

Installation

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Introduction

Qualified Persons

WARNING

The equipment covered by this publication must be installed, operated, and maintained by qualified persons who are knowledgeable in the installation, operation, and maintenance of underground electric power distribution equipment along with the associated hazards. A qualified person is one who is 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 the special precautionary techniques, personal protective equipment, insulating 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

Read this instruction sheet thoroughly and carefully before installing your S&C Vista SD Underground Distribution Switchgear. Familiarize yourself with the Safety Information and Safety Precautions on pages 3 through 5. The latest version of this publication is available online in PDF format at sandc.com/en/support/product-literature/.

Retain this Instruction Sheet

This instruction sheet is a permanent part of your S&C Vista SD Underground Distribution Switchgear. Designate a location where you can easily retrieve and refer to it.

Proper Application

WARNING

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the selected equipment.

Warranty

The warranty and/or obligations described in S&C's standard conditions of sale, as set forth in Price Sheet 150, 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 all seller's 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, 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 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 PREMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150.

Warranty Qualifications

The seller's standard warranty does not apply to components not of S&C manufacture that are supplied and installed by the purchaser or to the ability of the seller's equipment to work with such components.

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to your S&C Vista SD Underground Distribution Switchgear. Familiarize yourself 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 you do not understand any portion of this instruction sheet and need assistance, contact your nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C’s website sandc.com. Or call the S&C Global Monitoring and Support Center at 1-888-762-1100.

NOTICE	
Read this instruction sheet thoroughly and carefully before installing your S&C Vista SD Underground Distribution Switchgear.	

Replacement Instructions and Labels

If you need additional copies of this instruction sheet, contact your 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 your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

Safety Information

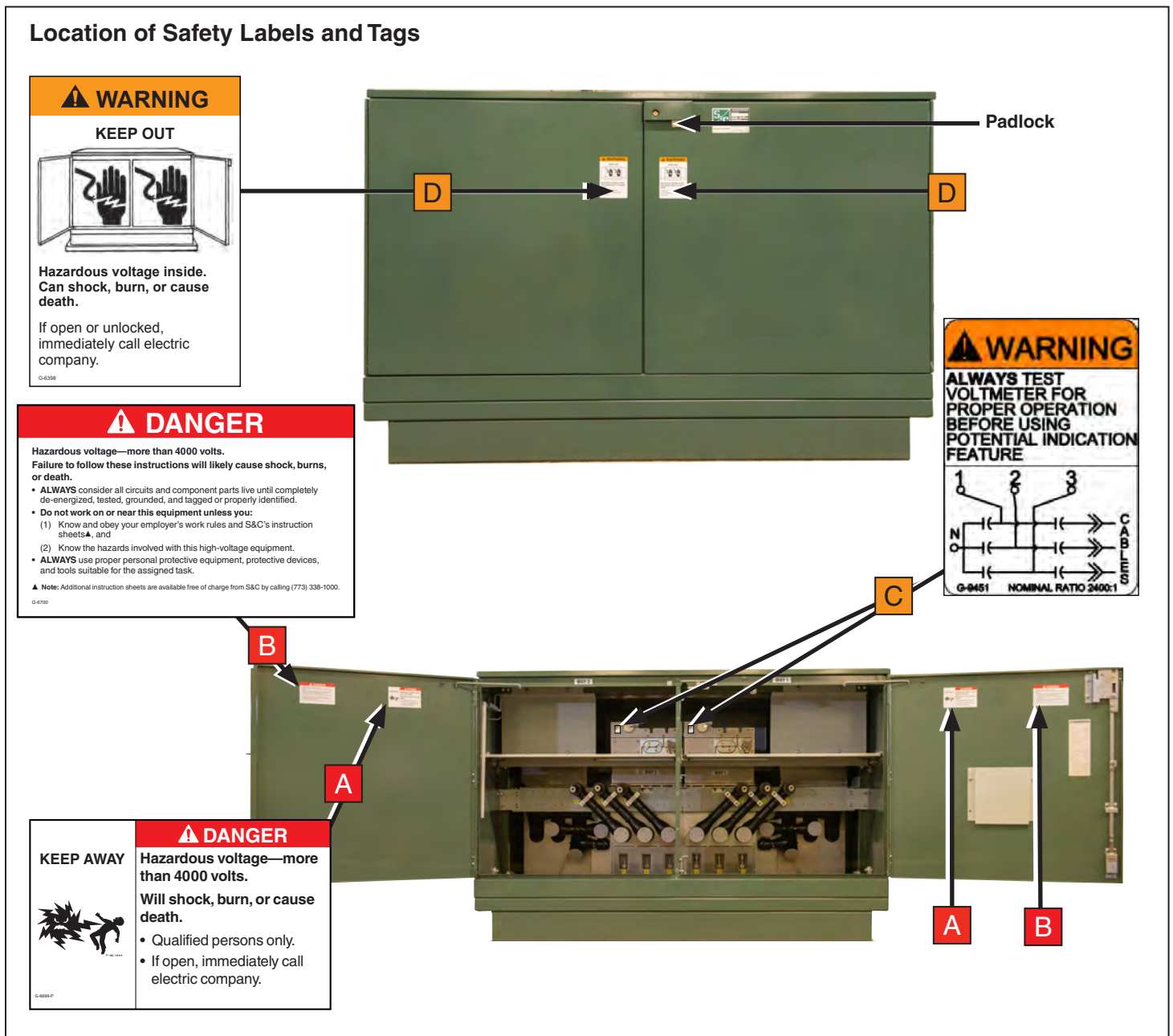


Figure 1. Location of Safety Labels — Model 431 (4-way) unit shown.

Reorder Information for Safety Information

Location	Safety Alert Message	Description	Part Number
A	⚠ DANGER	Keep Away—Hazardous Voltage (“Mr. Ouch”)	G-6699
B	⚠ DANGER	Hazardous Voltage—Always Consider Circuits and Components Live...	G-6700
C	⚠ WARNING	Voltage Tester—Always Test for Proper Operation	G-9451
D	⚠ WARNING	Keep Out—Hazardous Voltage Inside	G-6398

⚠ DANGER



S&C Vista SD Underground Distribution Switchgear operates at high voltage. **Failure to observe the precautions below will result in serious personal injury or death.**

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

1. **Qualified Persons.** Access to the Vista SD Underground Distribution Switchgear must be restricted only to qualified persons.
2. **Safety Procedures.** Always follow safe operating procedures and rules. Always maintain proper clearance from energized components.
3. **Personal Protective Equipment.** Always use suitable protective equipment such as rubber gloves, rubber mats, hard hats, safety glasses, and arc-flash clothing in accordance with safe operating procedures and rules.
4. **Doors.** High-voltage compartment doors must be securely closed and latched, with padlocks in place at all times unless work is being performed inside the enclosure.
5. **Key Interlocks.** Optional key interlocks, if furnished, 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.
6. **Opening Doors.** Do not apply any undue force when attempting to open a door. The use of undue force may damage the door-latching mechanism.
7. **Safety Labels.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
8. **Energized Bushings.** Always assume that the bushings are energized unless proven otherwise by test, by visual evidence of an open-circuit condition at the load-interrupter switch or fault interrupter, or by observing that the load-interrupter switch or fault interrupter is grounded.
9. **Backfeed.** Bushings, cables, load-interrupter switches, and fault interrupters may be energized by backfeed.
10. **Grounding.**
 - Vista SD switchgear must be connected to a suitable earth ground before energizing 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 cannot be severed or removed.
 - After the switchgear has been completely disconnected from all sources of power and tested for voltage, properly ground the load-interrupter switches and fault interrupters before touching any bushings or components that are to be inspected, replaced, serviced, or repaired.
11. **Load-Interrupter Switch or Fault-Interrupter Position.**
 - Always confirm the **Open/Closed** position of the load-interrupter switch or fault interrupter by visually observing the position of the isolating disconnect.
 - Be aware load-interrupter switch or fault interrupter may be energized by backfeed.
 - Be aware load-interrupter switch or fault interrupter may be energized in any position.
12. **Maintaining Proper Clearance.** Always maintain proper clearance from energized components.

Inspection and Handling

Packing

S&C Vista SD Underground Distribution Switchgear is fastened to a wood skid. At the first opportunity, remove all packing materials (cardboard, paper, foam padding, etc.) from the switchgear assembly. This will prevent the switchgear from being damaged by rainwater absorbed by the packing materials and will also prevent wind-induced abrasion from loose cardboard.

Inspection

Examine the shipment for external evidence of damage as soon after receipt as possible, preferably before removal from the carrier's conveyance. Check the bill of lading to make sure all listed shipping skids, crates, and containers are present.

If there is visible loss and/or damage:

1. Notify the delivering carrier immediately.
2. Ask for a carrier inspection.
3. Note the condition of shipment on all copies of the delivery receipt.
4. File a claim with the carrier.

If concealed damage is discovered:

1. Notify the delivering carrier within 15 days of receipt of shipment.
2. Ask for a carrier inspection.
3. File a claim with the carrier.

Also notify S&C Electric Company in all instances of loss and/or damage.

Handling

⚠ WARNING

When handling S&C Vista SD Underground Distribution Switchgear with an overhead hoist, observe standard lifting practices as well as the general instructions below. **Failure to follow these precautions can result in serious personal injury or equipment damage.**

NOTICE

Refer to the nameplate affixed to exterior of switchgear assembly for the net weight.

STEP 1. Use 7-foot (213-cm) or longer hoist slings of equal length to prevent damage to the gear during lifting. See Figure 2.

STEP 2. Arrange the hoist slings to distribute lifting forces equally between the lifting tabs.

⚠ WARNING

For switchgear with a low voltage enclosure (LVE), make sure not to attach the hoist slings to the LVE. Failure to do so can result in equipment damage.

STEP 3. Avoid sudden starts and stops.

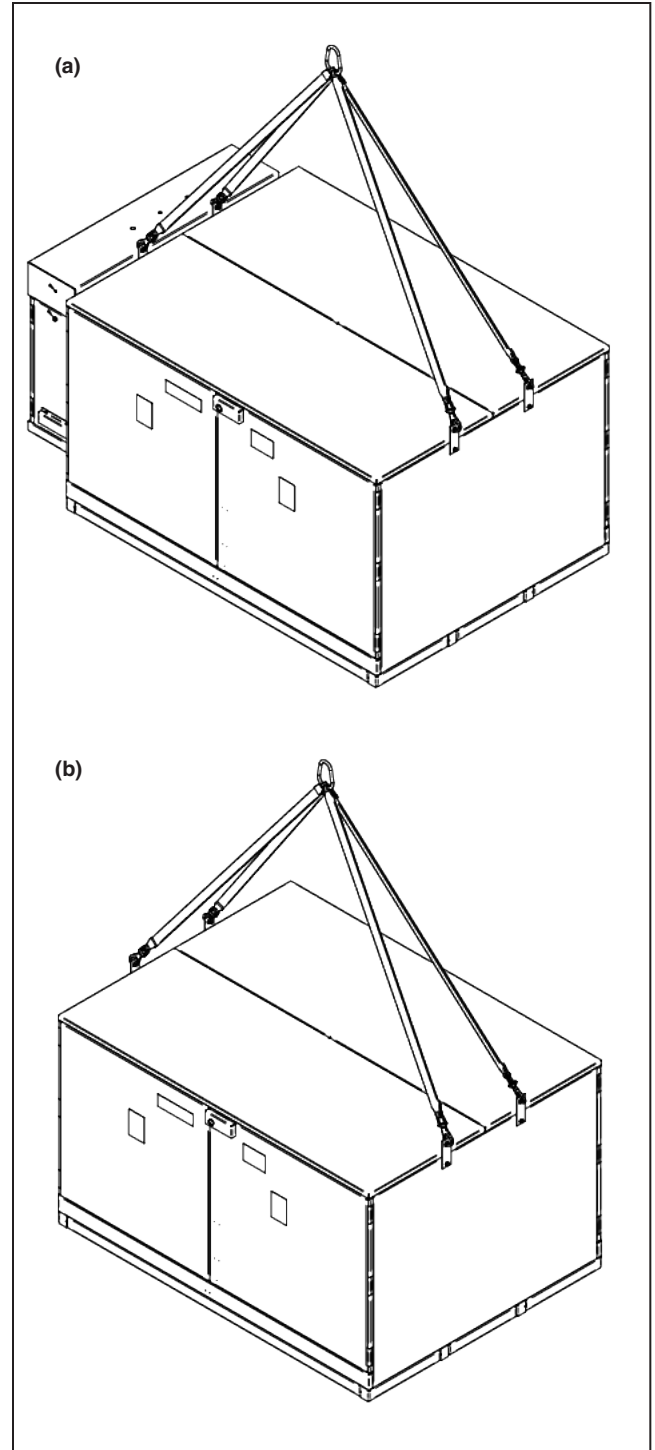


Figure 2. (a) Hoisting the gear with a low voltage enclosure. (b) Hoisting the gear without a low voltage enclosure.

Installation

Switchgear Placement

- STEP 1.** At the installation site, remove all separately packaged components (if any) that were shipped within the enclosure and set them aside.
- STEP 2.** Unbolt the switchgear assembly from its skid and lift the unit onto the mounting pad, observing the precautions given under “Handling” on page 7. See Figure 3. Refer to the catalog dimensional drawing furnished and verify the enclosure is positioned correctly and the unit is properly aligned with respect to the anchor bolts (or flush anchors).
- STEP 3.** Level the enclosure using metal shims (user provided) as required between the mounting pad and the enclosure. Shim the enclosure of the unit until the tops of the compartment doors are even. Then secure the enclosure to the pad using the anchor brackets provided (see anchor-bolt detail on the catalog dimensional drawing). Make sure all doors open and the latch closes without binding. Binding indicates enclosure distortion that must be corrected by additional shimming.

Access to Interior

- STEP 1.** To access the operation compartment, insert a pentahead socket wrench (or hexhead socket wrench if option “-N” is chosen) into the door latch mechanism. Rotate the wrench or tool counterclockwise to unlatch the doors. See Figure 4.

CAUTION

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



Figure 3. PMH/PME Vista SD assemblies are shipped on a skid.



Figure 4. To unlock the front doors, turn the pentahead socket wrench 60° counterclockwise against spring resistance until a “click” is heard and the wrench or tool reaches its stop.

- STEP 2.** Open the right door fully and latch the door holders to the desired open position. There are two open positions to choose from. See Figure 5.
- STEP 3.** Disengage the left door manual latching mechanism to open the door. See Figure 6. Then, repeat Step 2 for the left door to latch it open.
- STEP 4.** To gain access to the termination compartment, repeat Steps 1, 2, and 3 to open the rear doors of the enclosure.

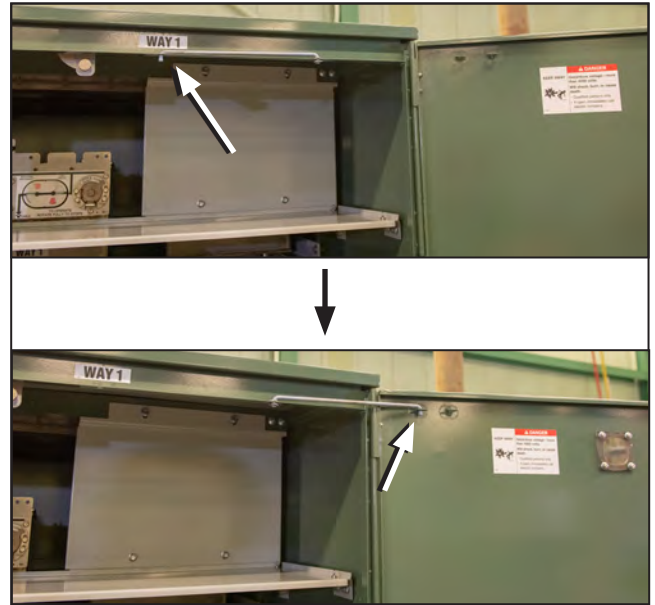


Figure 5. Using the door holders to hold the door open.

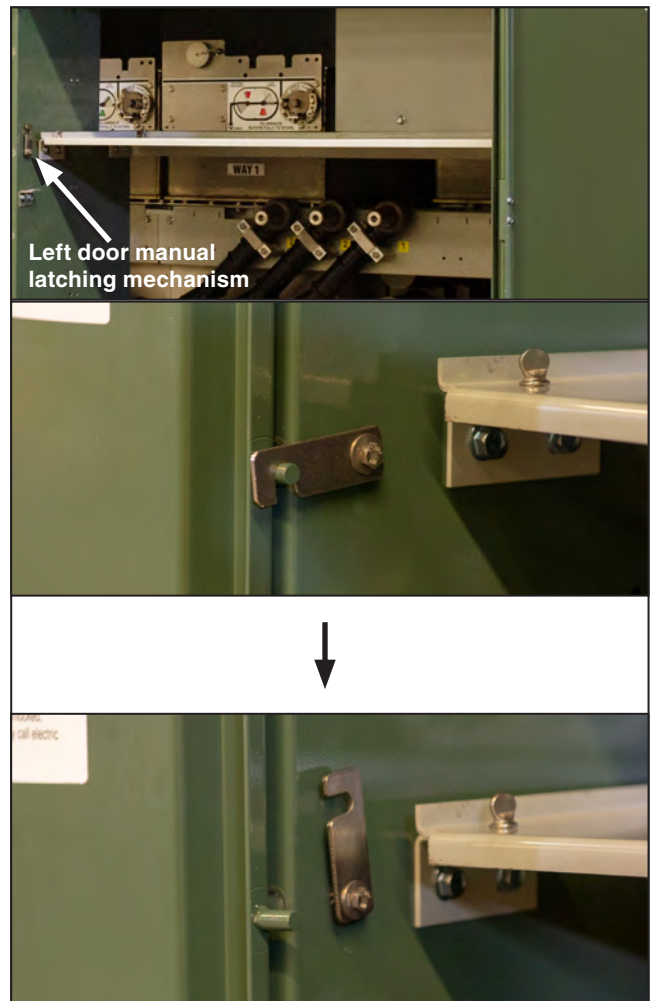


Figure 6. Disengaging the left door manual latching mechanism.

Installation

Cables

⚠ DANGER

Before energizing the switchgear, replace the shipping covers on all bushings and bushing wells with elbows or insulated protective caps. **Failure to replace the shipping covers on all bushings with elbows or insulated protective covers or plugs can result in a flashover and serious personal injury or death.**

STEP 1. Remove the shipping covers from the 600-ampere bushings (yellow) or 200-ampere bushing wells (orange). See Figure 7.

⚠ CAUTION

ALWAYS follow proper cable-installation practices. When installing cable that will be attached to the switchgear, provide a strain-relief segment to minimize the load on the bushings. Cables must be allowed to expand and flex without putting a significant load on the bushings. For a pit, either loop the cable in the pit or bring it into the pit horizontally and up to the gear at a 90° angle. **Failure to follow these precautions can result in damage to the bushings and bushing wells.**

STEP 2. Install cable-support brackets in accordance with the appropriate reference drawing (RD) included in the Installation and Operation Information Kit. See Table 1.

Table 1. Reference Drawings (RD) for Cable-Support Brackets

Switchgear Style	Reference Drawing (RD)
All styles	RD-7809

STEP 3. Terminate the cables with user-furnished separable insulated connectors, following the manufacturer's instructions.

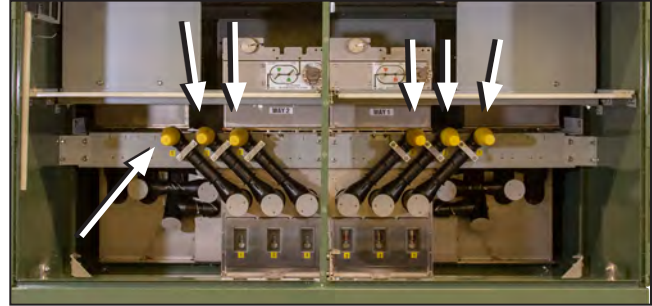


Figure 7. Remove the shipping covers from the 600-ampere bushing (yellow) or 200-ampere bushing wells (orange).

Grounding

STEP 1. Connect the ground pads on each way to the enclosure ground pad. Then connect the enclosure ground pad to the system ground in accordance with the user's standard practice. See Figures 8 and 9.

If the switchgear is furnished with the continuous ground bus (Catalog Number Suffix "-O"), connect the ground bus to the enclosure ground pad. Then connect the enclosure ground pad to the system ground in accordance with the user's standard practice.

Use the equivalent of 4/0 copper (or cable sized in accordance with the user's standard practice) in either a single or multiple connection to realize the maximum momentary rating of the switchgear assembly. For a multiple connection, cables smaller than 1/0 copper or equivalent should not be used.

STEP 2. Connect the cable concentric-neutral wires to the grounding system as appropriate.

Fault Indicators

Fault indicators are to be furnished by the user and installed in accordance with the manufacturer's instructions. Optional mounting provisions for fault indicators (Catalog Number Suffix "-F1" or "-F2") are available for S&C Vista SD Underground Distribution Switchgear. If mounting provisions are specified, mount the fault indicators on the mounting brackets and attach the associated sensors to the cables below the cable terminations.



Figure 8. Location of Way ground pad.

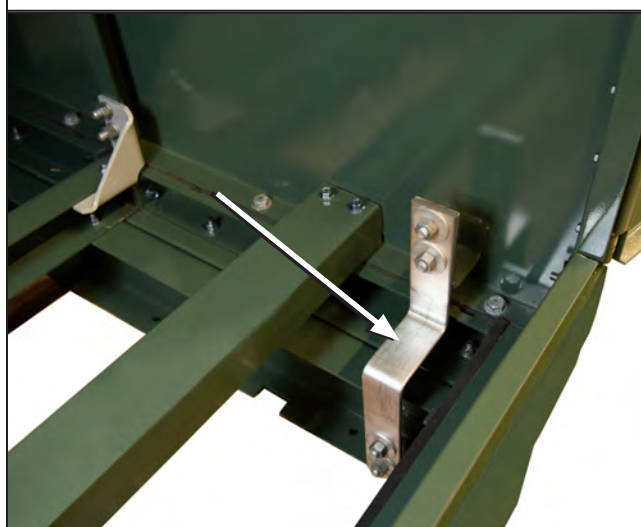
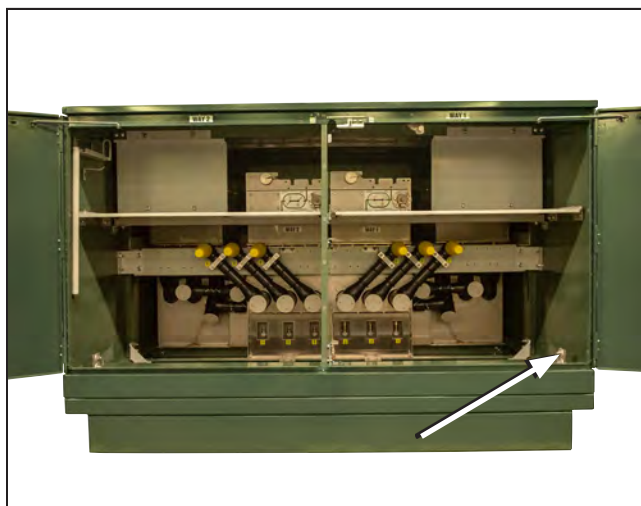


Figure 9. The enclosure ground pad.

Installation

Closing the Doors

- STEP 3.** Lift the door holder up to allow the door to swing closed. See Figure 10. Make sure the door holder is placed back in the storage position to allow the door to be fully closed. See Figure 11.
- STEP 4.** Repeat Step 1 for the right door.
- STEP 5.** Engage the left-door latching mechanism. See Figure 12.
- STEP 6.** 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 7.** Insert padlock shackle through the hole in padlock recess and lock the padlock. See Figure 13.
- STEP 8.** Repeat STEPS 1 through 5 for the doors on the other side of the enclosure (if open).



Figure 10. Lift the door holder to allow the door to swing closed.

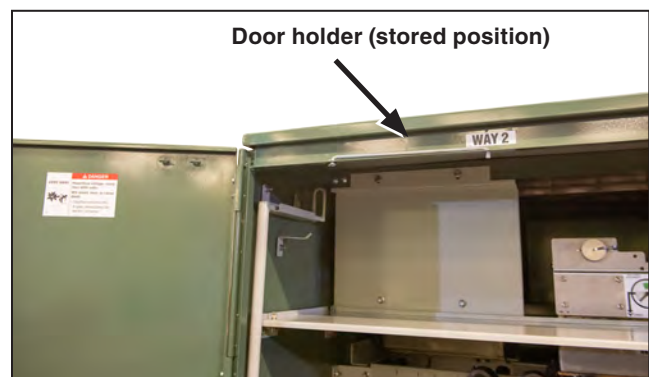


Figure 11. Door holder placed in the storage position to allow the door to close.



Figure 12. Left door latching mechanism engaged.



Figure 13. Enclosure doors padlocked.

Completing the Installation

STEP 1. A resilient closed-cell gasket on the bottom flange of the enclosure protects the finish from being scratched during installation and isolates it from the alkalinity of a concrete foundation. This gasket also helps to seal the enclosure; to guard against entry of rodents, insects, and weeds; and to discourage tampering.

In the event the gasket cannot compensate for an uneven foundation, grout the bottom of the enclosure as necessary. Any grout applied should be recessed enough to permit caulking. To complete the installation, caulk around the bottom of the enclosure; a weather-proof room-temperature vulcanizing (RTV) silicone-rubber compound is recommended. See Figure 14.

Apply a suitable compound to fill the spaces between the cable and the conduit, and cap all empty conduits to prevent the entry of moisture and rodents.

STEP 2. Wipe down the exterior of the enclosure with a clean, damp cloth. Refinish any scratches or abrasions with S&C touch-up finish and red-oxide primer, which are available in aerosol spray cans. Order Catalog Number 999-080 for light gray finish, 999-058 for olive green finish, 9991363-493 for seafoam green, 9991363-488 for equipment green, and 9999-061 for red-oxide primer. See Figure 15.

No other finish or primer is approved. The area to be touched up should be cleaned to remove all oil and grease. Sand the area to remove any traces of rust that may be present, and make sure all edges are feathered before applying primer.

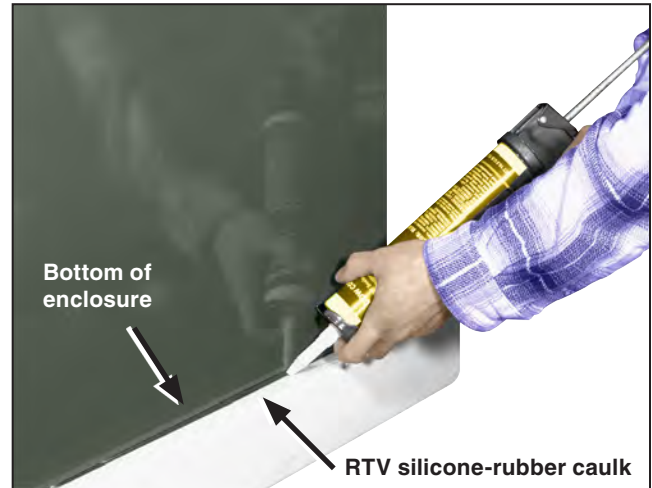


Figure 14. To complete the installation, caulk around the bottom of the enclosure using a weather-proof, room-temperature vulcanizing (RTV) silicone-rubber compound.



Figure 15. Refinish any scratches or abrasions with S&C red-oxide primer and S&C touch-up finish.

Routine Switchgear Testing

For the convenience of users who normally perform electrical tests on system components such as switchgear, appropriate withstand test values for Vista SD Underground Distribution Switchgear are given in the following tables. These test values are significantly greater than the normal operating voltage of the switchgear and are near the flashover voltage of the switchgear. They should be applied only when the switchgear is completely de-energized and disconnected from all power sources.

WARNING

When performing electrical withstand tests on Vista SD Underground Distribution Switchgear, always observe the following precautions. **Failure to observe these precautions can result in a flashover, injury, and equipment damage.**

1. Completely de-energize the switchgear and disconnect it from all power sources.
2. Terminate bushings with an insulated cap or other appropriate cable termination capable of withstanding the test voltage.

Dc Cable Testing and Fault Locating

Dc testing of installed cables is performed to determine the condition of the cables and to locate faults. Industry standards such as IEEE 400, "IEEE Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field," describe such testing and should be referenced for selection of the test procedures. Dc testing also includes cable "thumping" (the sudden application of dc voltage from a large capacitor for the purpose of fault locating), which causes transients and voltage doubling at the end of the open cable. When the cables are attached to the switchgear, the unit will also be subjected to the dc test voltages.

WARNING

The dc withstand capability of the switchgear may be reduced because of aging, damage, or electrical or mechanical wear. Therefore, the dc test voltage must be selected so it does not exceed the withstand limits of the switchgear. **Application of dc test voltage greater than the withstand capability of the switchgear can result in a flashover, injury, and equipment damage.**

Table 2. Maximum Insulation Test Voltages

Vista SD Switchgear Rating, kV			Withstand Test Voltage, kV	
IEC	IEEE	Impulse (BIL)	Power Frequency ^①	Dc ^{②③}
12	17.5	95	31	42
24	29	125	45	62

① The power-frequency withstand test voltages listed in the table are approximately 80% of the design values for new equipment.

② The dc withstand test voltages listed in the table are approximately 80% of the design values for new equipment.

③ Dc withstand test voltages are given for reference for those users performing dc withstand tests. The presence of these values does not imply a dc withstand rating or performance requirements for the switchgear. A dc withstand design test is specified for new equipment because the switchgear may be subjected to dc test voltage when connected to the cable. The dc withstand test voltages listed in the table are approximately equal to the ac test voltage.

⚠ DANGER

Do not exceed the test voltages given in Table 3. Exceeding the test voltages can cause a flashover of the isolating gap or phase-to-phase insulation of the switchgear. **This can lead to a power-frequency fault in the gear of the dc test source, and result in severe personal injury or death.**

S&C Vista SD Underground Distribution Switchgear has been designed to allow dc testing of the cables with the other ways of the gear energized. After testing, the dc test equipment should be used to discharge any stored charge on the cable. The dc test voltages and dc cable-thumping voltages should not exceed the voltages given in Table 3.

⚠ WARNING

When testing cables connected to energized switchgear, proper isolation of the power-frequency source from the dc test source must be maintained. Follow the recommendations provided by the manufacturer of the dc test equipment or fault-locating equipment. Follow the user's operating and safety procedures for grounding the cable, connecting the dc test source, isolating the dc test source (in case of flashover), ungrounding the cable, applying the dc test source, discharging the cable, and regrounding the cable.

Very Low Frequency (VLF) Cable Testing

IEEE Standard 400.2, "IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF) (less than 1 Hz)," addresses the application of 0.01- to 1-Hz high-voltage ac excitation as one means for evaluating a shielded power cable system during an acceptance test or a maintenance test. The cable system must be taken out of service for this testing.

An acceptance test is a field test made after installation of the power cable system, including terminations and joints, but before the cable system is placed in normal service. A maintenance test is a field test made during the operating life of a power cable system to detect deterioration and to check serviceability of the system.

VLF cable testing may subject the S&C Vista SD Underground Distribution Switchgear to the ac test voltage when the cables are attached to the switchgear. S&C recommends that the Vista SD Underground Distribution Switchgear be completely de-energized and disconnected from all power sources when performing VLF cable testing. However, Vista SD switchgear has been designed to allow VLF testing of the cables with the other ways of the gear energized, if necessary.

Upon completion of the VLF cable testing, or an interruption in the testing, the test set must be turned off to discharge the cable circuit and test set. Then the cable system must be grounded.

The VLF sinusoidal waveform test voltage applied to the S&C Vista SD Underground Distribution Switchgear must not exceed the voltages listed in Table 4 on page 16.

Table 3. Maximum Cable Testing and Cable Thumping Dc Withstand Voltages

Vista SD Switchgear Rating, kV			Dc Cable Test Voltage, kV	Dc Cable Thumping Voltage, kV ^①
IEC	IEEE	Impulse (BIL)		
12	17.5	95	34	17
24	29	125	40	20

① The dc cable thumping voltage is 50% of the dc cable test voltage because voltage doubling will occur at the open end of the cable, which is assumed to be a unit of Vista SD Underground Distribution Switchgear.

If the open end of the cable is grounded, the dc cable-thumping voltage applied to the cable and switchgear can be increased to the dc cable test voltage.

⚠ WARNING

The VLF ac withstand capacity of the switchgear may be reduced because of aging, damage, or electrical or mechanical wear. Therefore, the ac test voltage must be selected so it does not exceed the withstand limits of the switchgear. **Application of ac test voltage greater than the withstand capability of the switchgear can result in a flashover, injury, and equipment damage.**

⚠ DANGER

Do not exceed the test voltages given in Table 4. Exceeding the test voltages can cause a flashover of the isolating gap or phase-to-phase insulation of the switchgear. **This can lead to a power-frequency fault in the gear or the VLF test source, and result in severe personal injury or death.**

⚠ WARNING

When testing cables connected to energized switchgear, proper isolation of the power-frequency source from the VLF test source must be maintained. Follow the recommendations provided by the manufacturer of the VLF test equipment. Follow the user's operating and safety procedures for grounding the cable, connecting the VLF test source, isolating the VLF test source (in case of flashover), ungrounding the cable, applying the VLF test source, discharging the cable, and regrounding the cable.

⚠ WARNING

When VLF cable testing has been completed, or has been interrupted, you must discharge the cable system and the test equipment. Allow the time needed to fully discharge the cable system and test equipment. **Failure to fully discharge the cable system and test equipment can result in serious damage to the cable system and test equipment.**

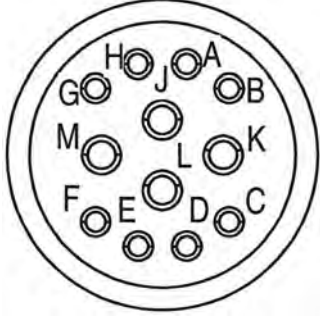
Fault-Interrupter Testing

When performing dielectrical tests on Vista SD Underground Distribution Switchgear, the vacuum fault interrupters will not be subject to voltage across the open gap because the disconnect switch isolates the vacuum interrupters from the test voltage. Since the vacuum interrupter will not be energized across the open gap, there is no exposure to the X-rays that are normally associated with high-voltage testing of vacuum devices. Routine testing of the vacuum fault interrupters is not recommended. For those users who desire to test the vacuum interrupters, contact the nearest S&C Sales Office for specific instructions.

Table 4. Vista SD Switchgear Very Low Frequency (.01- to 1-Hz) Sinusoidal Waveform Maximum Test Voltages

Vista SD Switch-gear System Class, kV	Acceptance Test (phase to ground)		Maintenance Test (phase to ground)	
	kV, RMS	kV, Peak	kV, RMS	kV, Peak
15.5	23	33	19	26
27	36	51	27	38

Table 5. Auxiliary Contacts Cable Connector^{①②}

Pin Location	Pin #	Function
	A	n/c
	B	Vacuum interrupter closed (NO)
	C	Vacuum interrupter closed (NC)
	D	Vacuum interrupter open (NO)
	E	Vacuum interrupter open (NC)
	F	Isolating disconnect closed (NO)
	G	Isolating disconnect closed (NC)
	H	Isolating disconnect open (NO)
	J	Isolating disconnect open (NC)
	K	Common
	L	Shield
	M	n/c

① Normally open (NO) and normally closed (NC) connections are rated 4 amperes at 30 Vdc.

② Operating switch is rated for 50,000 operations.

Legend: n/c = no connection