

# Cleaning Flooded Gear

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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 manual PMH Pad-Mounted Gear. Become familiar with the Safety Information page 4 and Safety Precautions on page 5. 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 manual 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 manual PMH Pad-Mounted Gear are listed in the ratings table in manual in Specification Bulletin 662-31. The ratings are also on the nameplate affixed to the product.

**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 contained in the seller's standard conditions of sale (as set forth in Price Sheet 150) does not apply to manual 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 manual PMH Pad-Mounted Gear where other than Fault Fiter Electronic Power Fuses, S&C Switch Blades, or the current-limiting fuses listed in Table 1 of S&C Information Bulletin 660-50 are used in conjunction with Fault Fiter Electronic Power Fuse mountings and S&C Holders designed therefor, or when current-limiting fuses are applied other than as set forth in the "Recommended Voltage Ratings" section.

## 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 manual 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.

**⚠ 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 your company's operating procedures and rules. Where a discrepancy exists, follow your company's operating procedures and rules.

1. **QUALIFIED PERSONS.** Access to 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 "CAUTION," "WARNING," "DANGER," or "NOTICE" labels.
5. **KEY INTERLOCKS.**
  - If optional key interlocks were furnished, they must be in place.
  - Check the operating sequence of key interlocks to verify proper sequencing.
  - After the pad-mounted gear is installed, either: (1) destroy the extra set of keys or (2) make them accessible only to qualified persons. This will maintain the integrity of the key-interlock scheme.
  - Key interlocks are not security locks and are not substitutes for padlocks.
6. **OPENING DOORS.** Do not force doors open. Forcing a door open can damage the latching mechanism. If optional key interlocks are provided, correctly position the interlocks so the doors can be opened.
7. **CLOSING AND LOCKING DOORS.**
  - Doors must be securely closed and latched, with padlocks in place at all times unless work is being performed inside the enclosure.
  - Mini-Rupter® Switches have switch-operating-shaft access covers located on the sides of the pad-mounted gear enclosure. They must be closed and padlocked at all times unless the switches are being operated.
8. **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.
9. **ENERGIZED TERMINALS.** Always assume both sets of power terminals on any Mini-Rupter 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.
10. **BACKFEED.** Mini-Rupter Switches and fuses may be energized by backfeed.
11. **DE-ENERGIZING, TESTING, AND GROUNDING.** Before touching any device that is to be inspected, replaced, serviced, or repaired in the high-voltage compartments, always disconnect Mini-Rupter Switches and fuses from all power sources (including backfeed), test for voltage, and properly ground. Test for voltage on both sets of power terminals of any Mini-Rupter Switch or fuse using proper high-voltage test equipment before touching any device that is to be inspected, replaced, serviced, or repaired in the high-voltage compartments.
12. **GROUNDING.**
  - Make sure the pad-mounted gear enclosure is properly grounded to the station or facility ground.
  - After the gear has been completely disconnected from all sources of power and tested for voltage, install suitable grounding cables in all compartments before touching any device to be inspected, replaced, serviced, or repaired in the high-voltage compartments.

CONTINUED ►

### 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 your company's operating procedures and rules. Where a discrepancy exists, follow your company's operating procedures and rules.

#### 13. SWITCH POSITION.

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

#### 14. MAINTAINING PROPER CLEARANCE.

Always maintain proper clearance from energized components.

#### 15. FUSE STORAGE.

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

#### 16. FUSES MUST BE DISCONNECTED.

Make sure fuses are disconnected from all power sources (including backfeed) before being inspected or replaced.

#### 17. 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.

#### 18. 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.

#### 19. 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] 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.

This publication provides cleaning recommendations for manual S&C PMH Pad-Mounted Gear that has been flooded. Before the gear can be returned to service, contaminants must be removed; insulators, bus, and barriers must be cleaned; and moving contacts and switch quick-make, quick-break mechanisms must be lubricated.

Equipment and cables must be de-energized and grounded in each compartment prior to starting work.

Applicable instruction sheets, drawings, and wiring diagrams are in an envelope labeled “Installation and Operation Information Kit” located in Compartment 1.

If cleaning or maintenance is required beyond the scope of this publication, or if replacement parts and lubricants are needed, contact the nearest S&C Sales Office. Have the complete catalog number of the gear and date of shipment (as shown in the nameplate) available for reference.

## Cleaning Procedure

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Complete these steps in the order listed for the cleaning procedure:

- STEP 1.** Remove the roof.
- STEP 2.** Remove the interphase and end-barriers in each switch and fuse compartment. Discard barriers made of Benelex. Benelex interphase and end-barriers must be replaced with barriers made of GPO-3 fiberglass.
- STEP 3.** Remove and discard the arc compressors from each Mini-Rupter® Switch.
- STEP 4.** Thoroughly rinse the interior of the enclosure and roof with clean water. Do not use a pressure washer.
- STEP 5.** Clean the bus, bus-support Cypoxy™ Insulators, and GPO-3 interphase and end-barriers as follows:
- (a) Wash with phosphate-free mild soap and water.
- STEP 6.** Lubricate each Mini-Rupter Switch quick-make, quick-break mechanism with WD-40® or similar penetrating oil. Do not get the oil on insulators.

### NOTICE

Do not use industrial-strength cleaning solutions such as Formula 409® or Simple Green®, which contain solvents. Solvent vapors can attack arc compressor components and fuse pull rings, resulting in reduced interrupting performance or weakened parts

- (c) Rinse thoroughly with clean water.
- (d) Dry with compressed air.

- STEP 7.** Lubricate each Mini-Rupter Switch contact with Nye Rheolube™ or similar grease.

### NOTICE

Do not use industrial-strength cleaning solutions such as Formula 409® or Simple Green®, which contain solvents. Solvent vapors can attack arc compressor components and fuse pull rings, resulting in reduced interrupting performance or weakened parts

- STEP 8.** Install new arc compressors on each Mini-Rupter Switch.
- STEP 9.** Remove and discard each Uni-Rupter® Interrupter.
- STEP 10.** Prepare the bus joint at each Uni-Rupter Interrupter as follows:
- (a) Clean the joint by abrading with medium-grit sandpaper. Copper and copper-alloy surfaces may be discolored from oxidation. This is normal and does not indicate overheating.
  - (b) Apply Penetrox® A to the joint.
- STEP 11.** Install each new Uni-Rupter Interrupter as follows:
- (a) Loosely connect the bus to the Uni-Rupter Interrupter terminal pad using new hardware and Belleville washers.
  - (b) With the pad-mounted gear level and square, slowly raise the fuse and check its alignment with the Uni-Rupter Interrupter. If necessary, loosen the bolts attaching the insulator to the frame, and rotate the Uni-Rupter Interrupter as required.
  - (c) Torque the bolts to 50 ft-lbs (68 Nm).
- STEP 12.** Replace all fault indicators, if present.
- STEP 13.** Follow the terminator manufacturer's recommendations with respect to cleaning and reuse of terminators.

**STEP 14.** Follow the surge arrester manufacturer's recommendations with respect to cleaning and reuse of surge arresters.

**STEP 15.** Reinstall all GPO-3 interphase and end-barriers.

**STEP 16.** Install new corner wire guards.

**STEP 17.** Reinstall the roof.

**STEP 18.** Open each fuse and remove it from its hinge.

***For each SML-20 Power Fuse, do the following:***

- (a) Remove the end-fittings and S&C Silencer. Wash them with phosphate-free mild soap and water.

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- (b) Thoroughly rinse the end-fittings and silencer with clean water.
- (c) Dry the end-fittings and silencer with compressed air.
- (d) Make sure the latch on the upper end-fitting pivots freely. If not, replace the end-fittings.
- (e) Apply No-Ox-ID "A" or similar electrically conductive grease to the contact rod assembly. Do not get electrically conductive grease on the latch or pull-ring.
- (f) Apply a light film of white petroleum grease to the surfaces of the latch and pull-ring where they touch during operation.
- (g) Remove and discard the SMU-20® Fuse Unit. Also discard all spare fuse units.

***For each SML-4Z Power Fuse, do the following:***

- (a) Remove the S&C Silencer. Wash it with phosphate-free mild soap and water.

### NOTICE

Do not use industrial-strength cleaning solutions such as Formula 409® or Simple Green®, which contain solvents.

- (b) Thoroughly rinse the silencer with clean water.
- (c) Dry the silencer with compressed air.
- (d) Remove and discard the SML-4Z Holder and SM-4® Refill Unit. Also discard all spare refill units.

***For each Fault Fiter® Electronic Power Fuse, do the following:***

- (a) Remove the holder. Wash it with phosphate-free mild soap and water.

### NOTICE

Do not use industrial-strength cleaning solutions such as Formula 409® or Simple Green®, which contain solvents. Solvent vapors can attack arc compressor components and fuse pull rings, resulting in reduced interrupting performance or weakened parts

- (b) Thoroughly rinse the holder with clean water.
- (c) Dry the holder with compressed air.
- (d) Make sure the latch on the holder pivots freely. If not, replace the holder.
- (e) Apply No-Ox-Id "A" or similar electrically conductive grease to the contact rod assembly. Do not get electrically conductive grease on the latch or pull-ring.
- (f) Apply a light film of white petroleum grease to the surfaces of the latch and pull-ring where they touch during operation.
- (g) Remove and discard the interrupting module and control module. Also discard all spare interrupting and control modules.

**STEP 19.** Perform a 60-Hz dielectric test on the pad-mounted gear unit using the test values shown in S&C Instruction Sheet 662-505.

## Replacement Parts and Lubricants

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**Table 1. Parts**

Part Number	Description
9999-044	Nye Rheolube, ¼-ounce tube
9999-130	NYE Rheolube, 7-pound can
0352-006	No-Ox-Id "A" 5-gallon can
0352-313	White petroleum grease, 5-gallon can
0825-435	Penetrox A, 4-ounce tube
SA-40726	Mini-Rupter Switch arc compressor replacement kit
SA-39139	Uni-Rupter Interrupter, 14.4 kV
SA-38945	Uni-Rupter Interrupter, 25 kV
92352	SML-4Z Holder, 14.4 kV
92353	SML-4Z Holder, 25 kV
3097	SML-20 Fuse Unit End-Fittings
99412R1	Fault Fiter fuse holder, 13.8 kV
99413R1	Fault Fiter fuse holder 25 kV
C-3753-1 & -2	Corner wire guards, for gear manufactured from August 1989 through December 1997
CP-1287-1 & -2	Corner wire guards, for gear manufactured from December 1997 to present
1023-332	Bus hardware, ½–13 × ½ hexhead cap screw, galvanized
1023-812	Bus hardware, ½–13 hex nut, galvanized
CD-2262-2	Bus hardware, Belleville washer