Operation

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August 18, 2025

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 Vista SD Underground Distribution Switchgear. Become familiar with the Safety Information on page 4 through 7 and Safety Precautions on page 8. The latest version of this publication is available online in PDF format at **sandc.com/en/Support/Product-Literature/**.

This instruction sheet covers the operation of S&C Vista SD Underground Distribution Switchgear. Along with this instruction sheet are copies of:

- S&C Instruction Sheet 695-505, "S&C Vista SD Underground Distribution Switchgear: Installation"
- S&C Instruction Sheet 695-590, "S&C Vista SD Underground Distribution Switchgear: Inspection Recommendations"
- Reference drawings detailing the installation of cable-support brackets and wiring diagrams for the CTs (provided if the switchgear assemblies contain at least one fault interrupter) and the auxiliary contacts (provided if the switchgear assemblies contain at least one factory-installed motor operator or if catalog number suffix "–Sx" has been specified, where "x" is the way on which the auxiliary contacts are installed)

Instruction sheets covering the installation and operation of Vista SD Underground Distribution Switchgear are included in the "Installation and Operation Information Kit" provided with each switchgear assembly. A catalog dimensional drawing showing cable-locating and anchor-bolt dimensions is also provided in the information kit. All personnel involved with the installation and operation of the gear should be thoroughly familiar with the contents of the kit.

A variety of optional features is available for S&C Vista SD Underground Distribution Switchgear. The catalog number stamped on the nameplate affixed to the unit is suffixed with letter-number combinations applicable to the gear furnished. Refer to Specification Bulletin 695-31 for descriptions of optional features.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the S&C Vista SD Underground Distribution Switchgear. Designate a location where users can easily retrieve and refer to this publication. The latest version of this publication is available online in PDF format at **sandc.com/en/Support/Product-Literature/**.

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 Vista SD Underground Distribution Switchgear are listed in the ratings table in S&C Specification Bulletin 695-31. The ratings are also on the S&C Nameplate affixed to the product.

Understanding Safety-Alert Messages

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Following Safety Instructions

If any portion of this instruction sheet is unclear and assistance is needed, contact the nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website **sandc.com**, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE

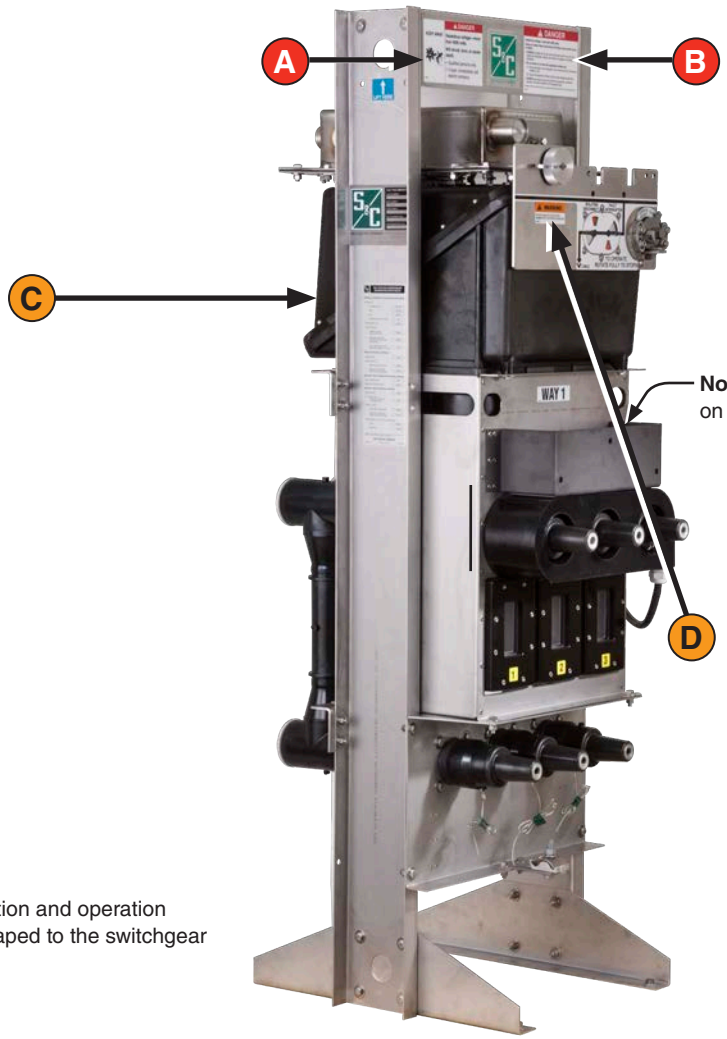
Read this instruction sheet thoroughly and carefully before operating S&C Vista SD Underground Distribution Switchgear.

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 and Tags



Note: The manual operating handle is stored on the mounting stand (not visible).

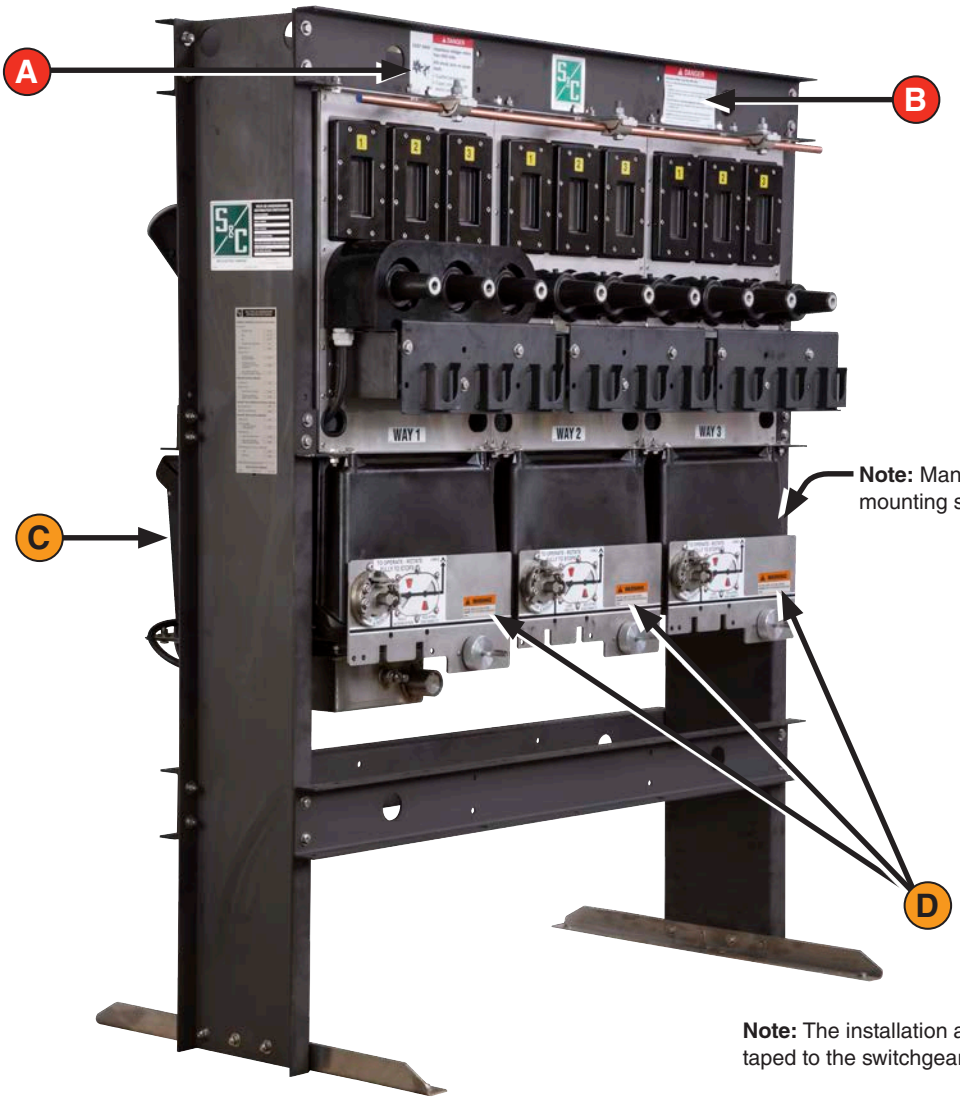
Note: The installation and operation information kit is taped to the switchgear assembly.

Reorder Information for Safety Labels

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	Do Not Block Pressure-Relief Device . . .	G-6742●
D	⚠ WARNING	Voltage Tester–Always Test for Proper Operation . . .	G-9451

● Not visible.

Location of Safety Labels and Tags



Note: Manual operating handle is stored on mounting stand (not visible).

Note: The installation and operation information kit is taped to the switchgear assembly.

Reorder Information for Safety Labels

Location	Safety Alert Message	Description	Part Number
A	⚠ DANGER	Keep Away–Hazardous Voltage ("Mr. Ouch") . . .	G-6699
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C	⚠ WARNING	Do Not Block Pressure-Relief Device . . .	G-6742●
D	⚠ WARNING	Voltage Tester–Always Test for Proper Operation . . .	G-9451

● Not visible.

Location of Safety Labels and Tags

Note: The installation and operation information kit is stored in a slot behind the manual operation handle to the left of Way 1.

Reorder Information for Safety Labels

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	Do Not Block Pressure-Relief Device	G-6742●
D	⚠ WARNING	Before Using Voltage Tester–Always Test for Proper Operation	G-9451
E	⚠ WARNING	Keep Out–Hazardous Voltage Inside	G-6398

● Not visible.

⚠ DANGER

Vista SD Underground Distribution Switchgear operate at high voltage. Failure to observe the precautions below will result in serious personal injury or death.

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

1. **QUALIFIED PERSONS.** Access to the Vista SD Underground Distribution Switchgear 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. 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. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **DOORS.** Do not apply any undue force when attempting to open a door. The use of undue force may damage the door-latching mechanism.
6. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.
7. **KEY INTERLOCKS.** Optional key interlocks, if furnished, must be in place. Check the operating sequence of the 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.
8. **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.
9. **ENERGIZED BUSHINGS.** Always assume 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.
10. **BACKFEED.** Bushings, cables, load-interrupter switches, and fault interrupters may be energized by backfeed.
11. **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.
12. **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.
    - The load-interrupter switch or fault interrupter may be energized by backfeed.
    - The load-interrupter switch or fault interrupter may be energized in any position.

S&C Vista SD Underground Distribution Switchgear features load-interrupter switches and microprocessor-controlled fault interrupters for the switching and protection of 600-ampere main feeders and 200- or 600-ampere taps, laterals, and sub-loops. These elbow-connected components are encapsulated in an environmentally friendly solid-dielectric insulating material. Vista SD switchgear is available in ratings through 29 kV and 16 kA symmetrical interrupting.

S&C Vista SD Underground Distribution Switchgear is considerably smaller than traditional air-insulated gear; it can be installed exactly where it's needed. It's completely submersible and thus suitable for installation in subsurface vaults subject to flooding. Single-way Vista SD assemblies are ideally suited for application on the primary side of network transformers. Multi-way assemblies, including bus taps and models with three to six ways with any combination of load-interrupter switches or fault interrupters, are also available.

S&C Visi-Gap load-interrupter switches use a vacuum interrupter in series with a manually operated two-position isolating disconnect for three-pole live switching of 600-ampere three-phase circuits. Load-interrupter switches comply with IEEE Standard 1247 and IEC Standard 62271-103. They feature an easy-to-operate manual operating mechanism.

S&C Visi-Gap fault interrupters use a vacuum interrupter in series with a manually operated two-position isolating disconnect for three-pole load switching of 200- or 600-ampere circuits and fault interrupting through 16 kA symmetrical at 17.5 kV and through 12.5 kA symmetrical at 29 kV. Fault interrupters comply with both IEEE Standard C37.60 and IEC Standard 62271-111.

Load-interrupter switches and fault interrupters can be directly opened and closed using the manual handle furnished; they can also be operated remotely using a piece of rope attached to the manual handle or by a user-furnished universal pole of the appropriate length, equipped with a standard fitting. Opening and closing speed of the vacuum interrupters is not dependent on the speed the handle is moved. Operating shafts are padlockable in either position.

Factory-installed and wired motor operators, to facilitate remote power operation of load-interrupter switches and fault interrupters, are optionally available. They can be decoupled from the operating mechanisms to permit testing without changing the positions of the switches or fault interrupters. The motor operators require a user-furnished 100-240 Vac, 50/60-Hz control power source; they're controlled from a hand-held, cable-connected portable remote control pendant.

Easy-to-follow mimic bus and indicators on the front of the switchgear convey the positions of the load-interrupter switches and fault interrupters (and their isolating disconnects), and whether a fault interrupter has tripped on a fault. The default color scheme is green for the OPEN/RESET indicator and red for the CLOSED indicator. If catalog number suffix "-J1" has been specified, these colors will be reversed. (i.e., green for the CLOSED indicator and red for the OPEN/RESET indicator). Large viewing windows provide a clear view of the isolating disconnects, allowing operating personnel to easily confirm the positions of the load-interrupter switches and fault interrupters.

Terminals are equipped with field-replaceable 600-ampere rated bushing adapters. Fault interrupters may be optionally equipped with 200-ampere bushing-well adapters in lieu of 600-ampere bushing adapters. Bushing and bushing-well adapter interfaces conform to IEEE Standard 386 and accept all standard insulated connectors and inserts recognized by this standard.

The self-powered overcurrent control can be programmed using a personal computer connected to the control through an adapter cable. The control features a variety of fuse and relay time-current characteristic (TCC) curves that comply with IEEE Standard C37.112.

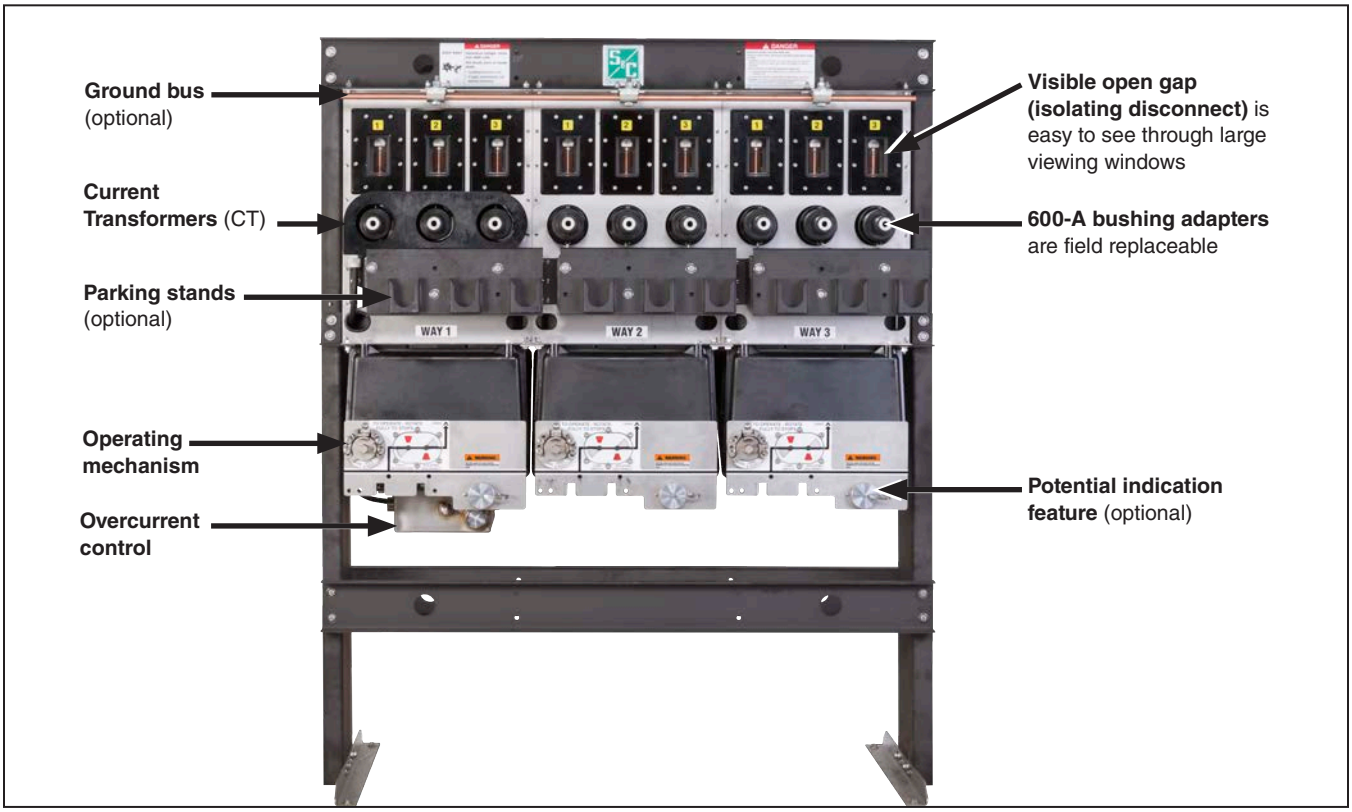


Figure 1. Vault-mounted style gear, model 321 (3-way) shown with cables at top, operating mechanism at bottom (Catalog Number Suffix "-V1").

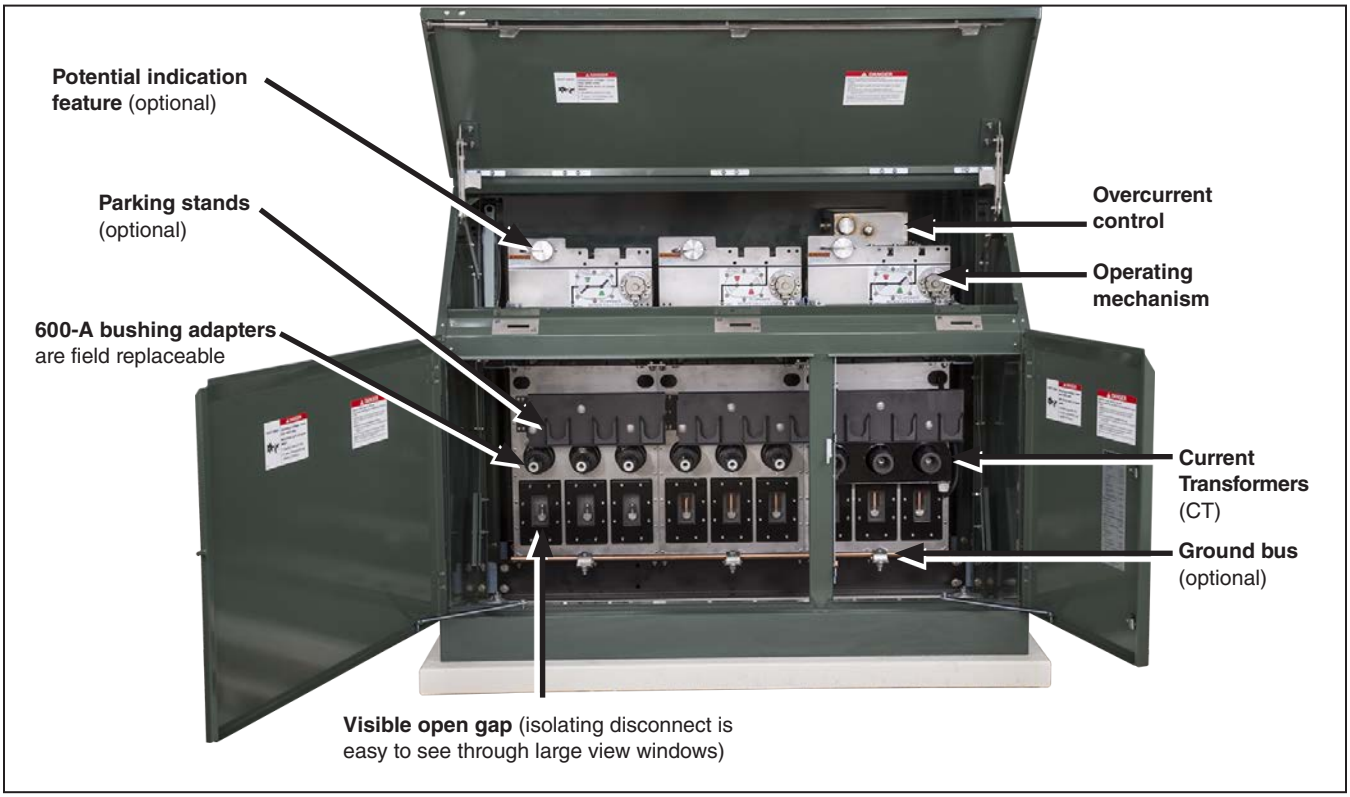


Figure 2. Pad-mounted style gear, model 321 (3-way) (Catalog Number Suffix "-P1").

Manually Opening or Closing Visi-Gap Load-Interruper Switches and Visi-Gap Fault Interrupters (Vault-Mounted Style)

NOTICE

If the load-interrupter switch or fault interrupter is equipped with a motor operator, refer to S&C Instruction Sheets 695-520, "S&C Vista SD Underground Distribution Switchgear: *Installation and Operation of Vista SD Motor Operator*," and 695-525, "S&C Vista SD Underground Distribution Switchgear: *Vista SD Portable Remote Control Pendant*."

Complete the following steps to manually operate the Visi-Gap load-interrupter switches or fault interrupters:

STEP 1. Retrieve the manual operating handle from its storage location on the side of the mounting frame. The handle is tethered to the switchgear assembly to prevent its removal. See Figure 3.

STEP 2. Attach the manual handle to the shaft of the operating mechanism. Rotate the handle in the appropriate direction firmly, and without hesitation, all the way to the stops. See Figure 4.

(a) To open the load-interrupter switch or fault interrupter, rotate handle counterclockwise.

(b) To close the load-interrupter switch or fault interrupter, rotate handle clockwise.

The manual operating handle may be operated from a variety of locations using a rope, a shotgun stick, or by hand (illustrated).

STEP 3. Check the position indicators to confirm the load-interrupter switch or fault interrupter is in the desired position (**Open** or **Closed**). See Figure 5.

STEP 4. Confirm the position of the isolating disconnect using the large viewing window. See Figure 6.

STEP 5. Return the manual operating handle to its storage location on the side of the mounting stand, taking care to position the tether out of the way.

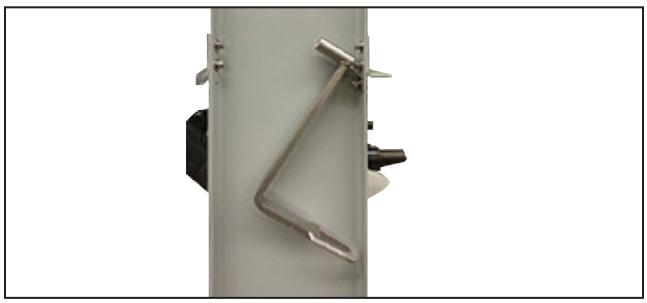


Figure 3. The manual operating handle stored on the mounting stand.

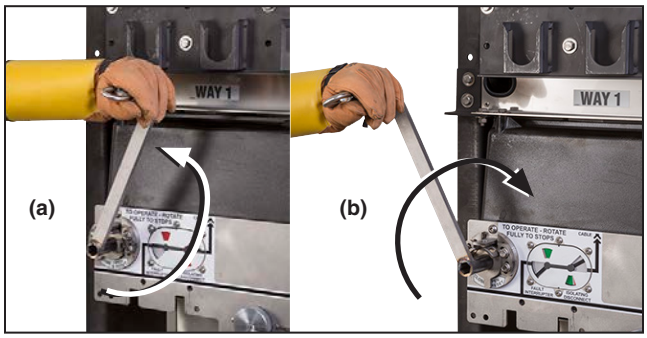
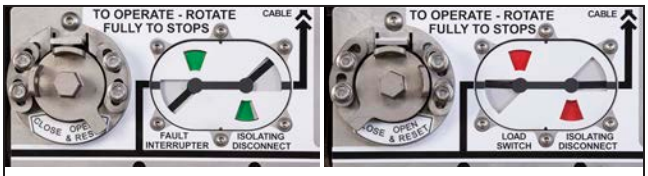


Figure 4. Rotate the manual handle counterclockwise to open (a), clockwise to close (b).



Open Closed

Figure 5. Indicators and mimic bus show position of load-interrupter switch or fault interrupter.

Open Closed

Figure 6. The visible-open gap (isolating disconnect) is easy to see through large viewing windows.

Manually Opening or Closing Visi-Gap Load-Interruper Switches and Visi-Gap Fault Interrupters (Pad-Mounted Style)

Complete the following steps to manually operate the Visi-Gap load-interrupter switches or fault interrupters:

STEP 1. Remove the padlock from the gear. See Figure 7.

STEP 2. Insert a pentahead socket wrench or tool (a hex-head socket wrench or tool when catalog number suffix "-H1" is specified) into the hinged roof latching mechanism. Rotate the wrench or tool 360° counterclockwise to unlatch the hinged roof. See Figure 8.

⚠ WARNING

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

A broken latch can result in public access and serious personal injury or death.

STEP 3. Lift the hinged roof all the way open; the "hold-open" latching mechanism will engage automatically. See Figure 9.

⚠ WARNING

After lifting the roof open and ensuring the "hold-open" latching mechanism is engaged, release pressure on the hinged roof slowly. **Failure to engage the "hold-open" latching mechanism can result in personal injury.**

Figure 7. The padlock location.

Figure 8. Using a pentahead socket wrench or tool, rotate the bolt latching mechanism 360° counterclockwise to unlock the hinged roof.

Figure 9. Lift the hinged roof to engage the "hold-open" latching mechanism.

STEP 4. To gain access to the termination compartment, lift the latch handle to open the right-side door or the center door. See Figure 10. Open the door far enough to permit the door-holder mechanism to engage automatically.

STEP 5. To open the left-side door, lift the finger latch. See Figure 11. Open the door far enough to permit the door-holder mechanism to engage automatically.

NOTICE

Optional pad-mounted style enclosures furnished on switchgear assemblies with five or six ways have three doors. The right-side door and the center door have lift-style latch handles. The left-hand door has a finger latch.

STEP 6. Retrieve the manual operating handle from its storage location at the top-left side of the switchgear assembly. The handle is tethered to the switchgear assembly to prevent its removal. See Figure 12.

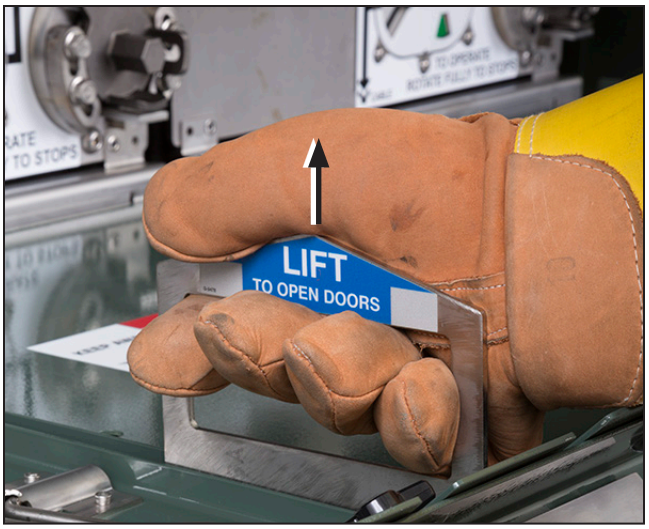


Figure 10. To gain access to the termination compartment, lift the latch handle to open the right-side or center door.

Figure 11. To open the left-side door, lift the finger latch.

Figure 12. Remove the operating handle from the storage location.

STEP 7. Rotate the manual operating handle guide ring to the active (**Up**) position. See Figure 13. Insert the manual operating handle through the guide ring; attach the handle to the shaft of the operating mechanism. See Figure 14.

STEP 8. To operate the load-interrupter switch or fault interrupter, rotate the operating handle in the appropriate direction firmly, and without hesitation, all the way to the stops. See Figure 15.

(a) To open the load-interrupter switch or fault interrupter, rotate the handle counterclockwise.

(b) To close the load-interrupter switch or fault interrupter, rotate the handle clockwise.

The manual operating handle may be operated from a variety of locations using a rope, a shotgun stick, or by hand (illustrated).

Figure 13. Rotate the operating handle guide ring to the active (Up) position.

Figure 14. Insert the handle through the guide ring and attach it to the shaft of the operating mechanism.

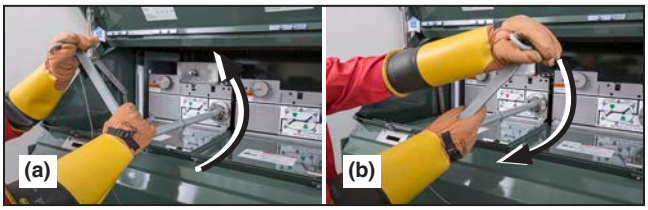


Figure 15. Rotate the operating handle counterclockwise to open (a), or clockwise to close (b).

STEP 9. Check the position indicators to confirm the load-interrupter switch or fault interrupter has been operated successfully. See Figure 16.

STEP 10. Confirm the position of the isolating disconnect using the large viewing window. See Figure 17.

STEP 11. Return the manual handle to its storage location, taking care to position the tether out of the way. Be sure the tether is completely inside the enclosure before closing the doors and the hinged roof.

STEP 12. Rotate the manual operating handle guide ring to the inactive (**Down**) position.

Open Closed

Figure 16. Indicators and mimic bus show position of load-interrupter switch or fault interrupter.

Open Closed

Figure 17. The visible-open gap (isolating disconnect) is easy to see through large viewing windows.

Resetting Visi-Gap Fault Interrupters (All Styles)

Complete the following steps to reset the Visi-Gap Fault Interrupters:

STEP 1. Check the POSITION indicators to confirm the fault interrupter has tripped. After a fault has occurred the fault interrupter will be in the **Open** position and the isolating disconnect will be in the **Closed** position. See Figure 18.

STEP 2. Retrieve the manual operating handle from its storage location. For pad-mounted styles, rotate the operating handle guide ring to the active (**Up**) position and insert the manual operating handle through the guide ring. See Figure 19. Attach the handle to the shaft of the operating mechanism See Figure 20.

STEP 3. Rotate the handle counterclockwise firmly, and without hesitation, all the way to the stops to reset the fault interrupter. See Figure 21.

Figure 18. The POSITION indicator after a fault has occurred. The fault interrupter is open, and the isolating disconnect is closed.

Figure 19. Rotate the operating handle guide ring to the active (Up) position.

Figure 20. Insert the handle through the guide ring and attach it to the shaft of the operating mechanism.

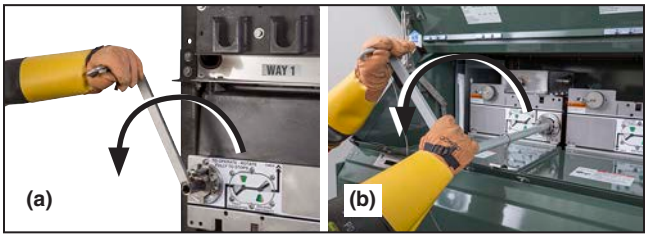


Figure 21. Resetting the fault interrupter after a fault: (a) vault-mounted style (b) pad-mounted style.

STEP 4. Check the POSITION indicators to confirm the fault interrupter has been opened. See Figure 22.

STEP 5. Confirm the position of the isolating disconnect using the large viewing window. See Figure 23.

STEP 6. Return the manual operating handle to its storage location, taking care to position the tether out of the way.

STEP 7. Rotate the manual operating handle guide ring to the inactive (**Down**) position.

STEP 8. To re-energize the circuit, retrieve the manual operating handle from its storage location. For pad-mounted styles, rotate the operating handle guide ring to the active (**Up**) position and insert the manual operating handle through the guide ring. See Figure 19 and Figure 20 on page 16. Attach the handle to the shaft of the operating mechanism, then rotate the manual operating handle clockwise to close the fault interrupter. See Figure 24.

STEP 9. Check the POSITION indicators to confirm the fault interrupter is closed. See Figure 25.

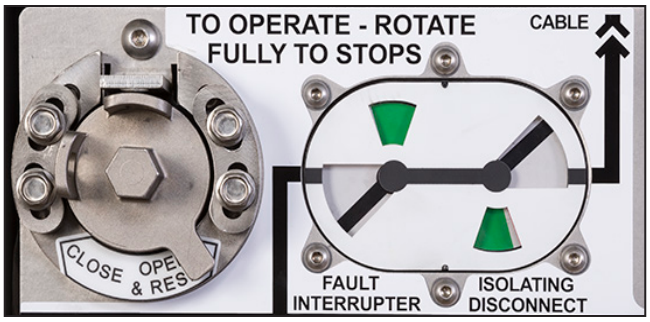


Figure 22. The POSITION indicator after the fault interrupter has been opened and reset.

Figure 23. The isolating disconnect after the fault interrupter has been opened and reset.

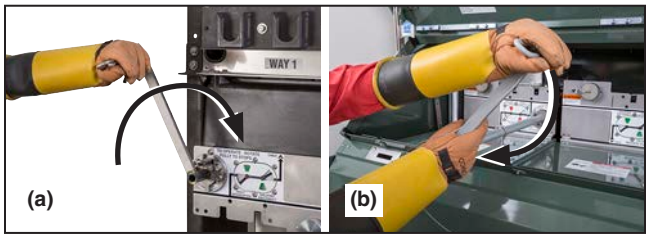


Figure 24. Closing the fault interrupter: (a) vault-mounted style (b) pad-mounted style.

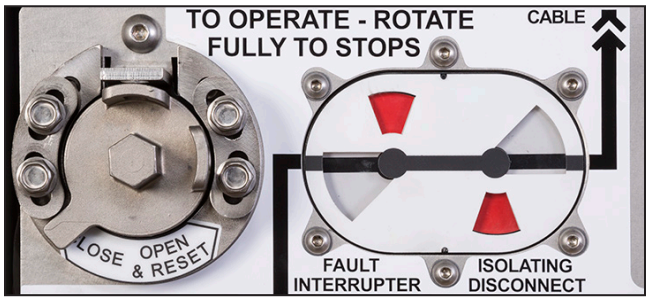


Figure 25. The POSITION indicator after the fault interrupter has been closed.

STEP 10. Confirm the **Closed** position of the isolating disconnect using the large viewing window. See Figure 26.

STEP 11. Return the manual operating handle to its storage location, taking care to position the tether out of the way.

STEP 12. For pad-mounted enclosures, rotate the manual operating handle guide ring to the inactive (**Down**) position.

Figure 26. The isolating disconnect after the fault interrupter has been closed.

Locking in Open or Closed Position

To prevent operation of a load-interrupter switch or fault interrupter, insert a padlock through the operating mechanism and the center hole in the locking collar. See Figure 27.

Figure 27. The load interrupter switches or fault interrupters may be padlocked in either position.

Checking for Voltage Using the Optional Potential Indication Feature

Complete the following steps to check for voltage using the potential indication feature:

NOTICE

Petroleum-based solvents should not be used on or around Vista SD Underground Distribution Switchgear.

STEP 1. Using water and mild soap, if necessary, clean the surface of the operating mechanism front panel around the **Potential Indication** feature.

STEP 2. Unscrew the aluminum cap covering the **Potential Indication** feature. See Figure 28.

STEP 3. Attach a high-impedance true RMS-reading voltmeter, set to read ac volts, between Test Jacks 1, 2, or 3, and the Neutral Jack to read the phase-to-neutral voltage, or between Test Jacks 1 and 2, 2 and 3, or 3 and 1, to read the phase-to-phase voltage. See Figure 29. A reading on the meter greater than 0.5 Vac indicates voltage is present at the bushing. A reading on the meter less than 0.5 Vac indicates there is no voltage at the bushing. No reading on the meter means there may be a poor connection, or the **Potential Indication** feature or the voltmeter may not be operating properly. Check all voltmeter and lead connections and retest. If there is still no reading on the meter, check for voltage using an alternate method.

NOTICE

The **Potential Indication** feature uses a capacitor voltage divider with a ratio of 2400:1. A line-to-neutral voltage of 7.2 kV will read approximately 3.0 Vac on the voltmeter. Accuracy of the **Potential Indication** feature is approximately +/-8%.

Figure 28. The Potential Indication feature with the cover removed.

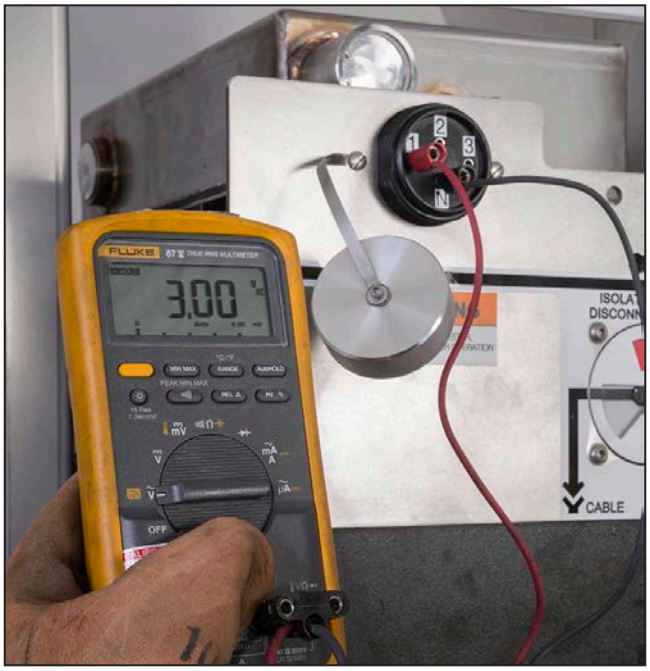


Figure 29. Checking for voltage using a voltmeter.

Low-Voltage Phasing Using Optional Potential Indication Feature

Complete the following steps to perform phasing using the **Potential Indication** feature:

NOTICE

Petroleum-based solvents should not be used on or around Vista SD Underground Distribution Switchgear.

STEP 1. Using water and mild soap, if necessary, clean the surface of the operating mechanism front panel around the **Potential Indication** feature.

STEP 2. Unscrew the aluminum cap covering the **Potential Indication** feature.

STEP 3. Using a high-impedance true RMS-reading voltmeter, set to read ac volts, determine the phase-to-neutral voltage for each phase of the two ways to be phased as follows:

(a) Set the voltmeter for volts ac.

(b) Connect one of the test probes of the voltmeter to the Neutral Jack of the way to be phased.

(c) Place the other test probe on each of the test jacks, in turn, of the two ways to be phased and measure the phase-to-neutral voltage. See Figure 30 (a), (b), and (c).

(d) If the voltage measured at each test jack is greater than 0.5 Vac and they are equal, proceed to Step 4 on page 22.

(e) If the voltage measured at any of the test jacks is less than 0.5 Vac, the phases are not energized and phasing cannot be performed. If the voltages measured are not equal, there may be a poor connection or the voltmeter may not be operating properly. Check all voltmeter and lead connections and retest. If the voltages measured are still not equal, phasing should be performed using an alternate method.

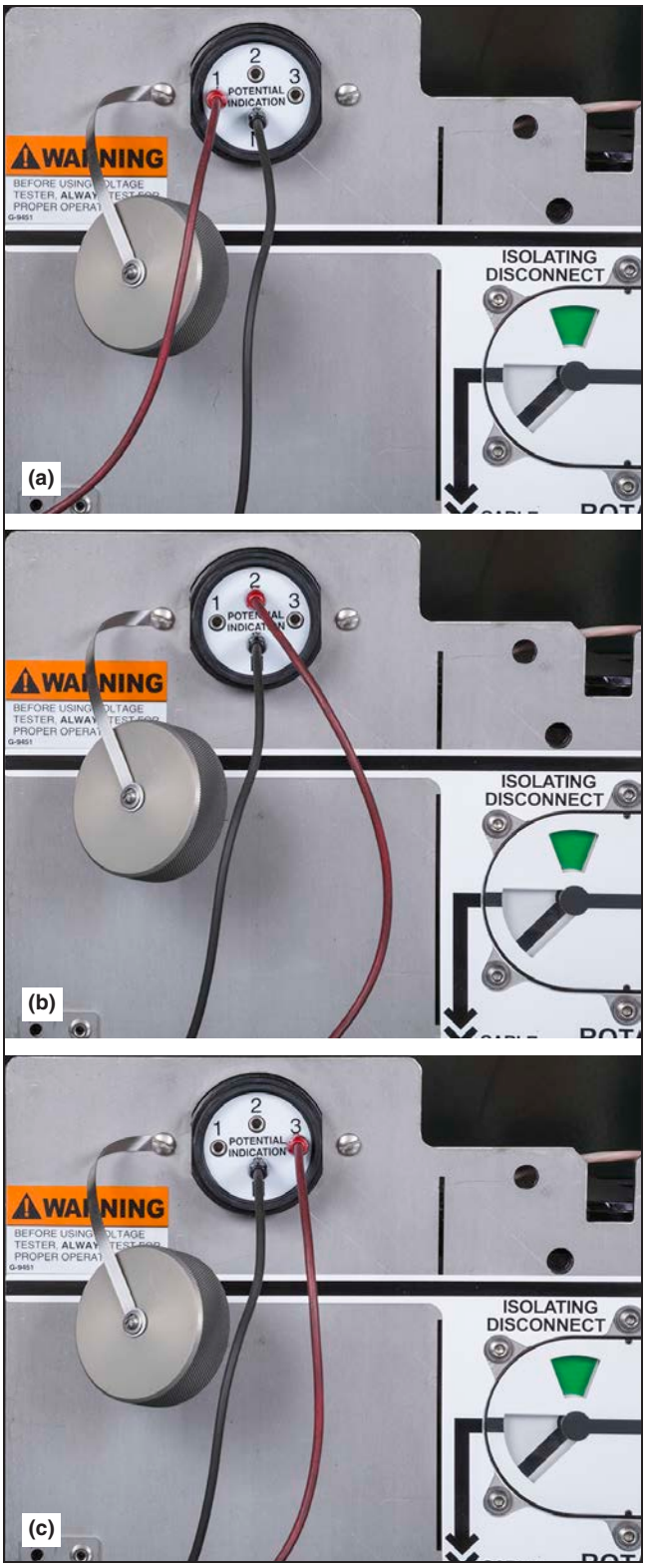


Figure 30. Measure the phase-to-neutral voltage of each phase of each way to be phased.

STEP 4. Determine the phase-to-phase relationships of the two ways to be phased as follows:

(a) Remove the test probe of the voltmeter from the Neutral Jack.

(b) Place one of the test probes on Test Jack 1 of the first way and place the other probe on Test Jack 1 of the second way. Measure the phase-to-phase voltage. When comparing the same phase of the two ways, the voltage should be 0.5 Vac or less for system voltages through 13.2 kV maximum, and between 0.5 Vac and 1.0 Vac for system voltages through 29 kV maximum, indicating the cables are in phase. See Figure 31.

(c) Keep the test probe on Test Jack 1 of the first way and move the other test probe to Test Jack 2 of the second way. Measure the phase-to-phase voltage. When comparing different phases of the two ways, the voltage should be 1.7 to 2 times the phase-to-neutral voltage measured in Step 3 on page 21. See Figure 32.

(d) Keep the test probe on Test Jack 1 of the first way and move the other test probe to Test Jack 3 of the second way. Measure the phase-to-phase voltage. Again when comparing different phases of the two ways, the voltage should be 1.7 to 2 times the phase-to-neutral voltage measured in Step 3 on page 21. See Figure 33.

(e) Repeat Steps 4b through 4d for Test Jack 2 and Test Jack 3 of the first way.

(f) If all the phase-to-phase relationships are correct, the cables are in phase and are properly installed.

Figure 31. Measure the phase-to-phase voltage between Test Jacks 1, 2 and 3 of the first way and Test Jack 1 of the second way.

Figure 32. Measure the phase-to-phase voltage between Test Jacks 1, 2 and 3 of the first way and Test Jack 2 of the second way.

Figure 33. Measure the phase-to-phase voltage between Test Jacks 1, 2 and 3 of the first way and Test Jack 3 of the second way.

Closing the Pad-Mounted Enclosure

Complete the following steps to close the pad-mounted enclosure:

STEP 1. Lift the door-holder mechanism up to allow left-side door to swing closed. See Figure 34. Make sure the finger latch engages the pin. See Figure 35.

STEP 2. Lift the door-holder mechanism up to allow right-side door or the center door to swing closed. See Figure 34. Close the door completely. Make sure the latch handle drops down fully to engage the door-latching mechanism.

Figure 34. Lift the door-holder mechanism up to allow the door to swing closed.

Figure 35. Fully engage the door latch mechanism.

STEP 3. On the right side of the switchgear enclosure, while pushing up on the hinged roof, release the latch on the "hold-open" mechanism. See Figure 36. Allow the hinged roof to sag against the "hold-open" mechanism. At the other end of the enclosure, push up on the hinged roof just enough to allow that "hold-open" mechanism latch to be released. Lower the hinged roof into the **Closed** position.

STEP 4. Insert a pentahead socket wrench or tool (or a hexhead socket wrench or tool if catalog number suffix "-H1" is specified) into the hinged roof latching mechanism. Rotate the wrench or tool 360° clockwise to fully latch the hinged roof. See Figure 37.

STEP 5. Insert the padlock shackle through the hole in the padlock recess and lock the padlock. See Figure 38.

Figure 36. While pushing up on the hinged roof, release the latch on the "hold-open" mechanism.

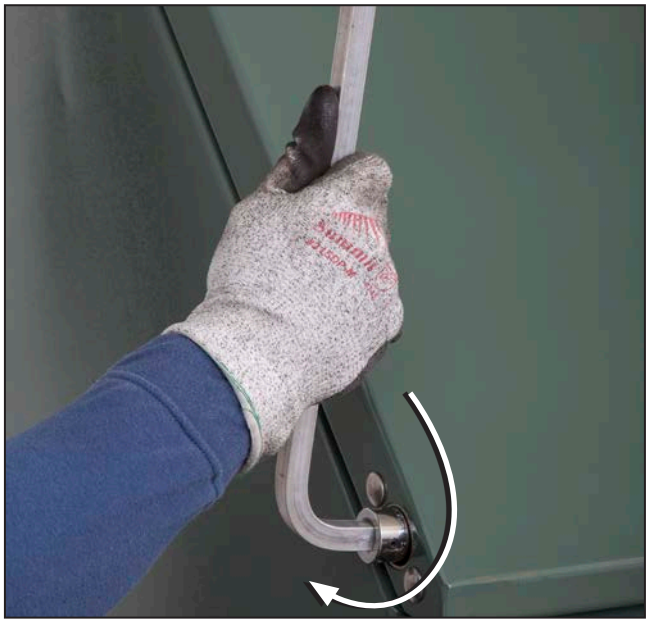


Figure 37. To fully latch the hinged roof, rotate the pentahead socket wrench or tool 360° *clockwise*.

Figure 38. The locked padlock in the recess.

Components

No mechanical maintenance is required for S&C Vista SD Underground Distribution Switchgear. However, occasional inspection and cleaning of the switchgear and exercising of the load-interrupter switches and fault interrupters is recommended. Refer to S&C Instruction Sheet 695-590, "S&C Vista® SD Underground Distribution Switchgear: *Inspection Recommendations*."

⚠ DANGER

When access to the bushings on S&C Vista SD Underground Distribution Switchgear is required for inspection, service, or repairs, always observe the following precautions. **Failure to observe these precautions will result in serious personal injury or death.**

- Access to the switchgear must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
- Always follow safe operating procedures and rules.
- Before touching any bushings, always disconnect the load-interrupter switches and fault interrupters from all power sources (including backfeed), test for voltage, and properly ground.
- Always assume the bushings are energized unless proved otherwise by test or by visual evidence of an **Open-Circuit** condition at the isolating disconnect.
- Test the bushings for voltage using the **Potential Indication** feature (if furnished) or other proper high-voltage test equipment.
- After the switchgear has been completely disconnected from all sources of power and tested for voltage, ground all load-interrupter switches and fault interrupters.
- Make sure the switchgear and pad-mounted enclosure (if furnished) are properly grounded to the station or facility ground. Do not return equipment to service until such grounds are properly made.

Inspecting Cable Terminations

To visually inspect the cables or to measure the temperature of the cable terminations using a noncontact infrared thermometer without opening the termination compartment doors, lift the applicable termination compartment cover panel. See Figure 39.

Figure 39. Lift the cover panel to visually inspect the cables or to measure the temperature of the cable terminations.

Pad-Mounted Enclosure Finish

The responsibility for ensuring a finish protects the enclosure lies with both the manufacturer and the user. S&C Vista SD Underground Distribution Switchgear is finished with the S&C Ultradur® II Outdoor Finish, which provides lasting protection for the enclosure. To retain this protection, the user should take periodic corrective action as follows:

STEP 1. Refinish any scratches or abrasions with S&C touch-up finish and red-oxide primer which are available in aerosol spray cans. See Figure 40. See S&C Specification Bulletin 695-31 for catalog number information used for ordering. No other finish or primer is approved.

The area to be touched up should be cleaned to remove 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.

STEP 2. Provide an occasional simple washdown—similar to what would be given to an automobile—to remove surface contaminants. Use any ordinary mild household detergent solution.

When the user must refinish the enclosure before the finish has weathered, such as when matching to other equipment, the user must take special precaution. The entire surface must be sanded to provide a tooth to bond the new coat to the unusually tough and smooth S&C Ultradur II Outdoor Finish.

Figure 40. Refinish any scratches or abrasions with S&C red-oxide primer and touch-up finish.

Replacing the Enclosure Latch Shear Pin

A shear pin is used at the mechanical joint between the pentahead (or hexhead when catalog number suffix "-H1" is specified) drive and the actuator of the enclosure latching mechanism. The shear pin prevents damage to the latching mechanism in the event excessive force (i.e. caused by vandalism, attempts to open the switchgear without removing the padlock, or use of a "breaker bar" or other torque-increasing device to turn the pentahead bolt) is used to attempt to open the latch. When excessive force is used, the shear pin will break to protect the latching mechanism from damage. See Figure 41.

Note: How to tell if the shear pin is broken: A broken shear pin will render the latching system inoperable. When a pentahead socket wrench is used to turn the pentahead bolt, the pentahead socket wrench will rotate more than 360° counterclockwise without opening the latch.

The following procedure describes how to open the switchgear enclosure and replace the shear pin.

Tools Required:

- Needle-nose pliers
- Slotted (flathead) screwdriver

Parts Required:

- Shear pin (part number: CH-2902)
- Retaining ring (two required) (part number: 1340-122)

STEP 1. Remove the padlock from the gear. If the shear pin was broken because someone tried to open the latch without first removing the padlock, turn the pentahead socket wrench clockwise to slowly "back off" the tension between the latching mechanism and the padlock, and then remove the padlock from the gear.

STEP 2. Use a pair of needle-nose pliers to remove the pentahead plug and shim washer from the latching mechanism. See Figure 42. If the actuator has been pushed backward while removing the pentahead plug, pull it forward to the fully closed position with a pair of needle-nose pliers. See Figure 43.

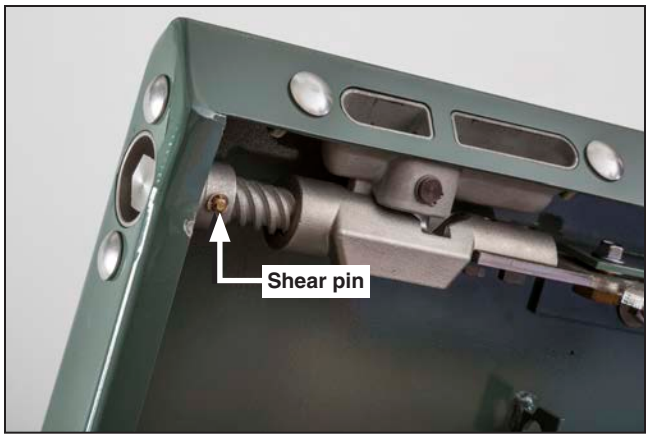


Figure 41. Vista SD enclosure latch mechanism.

Figure 42. Remove the plug and shim washer.

Figure 43. Pull the actuator forward if necessary.

STEP 3. Using a long-handled screwdriver, insert the blade of the screwdriver into one of the pin holes inside the actuator. Brace the screwdriver against the rim of the socket. Using the screwdriver like a handle, turn the actuator 360° counterclockwise to unlock the hinged roof. See Figure 44. Lift the hinged roof to engage the "hold-open" latch for the roof.

STEP 4. Attach the shim washer and pentahead plug to the latching drive. Turn the pentahead plug until the holes in the plug align with the holes in the latching drive. See Figure 45.

STEP 5. Install one of the retaining rings on one end of the new shear pin. Insert the shear pin into the hole on the side of the latch drive. The pin should go completely through the latch drive and pentahead plug. See Figure 46.

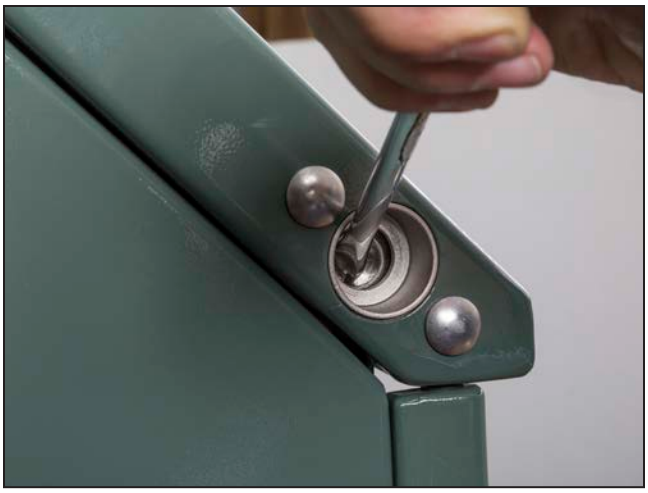


Figure 44. Rotate the actuator with a screwdriver until the latching mechanism opens.

Figure 45. Align hole in plug with the hole in the actuator.

Figure 46. Install the new shear pin.

STEP 6. Rotate the latch drive 180° and install the retaining ring on the opposite end of the shear pin. See Figure 47.

STEP 7. Insert a pentahead socket wrench or tool into the pentahead socket, and rotate it 360° counterclockwise. The mechanism should operate the latch smoothly through its full rotation and stop on reaching 360°.

STEP 8. Close and secure the hinged roof per the instructions in the "Closing the Pad-Mounted Enclosure" section on page 23.

Opening, Closing, and Securing the Enclosure if Replacement Shear Pin is Unavailable

If the shear pin is broken, the enclosure needs to be opened for any reason, and a replacement shear pin is unavailable, the enclosure can be easily opened, closed, and secured by following these steps:

STEP 1. To open the hinged roof, follow Step 1 through Step 4 of the "Replacing the Enclosure Latch Shear Pin" section on page 27. Retain the pentahead plug and shim washer in a secure area.

STEP 2. To gain access to the termination compartment:

(a) Lift the latch handle to open the right-side door or center door. See Figure 48. Open the door far enough to permit the door-holder mechanism to engage automatically.

(b) To open the left-side door, lift the finger latch. See Figure 49. Open the door far enough to permit the door holder mechanism to engage automatically.

Figure 47. Install a retaining ring on the opposite side of the shear pin.

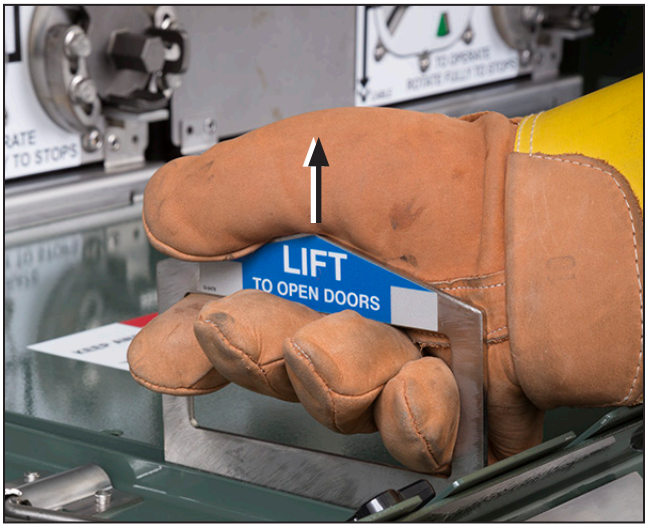


Figure 48. To gain access to the termination compartment, lift the latch handle to open the right-side or center door.

Figure 49. To open the left-side door, lift the finger latch.

STEP 3. Perform any necessary operations, inspections, or maintenance.

STEP 4. To close the enclosure, follow Step 1 through Step 3 of the "Closing the Pad-Mounted Enclosure" section on "Closing the Pad-Mounted Enclosure" on page 23.

STEP 5. Using a long-handled screwdriver, insert the blade of the screwdriver into one of the pin holes inside the actuator. Brace the screwdriver against the rim of the socket. Using the screwdriver like a handle, turn the screwdriver 360° clockwise to close and latch the hinged roof. See Figure 50.

STEP 6. Insert a padlock shackle through the hole in the padlock recess and lock the padlock. See Figure 51.

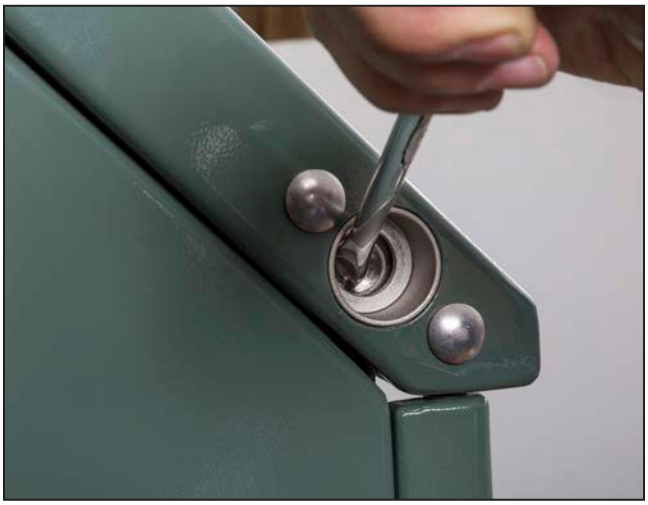


Figure 50. Rotate the actuator with a screwdriver until the latching mechanism closes.

Figure 51. Secure the enclosure with a padlock.

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 Table 1 and Table 2 on page 32. 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 the bushings with an insulated cap or other appropriate cable termination capable of withstanding the test voltage.

Table 1. Maximum Insulation Test Voltages

Vista SD Switchgear Rating, kV			Withstand Test Voltage, kV	
IEC	IEEE	Impulse (BIL)	Power Frequency①	Dc②③
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.

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 such that 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.**

⚠ DANGER

Do not exceed the test voltages given in Table 1 or Table 2 on page 32. Exceeding the test voltages can cause a flashover of the isolating gap or phase-to-phase insulation of the switchgear. **This will lead to a power-frequency fault in the gear of the dc test source and result in severe personal injury or death.**

⚠ WARNING

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. **Failure to follow these recommendations can result in injury or equipment damage.**

S&C Vista SD Underground Distribution Switchgear was 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 2.

Table 2. Maximum Cable-Testing and Cable-Thumping Dc Withstand Voltages

Vista SD Switchgear Rating, kV			Dc Cable-Test Voltage, kV	Dc Cable-Thumping Voltage, kV①
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.

Very Low Frequency (VLF) Cable Testing

⚠ WARNING

The VLF ac withstand capability of the switchgear may be reduced because of aging, damage, or electrical or mechanical wear. Therefore, the ac test voltage must be selected such that 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 3 on page 33. Exceeding the test voltages can cause a flashover of the isolating gap or phase-to-phase insulation of the switchgear. **This will lead to a power-frequency fault in the gear or the VLF test source, and result in severe personal injury or death.**

⚠ WARNING

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. **Failure to follow these operating and safety procedures can result in injury or equipment damage.**

⚠ 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.**

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. The cable system must then 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 3.

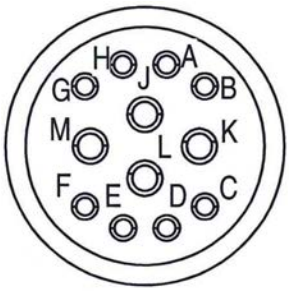
Table 3. Vista SD Switchgear Very Low Frequency (0.01- to 1-Hz) Sinusoidal Waveform Maximum Test Voltages

Vista SD Switchgear 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

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. Because the vacuum interrupter will not be energized across the open gap, there is no exposure to the X-rays 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. Auxiliary Contacts Receptacle Connector

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
	Legend: n/c = no connection	