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## Introduction

 <b>CAUTION</b>
The equipment covered by this publication must be selected for a specific application and it must be installed, operated, maintained, and inspected by qualified persons who are thoroughly trained and who understand any hazards that may be involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

This publication contains inspection and maintenance recommendations for S&C Manual Metal-Enclosed Switchgear.

It is generally recommended that metal-enclosed switchgear be inspected six months to a year after installation and then every five years thereafter to ensure continued proper performance of the gear. Each user's own experience as well as environmental conditions at the installation will determine whether more or less frequent inspections are required.

A partial visual inspection of the gear for general cleanliness and to confirm proper alignment and condition of

barriers and terminators may be performed with the gear energized, if permitted by the user's own operating practices and provided that standard precautionary practices are followed. Such visual inspections also may be performed when the gear is visited for other reasons. However, the more detailed inspection and maintenance procedures outlined in this publication may only be completed when the unit is completely de-energized and grounded.

Applicable instruction sheets, drawings, and wiring diagrams for each switchgear assembly, plus similar documents for meters, relays, and other low-voltage components not of S&C manufacture, are in an envelope entitled "Installation and Operation Information Kit." This envelope is located in a holder inside the appropriately labeled switchgear-bay door.

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



## Inspection and Maintenance Procedure①

### WARNING

When access to high-voltage bays is required, it must be restricted to qualified persons only. Such qualified persons must observe the following procedures:

1. Adhere to prescribed safety rules at all times.
2. Be certain that fuses, interrupter switches, and their mechanisms, and any other devices are disconnected from all power sources and are grounded before the device is inspected, serviced, or repaired.
3. Always assume both sets of terminals on any interrupter switch or fuse are energized unless proven otherwise by test, by visual evidence of open-circuit conditions on both terminal ends, or by grounding.
4. Test for voltage. Qualified persons should be certain they have and know how to operate the correct test equipment for determining voltage on both sets of terminals on any fuse or interrupter switch.
5. After the switchgear has been completely disconnected from all sources of power and tested, properly connect suitable grounding leads to both sides of the equipment, that is, the incoming and outgoing phases of the equipment to be maintained.
6. Install dual-purpose front barriers, if furnished, in the "slide-in" position. If a contact on either side of a barrier is energized, do not leave the barrier in the "slide-in" position for longer than one week. These barriers are intended for temporary use only to isolate the blades of the switch from the main contacts while work is being performed. If the barriers are left in the "slide-in" position for extended periods of time, there is the possibility of corona discharge to the barriers. Prolonged exposure to corona discharge may damage the barriers and result in a flashover.
7. Padlock and tag equipment in accordance with the user's standard operating procedures.
8. All voltage transformers and voltage sensors must be disconnected when external voltage is used to test any secondary-side wiring or devices to avoid energizing the high-voltage conductors through the voltage transformers or sensors. If drawout-type voltage transformers are provided, draw out the transformers and completely disconnect the secondary connections. Otherwise, remove the primary fuses of the voltage transformers and disconnect the secondaries by removing the secondary fuses or by disconnecting the secondary leads. Do not disconnect the burden or the voltage limiter from the voltage sensor until the switchgear is de-energized; otherwise, the voltage sensor will be damaged. For voltage sensors, the secondary leads must be shorted by inserting screws into shorting-type terminal blocks.

9. When the equipment to be inspected is not of S&C manufacture, follow the instructions supplied by the manufacturer of the equipment.

10. Make certain ground connections from the ground bus (or ground pad on a single-bay assembly) to the permanent station or system ground facility are made. No equipment should be returned to service unless such grounds are properly made.

**Note:** Occasionally, low-voltage components may require maintenance. In the servicing or repair of space heaters, voltage-transformer secondary wiring, and any other components located in a high-voltage bay, all the preceding safety procedures apply. The maintenance of other low-voltage components (such as voltmeters, ammeters, relays, etc.) isolated from high voltage may be performed under the safety rules for equipment rated 600 volts or less. If maintenance is to be performed on ammeters, short-circuit the secondary connections of the associated current transformer at the shorting-type terminal block before removing the ammeter. This may require access to a high-voltage bay, in which case the foregoing procedures apply.

When returning the equipment to service, observe the following procedure:

1. Reconnect any low-voltage terminals that may have been disconnected when servicing the gear.
2. Withdraw any dual-purpose front barriers, if furnished, from the "slide-in" position and return them to their normal, suspended position.
3. Make certain that fuses (or switch blades instead of fuses) are closed and securely latched.
4. Open any grounding switch, or remove other grounding means, before energizing the associated interrupter switch(es).
5. Close and securely latch each switchgear-bay door before energizing the circuit or operating any switching device.
6. Lock interrupter switches in the open or closed position as dictated by the electric power system design.
7. Padlock all doors, switch-operating handles, and covers before leaving the installation site, even momentarily. Observe this procedure even in those cases where the gear is accessible only to qualified persons.

## Inspection and Maintenance Procedure<sup>①</sup>—Continued

Item	Procedures																																																						
Inspect and clean interior	<ol style="list-style-type: none"> <li>1. Visually inspect the interior of each bay for dirt, weeds, rodent, reptile, and insect intrusion.</li> <li>2. If cleaning is necessary, S&amp;C recommends using water to wash dirty or contaminated surfaces. Mild soap may be used to remove particularly stubborn deposits on painted surfaces, barriers, and Cypoxy® Insulator parts.▲</li> <li>3. Inspect insulators, surge arrestors, terminators, etc., for physical and electrical damage.</li> <li>4. Check the gasketing around doors and windows is securely affixed and grouting around the exterior of the bays is in good condition. Verify there has been no major water ingress.</li> </ol>																																																						
Inspect barriers and minimum air clearances	<ol style="list-style-type: none"> <li>1. Inspect barriers for signs of tracking and corona discharge. Surface deposits can be wiped off. If surface erosion is present, the barriers may need to be replaced.</li> <li>2. Verify the interphase and end barriers hang vertically and retaining hardware securely holds them in place.</li> <li>3. Verify the clearance from the terminators and other energized parts to the barriers and electrical ground is maintained to prevent flashover (e.g. fuse silencer to terminator drain wire). Minimum air clearances are listed below:</li> </ol> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2">Rating, kV</th> <th colspan="4">Minimum Air Clearances Inches (mm)</th> </tr> <tr> <th>Nominal</th> <th>BIL</th> <th>Energized Parts to Barriers</th> <th>Terminator Skirts to Barriers</th> <th>Energized Parts to Elec. Ground</th> <th>Phase-to-Phase</th> </tr> </thead> <tbody> <tr> <td>4.8</td> <td>60</td> <td>½ (13)</td> <td>½ (13)</td> <td>3½ (89)</td> <td>4½ (114)</td> </tr> <tr> <td>7.2</td> <td>75</td> <td>1 (25)</td> <td>½ (13)</td> <td>4½ (114)</td> <td>6 (152)</td> </tr> <tr> <td>13.8</td> <td>95</td> <td>1 (25)</td> <td>½ (13)</td> <td>6 (152)</td> <td>6 (152)</td> </tr> <tr> <td>25</td> <td>125</td> <td>2¼ (57)</td> <td>1¼ (32)</td> <td>7½ (191)</td> <td>7½ (191)</td> </tr> <tr> <td>25</td> <td>150</td> <td>3¼ (83)</td> <td>1¼ (32)</td> <td>10½ (267)</td> <td>12 (305)</td> </tr> <tr> <td>34.5</td> <td>150</td> <td>3¼ (83)</td> <td>3 (76)</td> <td>10½ (267)</td> <td>12 (305)</td> </tr> <tr> <td>34.5</td> <td>200</td> <td>3¼ (83)</td> <td>3 (76)</td> <td>15 (381)</td> <td>15 (381)</td> </tr> </tbody> </table>	Rating, kV		Minimum Air Clearances Inches (mm)				Nominal	BIL	Energized Parts to Barriers	Terminator Skirts to Barriers	Energized Parts to Elec. Ground	Phase-to-Phase	4.8	60	½ (13)	½ (13)	3½ (89)	4½ (114)	7.2	75	1 (25)	½ (13)	4½ (114)	6 (152)	13.8	95	1 (25)	½ (13)	6 (152)	6 (152)	25	125	2¼ (57)	1¼ (32)	7½ (191)	7½ (191)	25	150	3¼ (83)	1¼ (32)	10½ (267)	12 (305)	34.5	150	3¼ (83)	3 (76)	10½ (267)	12 (305)	34.5	200	3¼ (83)	3 (76)	15 (381)	15 (381)
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Inspect and exercise Mini-Rupter and Alduti-Rupter Switches	<ol style="list-style-type: none"> <li>1. While switchgear-bay doors are closed and latched, exercise the Mini-Rupter and Alduti-Rupter Switches and verify proper opening and closing. If dual-purpose front barriers are furnished, make sure they are not in the “slide-in” position.</li> <li>2. Inspect, clean, and re-lubricate the Mini-Rupter Switches.▲◆             <ol style="list-style-type: none"> <li>a. Check blades for signs of galling and excessive arc interruption. Minor surface imperfections can be burnished out. Clean the blades and apply a thin layer of lubricant, as necessary.</li> <li>b. Clean rotating hinge contacts and apply a thin layer of lubricant, as necessary.</li> <li>c. Check contacts and joints for signs of overheating, as evidenced by distorted or discolored metal.■</li> </ol> </li> <li>3. Inspect, clean, and re-lubricate the Alduti-Rupter Switches.▲●             <ol style="list-style-type: none"> <li>a. Check the main current-carrying contacts for signs of galling. Minor surface imperfections can be burnished out. Clean the contacts and apply a thin layer of lubricant, as necessary.</li> <li>b. Check contacts and joints for signs of overheating, as evidenced by distorted or discolored metal.■</li> </ol> <p><b>Note:</b> S&amp;C recommends cleaning and re-lubrication of Mini-Rupter and Alduti-Rupter Switches every 10 years, regardless of condition, to ensure proper operation or more frequently if the environment tends to be excessively hot, humid, dry, dirty, or contaminated.</p> </li> </ol>																																																						
Inspect fuses	<ol style="list-style-type: none"> <li>1. Open and close fuses to ensure proper latching. Refer to the applicable S&amp;C Instruction Sheet for fuse handling instructions.</li> <li>2. Inspect the fuse-contact surfaces for signs of galling and overheating, as evidenced by distorted or discolored contacts.             <ul style="list-style-type: none"> <li>■ Minor surface imperfections can be burnished out. Clean contacts and apply a thin layer of lubricant, as necessary.▲</li> </ul> </li> </ol>																																																						

① If maintenance is required beyond the scope of this publication, or if replacement parts are necessary, contact the nearest S&C Sales Office. Have the complete catalog number of the switchgear and date of shipment (as shown on the nameplate) available for reference.

▲ Do not use industrial strength cleaning solutions (e.g. Formula 409®, Simple Green®) or lubricants that contain solvents. Solvent vapors can attack arc compressor components and fuse pull rings, resulting in reduced interrupting performance or weakened parts.

◆ NYE Rheolube 368, available in ¼-oz. tubes from S&C, part number 9999-044, is the only approved lubricant.

■ There may be discoloration of copper and copper alloy surfaces caused by oxidation. This does not indicate overheating.

● Shell Gadus® S2 U1000 2 Lubricant, catalog number 9999-043, is available in 1-oz. tubes from S&C. Shell Darina SD1, Dow 33, or equivalent can be substituted.

TABLE CONTINUED ►

# Inspection and Maintenance Procedure

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## Inspection and Maintenance Procedure<sup>①</sup>—Continued

Item	Procedures
Inspect mechanical and key interlocks, and door latching mechanisms	<ol style="list-style-type: none"><li data-bbox="334 281 1425 325">1. Inspect all mechanical interlocks and key interlocks for proper functioning. Refer to S&amp;C Instruction Sheets 621-500 and 622-500 for Custom and System II Metal-Enclosed Switchgear respectively.</li><li data-bbox="334 331 1425 357">2. Verify proper operation of the door latching mechanisms</li></ol>
Inspect, clean, and touch up exterior	<ol style="list-style-type: none"><li data-bbox="334 407 1425 478">1. To maintain the original integrity of the finish, clean the exterior of the switchgear and touch up scratches and abrasions using S&amp;C touch-up finish and red-oxide primer, available in aerosol spray cans. Order catalog number 9999-058 for olive green finish, 9999-079 for light-gray indoor finish, 9999-080 for light-gray outdoor finish, and 9999-061 for red-oxide primer.</li><li data-bbox="334 485 1425 556">2. Inspect exterior vent filters (if supplied). Replacement fiberglass filters (two required per vent) are available from S&amp;C, catalog number CD-1056-6. If the environment is very dusty, S&amp;C recommends that the filters be inspected several times during the year to ensure sufficient ventilation in the switchgear.</li></ol>

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