

# Operation

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# Introduction

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## 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 the source-transfer PMH Pad-Mounted Gear. Become familiar with the Safety Information on pages 4 through 6 and Safety Precautions on pages 7 through 8. The latest version of this publication is available online in PDF format at [sandc.com/en/contact-us/product-literature/](http://sandc.com/en/contact-us/product-literature/).

## Retain this Instruction Sheet

This instruction sheet is a permanent part of the source-transfer PMH Pad-Mounted Gear. 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 source-transfer PMH Pad-Mounted Gear are listed in the ratings table in Specification Bulletin 663A-31. Ratings for this gear are listed on the ratings label on the interior of the doors (right-hand door only for double door models.)

**Warranty**

The warranty and/or obligations described in S&C's Price Sheet 150, "Standard Conditions of Sale—Immediate Purchasers in the United States," (or Price Sheet 153, "Standard Conditions of Sale—Immediate Purchasers Outside the United States"), plus any special warranty provisions, as set forth in the applicable product-line specification bulletin, are exclusive. The remedies provided in the former for breach of these warranties shall constitute the immediate purchaser's or end user's exclusive remedy and a fulfillment of the seller's entire liability. In no event shall the seller's liability to the immediate purchaser or end user exceed the price of the specific product that gives rise to the immediate purchaser's or end user's claim. All other warranties, whether express or implied or arising by operation of law, course of dealing, usage of trade or otherwise, are excluded. The only warranties are those stated in Price Sheet 150 (or Price Sheet 153), and THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY EXPRESS WARRANTY OR OTHER OBLIGATION PROVIDED IN PRICE SHEET 150 (OR PRICE SHEET 153) IS GRANTED ONLY TO THE IMMEDIATE PURCHASER AND END USER, AS DEFINED THEREIN. OTHER THAN AN END USER, NO REMOTE PURCHASER MAY RELY ON ANY AFFIRMATION OF FACT OR PROMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150 (OR PRICE SHEET 153).

**Warranty  
Qualifications**

The standard warranty does not apply to source-transfer PMH Pad-Mounted Gear where fuse units, fuse unit end-fittings, holders, refill units, or switch blades of other than S&C manufacture are used in conjunction with S&C SML Mountings. Nor does it apply to source-transfer PMH Pad-Mounted Gear where other than Fault Fiter Electronic Power Fuses, S&C Switch Blades, or where current-limiting fuses are used other than as set forth in Table 1 of S&C Information Bulletin 660-50, or when current-limiting fuses are applied other than as set forth in the "Recommended Voltage Ratings" section of S&C Information Bulletin 660-50.

The seller's standard warranty does not apply to major components not of S&C manufacture, such as remote terminal units and communication devices, including hardware, software, resolution of protocol-related matters, and notification of upgrades or fixes for those devices.

## Safety Information

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### 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](http://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 the source-transfer PMH Pad-Mounted Gear.

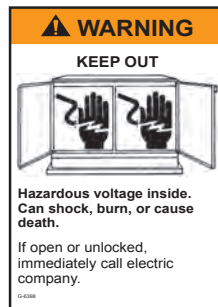
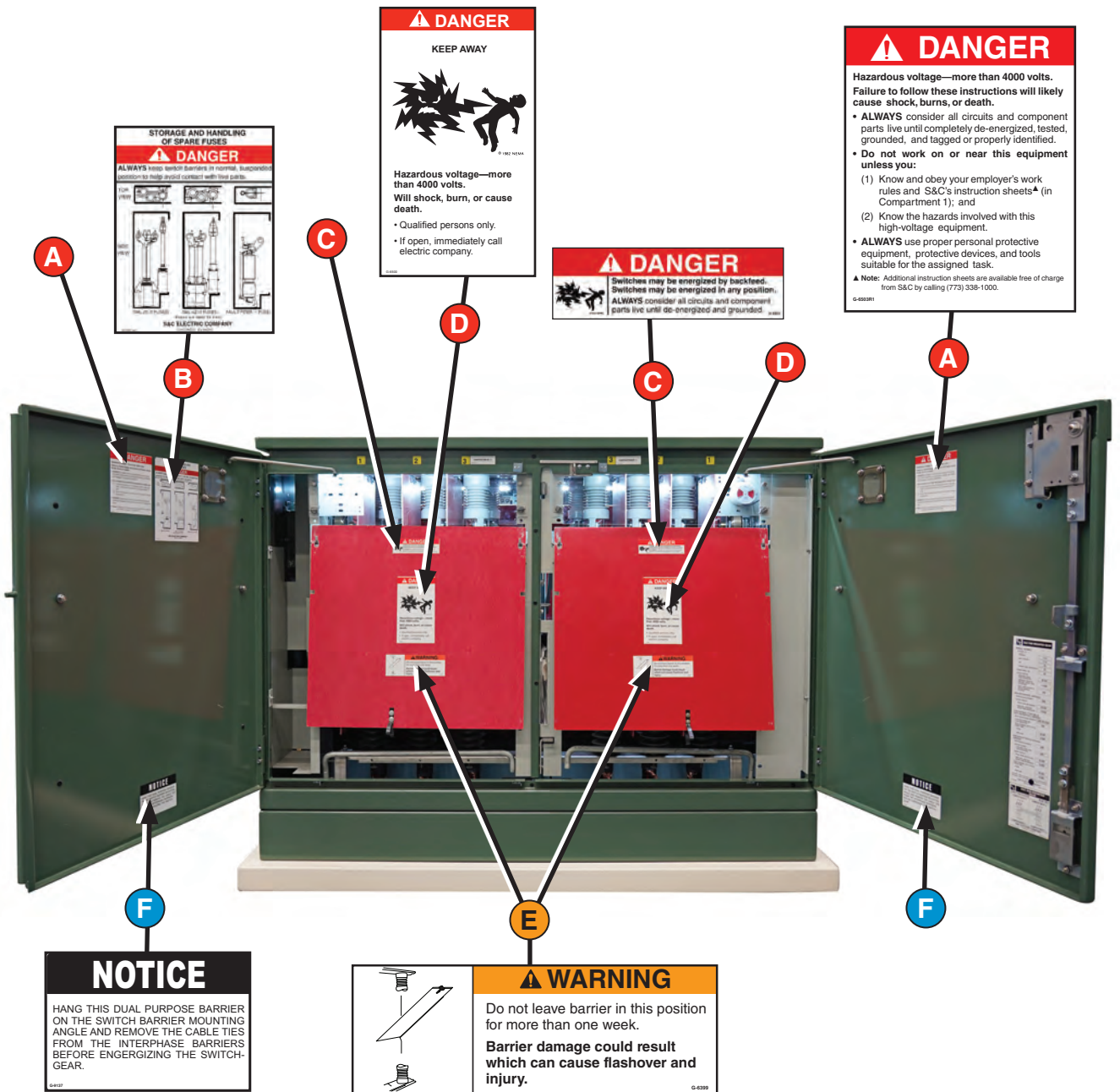


### Replacement Instructions and Labels

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



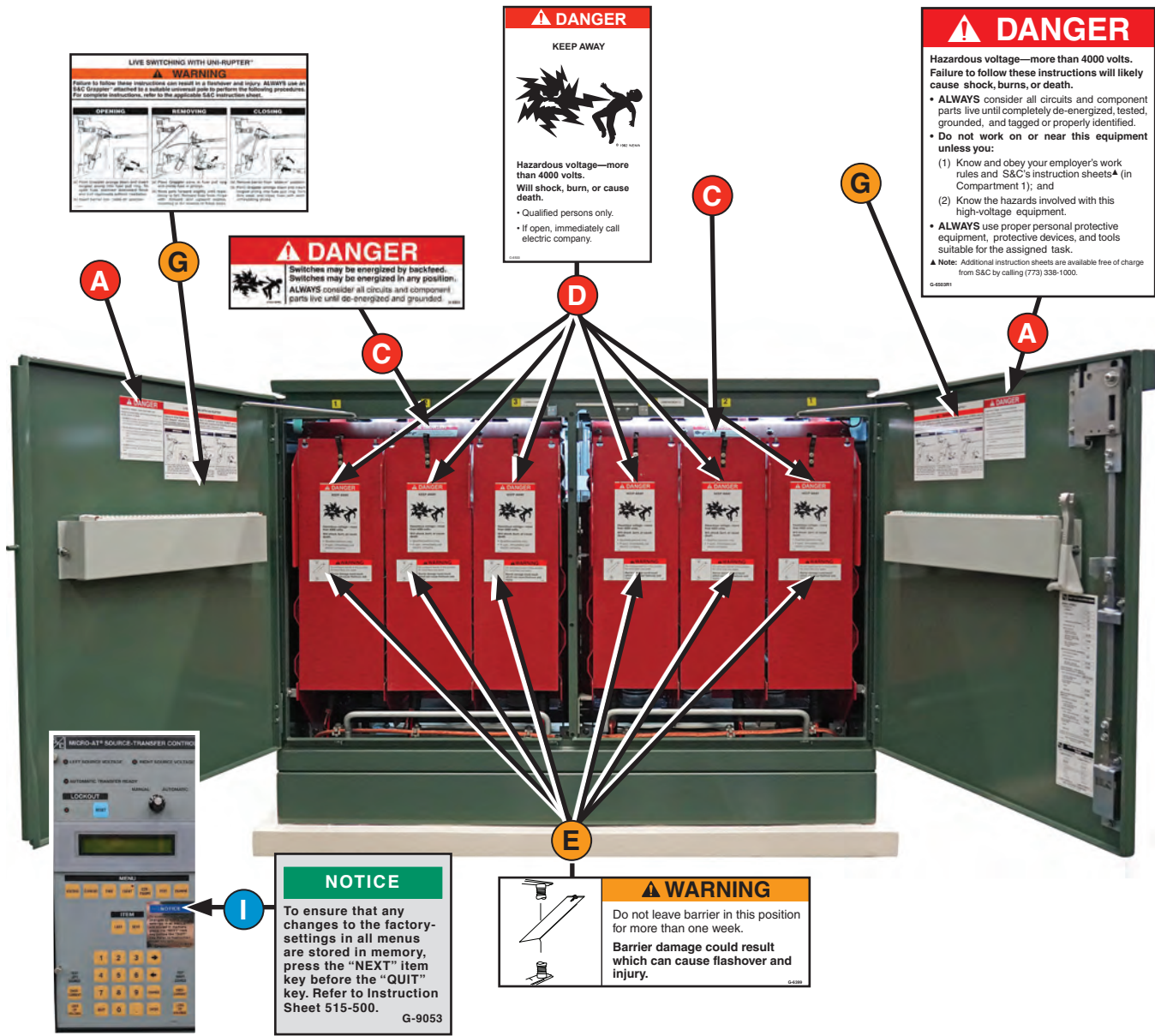
Doors





# Safety Information

## Location of Safety Labels



## Reorder Information for Safety Labels

Location	Safety Alert Message	Description	Part Number
A	<b>⚠ DANGER</b>	Hazardous voltage —more than 400 volts . . .	G-6503
B	<b>⚠ DANGER</b>	Storage and handling of spare fuses	G-5147-1R1
C	<b>⚠ DANGER</b>	Switches may be energized . . .	G-6501
D	<b>⚠ DANGER</b>	Keep away. . .	G-6500
E	<b>⚠ WARNING</b>	Do not leave barrier in this position . . .	G-6399
F	<b>NOTICE</b>	Hang this dual purpose barrier . . .	G-9137
G	<b>⚠ WARNING</b>	Live switching with Uni-Rupter . . .	G-6369
H	<b>⚠ WARNING</b>	Keep out . . .	G-6398
I	<b>NOTICE</b>	To ensure that any changes...	G-9053

**⚠ DANGER**



**Pad-mounted gear contains high voltage. Failure to observe the precautions below will result in serious personal injury or death.**

Some of these precautions may differ from company operating procedures and rules. Where a discrepancy exists, users should follow their company's operating procedures and rules.

1. **QUALIFIED PERSONS.** Access to source-transfer PMH Pad-Mounted Gear must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **HIGH-VOLTAGE ISOLATION.** Switch operators and controls are isolated from high voltage in grounded, metal-enclosed compartments. Access to these components is controlled by padlockable covers, which incorporate a nonremovable manual handle. Other low-voltage components, such as meters, selector switches, toggle switches, etc., are similarly isolated.
6. **TEST FOR VOLTAGE.** Test for voltage using proper high-voltage test equipment before touching any device to be inspected, serviced, or repaired in the high-voltage compartments.
7. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded. Voltage levels can be as high as the peak line-to-ground voltage last applied to the unit. Units energized or installed near energized lines should be considered live until tested and grounded.
8. **GROUNDING.** The source-transfer PMH Pad-Mounted Gear must be connected to a suitable earth ground at the base of the utility pole or to a suitable building ground for testing before energizing the switchgear, and at all times when energized.  
  
The ground wire(s) must be bonded to the system neutral, if present. If the system neutral is not present, proper precautions must be taken to ensure the local earth ground or building ground cannot be severed or removed.
9. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.
10. **GROUNDING EQUIPMENT.** Install suitable grounding equipment before touching any device to be inspected, serviced, or repaired in the high-voltage compartments.
11. **PADLOCKS.** Non-removable manual handles in high-voltage compartment doors and hinged-padlockable covers, as well as hinged-bolted panels, have provisions for padlocks which must be in place and secured at all times unless work is being performed inside the enclosure. Padlocks must be installed and secured on manual switch operating handles at all times unless the switch is being operated.
12. **KEY INTERLOCKS.** Key interlocks (if applicable) must be in place. Check the operating sequence of key interlocks to verify proper sequencing. After the switchgear is installed, destroy all duplicate keys or make them accessible only to authorized persons so the key interlock scheme will not be compromised. Key interlocks are not security locks.
13. **MECHANICAL CABLE INTERLOCKS.** Mechanical cable interlocks are provided to prevent access to fuses unless the switch is open and to prevent operation of stored-energy switch operators when the enclosure door is open. Do not attempt to operate any switch when the enclosure door is open. Periodically, verify these interlocks are functional.
14. **DO NOT APPLY UNDUE FORCE.** Do not apply any undue force when attempting to open a door. The use of undue force may damage the door-latching mechanism. If optional key interlocks are provided, make certain the interlocks are in their correct positions to allow door opening.
15. **FUSES MUST BE DISCONNECTED.** Make sure fuses are disconnected from all power sources (including backfeed) before being inspected or replaced.

### DANGER



**Pad-mounted gear contains high voltage. Failure to observe the precautions below will result in serious personal injury or death.**

Some of these precautions may differ from company operating procedures and rules. Where a discrepancy exists, users should follow their company's operating procedures and rules.

#### 16. SWITCH POSITION.

- Always confirm the **Open/Close** position of the Mini-Rupter Switches by visually observing the position of the switch blades.
- Switches and switch terminals may be energized by backfeed.
- Switches and switch terminals may be energized in any position.

#### 17. FUSE POSITION. Fuses and fuse mountings (Uni-Rupter Interrupter, load-side hinge, and terminals) may be energized by backfeed even when the fuse is in the fully **Open** position.

#### 18. CLOSING FUSES. Closing a fuse into a faulted circuit will cause a loud noise, a flash of light at the Uni-Rupter Interrupter contacts, and the fuse to blow. Closing a fuse into a faulted circuit is always a possibility. When closing a fuse, always turn your face away. Then, use a swift, unhesitating thrust because the closing operation is completely operator dependent. With the Uni-Rupter Interrupter, a fuse can be closed into a fault current once or twice, and the Uni-Rupter Interrupter will remain operable and able to carry and interrupt rated current.

#### 19. FRONT BARRIERS.

- Always use a Grappler™ Handling Tool attached to a suitable universal pole to handle barriers in the high-voltage compartments.

- Do not leave dual-purpose front barriers in the **Slide In** position for more than one week. If the barriers are left in the **Slide In** position for an extended period of time, there is the possibility of corona discharge to the barriers. Prolonged exposure to corona discharge can damage the barriers and result in a flashover, injury, and equipment damage.

- **Switch Side:** These barriers are intended for temporary use to isolate the blades of the Mini-Rupter Switch from the main contacts while work is being performed.

- **Fuse Side:** These barriers are intended for temporary use to isolate the fuse from the contacts of Uni-Rupter Interrupter while work is being performed.

#### 20. GRAPPLER HANDLING TOOL.

- The Grappler tool is the S&C fuse-handling fitting supplied with each unit equipped for fuses.
- The Grappler tool improves grip, balance, and control of fuses during handling.
- Always use the Grappler tool attached to a suitable universal pole (1¼ inch (32 mm) in diameter) to handle barriers and to install, remove, open, or close fuses. The universal pole must be at least 4 feet (122 cm) long for 14.4-kV gear or at least 6 feet (183 cm) long for 25-kV gear.



Each unit of the source-transfer PMH Pad-Mounted Gear is provided with an “Installation and Operation Information Kit” located in the holder inside the Penta-Latch® Mechanism-equipped door of the low-voltage control compartment. The information kit includes applicable instruction sheets covering installation of the gear and operation of components, plus wiring diagrams and a dimensional drawing showing cable-locating and anchor-bolt dimensions. All personnel involved with installation and operation of the gear should be thoroughly familiar with the contents of the kit.

These instructions are for operation of fuses and Mini-Rupter Switches in S&C Pad-Mounted Gear, source-transfer PMH Models equipped with the Micro-AT® Source-Transfer Control. For instructions regarding field programming and operation of the Micro-AT control, refer to S&C Instruction Sheet 515-500.

Source-transfer PMH Pad-Mounted Gear is a totally self-contained switching and protection package providing fault protection and fully automatic two-way source transfer for critical loads requiring a high degree of service continuity. This gear contains the following:

- Switch-operator-driven 600-ampere Mini-Rupter Switches for three-pole live switching of three-phase source circuits
- Stored-energy operators to provide high-speed power operation of the Mini-Rupter Switches (The operators automatically charge when voltage is present on the associated source.)
- Micro-AT Source-Transfer Control for programmed control of all switching functions associated with automatic source transfer
- S&C Voltage Sensors to provide three-phase sensing for automatic source transfer and control power for the Micro-AT control (The voltage sensors also provide supply power for motor charging of the stored-energy operators and capacitor charging for solenoid tripping of the operators.)
- Decouplers to permit exercising the stored-energy operators without affecting the position of the Mini-Rupter Switches
- 200- or 400-ampere hookstick-operated S&C Power Fuses with a Uni-Rupter Interrupter for single-pole live switching of single-phase or three-phase load circuits (Models available offer a choice of S&C Type SML-20 or SML-4Z Power Fuses, Fault Fiter

Electronic Power Fuses, or a variety of current-limiting fuses.)

- A Penta-Latch Mechanism on each set of doors for access control (Mechanism provides automatic door latching and permits padlocking only when the door is latched closed. Doors can be opened only with a pentahead socket wrench or tool except when hexhead actuators (catalog number suffix “-B1” or “-B2”) are specified.)

A variety of optional features are available for the source-transfer PMH Pad-Mounted Gear. The catalog number stamped on the nameplate affixed to the enclosure door is suffixed with letter-number combinations applicable to the gear furnished. Refer to S&C Specification Bulletin 663A-31 for descriptions of the optional features.

## Operating Description

Refer to S&C Instruction Sheet 515-500 for an operating description of the Micro-AT Source-Transfer Control.

## Remote Indication

The optional **Remote Indication** feature includes isolated contacts wired to a terminal block for external connection to remote indicating devices. Isolated contacts are provided for remotely monitoring the presence of source voltages; the position of the MANUAL/AUTOMATIC OPERATION selector switch; and the status of the READY indicator, EVENT indicator, and the over-current-lockout circuit (if furnished). Remote indicating devices and their control power are to be provided by the user and installed in accordance with the manufacturer's instructions.

## Components

Figure 1 through Figure 4 on page 13 illustrate many of the basic components and features of source-transfer Pad-Mounted Gear. Before proceeding with the remainder of the instructions, these figures should be reviewed to gain familiarity with the various components and locations.

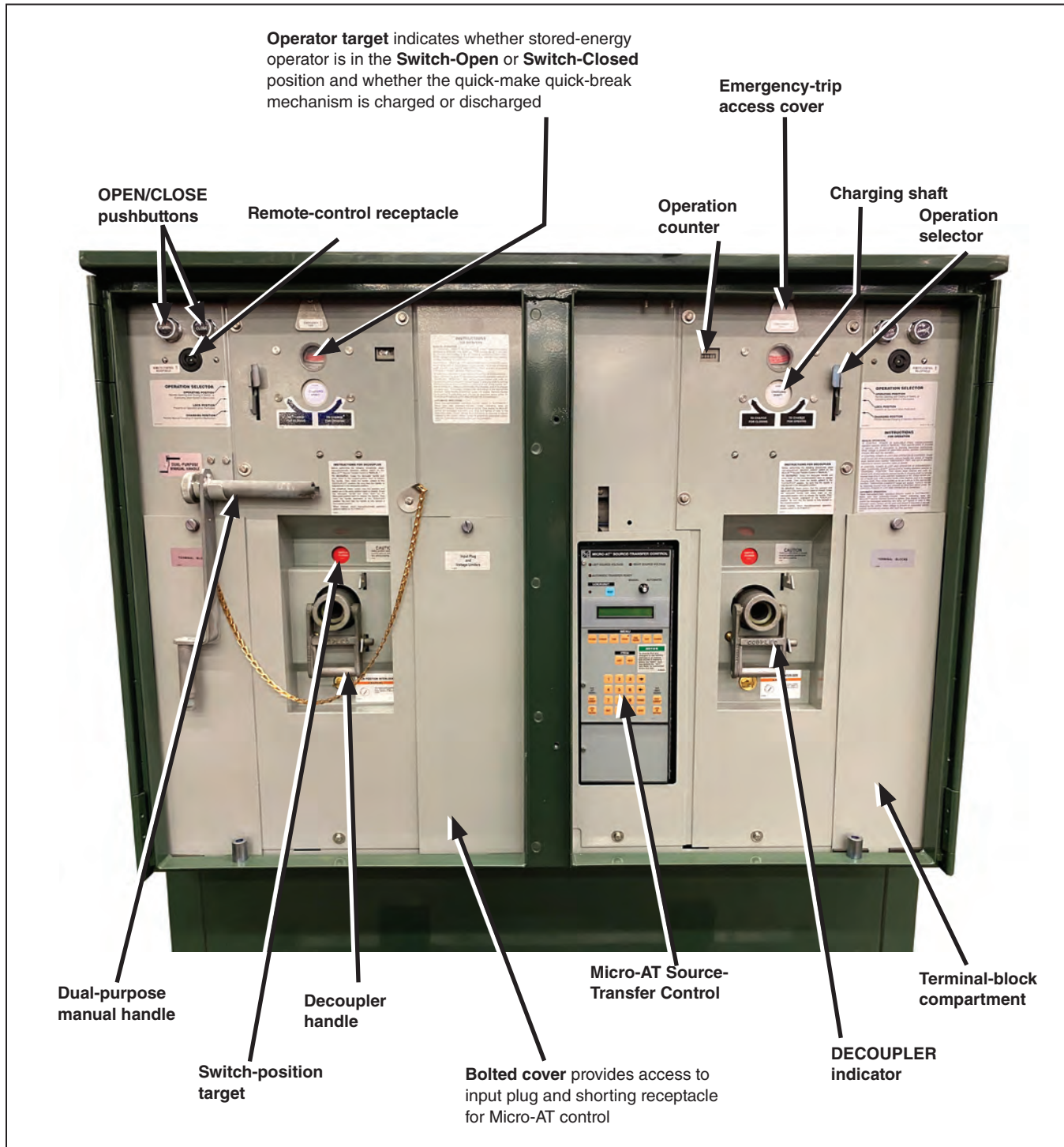


Figure 1. The low-voltage control compartment.

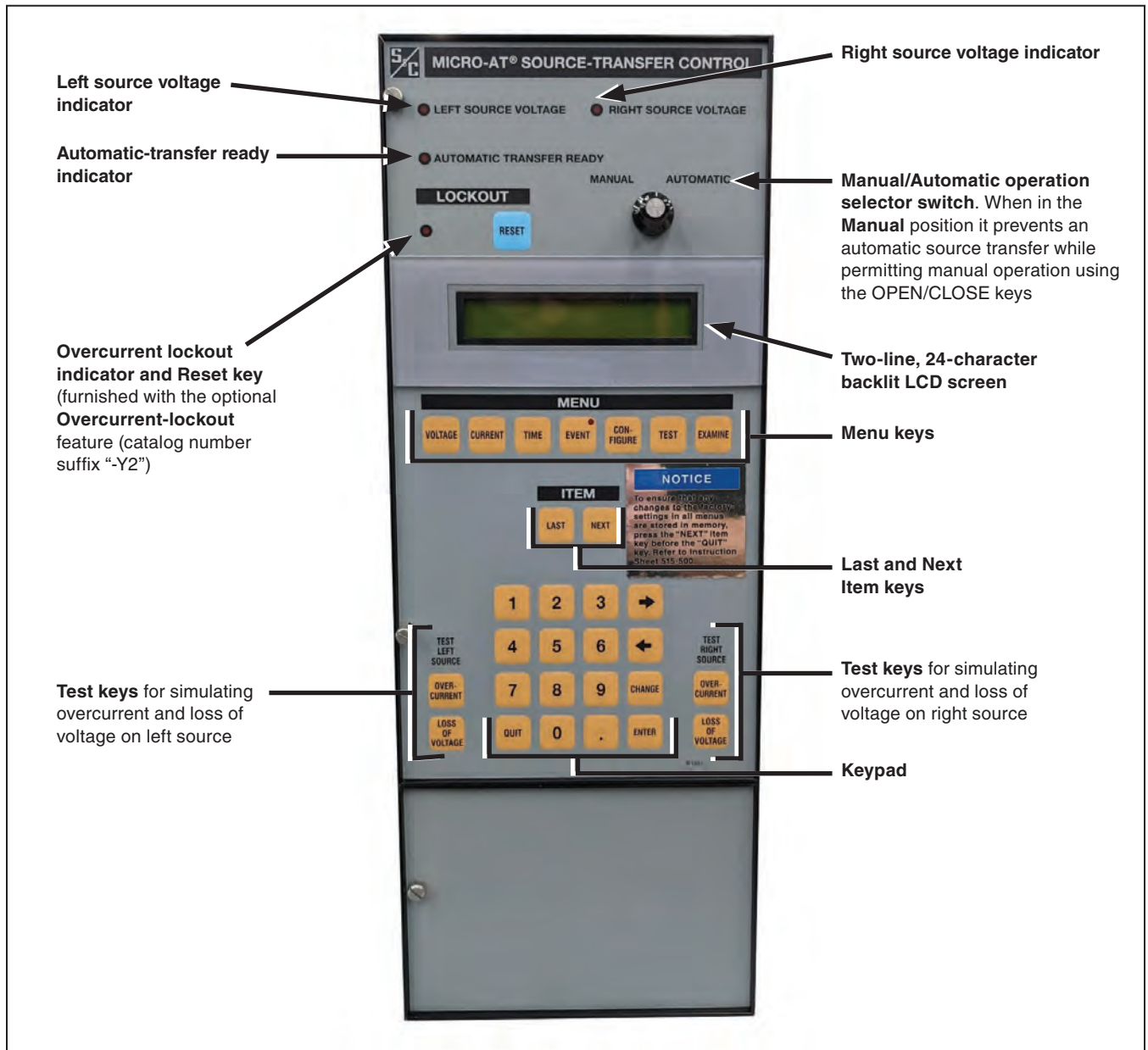


Figure 2. The Micro-AT Source-Transfer Control.



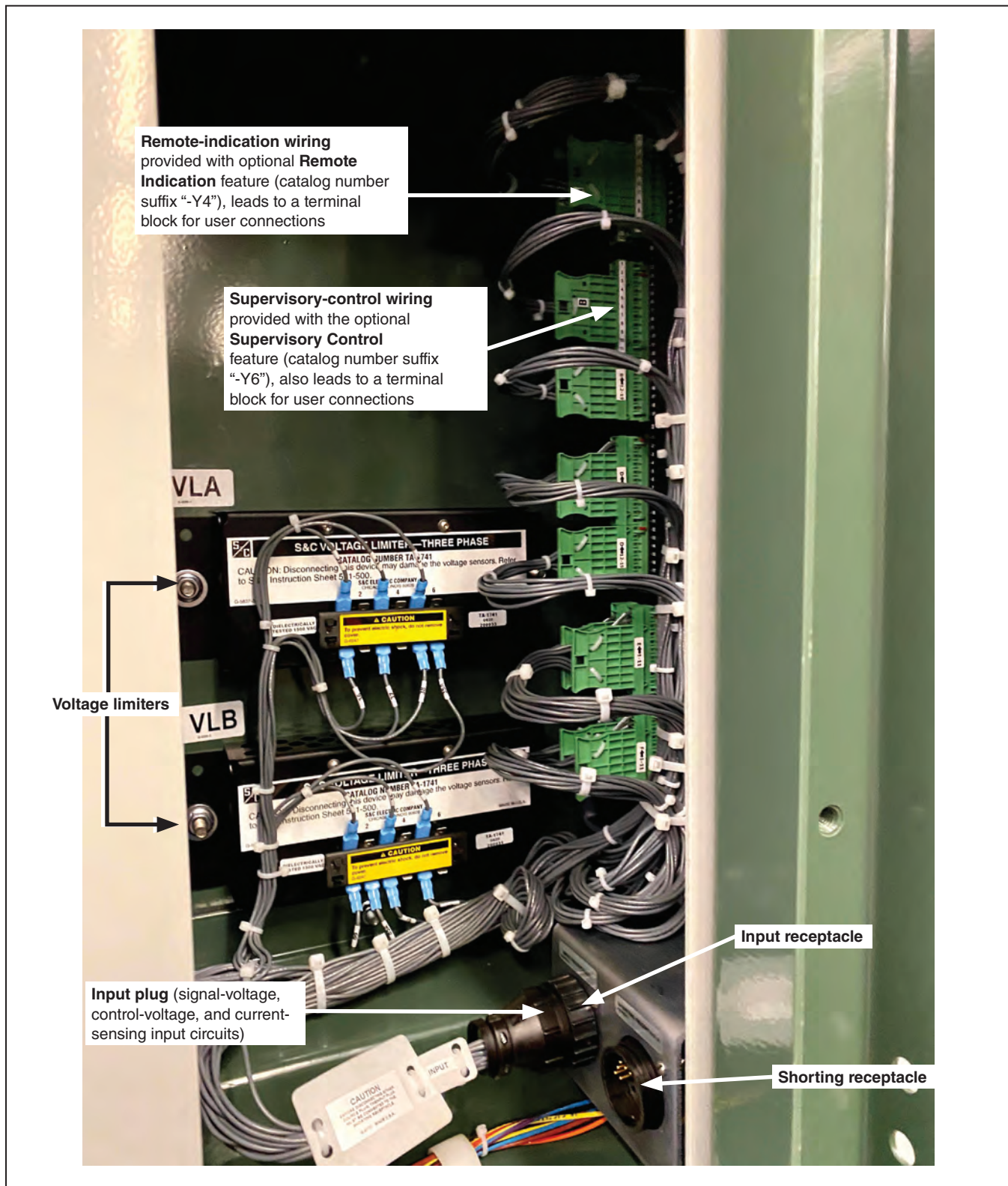


Figure 3. The access panel removed showing input plug, input receptacle, and shorting receptacle of the Micro-AT Source-Transfer Control.

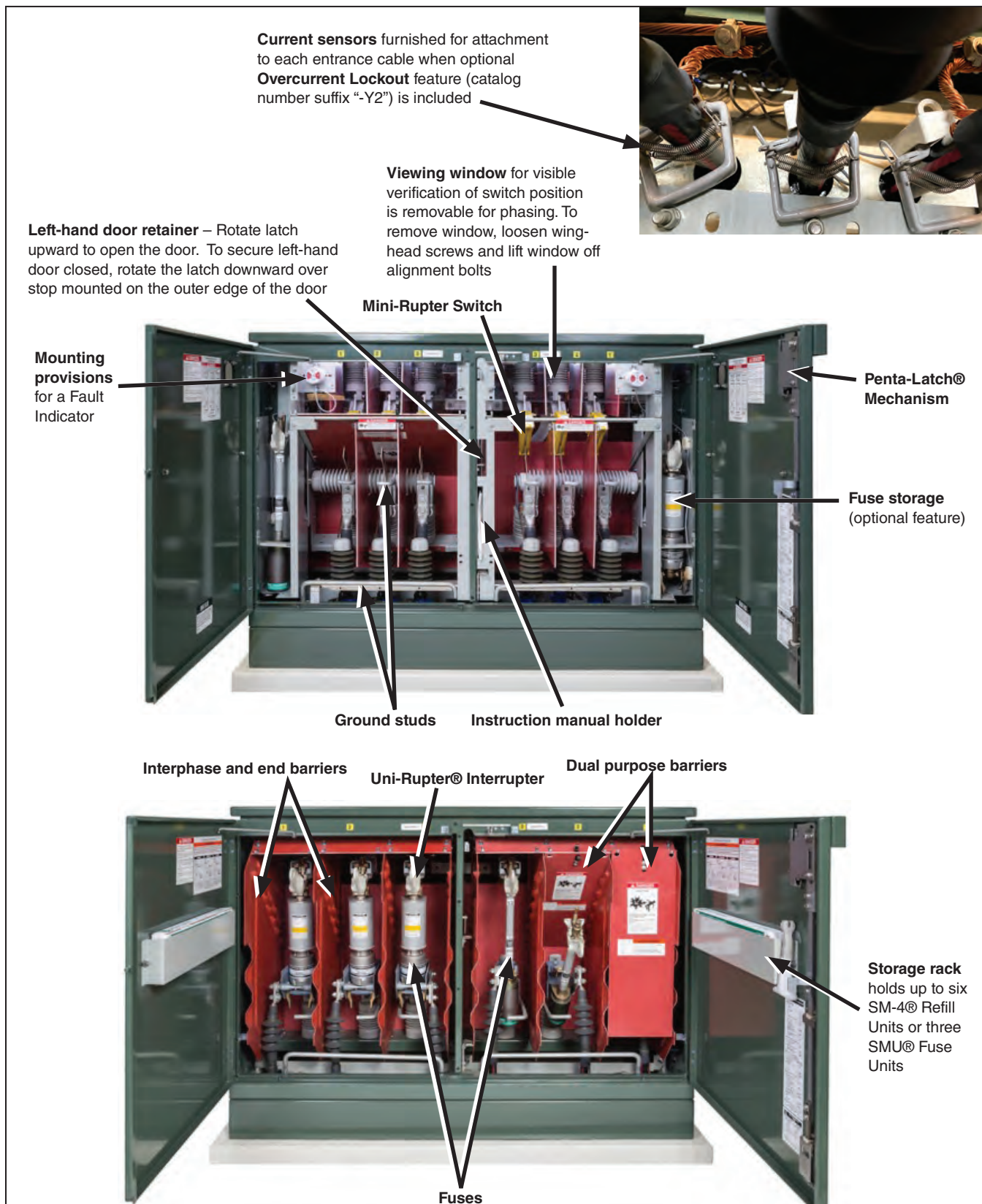


Figure 4. The switch and fuse compartments. The fuse compartments shows SML-20 Power Fuses in the right-hand compartment and Fault Fiter Electronic Power Fuses in the left-hand compartment. (This nonstandard combination of fuses is shown for comparison only.)



## Enclosure Doors

### DANGER

When access to high-voltage compartments is required for inspection, service, or repairs, always observe the precautions below. **Failure to observe these precautions may result in serious personal injury or death.**

1. Access to pad-mount gear must be restricted only to qualified persons. See the “Qualified Persons” section on page 2.
2. Always follow safe operating procedures and rules.
3. Before touching any device, always disconnect switches and fuses from all power sources (including backfeed), test for voltage, and properly ground.
4. Always assume both sets of power terminals on any switch or fuse are energized unless proved otherwise by test, by visual evidence of open-circuit conditions on both sets of terminals, or by observing that both sets of terminals are grounded.
5. Test for voltage on both sets of power terminals of any switch or fuse using proper high-voltage test equipment.
6. After the gear has been completely disconnected from all sources of power and tested for voltage, install suitable grounding cables in all compartments.
7. Make sure the enclosure is properly grounded to the station or facility ground. Do not return equipment to service unless such grounds are properly made.



**Figure 5.** To unlock the doors, turn the pentahead socket wrench 60° counterclockwise against spring resistance until a “click” is heard and the wrench reaches its stop.

### Opening and Closing the Doors

Complete the following steps to open the doors:

- STEP 1.** To access a side of the enclosure, remove the padlock from the doors.
- STEP 2.** Insert a pentahead socket wrench or tool (a hexhead socket wrench or tool when catalog number suffix “-B1” or “-B2” is specified) into the latching mechanism. Rotate the wrench or tool 60° counterclockwise to unlatch the doors. See Figure 5.

**NOTICE**

Do not apply any undue force when attempting to open the doors. The use of undue force may damage the latching mechanism.

- STEP 3.** Disengage the left-door latching mechanism by turning the latch clockwise. See Figure 6.
- STEP 4.** Open each door fully and latch the door holders. See Figure 7.
- STEP 5.** To gain access to the other side of the enclosure, repeat Step 1 through Step 4 to open the doors.

Complete the following steps to close and lock the doors:

- STEP 1.** Lift the door holder up to allow the left door to swing closed. See Figure 8. Make sure the door holder is placed back in the **Storage** position to allow the door to be fully closed. See Figure 9 on page 16.

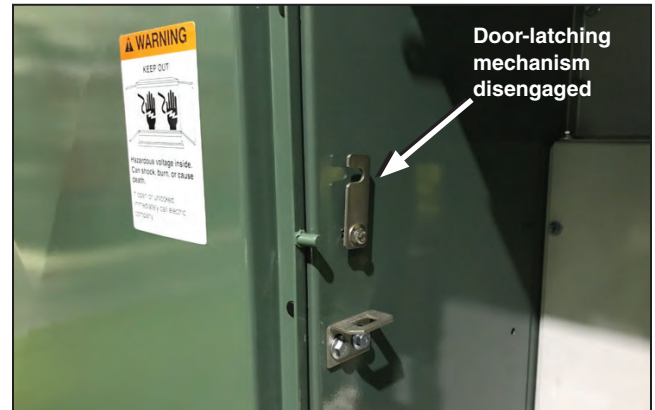


Figure 6. The left-door latching mechanism disengaged.

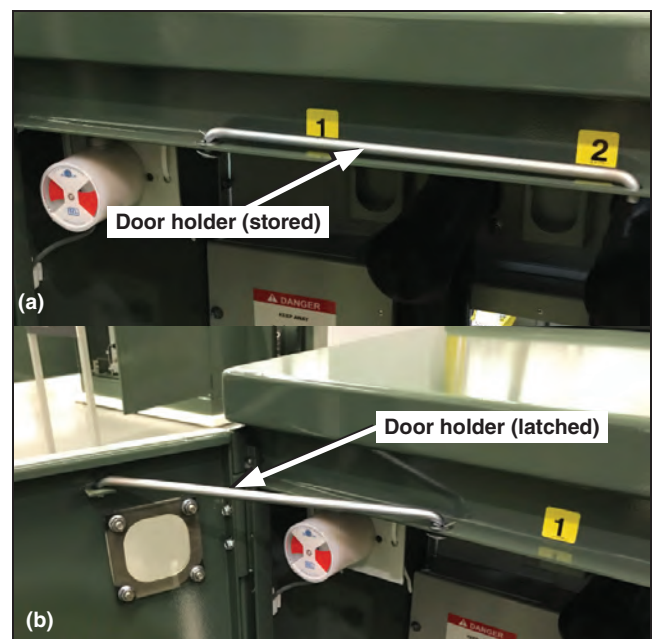


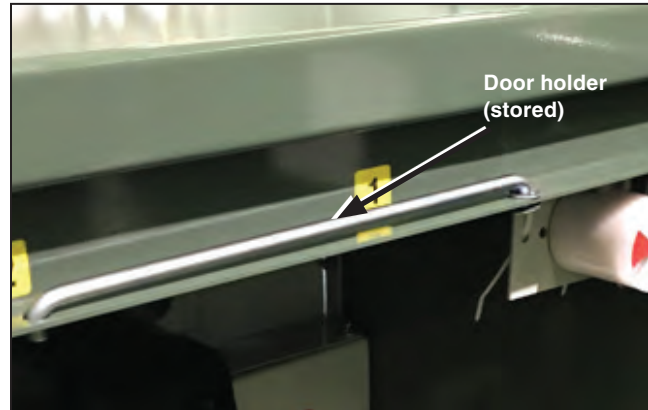
Figure 7. Using the door holder to hold the door open.



Figure 8. Lift and store the door holder to allow the door to swing closed.

## Enclosure Doors

- STEP 2.** Engage the left-door latching mechanism.  
See Figure 10.
- STEP 3.** Repeat Step 1 for the other door.
- STEP 4.** The right-hand door of the unit is equipped with the Penta-Latch Mechanism, which latches automatically when the door is closed. To close a door equipped with the Penta-Latch Mechanism, place one hand at the midpoint of the door-front near the edge and firmly push the door closed. When the latch points are positively engaged, the spring mechanism will trip to latch the door.
- STEP 5.** Insert the padlock shackle through the hole in padlock recess and lock the padlock.  
See Figure 11.
- STEP 6.** Repeat Step 1 through Step 5 for the doors on the other side of the enclosure (if open).



**Figure 9.** The door holder placed in the storage position to allow the door to close.



**Figure 10.** The left-door latching mechanism engaged.



**Figure 11.** The enclosure doors padlocked.

**⚠ WARNING**

To avoid equipment damage, accident, or injury when operating the source-transfer PMH Pad-Mounted Gear, follow these precautions:

1. To prevent an automatic operation when decoupling or coupling an operator to the switch, during manual charging of an operator or when manually operating a switch, place the MANUAL/AUTOMATIC operation selector switch located on the faceplate of the Micro-AT Source-Transfer Control in the **Manual** position.
2. Do not perform any switching operations if the **Source-Transfer** feature is in the **Lockout** mode, as indicated by the LOCKOUT indicator. See Figure 2 on page 11. For such cases, see the “Overcurrent-Lockout Condition” section in S&C Instruction Sheet 515-500.
3. If the gear is energized and paralleling of sources is not permitted, decouple both stored-energy operators to avoid temporary service interruptions when manually operating the gear. Switching operations will result in temporary service interruptions if stored-energy operators are coupled.
4. Because of operating errors, the stored-energy operator’s quick-make quick-break mechanism may stall in a **Partially Discharged** state. The conditions that will cause this mechanism to stall, as well as instructions for restoring the operator to the normal latched-open condition after a stall, are listed in the “If the Operator Stalls” section on page 39.
5. Do not assume the operator position necessarily indicates the **Open** or **Closed** position of the Mini-Rupter Switch. At completion of an opening or closing operation, make sure the following conditions exist:
  - The operator target (see Figure 1 on page 10) signals “OPERATOR IN SWITCH-OPEN POSITION” or “OPERATOR IN SWITCH-CLOSED POSITION” to indicate the switch operator has moved through a complete operation.
  - The switch-position target (see Figure 1 on page 10) that signals “SWITCH OPEN” or “SWITCH CLOSED,” is in agreement with the operator target.
  - The switch position, as verified by visual check of the switch-blade position, is in agreement with the switch-position target. A viewing window is provided in the switch compartment for positive visual verification of switch-blade position (see Figure 4 on page 13).
  - The operator target (see Figure 1 on page 10) signals “OPERATOR CHARGED” to indicate the operator is ready for the next operation.
6. To prevent all electrical and mechanical operations, padlock the operation selector in the Lock position. This will also prevent motor charging of the stored-energy operator if system operating procedures require the quick-make quick-break mechanism to remain discharged, and source voltage is present.

## Decoupling

Decoupling is accomplished using the decoupler handle. See Figure 12 on page 19. When decoupled, the stored-energy operator may be operated without affecting the position of the associated Mini-Rupter Switch. When decoupled, the Mini-Rupter Switch is prevented from moving by a mechanical device that locks the switch drive-shaft.

Follow these steps to decouple the stored-energy operators:

- STEP 1.** Place the MANUAL/AUTOMATIC operation selector switch on the faceplate of the Micro-AT Source-Transfer Control in the **Manual** position.
- STEP 2.** For each stored-energy operator, grasp the decoupler handle and press down on the coupled-position latch to release the handle.
- STEP 3.** Move the handle upward to the **Decoupled** position. Be sure the handle is fully latched in the **Decoupled** position.

When an operator is decoupled, the AUTOMATIC-TRANSFER READY indicator on the faceplate of the Micro-AT control will not light, to remind about the **Decoupled** state. See Figure 2 on page 11.

## Coupling

Follow these steps to couple the stored-energy operators:

- STEP 1.** Place the MANUAL/AUTOMATIC operation selector switch on the faceplate of the Micro-AT control in **Manual** position.
- STEP 2.** Make sure the stored-energy operators are in the same position (**Open** or **Closed**) as their associated Mini-Rupter Switches by observing the switch-position and operator targets. See Figure 1 on page 10. If required, use the OPEN/CLOSE pushbuttons (provided control power is available) to reposition the operator(s).
- STEP 3.** For each operator, grasp the decoupler handle and press down on the decoupled-position latch to release the handle.
- STEP 4.** Move the handle downward to the **Coupled** position. Be sure the handle is fully latched in the **Coupled** position.

An attempt to operate a switch that is not completely coupled (or decoupled) will cause the operator mechanism to stall.



### Automatic Switch Operation

High-speed quick-make quick-break operation is provided by stored-energy operators which, when solenoid tripped in response to control signals from the Micro-AT Source-Transfer Control, automatically open or close the Mini-Rupter Switches. After each trip operation, the operators automatically charge when voltage is present on the associated source—ready for the next operation.

For automatic switch operation, the MANUAL/AUTO-MATIC OPERATION selector switch on the Micro-AT control must be in the **Automatic** position. See Figure 2 on page 11. The Micro-AT control will not function automatically if one operator is coupled and the other is decoupled. Programming and operation of the Micro-AT control is described in S&C Instruction Sheet 515-500.

### Nonautomatic Switch Operation

**If Control Power Is Available:** To manually operate the stored-energy operator's quick-make quick-break mechanism—and (if coupled) to open or close a Mini-Rupter Switch—place the MANUAL/AUTOMATIC OPERATION selector switch in **Manual** position and press the associated OPEN/CLOSE pushbutton. See Figure 1 on page 10.

After each trip operation, the quick-make quick-break mechanism automatically charges when voltage is present on the associated source. The charging operation takes approximately 25 seconds.

**If Control Power Is Lost and Operator Is Charged:** To manually operate the stored-energy operator's quick-make quick-break mechanism—and (if coupled) to open or close a Mini-Rupter Switch—insert the small keyed end of the dual-purpose manual handle into the groove of the tripping shaft, behind the Emergency Trip cover, and turn in the direction indicated to effect desired operation. See Figure 13.

**If Control Power Is Lost and Operator Is Discharged:** Manually charge the stored-energy operator's quick-make quick-break mechanism as described in the “Charging Operator (Nonelectrical)” section on page 20. Then, proceed as described in the “If Control Power Is Lost and Operator Is Charged” section.



Figure 12. Decoupler handle being moved upward to decouple the switch from the associated switch operator.



Figure 13. The keyed end of the dual-purpose manual handle can be inserted into the groove of the tripping shaft for emergency manual switching if control power is lost.

### Charging Operator (Nonelectrical)

The dual-purpose manual handle is used to manually charge the stored-energy operator's quick-make quick-break mechanism (required only in the event control power has been lost). See Figure 14. Keep the charging-shaft access port open by holding the operation selector in the **Charging** position. See Figure 13 on page 19.

While the operation selector is in the **Charging** position, the control circuit is disconnected to prevent manual or automatic electrical operation (charging or tripping) in the event control power is restored; and the emergency-trip shaft is mechanically blocked to prevent a manual mechanical trip operation.

While holding the charging-shaft access port open, insert the keyed end (with recessed bolt) of the dual-purpose manual handle and secure it to the end of the charging shaft by turning the knurled knob clockwise eight to nine turns until firm resistance is felt. To charge the mechanism, grasp the tubular portion of the handle and, while pivoting the handle a few degrees, push in to engage the charging shaft. At the same time, rotate the handle as far as it will go (approximately 120°) in the appropriate direction. The Operator Charged target will appear in the indicator window.

After the charging operation, loosen the knurled knob and remove the handle. The operation selector will spring-return to the **Operating** position.



Figure 14. Dual-purpose manual handle on the charging shaft.

## Front Barriers

Before proceeding with the instructions on handling the front barriers, refer to the “Safety Precautions” section on page 7 and 8, and the “Warning” on page 17.

### DANGER

When working in the high-voltage compartments, always maintain proper clearance from energized components. **Failure to maintain proper clearance will result in serious injury or death.**

Always use a Grappler Handling Tool attached to a suitable universal pole (1 ¼ inches (32 mm) in diameter) to handle barriers and to install, remove, open, or close fuses. The universal pole must be at least 4 feet (122 cm) long (for 14.4-kV gear or at least 6 feet (183 cm) long for 25-kV gear.

Place the dual-purpose front barrier in the **Slide In** position whenever the Mini-Rupter Switch is open. When the barrier is in the **Slide In** position, the switch blades are isolated from the main contacts. This also keeps the blades from closing if, for any reason, the Mini-Rupter Switch is operated.

To insert the barrier in the **Slide In** position, use an Grappler tool attached to and in line with a suitable universal pole. Figure 15 and Figure 16 and Figure 17 on page 22 show the suggested insertion method. The Grappler tool prongs are pointed upward when lifting the front barrier.



Figure 15. The dual-purpose front barrier for the switch in its normal, suspended position.



Figure 16. The Grappler tool being used to lift the barrier. Note: The door holder is in place and the adjacent door is secured closed to reduce exposure to high voltage.

### **WARNING**

Do not leave dual-purpose front barriers in the **Slide In** position for more than one week. These barriers are intended for temporary use to isolate the blades of the Mini-Rupter Switch from the main contacts while work is being performed. If the barriers are left in the **Slide In** position for an extended period of time, there is the possibility of corona discharge to the barriers.

**Prolonged exposure to corona discharge can damage the barriers and result in a flashover, injury, and equipment damage.**

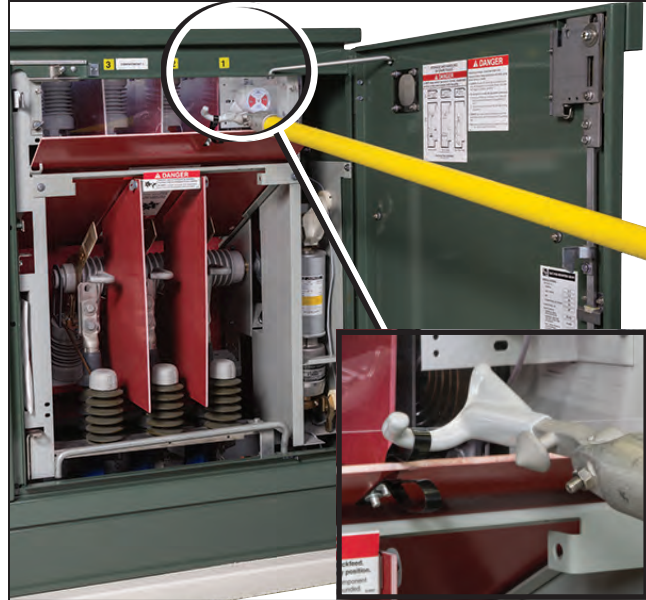
### **NOTICE**

Before closing a Mini-Rupter Switch, remove the dual-purpose front barrier from the **Slide In** position.

Closing a switch on the barrier will block the switch blades and result in a stalled condition.

If the Mini-Rupter Switch is closed with the front barrier in the **Slide In** position, the switch blades will be blocked and the stored-energy operator will stall in a partially **Closed** position. To correct this condition, follow the directions in the “If the Operator Stalls” section on page 39.

To restore the dual-purpose front barrier to the normal suspended position, use a Grappler tool attached to a suitable universal pole. Slowly and carefully withdraw the barrier with the Grappler tool prongs pointed upward (as shown in Figure 17) so it clears the **Slide In** position and the holes in the barrier catch on the hooks on the gear. Then, lower the barrier to its normal **Suspended** position.



**Figure 17. The Grappler tool, after lifting and pivoting the barrier, is used to lower it into the Slide In position. The Grappler tool is being used to return the barrier to its normal, suspended position.**



If the barrier was completely removed from the enclosure, a method for placing it in its normal **Suspended** position is shown in Figure 18. The barrier is supported on the Grappler tool prongs and held there by engaging the lifting ring with the Grappler tool cone. Then, place the barrier on the hooks of the gear and lower it to the **Suspended** position.

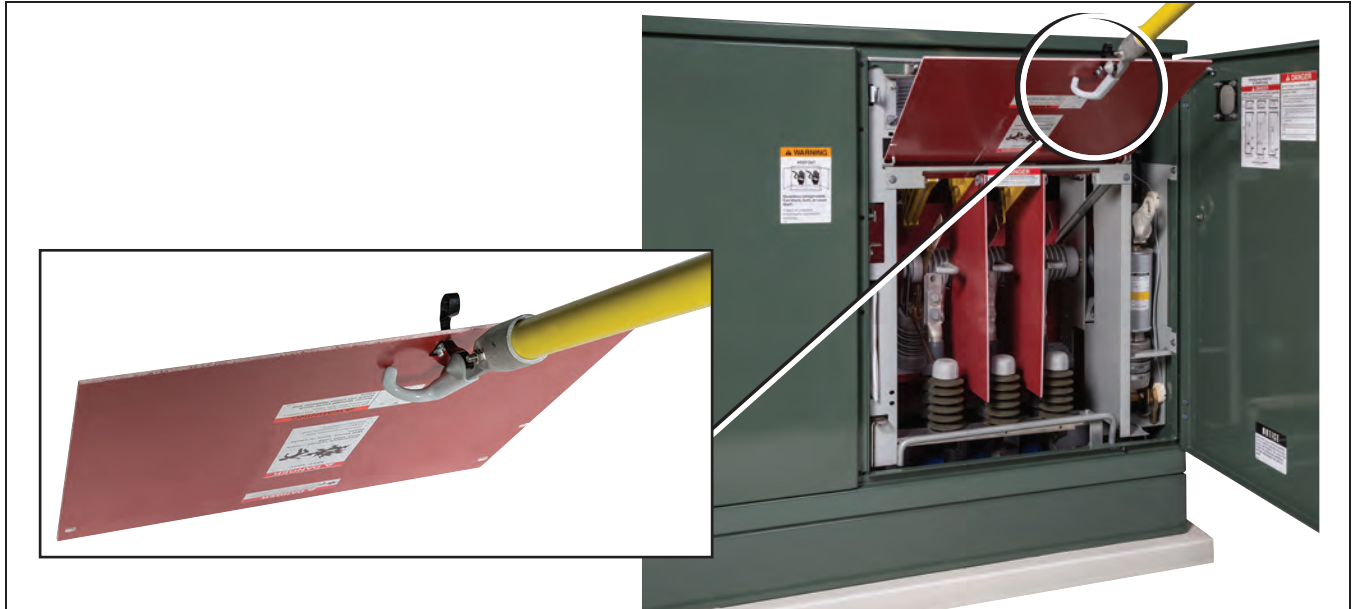


Figure 18. Alternate method of replacing front barrier using the Grappler tool. Place the barrier on the hooks of the gear and lower the barrier to its suspended position. Inset shows close-up of the Grappler tool in position to replace the barrier.



## Fusing

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Source-transfer PMH Pad-Mounted Gear is furnished with S&C Fuse Mountings with the Uni-Rupter Interrupters that accommodate S&C Type SML-20 Power Fuses, S&C Type SML-4Z Power Fuses, or Fault Fiter Electronic Power Fuses. Fault Fiter Electronic Power Fuse mountings also accommodate a variety of current-limiting fuses.



### **WARNING**

When selecting current-limiting fuses, the voltage rating of the fuses must conform to the recommendations in S&C Information Bulletin 660-50. **Failure to conform to these recommendations can result in a flashover, injury, and equipment damage.**

## Assembling the Fuse

### **S&C Power Fuses**

Install an SML-20 Fuse Unit into each set of end-fittings, an SM-4® Refill Unit into each holder, or a Fault Fiter Electronic Power Fuse into each holder in accordance with the instruction sheet furnished with the fuse unit, refill unit, or interrupting module.

### **Current-Limiting Fuses**





S&C Holders for current-limiting fuses are designed for use in pad-mounted gear models that include mountings for Fault Fiter Electronic Power Fuses. These holders will accommodate the current-limiting fuses listed in Table 1 of S&C Information Bulletin 660-50. For instructions on installing current-limiting fuses in current-limiting fuse holders, refer to S&C Instruction Sheet 660-500.

## Installing a Fuse in the Mounting

Follow the instructions found in the “Installing and Closing the Fuse” section on page 25.

### Installing and Closing the Fuse●

Before proceeding with the instructions on installing and closing the fuse, refer to the “Safety Precautions” section on page 7 and page 8.

⚠ WARNING		
<p>Always use a Grappler Handling Tool attached to a suitable universal pole to insert, remove, or replace front barriers. No other tools are recommended. <b>Failure to use the proper tools can result in damage to the equipment, flashover, and injury.</b></p>		
 <p><b>Grappler Handling Tool</b></p>		
 <p><b>Talon™ Handling Tool</b></p>	 <p><b>Distribution prong</b></p>	 <p><b>Station prong</b></p>

Use a Grappler tool attached to and in line with a suitable universal pole■▲ to follow this procedure:

**STEP 1.** Open the appropriate fuse-compartment door and secure it with the door holder. See Figure 19.

⚠ WARNING	
<p>On double-door models, the adjacent compartment door should be closed and latched to minimize exposure to high voltage. <b>Failure to do so can result in personal injury or death.</b></p>	

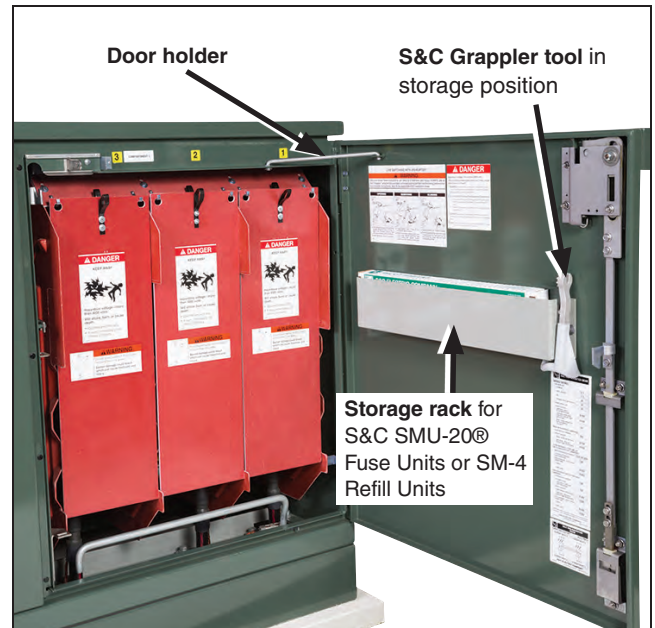


Figure 19. The dual-purpose front barriers for fuses in their normal, suspended positions. Note the door holder is in place.



Figure 20. Removing or replacing the dual-purpose front barrier with the Grappler tool.

● Although the operations as described in this section often refer simply to “fuses,” the procedures apply to S&C Type SML-20 and SML-4Z Power Fuses, Fault Fiter Electronic Power Fuses, and current-limiting fuses used in Fault Fiter Electronic Power Fuse mountings with Uni-Rupter Interrupters.

■ If the enclosure is furnished with an optional base spacer (or is attached to a higher than normal mounting pad), it may be desirable for easier handling at the increased height to reposition the Grappler tool on the universal pole at a favorable angle.

▲ Use a universal pole 1 ¼ inches (32 mm) in diameter and at least 6 feet (183 cm) long for 14.4-kV gear; or at least 8 feet (244 cm) long for 25-kV gear.

## Switching with a Uni-Rupter® Interrupter

- STEP 2.** If optional inner barrier panels are furnished, loosen the pentahead bolts and remove the panel.
- STEP 3.** Remove only the dual-purpose front barrier associated with the fuse mounting into which the fuse is to be installed. See Figure 20 on page 25.
- STEP 4.** Insert the barrier into the **Slide In** position using the Grappler tool as illustrated in Figure 21. The barrier is supported on the Grappler tool prongs and held there by engagement of the lifting ring with the Grappler tool cone.

### **WARNING**

Dual-purpose front barriers must be wiped clean before placing them in the **Slide In** position. In addition, do not leave dual-purpose front barriers in the **Slide In** position for more than one week. These barriers are intended for temporary use to isolate the fuse from the contacts of the Uni-Rupter Interrupter while work is being performed. If the barriers are left in the **Slide In** position for an extended period of time, there is the possibility of corona discharge to the barriers. **Prolonged exposure to corona discharge can damage the barriers and result in a flashover, injury, and equipment damage.**

- STEP 5.** *For all fuses except 25-kV Fault Fiter Electronic Power Fuses:* Install a fuse into its hinge as follows:
- Position the Grappler tool cone in the fuse pull-ring and cradle the fuse in the Grappler tool prongs. See inset of Figure 22.
  - Grasp the universal pole with both hands (approximately 2 feet (61 cm) apart), with one hand at the opposite end of the pole from the Grappler tool.
  - Lift the fuse and lower it into its hinge. See Figure 22. Make sure the fuse is securely seated in the hinge. Then, disengage the Grappler tool from the fuse. See Figure 23 on page 27.



**Figure 21.** Inserting the dual-purpose front barrier into the Slide In position using the Grappler tool.



**Figure 22.** Installing the fuse using the Grappler tool. The inset image shows a close-up of the Grappler tool in position to install the fuse.

**⚠ WARNING**

Keep the fuse away from the Uni-Rupter Interrupter contacts when installing the fuse into its hinge. Touching the contacts will close the circuit which can cause a flashover and serious injury. Always place the dual-purpose front barrier in the **Slide In** position whenever a fuse is open or is being removed from or installed into its hinge.

- STEP 6.** *For 25-kV Fault Fiter Electronic Power Fuses:* De-energize, test, and properly ground the mounting in accordance with safe operating procedures and rules. Then, install the fuse into its mounting by hand using suitable personal protective equipment (PPE).

**NOTICE**

Do not close a door on a fuse in the **Open** position. The door will strike the fuse pulling and interfere with door closing. The door may be closed if the fuse is removed from its mounting.

- STEP 7.** Use the Grappler tool to remove the dual-purpose front barrier from the **Slide In** position. See Figure 24.

**⚠ CAUTION**

Closing a fuse into a faulted circuit will cause a loud noise, a flash of light at the Uni-Rupter Interrupter contacts, and the fuse to blow. Closing a fuse into a faulted circuit is always a possibility. When closing a fuse, always turn your face away. Then, use a swift, unhesitating thrust because the closing operation is completely operator dependent. **Failure to do so can result in personal injury.**

**NOTICE**

With a Uni-Rupter Interrupter, a fuse can be closed into a fault current once or twice as specified in Specification Bulletin 663A-31, and the Uni-Rupter Interrupter will remain operable and able to carry and interrupt rated current.



**Figure 23.** A fuse installed in the mounting in the Open position.



**Figure 24.** Removing the dual-purpose front barrier from the Slide In position using a Grappler tool.



## Switching with a Uni-Rupter® Interrupter

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**STEP 8.** With the Grappler tool prongs pointed downward, insert the longer prong into the pull-ring of the fuse. See the inset of Figure 25 on page 29. Then, with one's face turned away, close the fuse with a swift, unhesitating thrust. See Figure 25 on page 29.

If space is tight between the pull-ring of the fuse and an interphase or end barrier, it's acceptable to attach the Grappler tool to the pull-ring with the prong pointed up. See inset of Figure 25 on page 29.

**STEP 9.** Remove the Grappler tool from the pull-ring.

**STEP 10.** After removing the Grappler tool from the pull-ring, be sure complete fuse closure was attained by pushing against the fuse with the Grappler tool.



### **WARNING**

**Failure to completely close the fuse can result in damage to the Uni-Rupter Interrupter, flashover, and injury.**

**STEP 11.** Use the Grappler tool to hang the dual-purpose front barrier in its normal, suspended position. See Figure 20 on page 25. Also install the optional inner barrier panel, if furnished.

**STEP 12.** Close and latch the doors and install a padlock. Pull on the doors to verify they are securely latched.



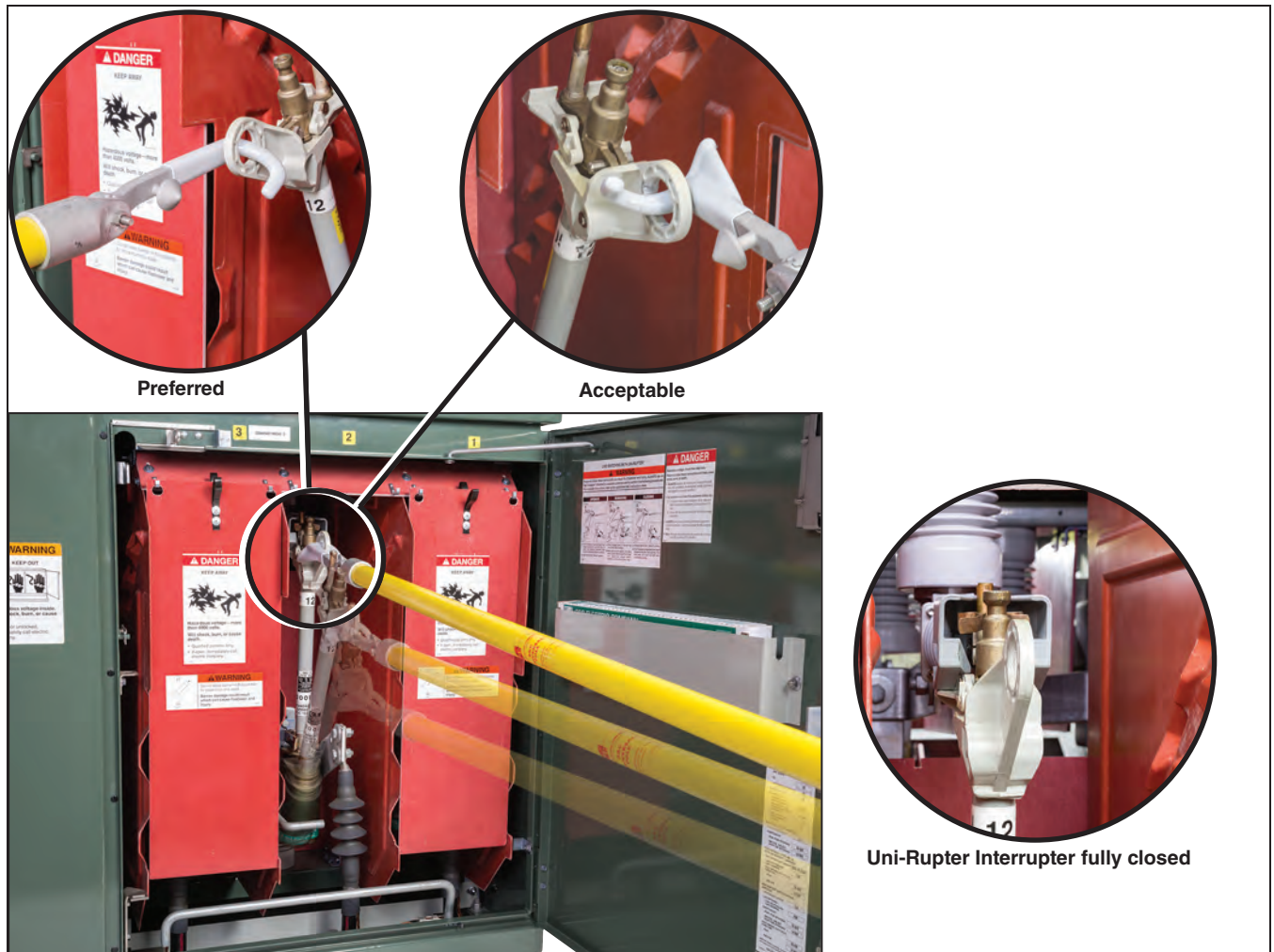


Figure 25. Closing the fuse with a swift, unhesitating stroke. The upper left inset shows a close-up of a Grappler tool in the preferred position to close the fuse. The upper right inset shows a close-up of a Grappler tool in an acceptable position to close the fuse. The lower right inset shows a close-up of a Uni-Rupter Interrupter with the fuse fully closed.





## A Note on Single-Pole Switching

In single-pole fuse switching of ungrounded-primary three-phase transformers or banks (or single-phase transformers connected line to line), circuit connections or parameters may, in some cases, produce excessive overvoltages. In particular, for the following applications above 22 kV, single-pole switching by any means—including the Uni-Rupter Interrupter—should be performed only under the conditions stated in italics:

- Switching unloaded or lightly loaded delta-connected or ungrounded-primary wye-wye connected three-phase transformers or banks (or line-to-line connected single-phase transformers), rated 150 kVA or less three-phase, or 50 kVA or less single-phase—or of any kVA rating when combined with unloaded cables or lines—where maximum system operating voltage exceeds 22 kV (*Single-pole switching should be performed only if each phase is carrying 5% load or more, or if the transformer or bank is temporarily grounded at the primary neutral during switching.*)
- Switching loaded or unloaded ungrounded-primary wye-delta connected three-phase transformers or banks—alone or combined with unloaded cables or lines—where maximum system operating voltage exceeds 22 kV (*Single-pole switching should be performed only if each phase is carrying 5% load or more and if the lighting-load phase is always switched open first (or switched closed last) or if the transformer or bank is temporarily grounded at the primary neutral during switching.*)

## Opening and Removing the Fuse

Before proceeding with the instructions on opening and removing the fuse, refer to the “Safety Precautions” section on page 7 and page 8.

<b>⚠ WARNING</b>		
<p>Always use a Grappler Handling Tool attached to a suitable universal pole to insert, remove, or replace front barriers. No other tools are recommended. <b>Failure to use the proper tools can result in damage to the equipment, flashover, and injury.</b></p>		
 <b>Grappler Handling Tool</b>		
 <b>Talon™ Handling Tool</b>	 <b>Distribution prong</b>	 <b>Station prong</b>

Use a Grappler tool attached to and in line with a suitable universal pole● to follow this procedure.

- STEP 1.** Open the appropriate fuse-compartment door and secure it with the door holder. See Figure 19 on page 25.

**⚠ WARNING**

On double-door models, the adjacent door should be closed and latched to minimize exposure to high voltage. **Failure to do so can result in personal injury.**

- STEP 2.** If the optional inner barrier panels are furnished, loosen the pentahead bolts and remove the panel.
- STEP 3.** Remove only the barrier associated with the fuse to be opened, using the Grappler tool for this purpose. See Figure 20 on page 25.
- STEP 4.** With the Grappler tool prongs pointed downward (preferred), insert the longer prong into the pull-ring of the fuse. Rotate the hookstick clockwise slightly to ensure full and complete engagement of the Grappler tool's prong with pull-ring of the fuse. See Figure 26.

If the space is tight between the pull-ring of the fuse and an interphase or end barrier, it's acceptable to attach the Grappler tool to the pull-ring with the prong pointed up. See inset of Figure 26.

- STEP 5.** Pull the fuse vigorously through its full travel without hesitation at any point. See Figure 27 on page 32. A downward force should be maintained on the universal pole through the fuse-opening operation to counteract any tendency the fuse may have to bounce toward the **Closed** position.

**Note:** The Uni-Rupter Interrupter is designed to require a hard pull to unlatch the fuse, thus reducing the possibility of an incomplete opening operation.



**Figure 26.** A Grappler tool, as positioned for an opening stroke.

● Use a universal pole 1 ¼ inches (32 mm) in diameter and at least 6 feet (183 cm) long for 14.4-kV gear; or at least 8 feet (244 cm) long for 25-kV gear.

- STEP 6.** Remove the Grappler tool from the fuse pull-ring.

### DANGER

The fuse and fuse mounting (Uni-Rupter Interrupter, load-side hinge, and terminals) may be energized by backfeed even when the fuse is in the fully **Open** position. Always assume both terminals of a fuse are energized unless proved otherwise by test, by visual evidence of open-circuit conditions on both terminals, or by observing both terminals are grounded. **Failure to follow these precautions will result in serious injury or death.**

### NOTICE

Do not close a door on a fuse in the **Open** position. The door will strike the fuse pull-ring and interfere with door closing. The door may be closed when the fuse is removed from its mounting.

- STEP 7.** Place the dual-purpose front barrier associated with the fuse to be removed in the **Slide In** position. Use the Grappler tool for this. See Figure 28 on page 33. The barrier is supported on the Grappler tool prongs and held there by engagement of the lifting ring with the Grappler tool cone.



Figure 27. Opening the fuse.



**⚠ WARNING**

Do not leave the dual-purpose front barriers in the **Slide In** position for more than one week. These barriers are intended for temporary use to isolate the fuse from the contacts of the Uni-Rupter Interrupter while work is being performed. If the barriers are left in the **Slide In** position for an extended period of time, there is the possibility of corona discharge to the barriers. **Prolonged exposure to corona discharge can damage the barriers and result in a flashover, injury, and equipment damage.**

**STEP 8.** *For all fuses except 25-kV Fault Fiter Electronic Power Fuses:* Remove the fuse from its hinge as follows:

- (a) Grasp the universal pole with both hands (approximately 2 feet (61 cm) apart), with one hand at the opposite end of the pole from the Grappler tool.
- (b) Position the Grappler tool cone in the fuse pull-ring and cradle the fuse in the Grappler tool prongs. See Figure 29.
- (c) Stand in a normal, upright position facing the universal pole. Move the pole forward until resistance between the Grappler tool and the fuse is felt (approximately 2 inches (51 mm)). Then, remove the fuse from its hinge with a forward and upward lifting motion. See Figure 30 on page 34.

**⚠ DANGER**

Keep the fuse away from the Uni-Rupter Interrupter contacts when removing the fuse from its hinge. Touching the contacts will close the circuit, which can cause a flashover and serious injury. Always place the dual-purpose front barrier in the **Slide In** position whenever a fuse is open or is being removed from or installed into its hinge.

**STEP 9.** *For 25-kV Fault Fiter Electronic Power Fuses:* de-energize, test, and properly ground the mounting in accordance with safe operating procedures and rules. Then, remove the fuse from its mounting by hand using suitable personal protective equipment (PPE).



**Figure 28.** Inserting the dual-purpose front barrier into the Slide In position with the Grappler tool.



**Figure 29.** The Grappler tool positioned for fuse removal.

## Switching with a Uni-Rupter® Interrupter

**STEP 10.** Hang the dual-purpose front barrier in its normal, suspended position using the Grapppler tool. See Figure 30 on page 34. Also install the optional inner barrier panel, if furnished. Then, close, latch the doors, and padlock securely. Pull on the doors to verify they are securely latched.

### NOTICE

Always store fuses in a clean, dry location. Do not store end-fittings, holders, interrupting modules, or current-limiting fuses in high-voltage compartments unless the unit is equipped with the optional **Fuse Storage** feature.

The optional **Fuse Storage** feature, if furnished, can accommodate three completely assembled spare Type SML Fuses, two spare Fault Fiter fuse interrupting modules, one spare Fault Fiter Electronic Power Fuse holder, or one spare current-limiting fuse holder in each switch compartment, as applicable. The **Fuse Storage** feature is mounted inside the enclosure, between the interrupter switch and the side wall of the enclosure. For storage, position the assembled fuses in the **Fuse Storage** feature as shown on the label headed "STORAGE AND HANDLING OF SPARE FUSES" affixed to the inside of each applicable switch-compartment door.

### DANGER

Do not handle spare fuses unless the front barriers for the switches are in their normal, suspended positions to guard against inadvertent contact with live parts. **Failure to follow this precaution can result in serious injury or death.**



**Figure 30.** Removing a fuse from its hinge with a forward and upward lifting motion.

## How to Detect and Replace a Blown Fuse

Follow these steps to detect and replace a blown fuse:

- STEP 1.** Open the appropriate fuse-compartment door and secure it with the door holder.

 **WARNING**

To minimize exposure to high voltage on double-door models, close and latch the adjacent door. **Failure to do so can result in personal injury or death.**

- STEP 2.** Remove the optional inner barrier panel, if furnished. Then, using the Grappler tool, remove the dual-purpose front barrier associated with the fuse mounting which will be inspected.

 **DANGER**

When working in high-voltage compartments, always maintain proper clearance from energized components. **Failure to follow this precaution can result in serious injury or death.**

**STEP 3. For S&C Power Fuses:** From a safe distance, observe the blown-fuse target for the fuse type furnished. See Figure 31.

**For an SML-20 Power Fuse or Fault Fiter Electronic Power Fuse:** A red blown-fuse target projects from the top of the SML-20 Power Fuse upper end-fitting or the Fault Fiter Holder when the fuse has operated, making it easy to check the fuse condition with the fuse in the **Closed** position. The blown-fuse target retracts within the end-fitting or holder when the blown fuse unit or interrupting module is replaced.

**For an SML-4Z Power Fuse:** A fluorescent-orange target in the translucent SML-4Z Holder moves to the BLOWN indicator window

when the fuse operates, permitting a positive visual check of the fuse condition without removing the fuse from its mounting. The target fluoresces when illuminated.

**Note on Handling:** The present design of the upper end-fitting for use in SML-20 Power Fuses and the Fault Fiter fuse holder use a free-floating blown-fuse target that can move (by force of gravity) into the **Blown** position should the fuse be inverted during handling. The fuse condition can be verified by returning the fuse to the upright position. If the fuse is blown, the target will remain in the extended (projecting) position.

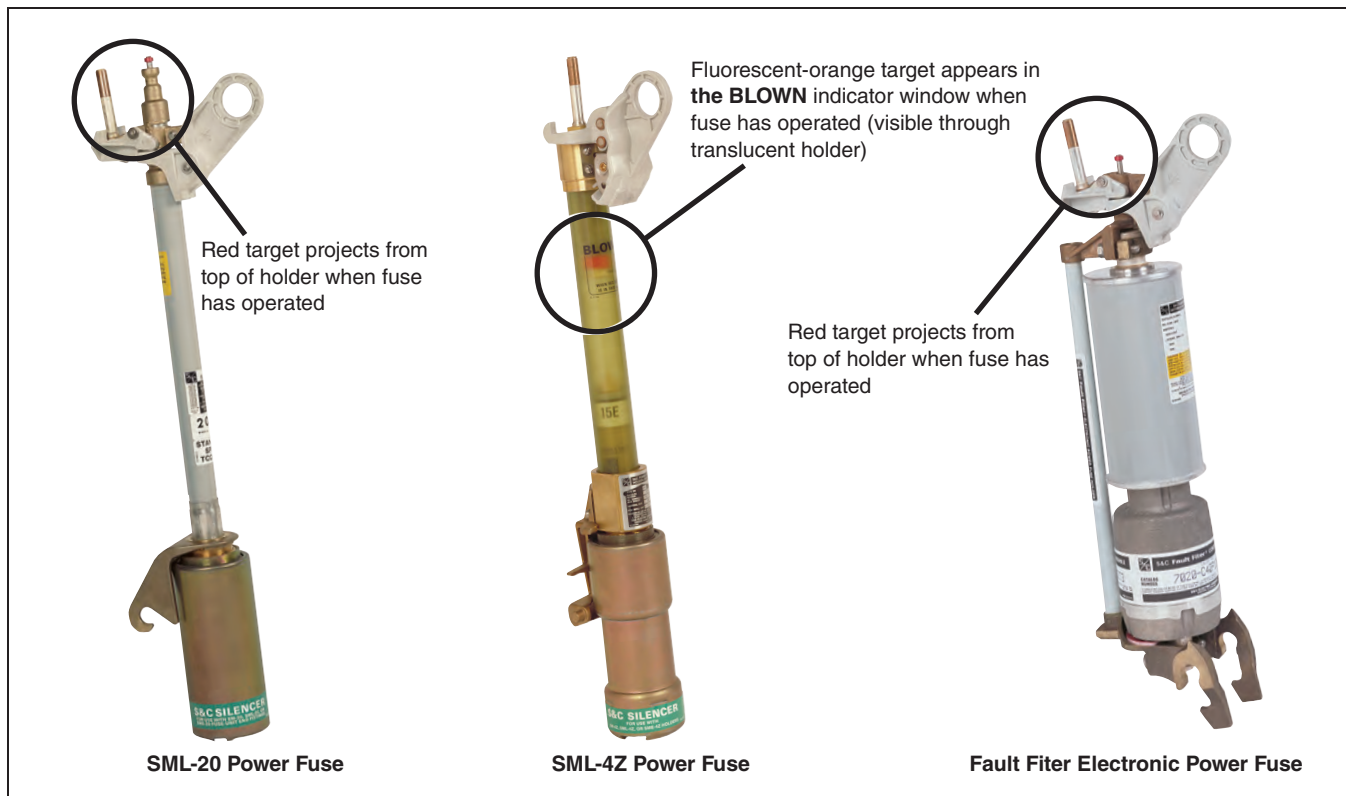


Figure 31. Blown-fuse target locations for the fuse types used in PMH models of S&C Pad-Mounted Gear.



**STEP 4.** Remove the blown fuse from its mounting following the instructions in the “Opening and Removing the Fuse” section on pages 30 through 34. Then, follow the instructions for replacing blown SM-4 Refill Units, SMU-20 Fuse Units, or Fault Fiter fuse interrupting modules (as applicable) that are provided with each new refill unit, fuse unit, or interrupting module.

### Current Limiting Fuses

**STEP 5.** *For current-limiting fuses:* To find the blown fuses, remove each fuse in turn from its mounting (the target cannot be seen when the fuse is in the mounting) by following the instructions in the “Opening and Removing the Fuse” section on page 30 through page 34. Then, inspect the fuse and check for a blown-fuse target.

**Note:** Take the blown fuse back to the service center for proper disposal.

**Note:** Following a two- or three-phase fault at a three-phase installation, any unblown fuses that carried fault current should also be replaced. For instructions about replacing current-limiting fuses in S&C Holders, refer to S&C Instruction Sheet 660-500. S&C Holders will accommodate the current-limiting fuses listed in Table 1 of S&C Information Bulletin 660-50.

### Installing the Fuse in the Mounting

Follow the instructions in the “Installing and Closing the Fuse” section on page 25.

## Final Checks Before Walking Away

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To ensure the Micro-AT Source-Transfer Control is ready for automatic operation, both SOURCE VOLTAGE indicators and the AUTOMATIC-TRANSFER READY indicator are illuminated. If the READY indicator is not lit, check the LCD screen on the faceplate of the Micro-AT control. When not displaying menu information, this screen has messages explaining why the indicator is not lit.

**Note:** A lit READY indicator shows the associated components are in a **Normal** state but when not lit it does not necessarily mean the control is inoperative. For example, when transfer to the alternate source occurs, the READY indicator goes out but the control is ready for any subsequent programmed automatic operation required by a change in source conditions. If the stored-energy operators are decoupled, the READY indicator is off—and the switches will not operate—but the control is fully operational.

Close and padlock the access doors to the low-voltage control compartment and the high-voltage compartments.

The stored-energy operator's quick-make quick-break mechanism will stall in a partially discharged state if the operator is inadvertently tripped while its associated Mini-Rupter Switch is prevented from closing by any of the following conditions:

- The switch is not completely coupled (or decoupled) to switch operator.
- The switch is blocked open by mechanical cable interlock (applicable when that option, catalog number suffix "-C6," is included).
- The switch is blocked open by mechanical anti paralleling (applicable when that option, catalog number suffix "-C7," is included).
- The switch is locked open by key interlock (applicable when that option, catalog number suffix "-C5," is included).
- The switch blades blocked by insertion of the dual-purpose front barrier in its **Slide In** position.

To determine whether the quick-make quick-break mechanism has stalled, observe the switch-position indicator target. If the words "SWITCH OPEN" on the target appear slightly off-center and one or more letters are partially hidden from view in the target opening, then the mechanism is in a stalled condition.

Follow these steps to restore the stored-energy operator to a normal latched-open condition after such an occurrence as follows:

- STEP 1.** Make sure the MANUAL/AUTOMATIC OPERATION selector switch is in the **Manual** position.
- STEP 2.** Place the large notched end (with recessed bolt) of the dual-purpose manual handle in the center of the decoupler. (The handle's knurled knob performs no function in this application.) While pivoting the handle, push it in to engage the reverse-drive hub.
- STEP 3.** Rotate the handle counterclockwise for the left-hand switch (clockwise for the right-hand switch) to back drive the switch and the quick-make quick-break mechanism against the tension of the stored-energy spring until the mechanism latches in its **Open** position. A slight click may be heard when the mechanism latches.
- STEP 4.** Verify the latched-open condition has been achieved by observing that the switch-position target shows SWITCH OPEN and the operator targets show OPERATOR IN SWITCH-OPEN POSITION and OPERATOR-CHARGED.

## Components

No routine maintenance is required for the Micro-AT Source-Transfer Control. However, operational testing once per year in accordance with S&C Instruction Sheet 663-590 is recommended to verify proper functioning of the system.

No mechanical maintenance is required for S&C Pad-Mounted Gear. However, occasional inspection of the gear and exercising of the Mini-Rupter Switches is recommended.

In, addition, inspection and cleaning of insulators and cable terminators in particular should be performed periodically, at intervals based on environmental conditions.

### **DANGER**

When access to high-voltage compartments is required for inspection, service, or repairs, always observe the precautions in the “Safety Precautions” section on page 7 and 8. **Failure to follow this precaution can result in serious injury or death.**

### **NOTICE**

When, in the user’s judgment, cleaning is required, S&C recommends the pad-mount gear be completely de-energized, tested, and grounded the pad-mounted gear according to the user’s operating and safety procedures, and thoroughly cleaned by hand. If it is not possible to de-energize the gear, the use of pressure sprayed dry ice (solid CO<sub>2</sub>) is an acceptable alternative cleaning method.

Never use pressure-sprayed abrasives to clean pad-mounted gear. Pressure-sprayed abrasives will damage switch and fuse components.

The stored-energy operators should be given an exercising consisting of five or more operations at least once every year, unless normal operating duty provides equal or greater exercise. With the switches decoupled from the operators, exercising can be accomplished at any convenient time without the switches themselves being operated, therefore, without a service interruption.

The nominal operating life of the stored-energy operators is 1500 operations (complete close-open cycles), provided no more than 500 operations are performed while decoupled.

### **WARNING**

Dual-purpose front barriers for switch and fuse compartments should be inserted into the open gap of the Mini-Rupter Switch or fuse to provide physical isolation for additional security in the event it is necessary to work on the cables connected to the Mini-Rupter Switch or fuse. See Figure 17 on page 22 and Figure 21 on page 26. **Failure to do so can result in personal injury.**

**Note:** Occasionally, low-voltage components may require maintenance. The maintenance of other low-voltage components isolated from high-voltage compartments may be performed under the safety rules for equipment rated 600 Volts or less. If maintenance is to be performed on devices connected to the secondary of a voltage sensor, short-circuit the secondary connections. A separate drawing will be provided with the replacement part explaining how to properly short-circuit the secondary connections.

★ These recommendations may differ from the user’s operating and safety procedures. Where a discrepancy exists, users should follow their procedures.



## Returning Equipment to Service

Follow these steps to return the equipment to service:

- STEP 1.** Make sure the switch and fuse grounding means are removed and the dual-purpose front barriers are removed from the **Slide In** position before closing the associated Mini-Rupter Switch or power fuses.
- STEP 2.** Make sure the Mini-Rupter Switches are in the correct position (**Open** or **Closed**) as dictated by system circumstances.
- STEP 3.** Close each door that permits access to high voltage. Make sure the associated Penta-Latch Mechanisms are securely latched and padlocked before energizing the circuit or operating any switching device.
- STEP 4.** Make sure the Micro-AT control is connected by checking that the input plug is in the input receptacle.
- STEP 5.** Refer to the “Final Checks Before Walking Away” section on page 38 to make sure the Micro-AT control is ready for automatic operation.
- STEP 6.** Close both low-voltage compartment doors and make sure the associated Penta-Latch Mechanism is completely latched and padlocked.
- STEP 7.** Padlock all doors before leaving the installation site, even momentarily. Observe this procedure even in those cases where the gear is accessible only to qualified persons.

## Enclosure Finish

The responsibility for ensuring the finish protects an enclosure lies with both the manufacturer and the user. Source-transfer PMH Pad-Mounted Gear is finished with the Ultradur® II Outdoor Finish, which provides lasting protection for the enclosure. To retain the protection, users should follow these steps to take periodic corrective action:

- STEP 1.** Touch up any penetration of the finish to bare metal, such as scratches and abrasions due to shipping or vandalism, to maintain the original integrity. S&C touch-up finish and primer are available in aerosol spray cans. See S&C Specification Bulletin 663A-31 for catalog number information used for ordering. No other finish or primer is approved.
- STEP 2.** The area to be touched up should be cleaned to remove all oil and grease.
- STEP 3.** Sand the area, removing any traces of rust that may be present, and make sure all edges are feathered before applying primer.
- STEP 4.** Provide an occasional simple wash, such as an automobile would be given, to remove surface contaminants. Use any ordinary mild household detergent solution.  
**Note:** When the enclosure must be refinished by the user before the finish has weathered—for example, to match other equipment—a special precaution must be taken. The entire surface must be sanded to provide a tooth to bond the new coat to the unusually tough and smooth Ultradur II Outdoor Finish.

★ These recommendations may differ from the user's operating and safety procedures. Where a discrepancy exists, users should follow their procedures.

## Optional Tryout Before Gear Is Energized

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To expedite full service when high voltage is available, the user may want to perform a preliminary checkout of the Micro-AT Source-Transfer Control before the gear is energized. For this purpose the S&C Test Accessory is available to permit checkout of the source-transfer operation using an external single-phase 120-Vac source.

When a preliminary checkout is to be performed, special instructions must be followed to ensure correct operation of the Micro-AT control. These instructions are set forth in S&C Instruction Sheet 515-510, furnished with the test accessory. The programming and testing described in the "Field Adjustment and Programming" and the "Operational Testing" sections in S&C Instruction Sheet 515-500 can be completed during the preliminary checkout.

When the test accessory is used, the control power available to supply the charging motors of the stored-energy operators and to maintain the charge on the solenoid-tripping capacitors is less than that available during normal three-phase operation. As a result, the time required for the motors to charge the stored-energy operators will be longer than normal.

It may take as long as two minutes after the stored-energy operators are charged for the solenoid-tripping capacitors to become fully charged. Therefore, wait at least two minutes after the stored-energy operators are charged before initiating a transfer operation.

When high-voltage dielectric tests are to be performed on source-transfer PMH Pad-Mounted Gear, special precautions should be taken to prevent damage to the voltage sensors and voltage limiters. Refer to S&C Instruction Sheet 591-500.