- The appropriate number of mounting pedestals complete with support arms and channels:
 - Single-pedestal: 69 kV (with 48-inch (1219-mm) phase spacing)
 - Two-pedestals: 69 kV (with 84-inch (2134-mm) phase spacing); 115 kV and 138 kV and can be specified on 161 kV
 - Three-pedestals: Can be specified on 161 kV, and standard on 230 kV.
- A Series 2000 Circuit-Switcher switch operator
- A container of operating-mechanism components and hardware—all individually identified
- Any optional features or accessories specified, such as a grounding switch

 **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. Alternatively, store the operator in a climate controlled area.

If the Series 2000 Circuit-Switcher must be stored before installation, keep it in a clean, dry, 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. Inspect the circuit-switcher regularly when storing for prolonged periods.

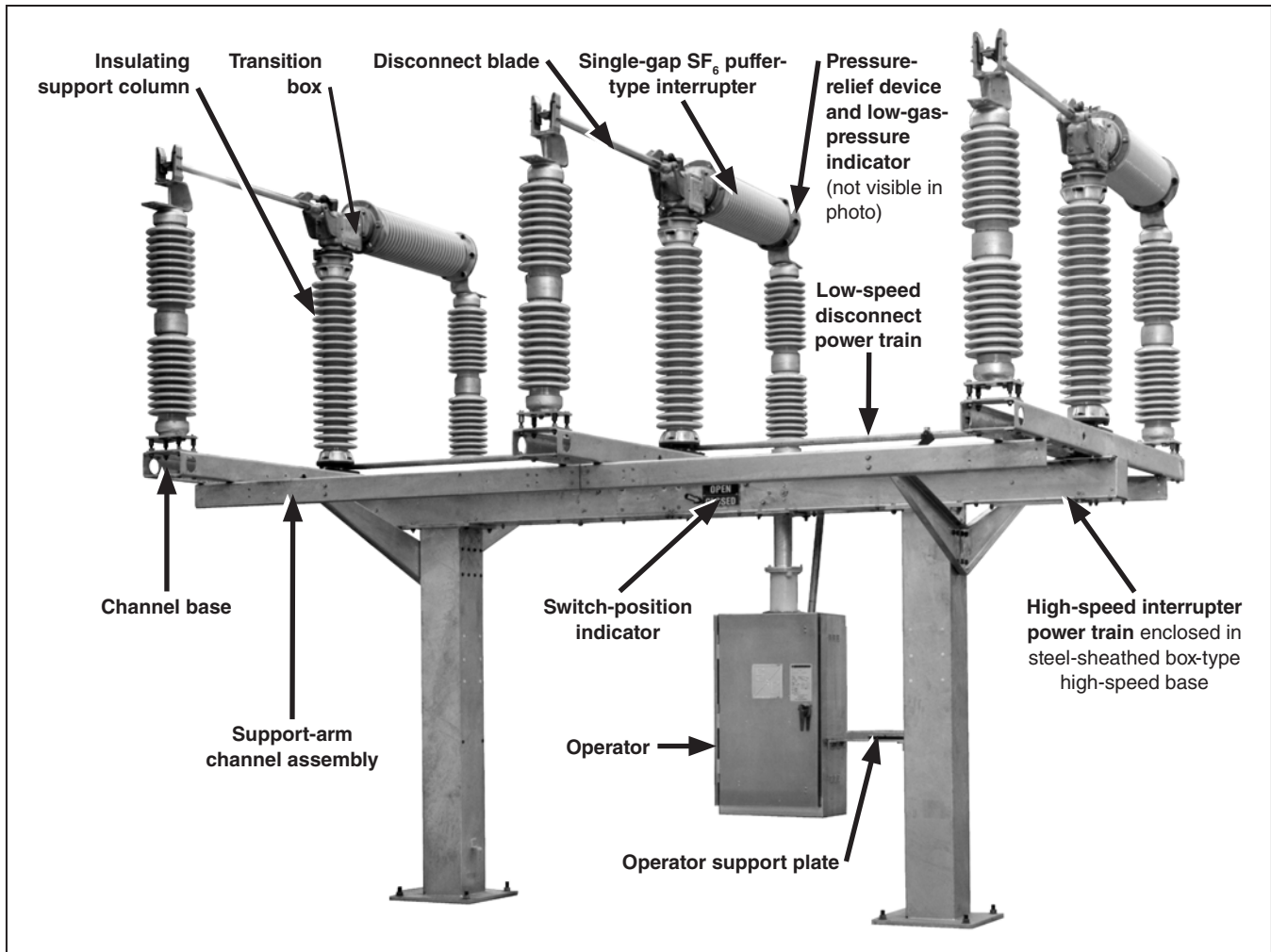


Figure 1. A Model 2010 Series 2000 Circuit-Switcher rated 138 kV.

Before Starting

Cut the steel straps that bind the mounting pedestals to the high-speed base, the straps that bind the container of miscellaneous operating-mechanism components and hardware, and the straps that bind the pole-units. Also remove the wood bracing between the pole-unit terminal pads. See Figure 2.

For circuit-switchers rated 161 kV and 230 kV: Remove the lifting angles attached to the pole-unit channel bases; retain these lifting angles and associated hardware for re-use in Step 2 on page 18.

⚠ 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 can result.

NOTICE

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

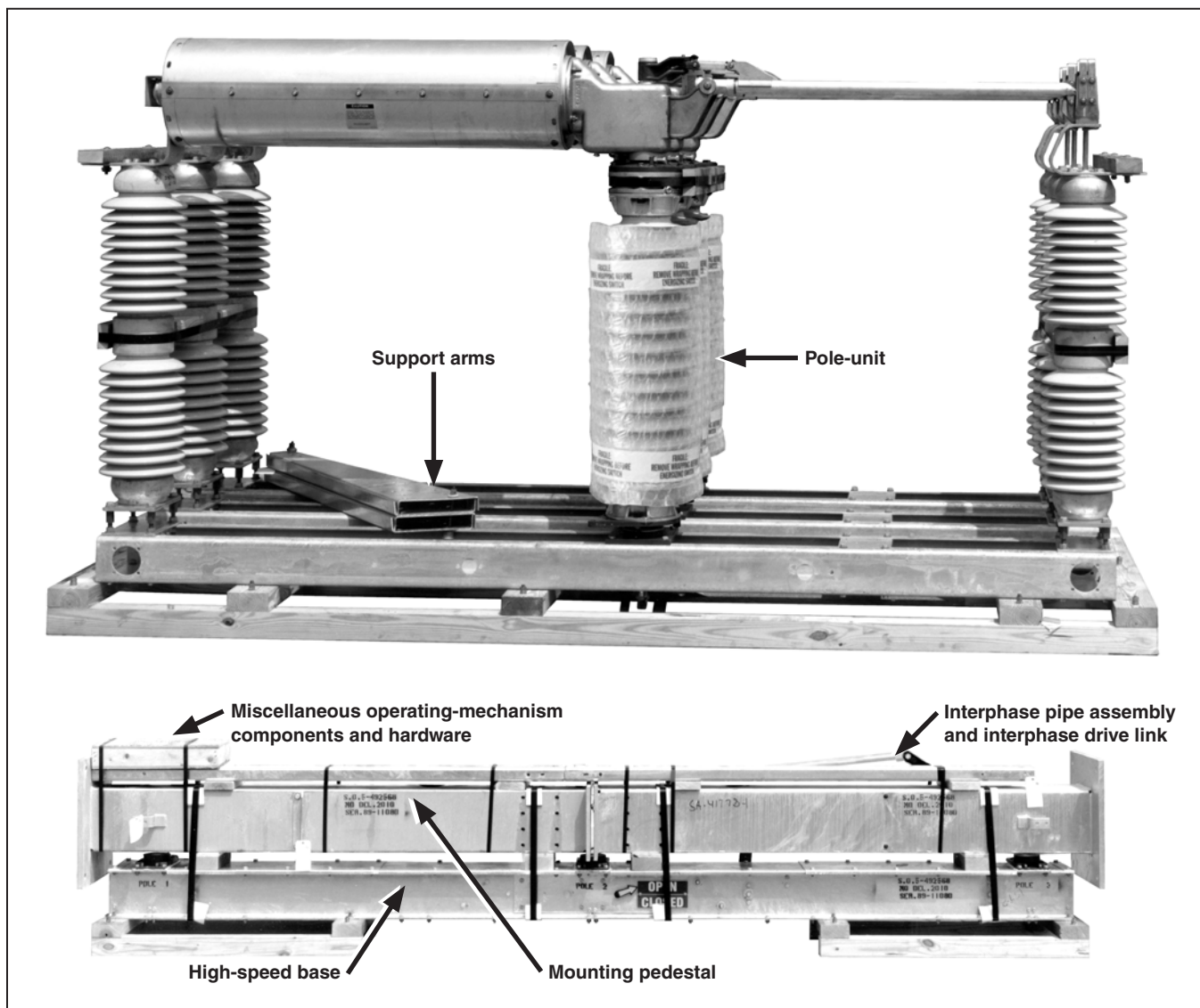


Figure 2. A typical shipment of a Model 2010 Series 2000 Circuit-Switcher. The operator is shipped on a separate skid. See Figure 9 on page 15.

Installation

Installing the Mounting Pedestals and High-Speed Base

Install each pedestal as follows:

⚠ 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.**

STEP 1. Install the mounting pedestals. See Figure 3 and Figure 4. Make sure the grounding pad on each mounting pedestal is properly positioned for this particular installation.

Adjust the lower set of anchor-bolt nuts at each pedestal to generally plumb and level the pedestal. The upper set of anchor-bolt nuts should be only loosely attached at this time.

⚠ WARNING

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 box-type base, and to the reciprocating-action insulated operating rods that pass 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 can result.**

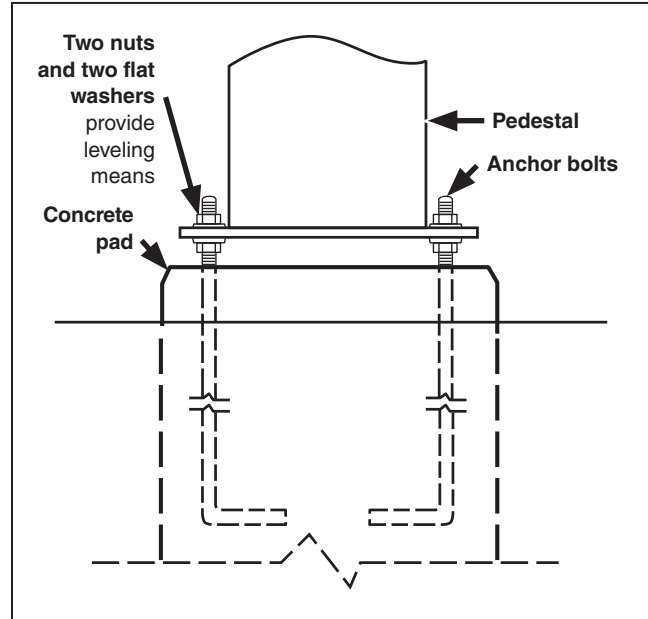


Figure 3. Pedestal mounting detail.

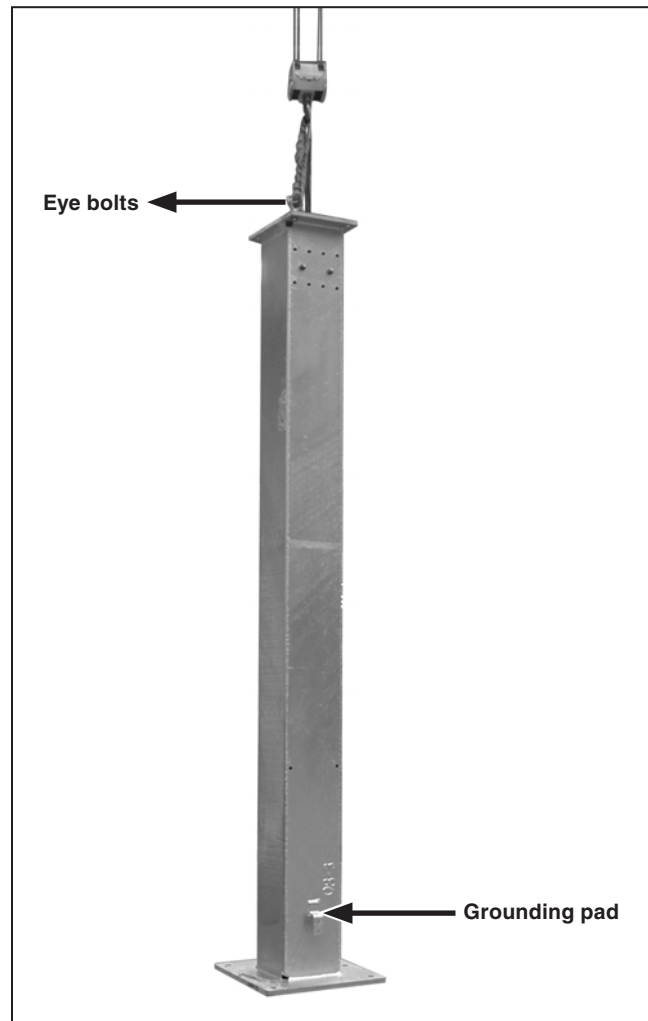


Figure 4. Lift the pedestal into position.

STEP 2. Attach four suitable lifting slings to the high-speed base. See Figure 5. Unbolt the base from the shipping skid and lift the base atop the mounting pedestals, 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).

STEP 3. Loosely bolt the high-speed base to the mounting pedestals using the $\frac{5}{8}$ — $11 \times 2\frac{1}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Then, using a level, verify the high-speed base is horizontal, both lengthwise and side to side. Adjust the lower set of anchor-bolt nuts at the pedestals to achieve this condition.

STEP 4. Securely bolt the high-speed base to the mounting pedestals. Shims are furnished and should be installed as necessary between the high-speed base and the mounting pedestals to compensate for any irregularities greater than $\frac{1}{8}$ -inch (3 mm) between the mating surfaces. See Figure 6.

STEP 5. Check the lower set of anchor-bolt nuts at each mounting pedestal to verify all nuts are in contact with the bottom of the pedestal. Hand-tighten these anchor-bolt nuts as necessary. Then, securely tighten the upper set of anchor-bolt nuts at each mounting pedestal.

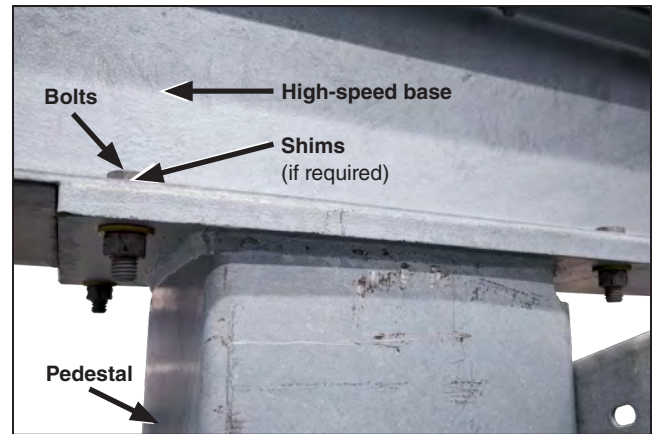


Figure 6. Shim under the high-speed base for gaps of more than $\frac{1}{8}$ -inch.

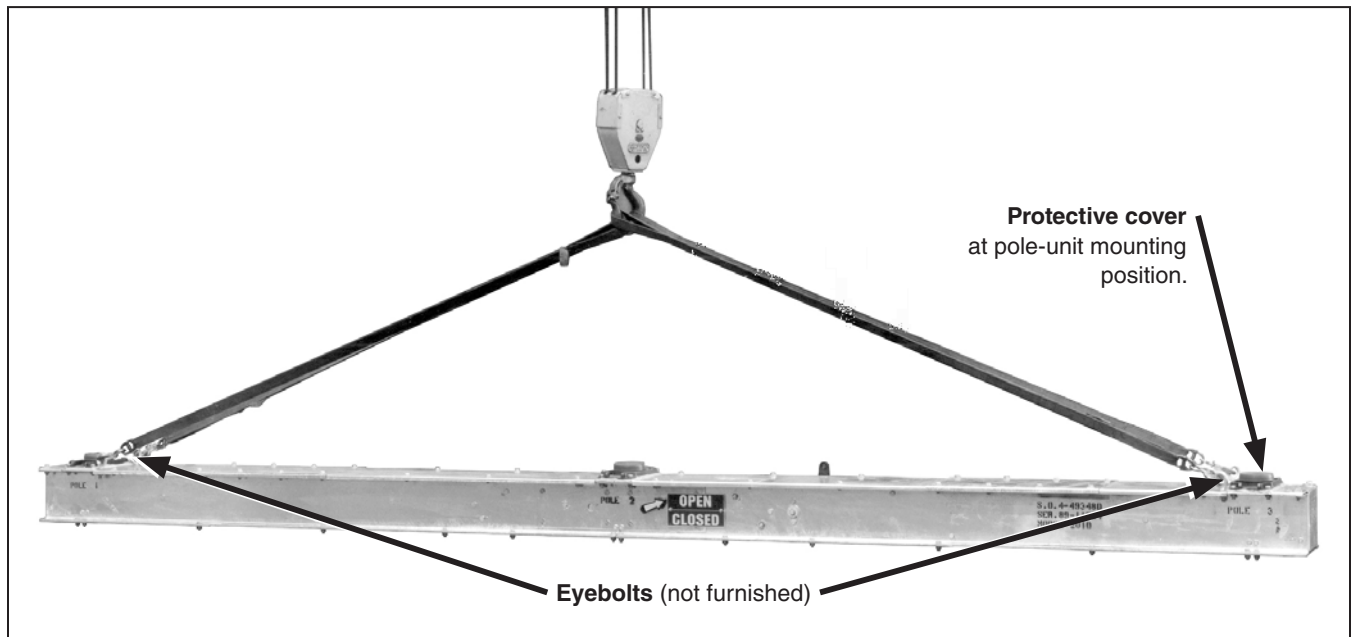


Figure 5. Hoisting the high-speed base.

Installation

Installing the Switch Operator

⚠ 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 can result.**

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 to the underside of the high-speed base. Remove the plates and place them and their hardware aside on a clean surface. See Figure 7.

Also remove the $\frac{3}{4}$ -inch stainless steel pin and cotter pin from the interphase drive shaft lever enclosed in the high-speed base. See Figure 8 and Figure 14 on page 21. Retain these pins for reuse in Step 1 on page 22.

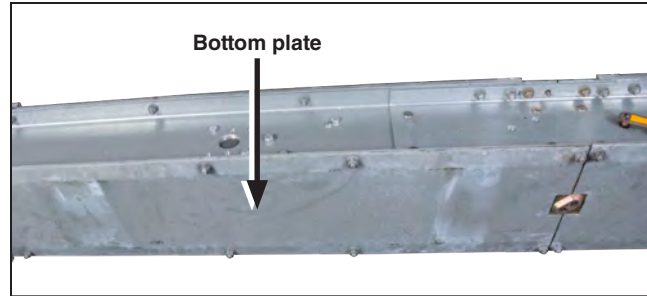


Figure 7. Remove bottom plates from high-speed base

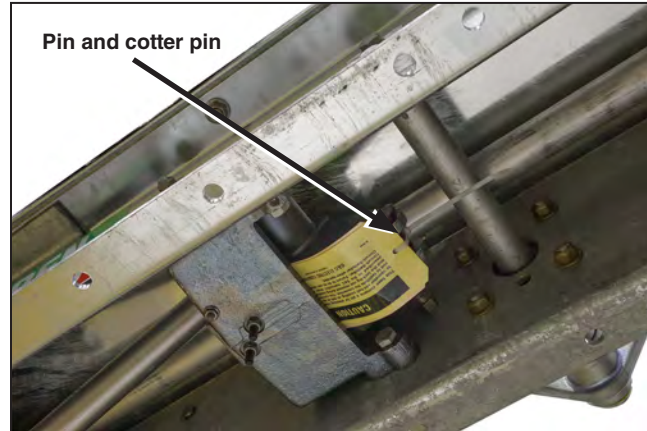


Figure 8. Remove the $\frac{3}{4}$ -inch stainless-steel pin and cotter pin from the interphase drive lever inside the high-speed base.

STEP 2. Wrap a lifting sling around the stored-energy housing of the operator, as shown in Figure 9 (left). Now, carefully raise the operator to the **Upright** position so it rests on its base skid, as shown in Figure 9 (right).

Remove the skid and bracing that runs the length of the operator, stored-energy housing, and operator support tube. Also, remove the protective cover atop the operator support tube and the protective covers on the operator enclosure louvers.

CAUTION

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

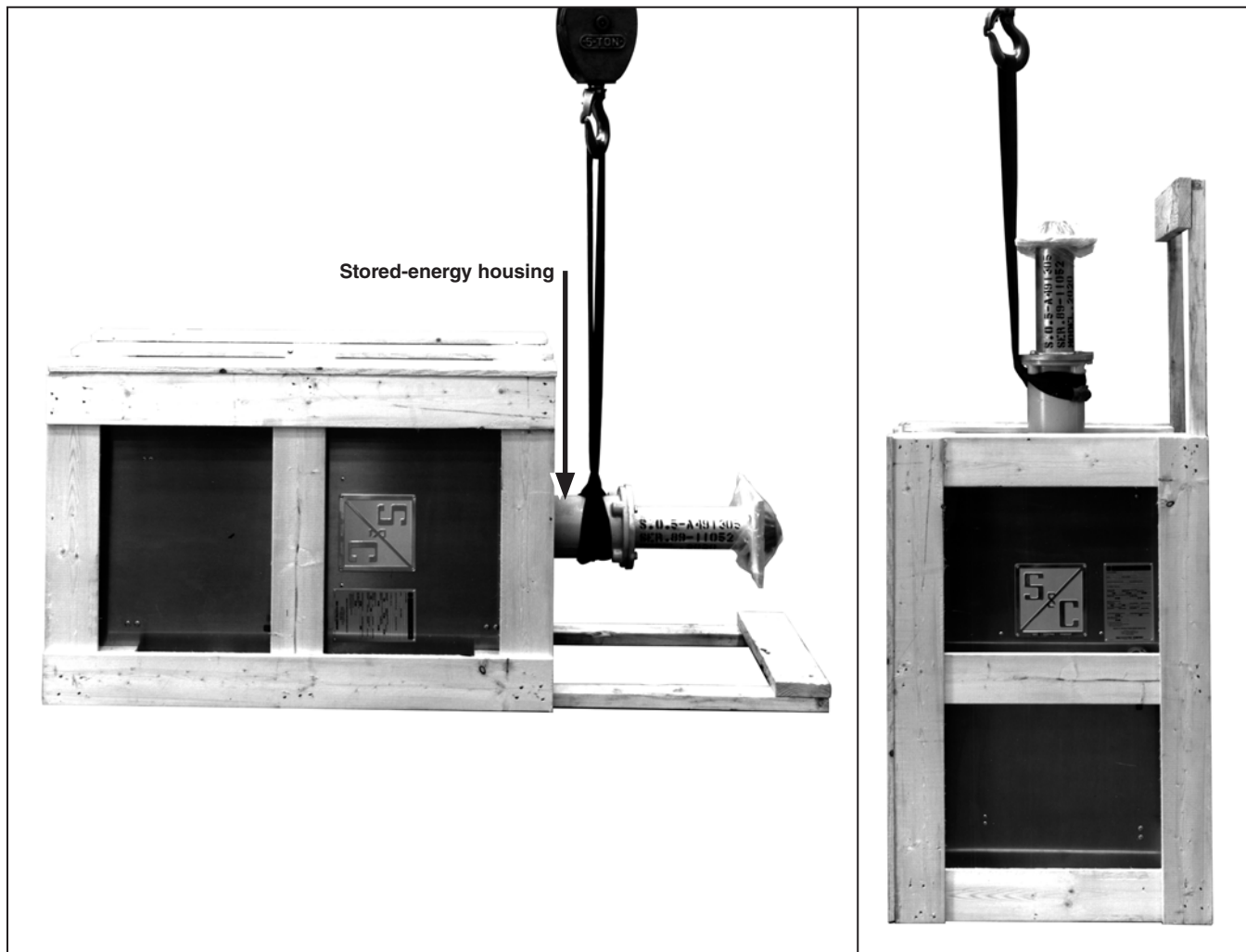


Figure 9. Raising the operator up on the base skid.

Installation

STEP 3. 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. Make sure the operator door faces the same way as the switch-position indicator on the high-speed base. Then, carefully 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.**

Attach the operator support tube mounting plate to the underside of the high-speed base using four $\frac{1}{2}$ — $13 \times 1\frac{1}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts. Tighten all four screws securely.

STEP 4. 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 furnished. Refer to the catalog drawing and Figure 10. Then, attach the operator support plate to the angle on the side of the operator enclosure and to the operator support angle on the mounting pedestal using four $\frac{1}{2}$ — $13 \times 1\frac{1}{2}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Securely tighten the screws. See Figure 1 on page 10 and Figure 10. On circuit-switchers using two or three mounting pedestals, insert the hole plugs furnished into all unused holes in the pedestals.

STEP 5. Attach the support arms● to the mounting pedestals, as shown on the catalog drawing, using $\frac{5}{8}$ — $11 \times 1\frac{1}{2}$ -inch hex-head galvanized steel cap screws and flat washers furnished. The screws should only be loosely attached at this time.

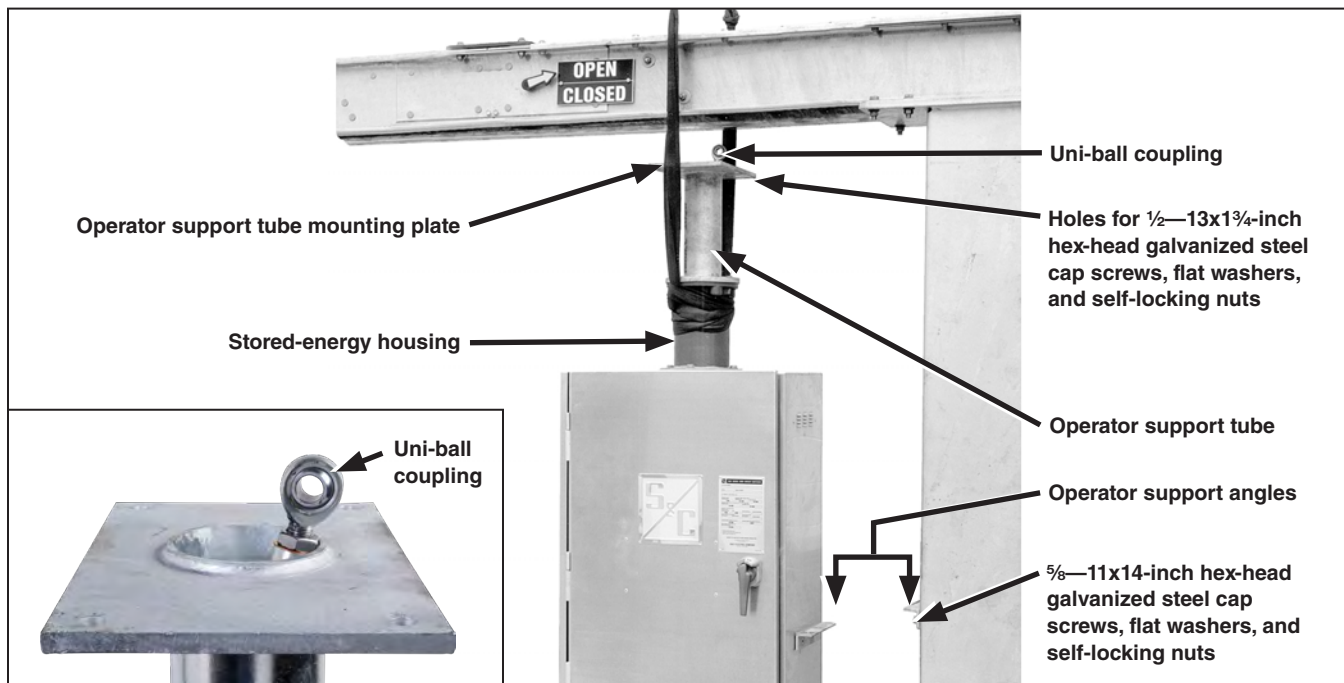


Figure 10. Hoisting the operator into position.

● A single support arm and support arm channel assembly are used on 69-kV circuit-switchers with 48-inch (122-cm) phase spacing for attachment at the interrupter end. A disconnect-end support arm angle also is furnished in lieu of a disconnect-end support arm channel assembly.

Installing the 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 which 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 eliminate water from being pumped in due to 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.**

STEP 1. For circuit-switchers rated 69 kV through 138 kV: Refer to the catalog drawing and attach the interrupter-end and disconnect-end support arm channel assemblies● to the support arms using clip angles, $\frac{1}{2}$ —13×1 $\frac{3}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished.

For circuit-switchers rated 161 kV and 230 kV: Refer to the catalog drawing and attach the interrupter-end and disconnect-end support arm channel assemblies to the support arms using clip angles, $\frac{1}{2}$ —13×1 $\frac{3}{4}$ -inch hex-head galvanized steel cap screws (at the outboard pole-units), $\frac{1}{2}$ —13×2-inch hex-head galvanized steel cap screws (at the center pole-unit), flat washers, and self-locking hex nuts furnished.

Level the support arm channel assemblies to the same elevation as the high-speed base and then tighten the associated cap screws securely. Now, securely tighten the $\frac{5}{8}$ —11×1 $\frac{1}{2}$ -inch hex-head galvanized steel cap screws that attach the support arms to the mounting pedestals. Torque the cap screws to 160 foot-pounds.

● A single support arm and support arm channel assembly are used on 69-kV circuit-switchers with 48-inch (122-cm) phase spacing for attachment at the interrupter end. A disconnect-end support arm angle also is furnished in lieu of a disconnect-end support arm channel assembly.

Installation

STEP 2. For circuit-switchers rated 69 kV through 138 kV: Attach four suitable lifting slings to the channel base of the pole-unit that will be mounted at the center of the high-speed base—marked “Pole 2”—as shown in Figure 11 (left). (“Pole 2” is positioned outboard on the shipping skid for ease in handling.)

For circuit-switchers rated 161 kV and 230 kV: Attach the lifting angles retained from the “Before Starting” section on page 11 to the channel base of the pole-unit that will be mounted at the center of the high-speed base, marked “Pole 2,” using $\frac{1}{2}$ —13×1 $\frac{3}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and hex nuts furnished. See Figure 11 (right). Securely tighten the cap screws. (“Pole 2” is positioned outboard on the shipping skid for ease in handling.) Then, attach four suitable lifting slings, 10 to 12 feet (305 to 366 cm) long for circuit-switchers rated 161 kV, and 12 to 14 feet (366 to 427 cm) long for circuit-switchers rated 230 kV) to the lifting angles.

- (a) Make sure the rigging does not stress the interrupter, transition box, or disconnect. Unbolt the base from the skid. Raise the pole-unit a few feet, and then remove the two $\frac{1}{2}$ —13×1 $\frac{3}{4}$ -inch hex-head galvanized steel cap screws, flat washers, and hex nuts that attach the shipping bracket to the bottom of the pole-unit channel base.

CAUTION

The insulated operating rod is under pressure. Removal of the shipping bracket can 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 to avoid injury.**

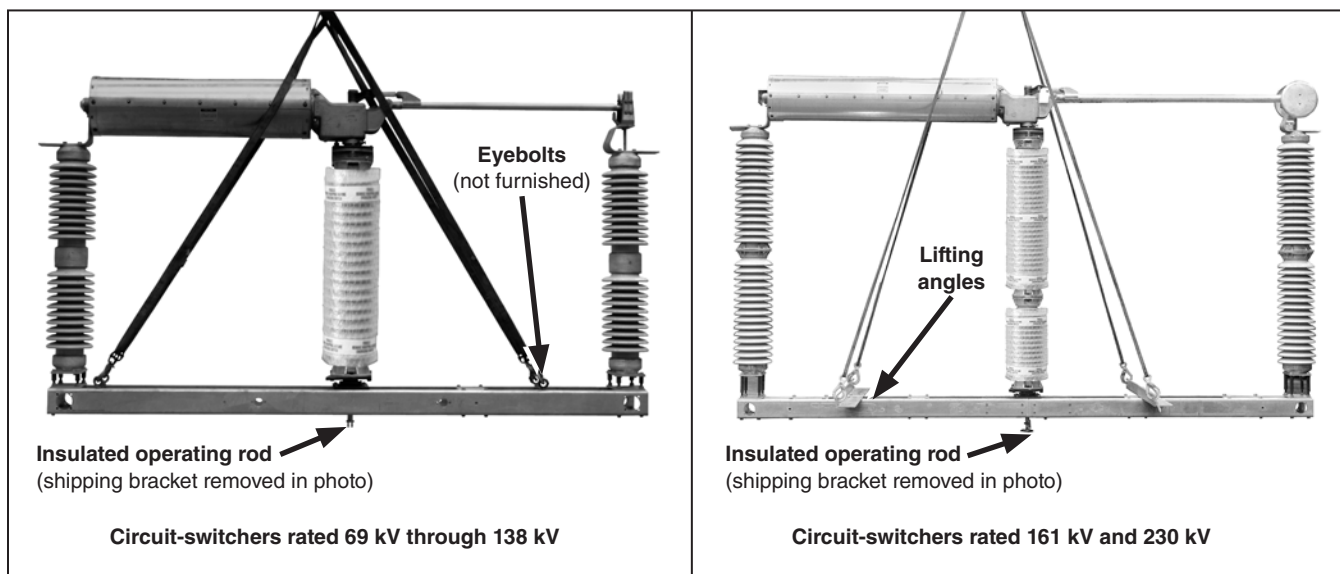


Figure 11. Hoisting the pole-unit.

- (b) Remove the ½-inch silicon-bronze pin and cotter pin from the insulated operating rod and retain these for re-use in Step 1(d) on page 21. Discard the shipping bracket and associated hardware.
- (c) Remove the protective cover on the high-speed base at the pole-unit mounting position. See Figure 5 on page 13. Now, 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.

 **WARNING**

Do not attempt to lift the pole-unit by the interrupter or disconnect to avoid causing damage or injury.

Attach the pole-unit channel base to the high-speed base using ½—13×1¾-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Securely tighten the cap screws.

- (d) Attach the pole-unit channel base to the interrupter-end support arm channel assembly.
- For circuit-switchers rated 69 kV through 138 kV:** Use ½—13×1½-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished.
- For circuit-switchers rated 161 kV and 230 kV:** Use ½—13×2-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished. Securely tighten the cap screws.

- (e) Attach the pole-unit channel base to the disconnect-end support arm channel assembly●.

For circuit-switchers rated 69 kV through 138 kV: Use ½—13×1½-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished.

For circuit-switchers rated 161 kV and 230 kV: Use ½—13×2-inch hex-head galvanized steel cap screws, flat washers, and self-locking hex nuts furnished.

- (f) Securely tighten the cap screws. Shims are furnished and should be installed 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 3. Repeat Step 2 on page 18 for the two outboard pole-units, marked “Pole 1” and “Pole 3.”

STEP 4. For 69-kV circuit-switchers with 48-inch (122-cm) phase spacing: Re-level the interrupter-end support arm channel assembly and disconnect-end support arm angle 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, interrupter-end support arm channel assembly, and disconnect-end support arm angle, and shift the pole-units to level the channel assembly and support arm angle. Then, securely tighten the cap screws.

● The disconnect-end support arm angle on 69-kV circuit-switchers with 48-inch (122-cm) phase spacing.

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

STEP 1. Prepare the insulated operating rod of each pole-unit for attachment to the interphase drive in the high-speed base as follows:

- (a) Remove the six $\frac{5}{16}$ —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. See Figure 12. Remove the cover and place it and the hardware on a clean surface.
- (b) Make sure the transition lever is in the **Open** position. The lever should be turned fully counterclockwise. See Figure 13. If the lever is not in the **Open** position, complete the following:

⚠ CAUTION

Keep fingers clear of the transition lever's travel. Injury to the fingers can result. The transition lever is under pressure and could quickly rotate counterclockwise.

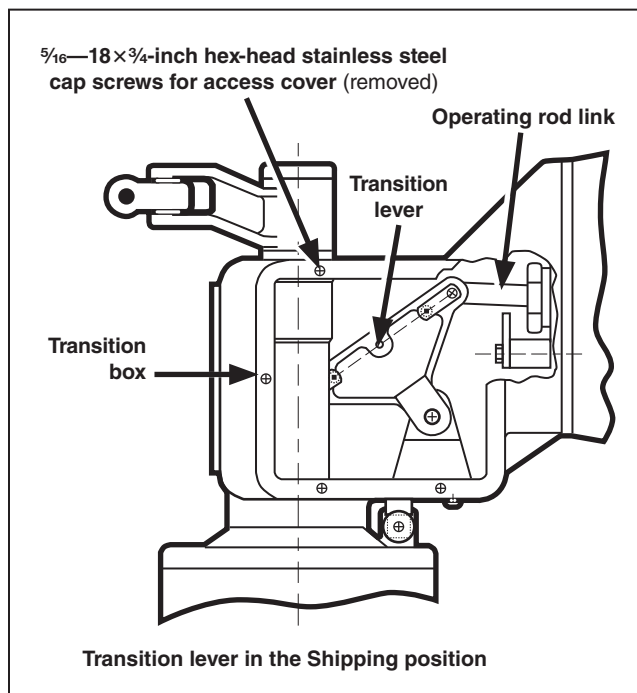


Figure 12. Preparing the insulated operating rod for attachment.

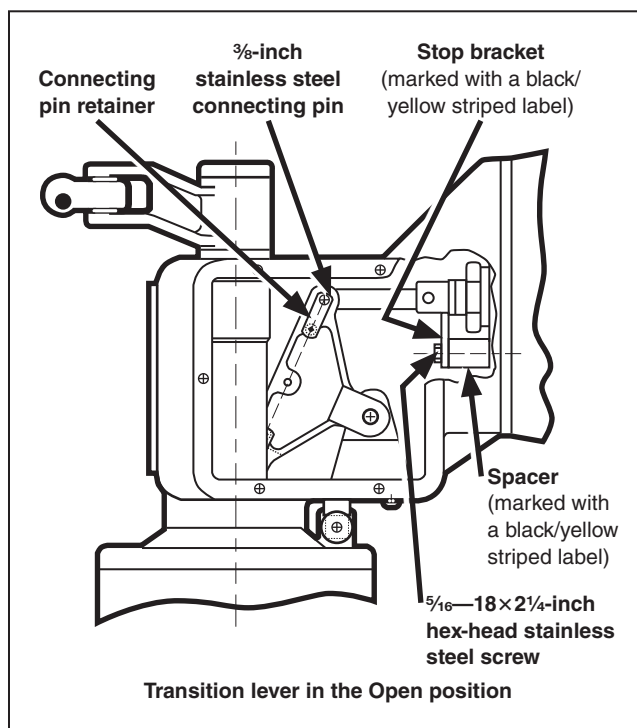


Figure 13. Preparing insulated operating rod for attachment.

Carefully turn the transition lever to the **Open** position. If the transition lever cannot be freely rotated to its fully **Counterclockwise** position, misalignment of the interphase drive is occurring in the high-speed base. Swing the insulated operating rod end links up, away from the interphase drive linkage lever, and again try rotating the transition lever to its fully **Counterclockwise** position. See Figure 14.

- (c) Remove the $\frac{3}{8}$ -inch stainless steel connecting pin used to attach the transition lever to the operating rod link. See Figure 13 on page 20. The pin is locked in place by a retainer; lift and turn the retainer to remove the pin. Keep the pin for re-use in Step 1(e).
- (d) 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 2(b) on page 18. See Figure 14. The insulated operating rod may be moved up or down, as required, to make the connection.
- (e) Replace the $\frac{3}{8}$ -inch stainless steel connecting pin retained from Step 1(c). See Figure 13 on page 20.

Note: It will be necessary to loosen the $\frac{5}{16}$ — $18 \times 2\frac{1}{4}$ -inch hex-head stainless steel screw indicated in Figure 13 on page 20 and withdraw it approximately $\frac{1}{8}$ -inch (3 mm) so the connecting pin can be inserted. Do not remove the screw at this time.

- (f) After the connecting pin has been inserted and locked in place by its retainer, remove and discard the $\frac{5}{16}$ — $18 \times 2\frac{1}{4}$ -inch hex-head stainless steel screw and stop bracket (marked with a black/yellow striped label) illustrated in Figure 13 on page 20.

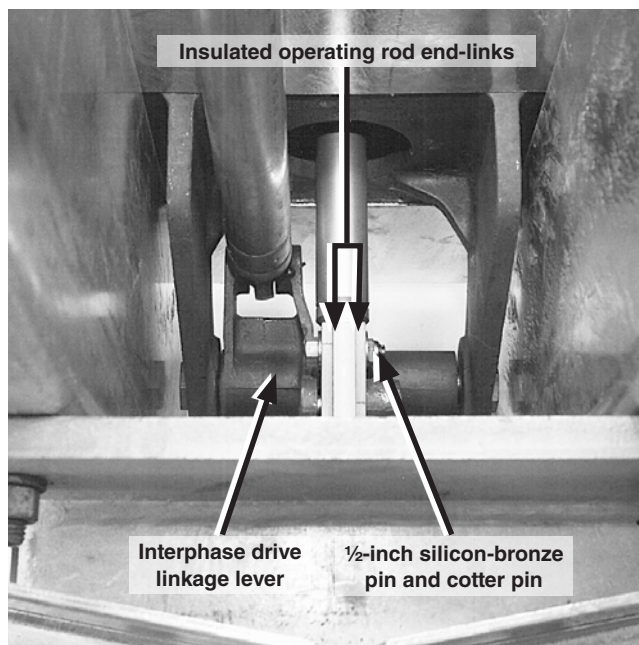


Figure 14. Attaching the insulated operating rod to the interphase drive.

Connecting the Operator 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 15. An adjustable locking rod (marked with a black/yellow striped label) is furnished, factory-connected to the interphase drive lever; turn the associated $\frac{1}{4}$ -inch—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 $\frac{1}{4}$ -inch—20 locknut that retains the adjustable locking rod. Then, remove and discard the adjustable locking rod and locknuts. See Figure 15.

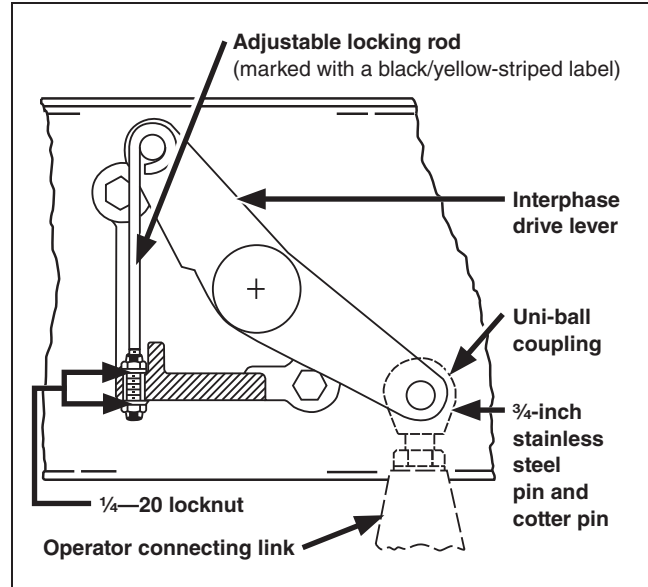


Figure 15. Attaching connecting link to interphase drive lever.

STEP 3. Make sure the insulating support column drive lever at each pole-unit is turned completely in the blade-closing direction. Connect the factory-adjusted interphase pipe assembly to the center pole-unit insulating support column drive lever using a 1/2-inch stainless steel pin, two galvanized steel spacers, and two stainless steel “X” washers. See Figure 16. Then, 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 then tighten the locknut. See Figure 16 and Figure 17.

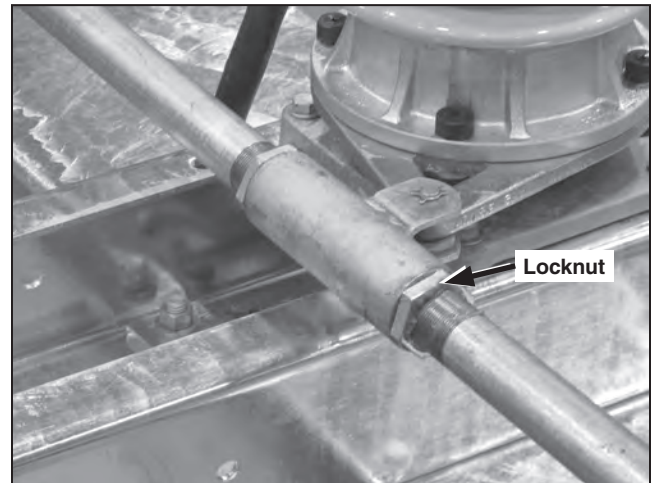


Figure 17. Locknut at adjustable coupling.

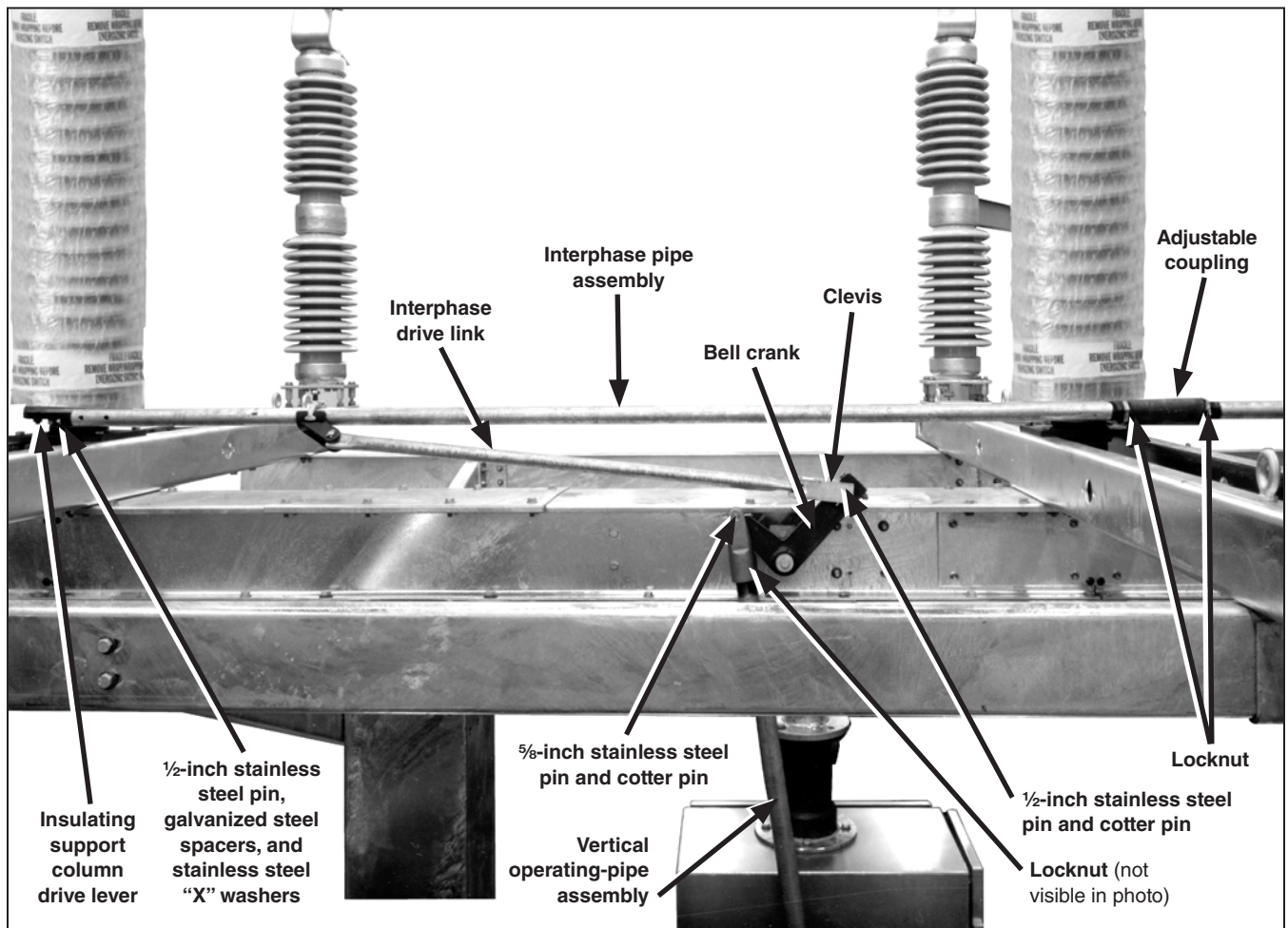


Figure 16. Connecting the interphase pipe assembly and vertical operating-pipe assembly. Attachment of the interphase drive link to the interphase pipe assembly is different on circuit-switchers rated 69 kV [with 48-inch (122-cm) phase spacing], 161 kV, and 230 kV; refer to the catalog drawing.

Installation

Verify at each outboard pole-unit insulating support column the clearance between the rotating-spindle closed-stop bolt and the bumper is $\frac{1}{16}$ -inch (2 mm) or less. See Figure 18 (left). (At the center pole-unit insulating support column, the closed-stop bolt must touch the bumper.)

If the clearance between the closed-stop bolt and the bumper exceeds $\frac{1}{16}$ -inch (2 mm) at either outboard pole-unit insulating support column: Remove the pin at the appropriate insulating support column drive lever, loosen the appropriate locknut at the adjustable coupling, and rotate the affected interphase pipe section so the aforementioned clearance is attained. Then, replace the pin and tighten the locknut. See Figure 16 on page 23. Do not adjust the closed-stop bolts.

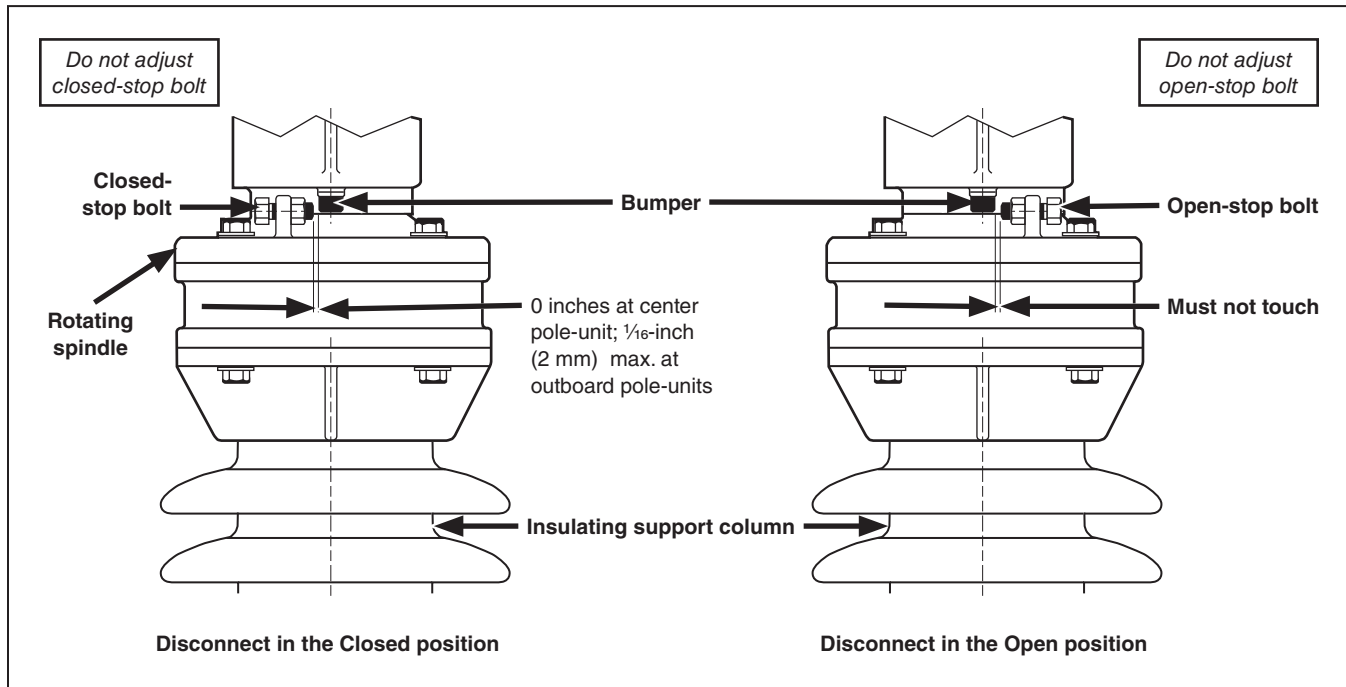


Figure 18. Clearances at closed and open stops.

STEP 4. Attach the clevis end of the interphase drive link to the longer of the bell-crank arms on the high-speed base using a 1/2-inch stainless steel pin and the cotter pin furnished. See Figure 16 on page 23.

STEP 5. 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 5/8-inch stainless steel pin and the stainless steel “X” washer furnished. See Figure 19 and Figure 20. Then, 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 a 5/8-inch stainless steel pin and cotter pin furnished. See Figure 16 on page 23.

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. Then, tighten the locknuts.

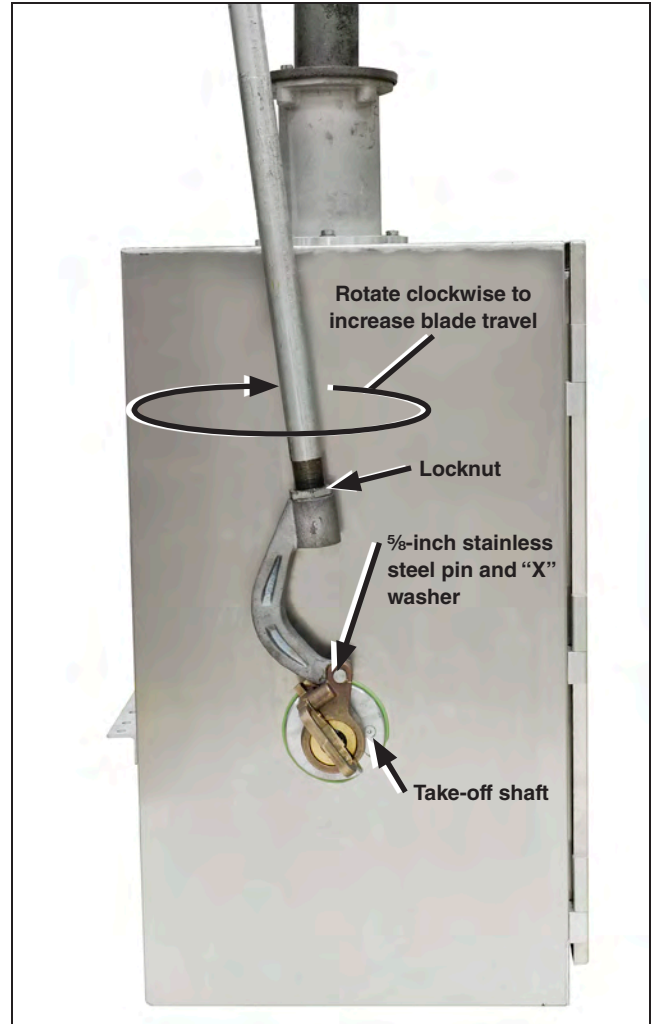


Figure 19. Rear of switch operator.

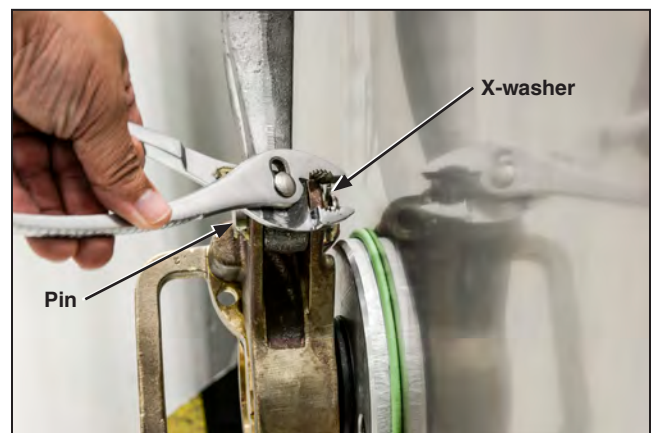


Figure 20. The “C”-shaped clevis on rear of operator connects the vertical operating pipe to the back of the operator using a 5/8-inch steel pin and X-washer.

Installation

STEP 6. Use the manual charging handle furnished with the operator to check the functioning of the low-speed power train, as follows. Refer to Figure 33 on page 36.

- (a) Open the access shutter and place the manual charging handle on the manual charging shaft.
- (b) Rotate the shaft, clockwise only, just to the point at which the disconnect-blade tongue contacts clear their respective jaw-contact fingers. See Figure 21.

With the disconnect blades maintained in the position shown in Figure 21, check each blade to verify its centerline has not shifted left or right by more than $\frac{1}{4}$ -inch (6 mm)—as measured to the centerline of its respective jaw contact. If any blade centerline has shifted by more than $\frac{1}{4}$ -inch (6 mm), loosen the leveling-screw locknuts located under the associated jaw-contact support insulator. See Figure 22.

Adjust the locknuts as necessary to shift the jaw-contact centerline to correspond to that of the blade centerline, $\pm\frac{1}{4}$ -inch (6 mm). Then, tighten the locknuts.

Note: To avoid changing the effective height of the support insulator, do not adjust more than three of the four sets of locknuts.

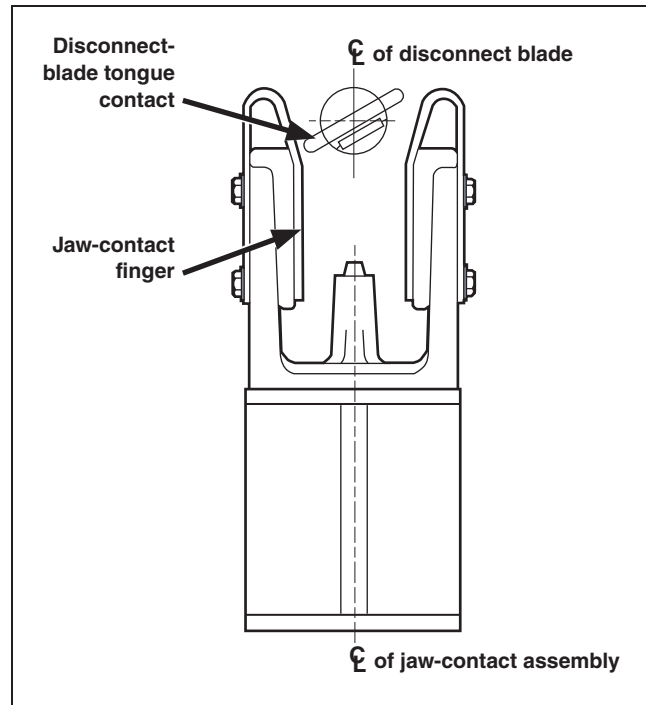


Figure 21. Checking the alignment of the disconnect blade and the jaw contact.

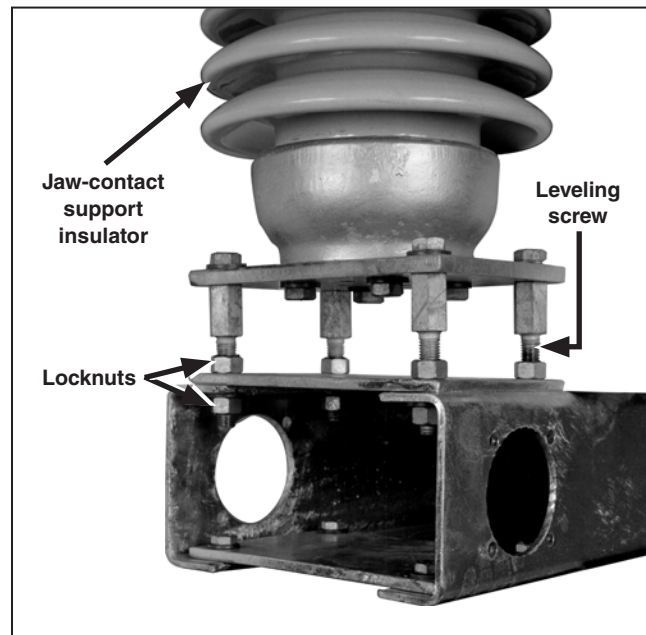


Figure 22. Adjusting the leveling-screw locknuts.

- (c) Continue to rotate the shaft, clockwise only, until feeling a firm resistance. At this point, the disconnect blades should be open past 90 degrees.

If the disconnect blades are not open past 90 degrees: 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. Then, tighten the locknuts.

Now, verify at each pole-unit insulating support column the rotating-spindle open-stop bolt does not touch the bumper. See Figure 18 on page 24 (right).

If any open-stop bolt does touch the bumper: Loosen the locknuts at the top and bottom of the vertical operating pipe and rotate the pipe counterclockwise (as viewed from the top) to decrease blade travel. Then, tighten the locknuts. Do not adjust the open-stop bolts.

- (d) Remove the manual charging handle from the manual charging shaft.

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.**

- STEP 1.** Attach the high-voltage conductors to their respective circuit-switcher terminal pads using flexible-conductor connections. Observe the terminal-pad loading limits specified on the catalog drawing. Use the following procedure for attaching the conductors:
- (a) 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.

- (b) Wire-brush each terminal pad and apply a coating of Penetrox A. Then, bolt the connectors to the terminal pads.
- (c) Prepare the conductors using established procedures and clamp them in their respective connectors.

Removing the Interrupter Containers

- STEP 1.** Remove the container from each interrupter as follows:
- (a) Remove and discard the $\frac{3}{8}$ -16 zinc-plated serrated hex nuts that run the length of the container.
- (b) Remove and discard the $\frac{3}{8}$ -16 $\times\frac{7}{8}$ -inch and two $\frac{3}{8}$ -16 \times 1-inch zinc-plated hex-head cap screws and flat washers that attach the upper container half to the coupling end casting of the interrupter. Also, remove and discard the $\frac{3}{8}$ -16 $\times\frac{7}{8}$ -inch and two $\frac{3}{8}$ -16 \times 1-inch zinc-plated hex-head cap screws and flat washers that attach the upper container half to the indicator-end casting of the interrupter.
- (c) Pry the container halves apart with a flat-head screwdriver or other sturdy pry tool. The upper container half can now be removed and discarded. Slotted holes are provided so a rope or lifting sling can be attached and the container half more safely lowered to the ground.
- (d) Remove and discard the $\frac{3}{8}$ -16 $\times\frac{7}{8}$ -inch hex-head cap screw and flat washer that attach the lower container half to the coupling-end casting of the interrupter and the $\frac{3}{8}$ -16 $\times\frac{7}{8}$ -inch hex-head cap screw and flat washer that attach the lower container half to the indicator-end casting of the interrupter. Then, discard this container half.
- (e) Remove and discard the foam-core inner liner wrapped around the interrupter.
- (f) Remove the shield for the pressure-relief device.
- STEP 2.** Remove and discard the wrappers from each insulating support column.

Installation

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 approved by both the user and S&C Electric Company.

Do not apply control voltage to the operator at this time. Unexpected operation of the circuit-switcher can occur, resulting in equipment damage or personal injury.

Become familiar with the parts of the switch operator as shown in Figure 24 on page 29 and Figure 25 on page 30.

STEP 1. Perform the following set-up procedure on the operator.

- (a) To avoid accidentally energizing the operator after the external connections have been completed, open the control power KNIFE switch, and then 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. See Figure 23.
- (b) Mark the conduit-entrance location for the control-circuit wiring on the conduit entrance plate in the bottom of the operator enclosure. Then, remove the plate and cut out the necessary opening.

Apply the sealing compound furnished, replace the plate, and make up 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.**

- (c) 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 correct polarity on dc control-voltage models.

NOTICE

Trip-circuit 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.

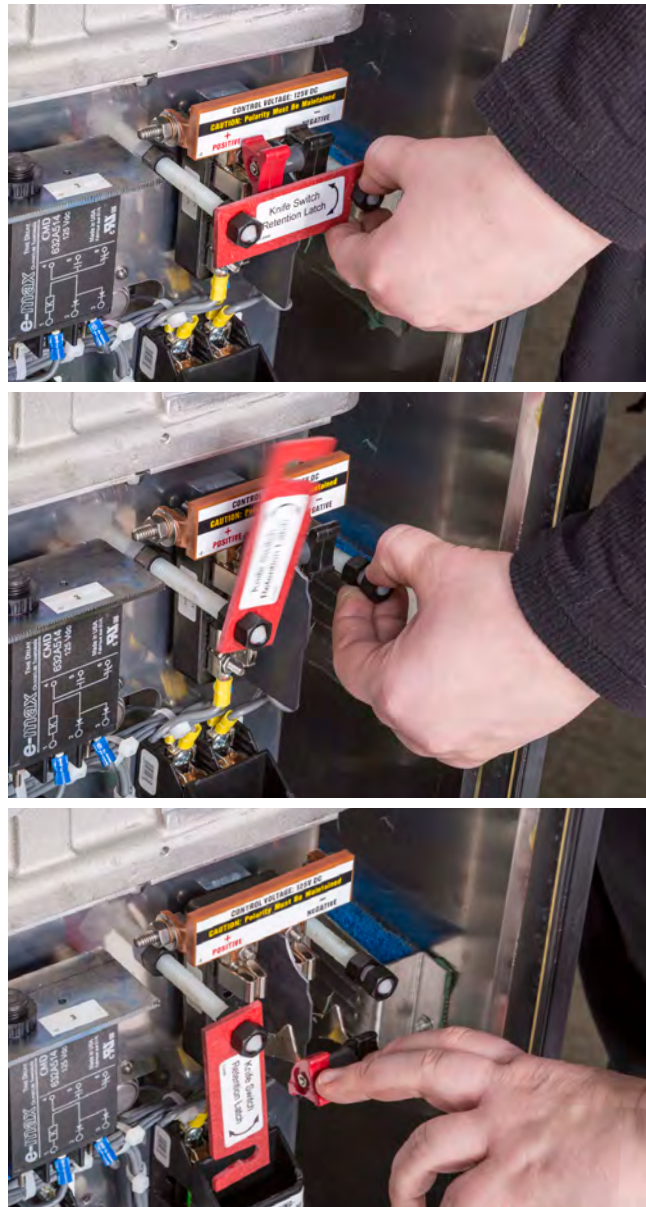


Figure 23. KNIFE switch retainer and KNIFE switch.

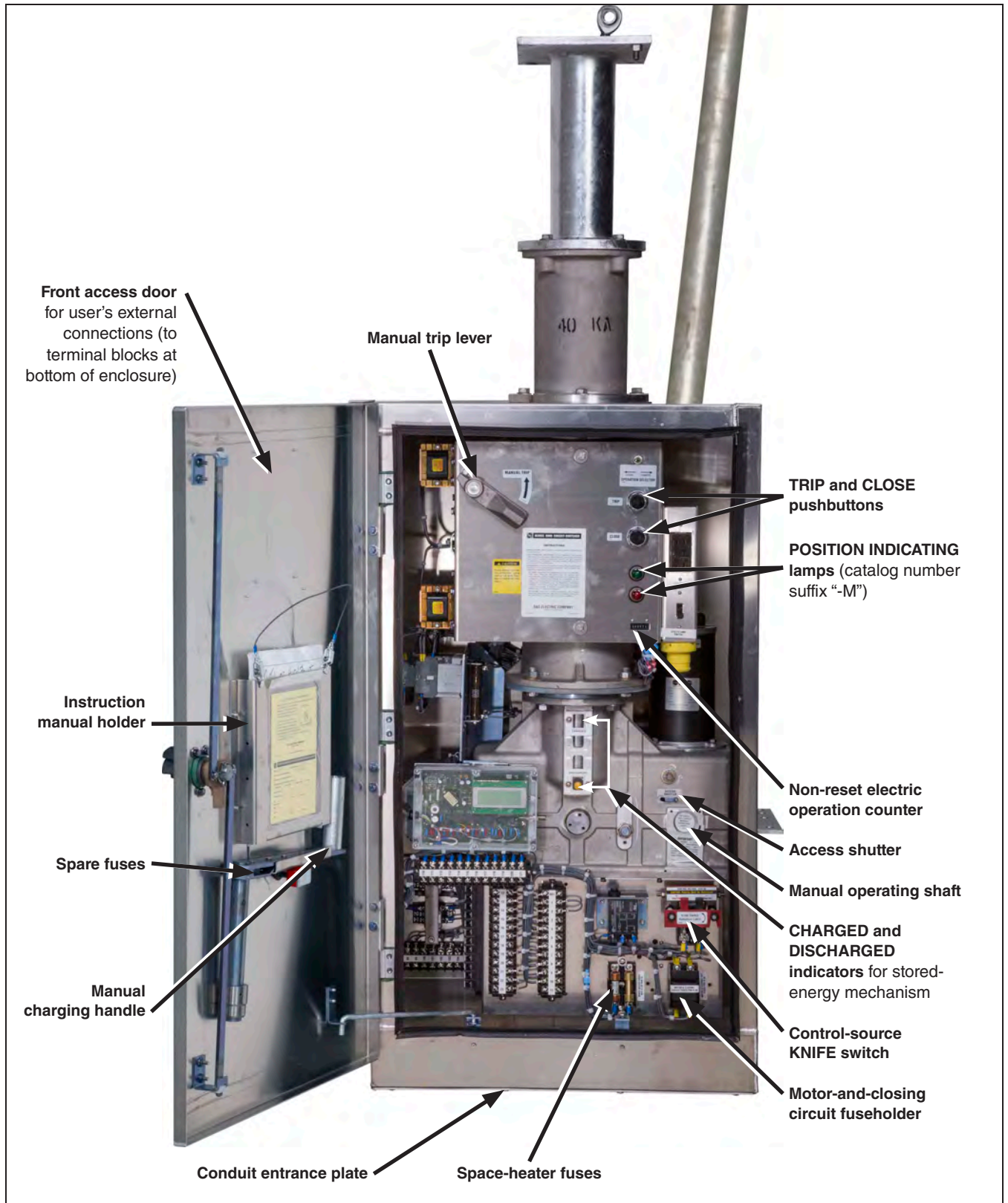


Figure 24. Interior of the Series 2000 Switch Operator.

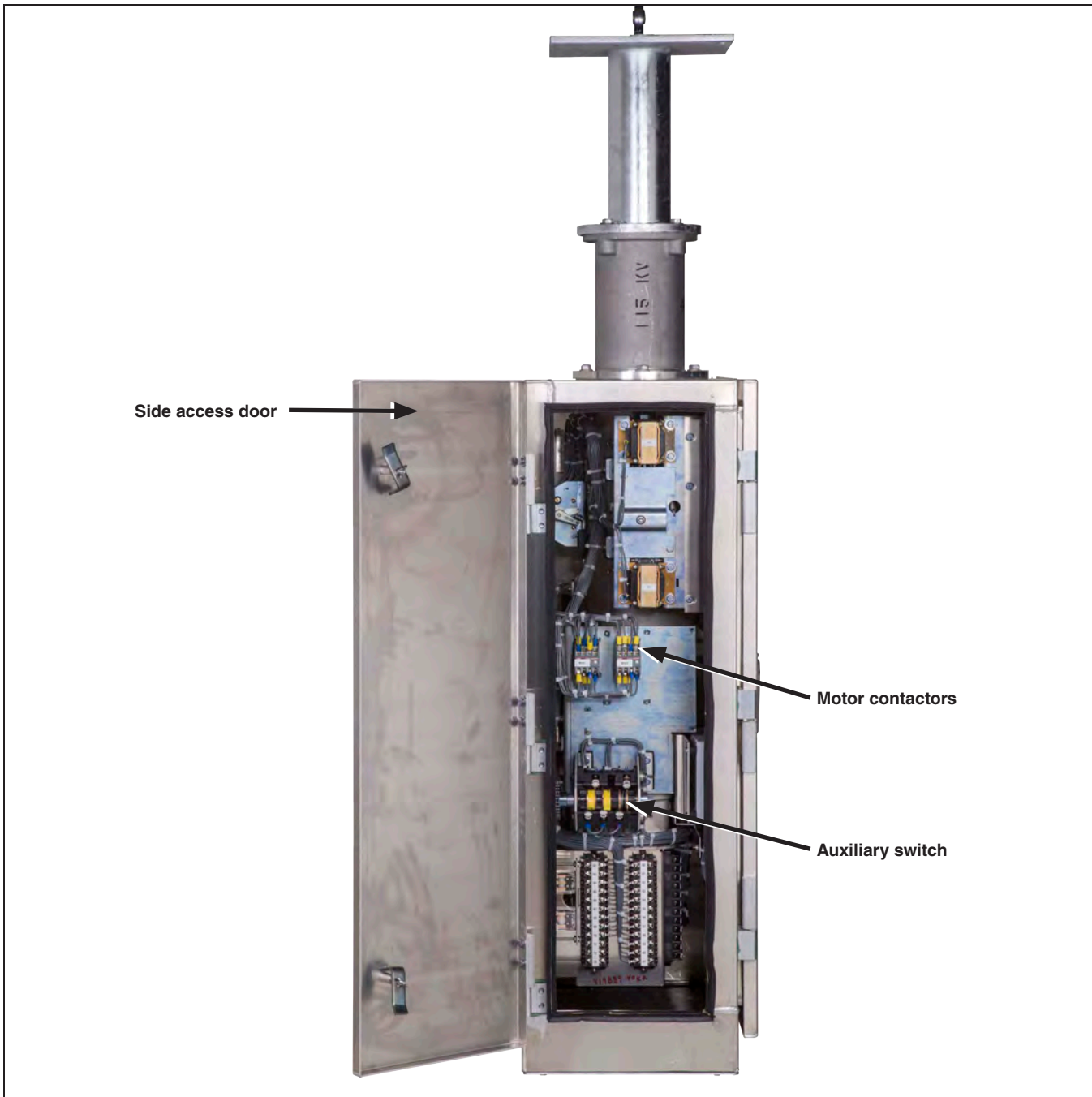


Figure 25. Series 2000 Switch Operator side-access panel.

STEP 2. Perform final checkout as described below:

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

- (a) At each transition box:
- The interrupter stop bracket and spacer have been removed. See Figure 12 on page 20 and Figure 26.
 - The transition lever has been connected to the operating rod link. See Figure 13 on page 20.
 - When the optional remote gas-density monitor is present (catalog number suffix “-R”) make sure the connections are made according to S&C Instruction Sheet 716-530.

- (b) In the high-speed base:
- Each insulated operating rod has been connected to the interphase drive. See Figure 14 on page 21.
 - The interphase drive lever has been connected to the operator uni-ball coupling. See Figure 15 on page 22.
 - The adjustable locking rod attached to the interphase drive lever has been removed. See Figure 15 on page 22 and Figure 26.
 - All other pinned connections have been made and all bolted connections have been securely tightened.

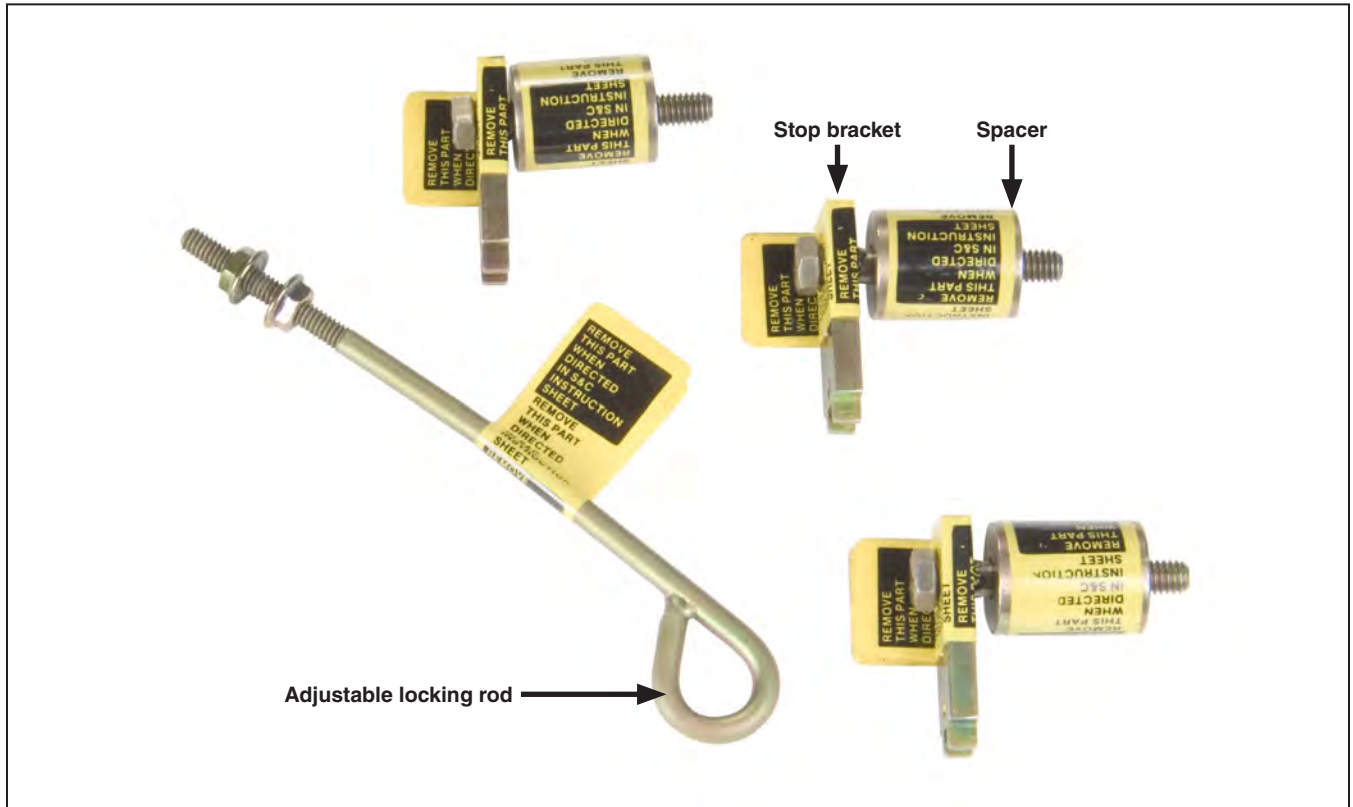


Figure 26. Check the transition box and high-speed base for these shipping parts.

Installation

(c) At the operator:

- Check the open and close motor contactors and surge suppressor to ensure all electrical connections are secure and that all contactors and surge suppressors are fully-seated in their mounts. See Figure 27.
- Correct polarity has been observed on dc-control-voltage models.
- That any optional “ice cube” style relays (used for catalog option “-P” and “-T2”) are fully seated. See Figure 28.

STEP 3. 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 4. 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.

For circuit-switchers rated 161 kV and 230 kV: Attach the six $13 \times 3\frac{1}{4}$ -inch adjustment plates to the underside of the high-speed base. These plates are used to cover small gaps between the bottom plates, the operator support tube mounting plate, and the mounting pedestals.

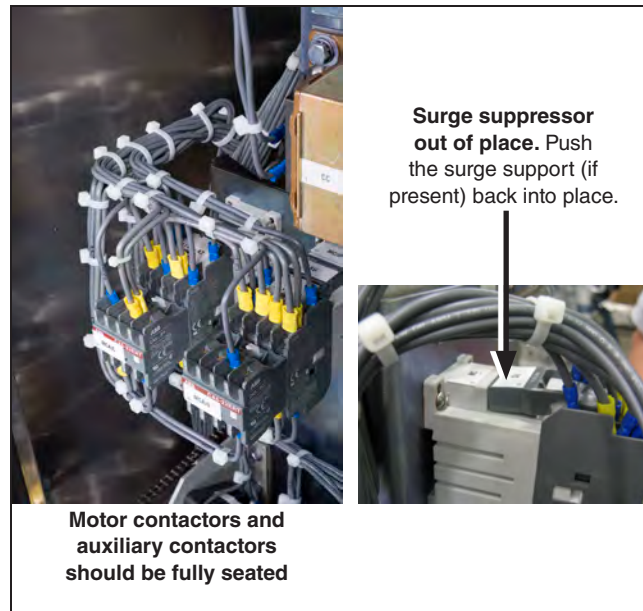


Figure 27. Check the open and close motor contactors, auxiliary contact blocks, and surge suppressors behind the operator side panel.

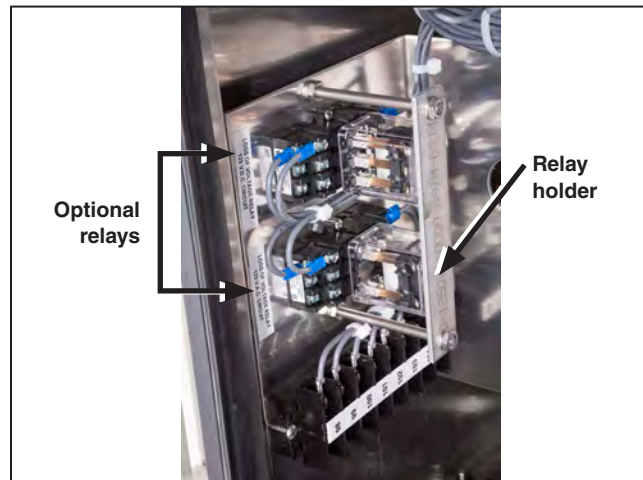


Figure 28. Ice cube-style relays and relay holder.

STEP 5. Insert the motor-and-closing circuit fuse holder. Then, close the control-source disconnect KNIFE switch. See Figure 29.

STEP 6. Press the CLOSE● button. 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 spring. This action closes the interrupters. The switch-position indicator on the high-speed base will move to the **Closed** position. Further, if the POSITION-INDICATING lamp option has been specified, the red lamp will light.

STEP 7. Verify at the center pole-unit insulating support column the rotating-spindle closed-stop bolt touches the bumper. See the left image in Figure 18 on page 24.

If the closed-stop bolt is not touching the bumper: Loosen the locknuts at the top and bottom of the vertical operating pipe and turn the pipe counterclockwise (as viewed from the top) to increase blade travel. Then, tighten the locknuts. Do not adjust the closed-stop bolt.

STEP 8. Verify at each outboard pole-unit insulating support column the clearance between the rotating-spindle closed-stop bolt and the bumper does not exceed $\frac{1}{16}$ -inch (2 mm). See the left image in Figure 18 on page 24.

If the clearance between the closed-stop bolt and the bumper exceeds $\frac{1}{16}$ -inch (2 mm) at either outboard pole-unit insulating support column: Remove the pin at the appropriate insulating support column drive lever, loosen the appropriate locknut at the adjustable coupling, and rotate the affected interphase pipe section so the aforementioned clearance is obtained. Then, replace the pin and tighten the locknut. See Figure 16 on page 23. Do not adjust the closed-stop bolts.

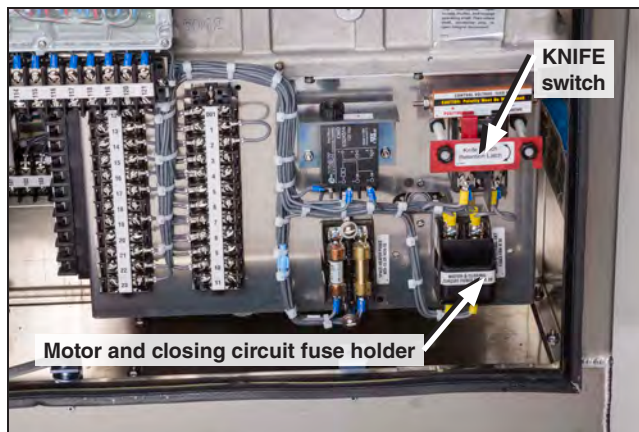


Figure 29. The motor and closing circuit fuse holders and the control source knife switch.

● TRIP and CLOSE buttons 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.

Installation

STEP 9. 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. This practice is recommended for increased reliability because low-voltage fuses can be damaged by the repeated inrush current experienced during normal circuit-switcher opening and closing operations and can thus 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 by using fuses or circuit breakers located at the battery bus.

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 by a cam. The cams are individually adjustable in 4.5-degree increments. Adjustment of the cams is accomplished as follows:

- STEP 1.** Push the cam toward its adjacent spring until the cam is separated from the teeth of the inner gear. See Figure 30.
- STEP 2.** Rotate the cam to advance or lessen engagement with its roller.
- STEP 3.** Release the cam, making sure the teeth are in mesh with the inner gear.

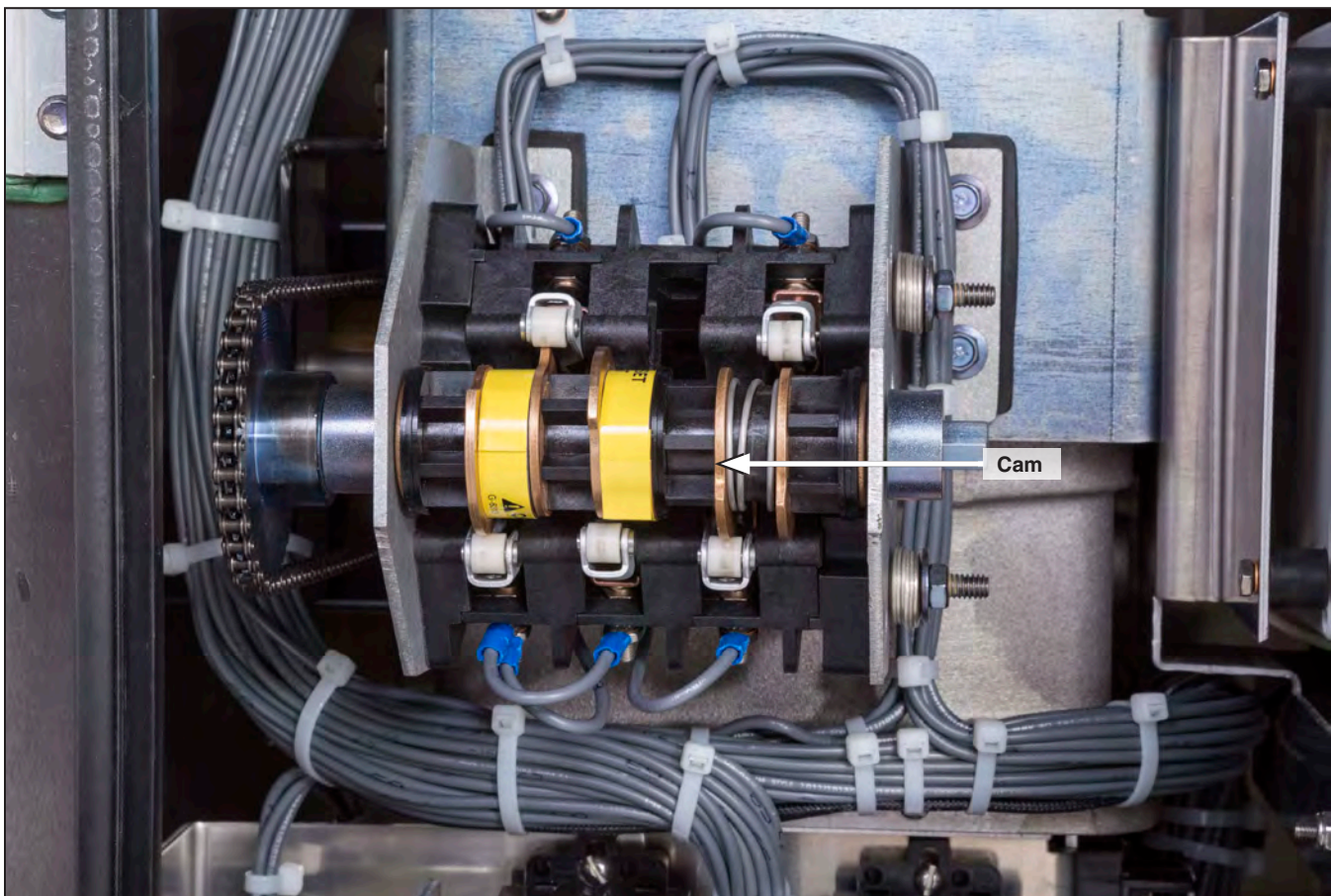


Figure 30. Adjusting cams on the auxiliary switch.

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 10 seconds for Model 2010 Circuit-Switchers rated 69-kV through 138-kV and 16 seconds for circuit-switchers rated 161 kV and 230 kV.

Electrical Operation

Refer to Figure 31 and Figure 32. **To open the circuit-switcher:** Press the TRIP button. The opening latch in the stored-energy mechanism will release, discharging the opening spring. This action trips the interrupters and forces the opening and closing pistons in the mechanism downward, as denoted by movement of the STORED ENERGY indicator to the **Discharged** window.

The switch-position indicator on the high-speed base will move to the **Open** position. Further, if the POSITION-INDICATING lamp option (catalog number suffix “-M”) has been specified, the green lamp will light.

The motor-driven cam in the stored-energy mechanism will immediately start rising, thereby charging both the opening and closing springs. When the opening spring latches, the STORED ENERGY indicator will again be visible at 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.

To close the circuit-switcher: Press the CLOSE button. 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 spring. This action closes the interrupters.



Figure 31. Switch-position indicator in the OPEN position. Switch-position indicator in the CLOSED position.

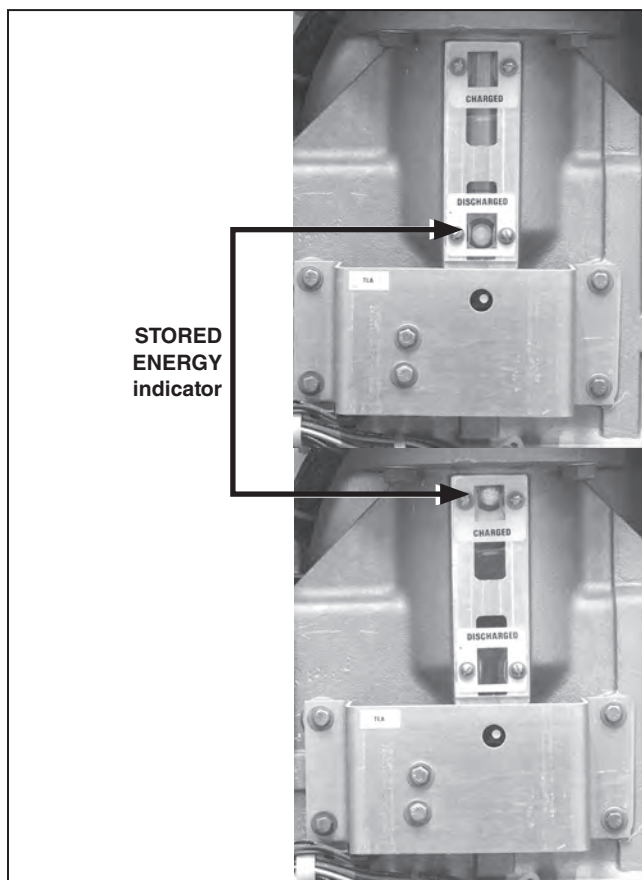


Figure 32. The STORED ENERGY indicator.

● TRIP and CLOSE buttons are not included on operators specified with catalog number suffix “-J.” Refer to the “Manual Operation” section on page 36.

Operation

The switch-position indicator on the high-speed base will move to the **Closed** position. Further, 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 such operations because control schemes vary with different installations. With any given installation, however, it may be possible and desirable to effect such operation.

Manual Operation

Refer to Figure 24 on page 29. **To trip the circuit-switchers:** Push the MANUAL TRIP lever counterclockwise. The opening latch in the stored-energy mechanism will release, discharging the opening spring.

This action trips the interrupters and forces the opening and closing pistons in the mechanism downward, as denoted by movement of the indicator to the “DISCHARGED” window. The switch-position indicator on the high-speed base will move to the **Open** position. Further, if the POSITION INDICATING lamp option has been specified—and operator control voltage is available—the green lamp will light.

The motor-driven cam in the stored-energy mechanism will immediately start rising, if operator control voltage is available, thereby charging both the opening and closing springs. When the opening spring latches, the indicator will again be visible at 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.

If operator control voltage is not available, 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, when control voltage returns.

If desired, the opening and closing springs can be charged and the disconnect opened after the interrupters have been tripped using the manual charging handle furnished. See Figure 33. Use the following procedure:

- 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.

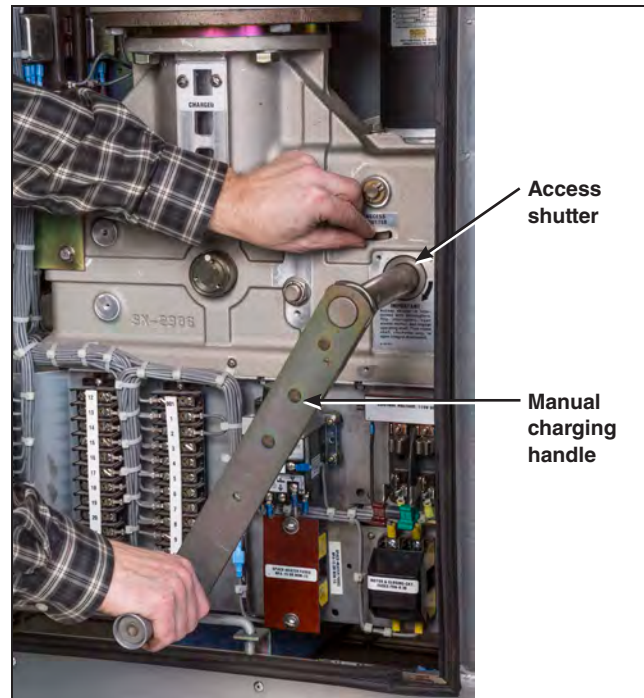


Figure 33. Using the manual charging handle to recharge the opening and closing springs and the open disconnect.

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 interrupters to be tripped and closed for inspection purposes.

To decouple: Open the circuit-switcher electronically or manually. Then, disengage the decoupling handle on the rear of the operator by pivoting it outward. See Figure 34. The disconnect-blade power train may now be padlocked open. In addition, the interrupters may now be closed and re-tripped as desired, either electronically or manually.

To recouple: Open the circuit-switcher electronically or manually. Then, engage the decoupling handle on the rear of the operator by pivoting it inward. See Figure 34. The disconnect-blade power train may now be padlocked coupled.

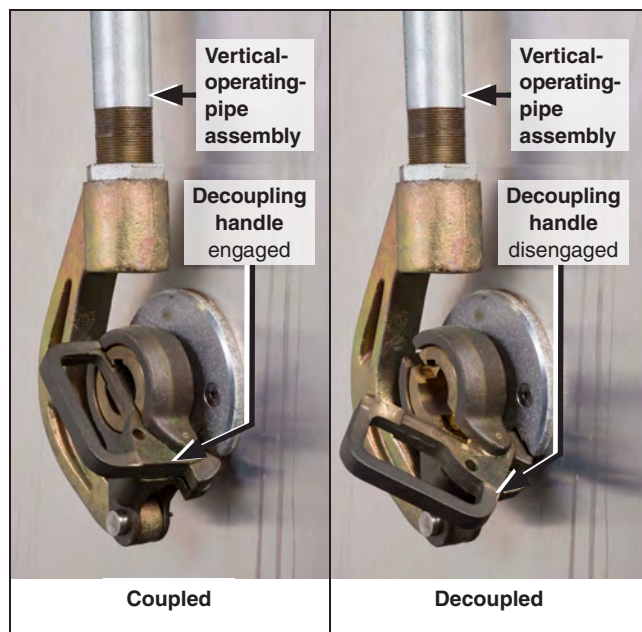


Figure 34. Decoupling the disconnect-blade power train.

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 35 illustrates a gas-pressure indicator with acceptable gas pressure.

Figure 36 illustrates a gas-pressure indicator with a red target indicator, 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.

- **Level 1 Alarm** indicates an interrupter is leaking. The Circuit-Switcher can still be operated, but the leaking interrupter should be replaced promptly.
- **Level 2 Alarm** indicates an interrupter has lost enough SF₆ gas that it can no longer clear faults properly.
- **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.

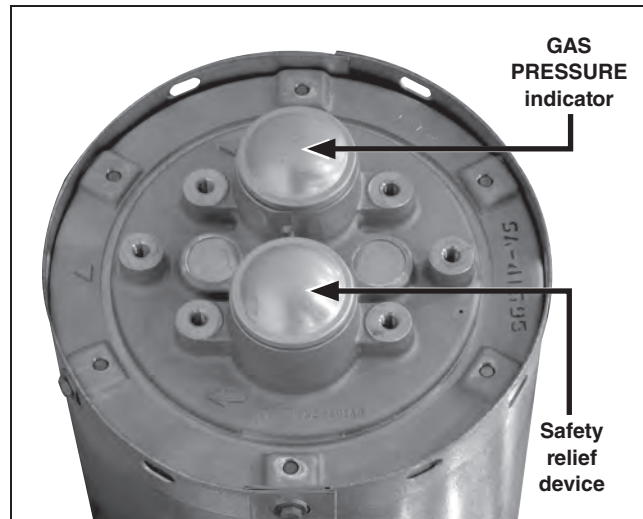


Figure 35. Normal gas-pressure indicator and safety relief device.

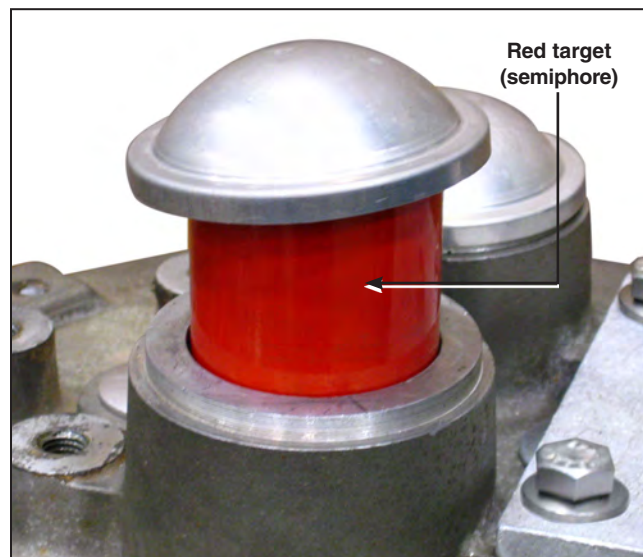


Figure 36. The visible red target gas pressure indicator.

Inspection Recommendations

To ensure the Series 2000 Circuit-Switcher'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.