Operation

This green leaf icon designates information specifically for Vista Green Underground Distribution Switchgear that uses an eco-friendly insulating gas. Unless otherwise designated, instructions provided apply to all manual Vista switchgear products.

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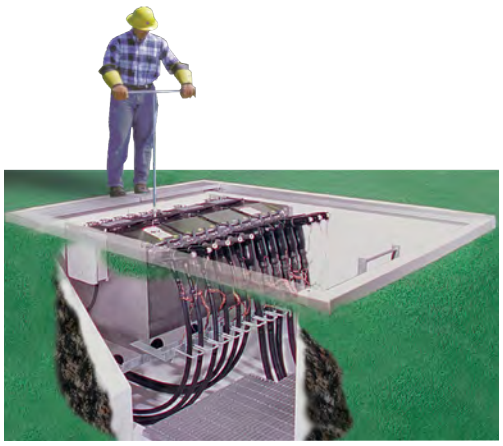


September 25, 2023

Qualified Persons

⚠ WARNING

Only qualified persons who are 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 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 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 remote supervisory Vista Underground Distribution Switchgear. Become familiar with the Safety Information and Safety Precautions on pages 4 through 6. The latest version of this publication is available online in PDF format at **https://www.sandc.com/en/contact-us/product-literature/**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the remote supervisory Vista Underground Distribution Switchgear. Designate a location where users can easily retrieve and refer to this publication.

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 equipment. Ratings for this gear are listed on a ratings label at the front of the switchgear. See Specification Bulletin 682-31 for more information.

Warranty

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

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the remote supervisory Vista 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 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

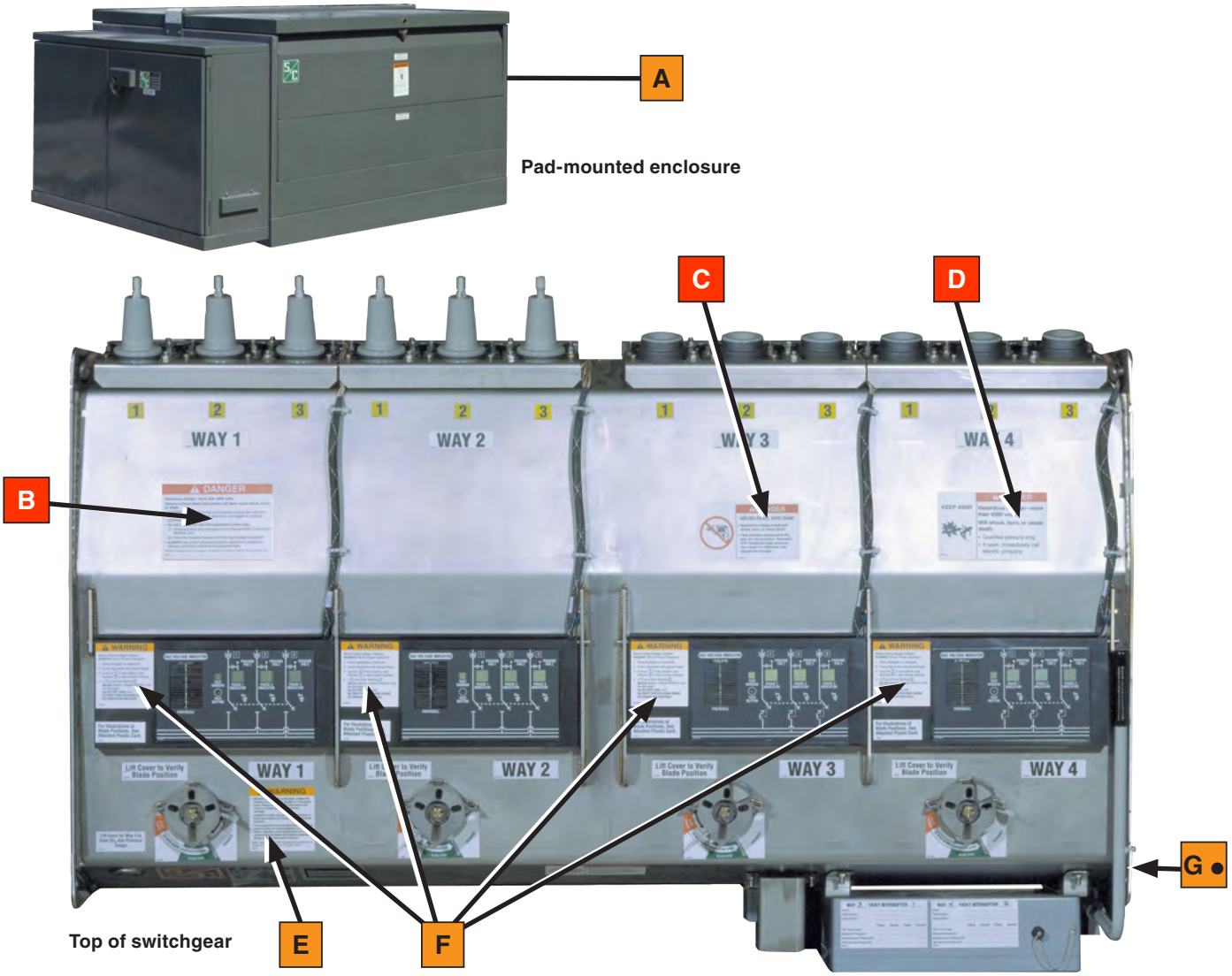
Read this instruction sheet thoroughly and carefully before installing the remote supervisory Vista Underground Distribution Switchgear.

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



Reorder Information for Safety Labels

Location	Safety-Alert Message	Description	Part Number
A	⚠ WARNING	Keep Out—Hazardous Voltage Inside	G-6681
B	⚠ DANGER	Hazardous Voltage—Always Consider Circuits and Components Live . . .	G-6700
C	⚠ DANGER	Never Drill Into Tank—Hazardous Voltage, Contains Pressurized Gas	G-6682
D	⚠ DANGER	Keep Away—Hazardous Voltage (“Mr. Ouch”)	G-6699
E	⚠ WARNING	Check Gas Pressure Before Operating Switchgear	G-6686
F	⚠ WARNING	Always Test Voltage Indicator For Proper Operation	G-6689
G●	⚠ WARNING	Always Visually Confirm Blade Position	G-6693 G-6694 (option “-L2”)

● This label is located on the side of the gear and is not visible in this photo.

⚠ DANGER

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

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

1. **QUALIFIED PERSONS.** Access to Vista Underground Distribution Switchgear must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operat ing procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "CAUTION," "WARNING," or "DANGER" labels.
5. **CLOSING AND LOCKING ENCLOSURES.** The pad-mounted enclosure and low-voltage compartment or enclosure must be securely closed with padlocks in place at all times unless work is being performed inside.
6. **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.
7. **BACKFEED.** Bushings, cables, load-interrupter switches, and fault interrupters may be energized by backfeed.
8. **DE-ENERGIZING, TESTING, AND GROUNDING.** Before touching any bushings or components inside the switchgear that are to be inspected, replaced, serviced, or repaired, always disconnect load-inter rupter switches and fault interrupters from all power sources (including backfeed), test for voltage, and properly ground.
9. **TESTING.** Test the bushings for voltage using the **Voltage Indication** feature (if furnished) or other proper high-voltage test equipment before touching any bushings or components inside the switchgear that are to be inspected, replaced, serviced, or repaired.
10. **GROUNDING.**
    - Make sure the switchgear tank and pad-mounted enclosure are properly grounded to the station or facility ground. Improper grounding will cause equipment damage.
    - After the switchgear has been completely discon nected from all sources of power and tested for voltage, properly ground the load-interrupter switches and fault interrupters before touching any bushings or components inside the switchgear that are to be inspected, replaced, serviced, or repaired.
11. **LOAD-INTERRUPTER SWITCH AND FAULT-INTERRUPTER POSITION.**
    - Always confirm the **Closed/Open/Grounded** position of load-interrupter switches and fault interrupters by visually observing the position of the blades.
    - Load-interrupter switches and fault interrupters may be energized by backfeed.
    - Load-interrupter switches and fault interrupters may be energized in any position.
12. **MAINTAINING PROPER CLEARANCE.** Always maintain a proper clearance from energized bushings.

Overview of Components

Remote supervisory Vista Underground Distribution Switchgear features load-interrupter switches for switching 600-ampere main feeders; microprocessor-controlled, resettable, vacuum fault interrupters for switching and protection of 600-ampere main feeders; and 200-ampere taps, laterals, and subloops. These elbow-connected components are enclosed in a submersible, gas-insulated, hermetically sealed welded-steel tank.

The three-position (CLOSED/OPEN/GROUNDED) load-interrupter switches are manually operated and provide three-pole live switching of 600-ampere three-phase circuits. These switches also provide a visible gap when open and internal grounding for all three phases. When they are fitted with motor operators and controls, these switches can be electrically operated via local operation pushbuttons. The user may also control the motor operators for the load-interrupter switches remotely when a remote terminal unit (RTU) and communication device are integrated with the remote supervisory Vista motor operators and controls.

The 200-ampere and 600-ampere fault interrupters feature resettable vacuum interrupters in series with manually operated three-position (CLOSED/OPEN/GROUNDED) disconnects for isolation and internal grounding of each phase. Fault interrupters provide single-pole or three-pole fault interruption and manual single-pole (standard) or three-pole (optional) live switching of load circuits. Fault interruption is initiated by a programmable overcurrent control. Conversion from single-pole trip control to three-pole trip control is accomplished using a personal computer. See S&C Instruction Sheet 681-530 for instructions on programming the control. The three-pole fault interrupters may be fitted with motor operators and controls so they may be electrically operated via local operation pushbuttons. The user may also control the motor operators for the three-pole fault interrupters remotely when an RTU and a communication device are integrated with the remote supervisory Vista motor operator and controls.

When the optional voltage indicator (option suffix "-L1" or "-L2") is specified, all routine operating tasks—switching, voltage testing, and grounding—can be accomplished by a single person without cable handling or exposure to high voltage. Cable testing for faults can be performed through the back of a user-supplied elbow with an insert or feedthrough bushing insert, eliminating the need for cable handling or parking stands. Refer to Figures 1 through 7 on pages 7 through 9 for the location of components.

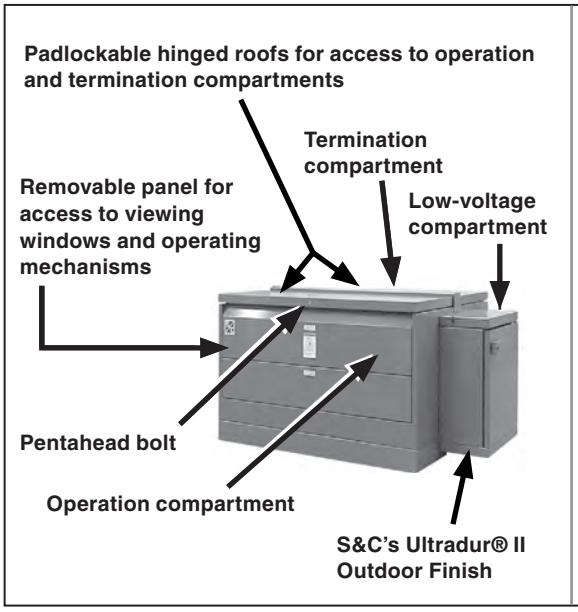


Figure 1. Pad-mounted style gear.

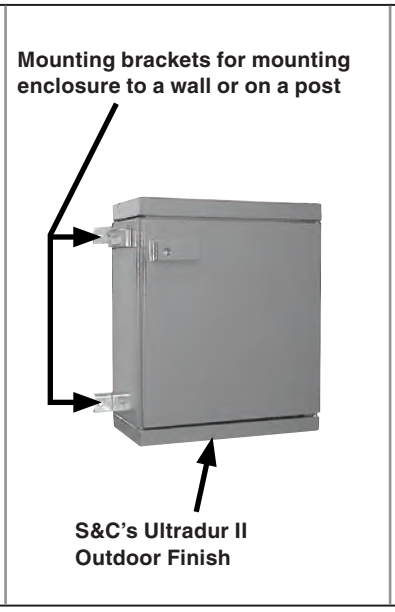


Figure 2. Dry-vault-mounted style gear low-voltage enclosure.

Figure 3. Wet-vault and UnderCover™ Style gear low-voltage enclosure.

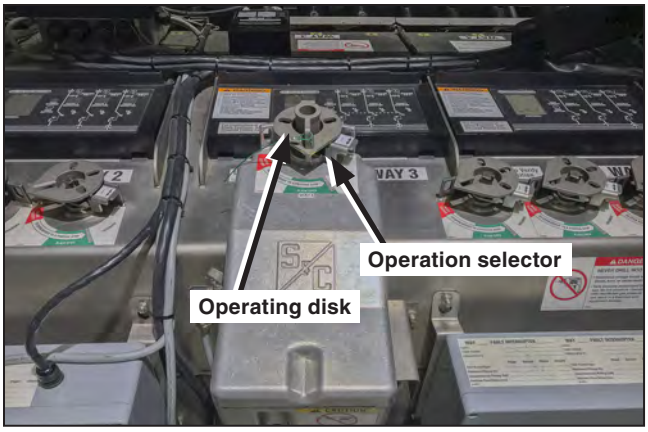


Figure 4. The Open position indication on the motor operator.

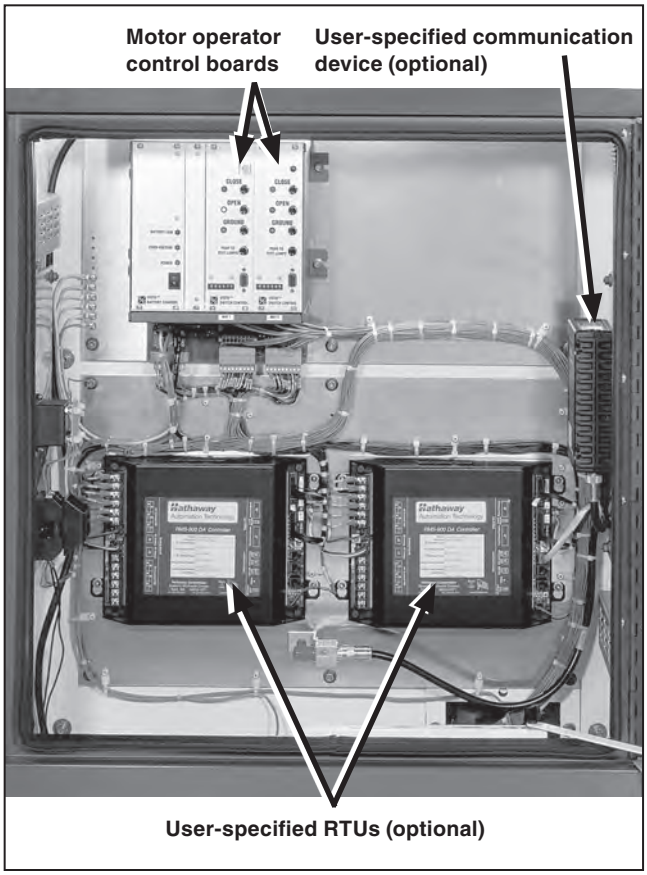


Figure 5. The low-voltage enclosure.

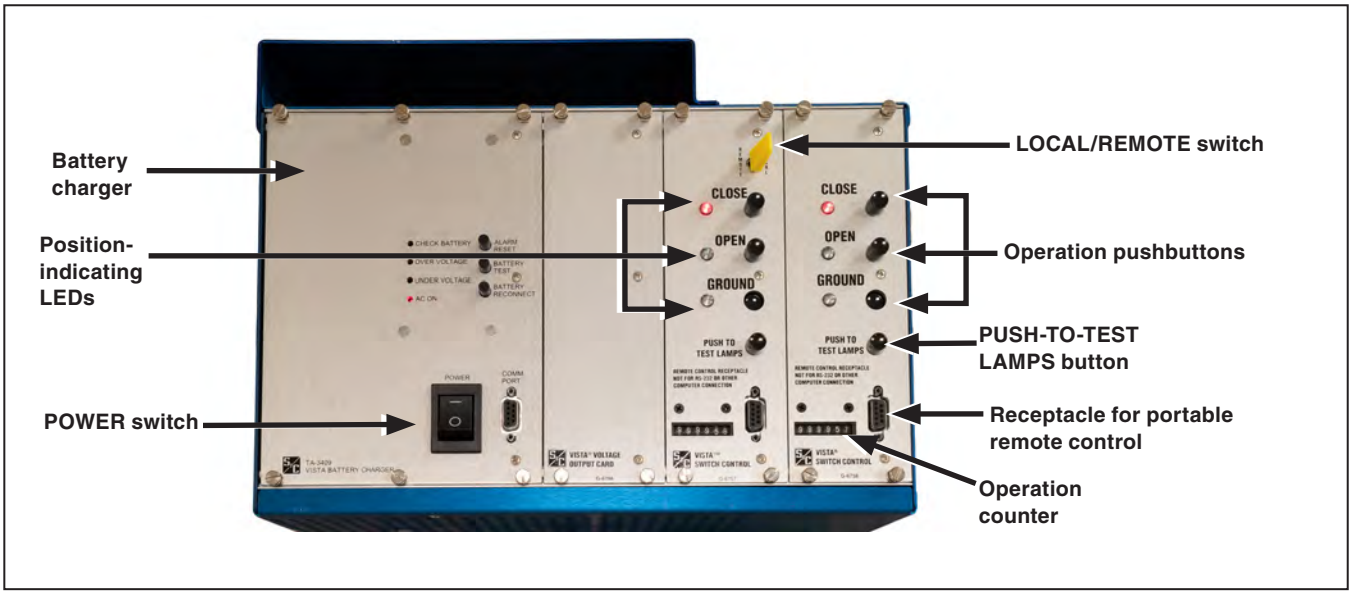


Figure 6. The motor operator control rack.

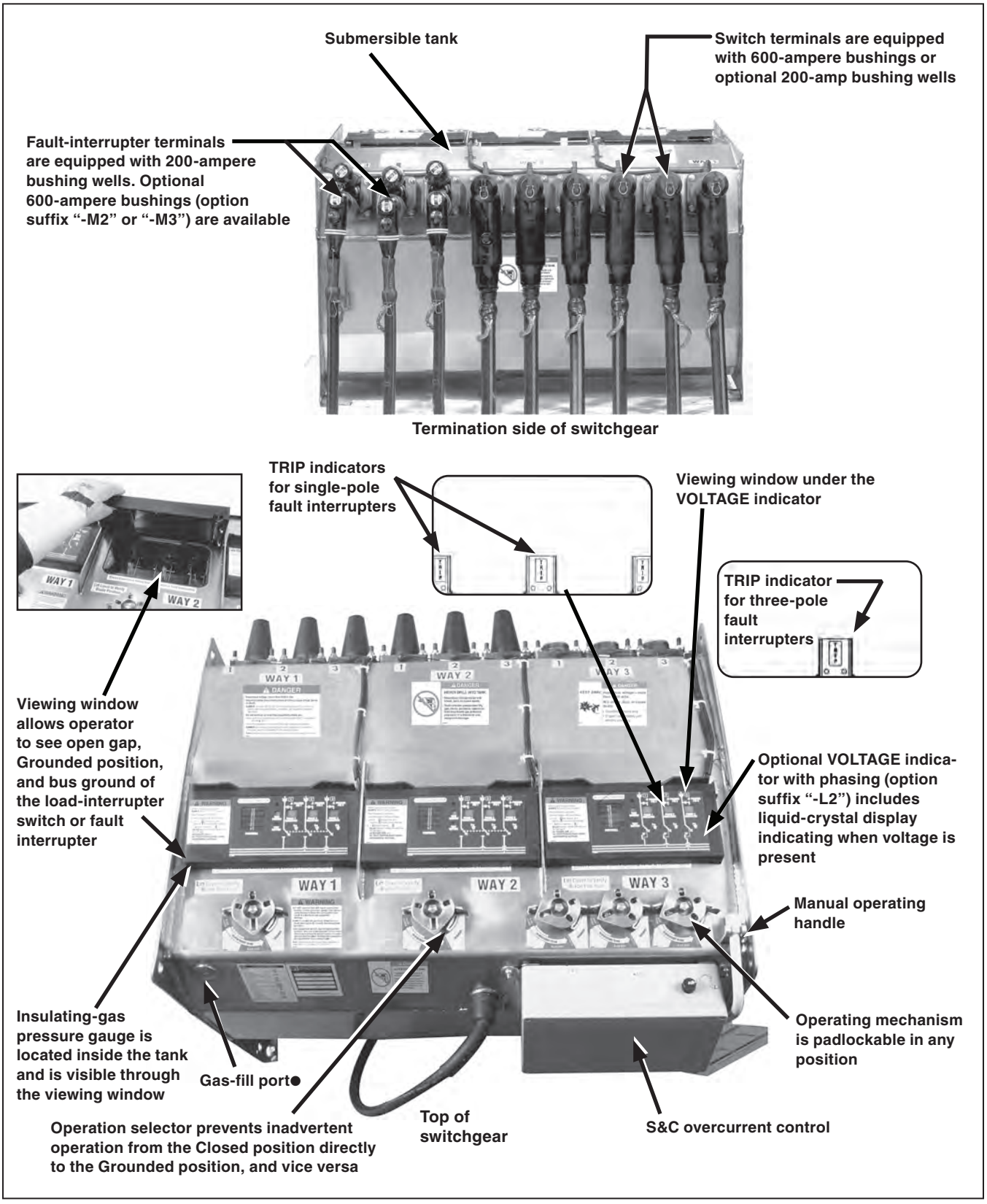


Figure 7. The termination side and top of switchgear.

●The gas-fill port is field-accessible for SF_6 models. For Vista Green switchgear models, the gas-fill port is designed to prevent field-refilling.

Understanding the Gas-Pressure Gauge

Vista switchgear incorporates a temperature-compensated gas-pressure gauge inside the tank to provide indication of the insulating-gas pressure. The gas-pressure gauge includes four distinct color-coded zones. See Figures 8 and 9.

If the needle is within a particular zone as described below, it indicates the following:

Green zone:

The Vista switchgear unit is OK to operate.

Green/Yellow zone:

The Vista switchgear unit may have lost some gas but is still OK to operate. ***For SF_6 models***: The unit should be evaluated to determine whether it needs to be refilled with SF_6 gas via the field-accessible fill port and repaired accordingly. Contact S&C for assistance.

Vista Green switchgear models are hermetically sealed. The gas-fill port is not accessible in the field as standard. Contact S&C for assistance.

Red zone:

The insulating gas may be below the minimum operating pressure for the gear. **Vista switchgear should not be operated if the needle is in the Red zone.** Contact S&C Electric Company for assistance.

Orange zone:

The Vista switchgear unit has been overfilled or has a defective pressure gauge. For SF_6 models and field-accessible ports, an external gauge can be used instead to verify the gas pressure before operation of the device. Contact S&C for assistance.

Vista Green switchgear models are hermetically sealed. The gas-fill port is not accessible in the field as standard. Contact S&C for assistance.

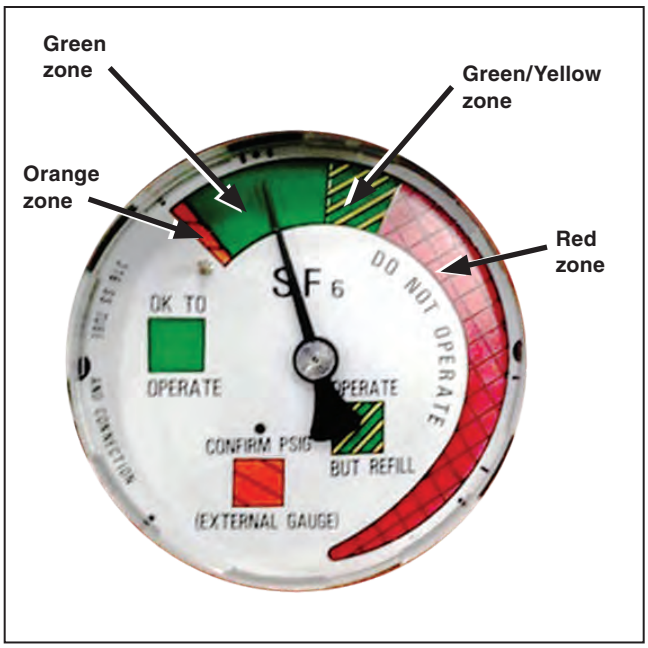


Figure 8. The internal gas-pressure gauge for most SF_6 models.

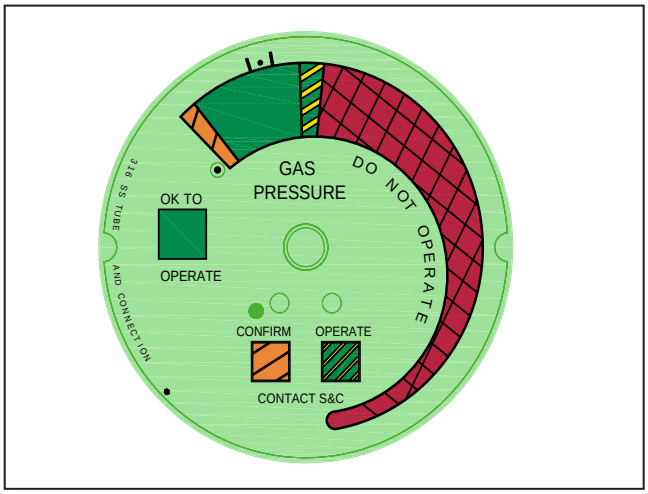


Figure 9. The internal gas-pressure gauge for Vista Green switchgear models, "-GRN" catalog numbers.

Gauge Needle Fluctuations from Rapid Ambient Temperature Changes

When the Vista switchgear tank experiences rapid changes in ambient temperature, the gas-pressure gauge needle may temporarily move to indicate a higher gas pressure when the tank is rapidly cooled or at a lower gas pressure when the tank is rapidly heated. This phenomenon may occur, for instance, with sudden, direct exposure to intense sunlight.

The gas-pressure gauge uses a small reference gas chamber filled with helium to compensate for ambient temperature and altitude without applying correction factors. The gauge indicates tank pressure by measuring the pressure differential between the gas in the tank and the gas in the gauge. When the tank experiences rapid ambient temperature changes, the smaller volume of gas inside the gauge can change temperature more quickly than the larger volume of gas in the tank, which can lead to temporary movement of the needle. When the temperature stabilizes, the needle will return to its previous position within 1-2 hours.

For SF_6 units: If a sudden drop or increase in pressure is seen on the gauge, S&C recommends checking with an external gauge or waiting for ambient temperature conditions to stabilize to confirm that the needle has returned to its nominal position.

Vista Green switchgear models are hermetically sealed. The gas-fill port is not accessible in the field as standard. Contact S&C for assistance.

Manually Opening, Closing, or Grounding a Way

⚠ WARNING

Do not operate this switchgear if the SF_6-gas pressure gauge is in the Red zone. **Failure to follow this precaution can result in a flashover, injury, and equipment damage.**

Make sure the insulating-gas pressure gauge is in the Green zone (or the Green-and-Yellow striped zone) by lifting the viewing window cover on way one. See Figures 10 and 11.

Note: If the SF_6-gas pressure gauge is in the Green-and-Yellow striped zone, the switchgear can be operated but the tank must be repaired (if necessary) and refilled with SF_6 gas as soon as possible.

Note: If the Vista Green switchgear gas is in the Green-and-Yellow striped zone, the switchgear can be operated but must be serviced. Contact S&C for assistance.

STEP 1. Open the viewing window cover and confirm the position of the load-interrupter switch or the three-pole fault interrupter by visually observing the position of the blades. See Figures 12 and 13 on page 13.

Also, inspect the current-carrying components inside the tank for any signs of abnormalities but specifically for disconnect blade alignment, contact finger position, and dislodged hardware.

⚠ WARNING

DO NOT operate the energized load interrupter switch or fault interrupter if it has dislodged hardware, or obvious signs of arcing or blade misalignment. **Failure to follow this precaution can result in an injury or equipment damage.**

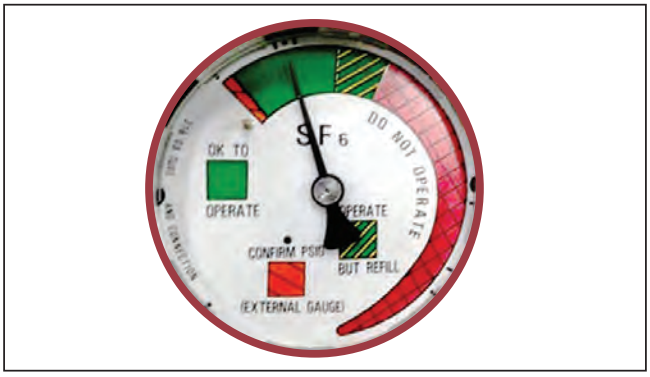


Figure 10. The internal SF_6-gas pressure gauge.

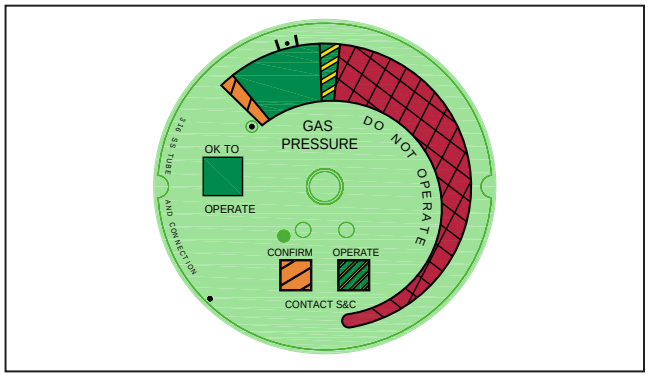


Figure 11. The internal gas-pressure gauge for Vista Green switchgear models, "-GRN" catalog numbers.

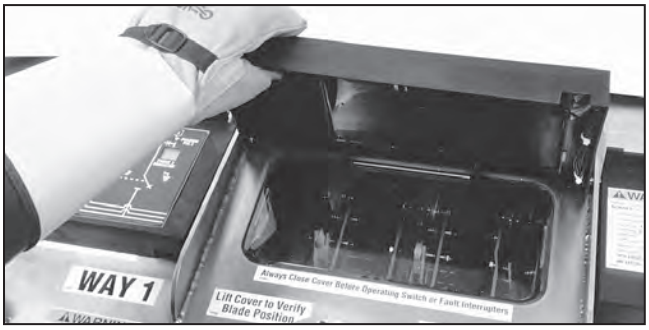


Figure 12. The window cover lifts for viewing of switch or fault-interrupter blade positions.

STEP 2. Remove the electrical-operation mechanical blocking key from the motor operator. Verify the operation selector is in the far right position. This allows operation between **Closed** and **Open** positions (see Figure 14) and prevents inadvertent operation directly from the **Closed** position to/from the **Grounded** position.

STEP 3. If the operation selector is blocking operation, remove the electrical-operation mechanical blocking key from the motor operator and rotate the operation selector out of the way, as shown in Figure 15.

⚠ WARNING

ALWAYS confirm the position of switches or fault interrupters by VISUALLY OBSERVING blade position. **Failure to follow this precaution can result in an injury or equipment damage.**

Figure 13. Confirm the blade positions.

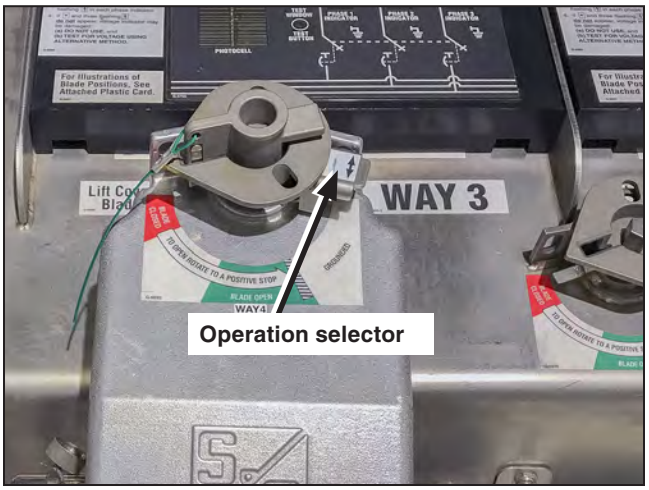


Figure 14. The operation selector In the far right position.

Figure 15. Rotate the operation selector out of the way.

STEP 4. In the far left position, the operation selector allows operation between the **Open** and **Grounded** positions. See Figure 16. The operation selector in this position prevents inadvertent manual operation directly from the **Grounded** position to the **Closed** position.

STEP 5. Insert the manual operating handle into the notch of the motor operator operating mechanism, as shown in Figure 17.

STEP 6. Rotate the manual operating handle in the appropriate direction to open, close, or ground the load-interrupter switch or three-pole fault interrupter. Operation to the **Open** position is shown in Figure 18.

Figure 16. The operation selector in the far left position.

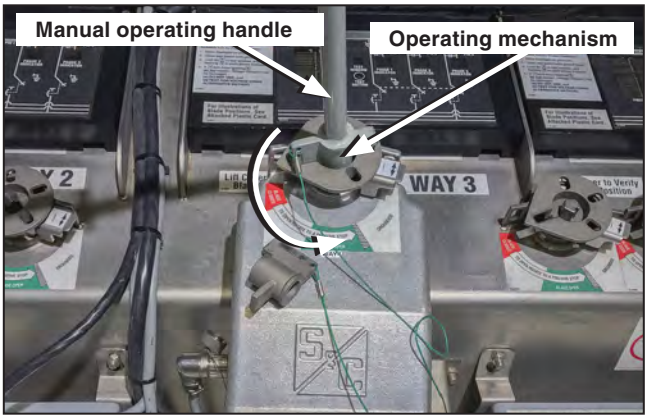


Figure 17. Insert the manual operating handle.

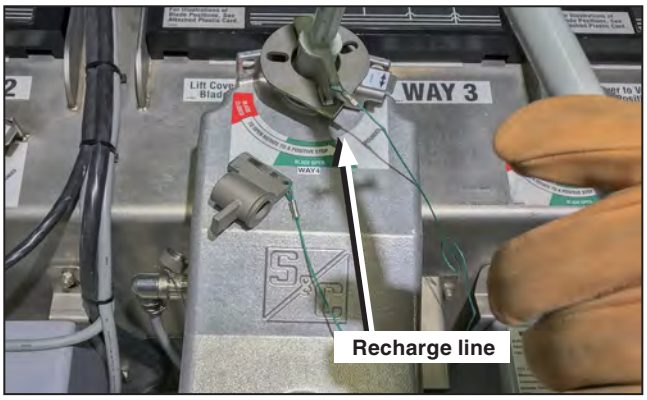


Figure 18. Rotate the manual operating handle.

STEP 7. When operating from **Closed** to **Open** position, the operating handle must be rotated all the way to the line, as shown on the label to recharge the mechanism. See Figure 18 on page 14. For the three-pole fault interrupter, the operating handle cannot be removed until the mechanism is fully charged. See Figure 19.

***For single-phase fault interrupters*:** When the fault-interrupter is operated from the **Closed** position, it will move to the **Open** position before the TRIP indicator will appear. ***To reset the TRIP indicator*:** Operate by going from the **Open** position back to the **Closed** position.

***For three-phase fault interrupters*:** When the fault-interrupter is operated from the **Closed** position, it will move toward the **Open** position and the TRIP indicator will immediately appear after the indicator leaves the **Closed** position. ***To reset the trip indicator*:** Continue operating until the **Open** position is reached.

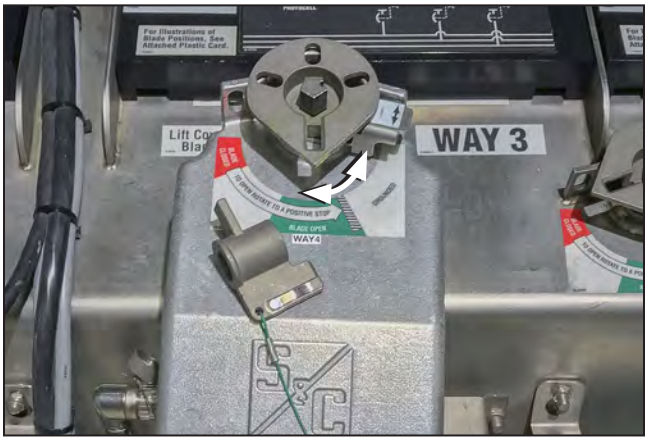


Figure 19. The motor operator recharged and in the Open position.

⚠ WARNING

ALWAYS make sure the cables connected to the load-interrupter switch or fault interrupter are de-energized before grounding the switchgear. **Failure to follow this precaution can result in a flashover and equipment damage.**

STEP 8. If operation is to the **Grounded** position, rotate the operation selector to the far left and make sure the cables connected to the load-interrupter switch or fault interrupter are de-energized. See Figure 20. Check for voltage using the optional VOLTAGE indicator (option suffix "-L1" or "-L2") as instructed under the "Checking for Voltage Using Optional Voltage Indicator" section on page 24, or use an alternate method.

STEP 9. Open the viewing window cover again and confirm the position of the load-interrupter switch or the three-pole fault interrupter by visually observing the position of the blades. Use the manual operating handle to move the switch to the **Grounded** position. See Figure 21.

Note: Replace the electrical operation mechanical blocking key when finished operating the gear with the manual operating handle.

Locking Out Grounded Position

To prevent operation of a motor operator into the **Grounded** position, insert a padlock through the operation selector and the right-side hole of the locking collar. See Figure 22.

Figure 20. Rotating the operation selector to far left enables operation to Grounded position.

Figure 21. Grounding the load-interrupter switch (or fault interrupter).

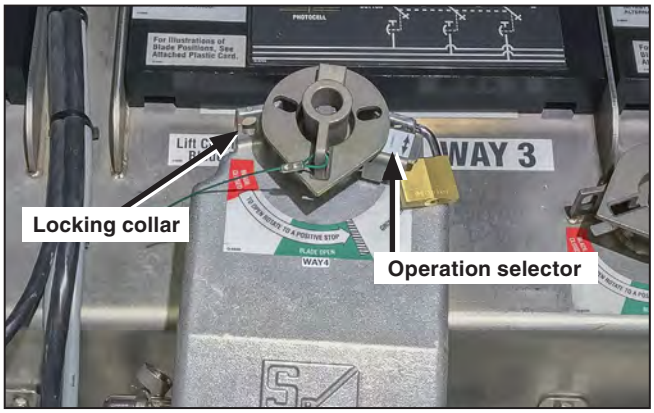


Figure 22. Locked out of Grounded position.

Locking In Closed, Open, or Grounded Position

To lock a motor operator into position, insert a padlock through the operating mechanism and the center hole in the locking collar. See Figures 23 through 25.

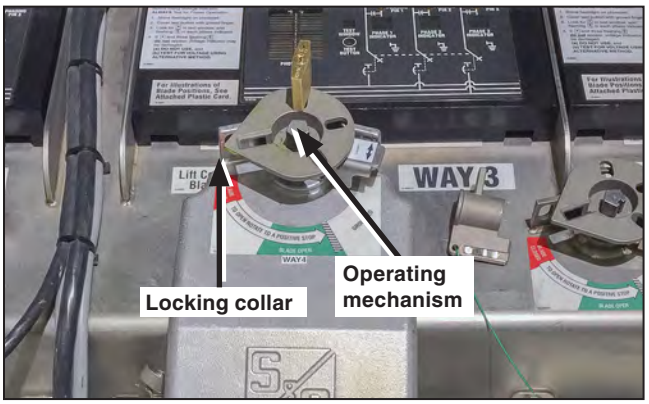


Figure 23. Locked in the Closed position.

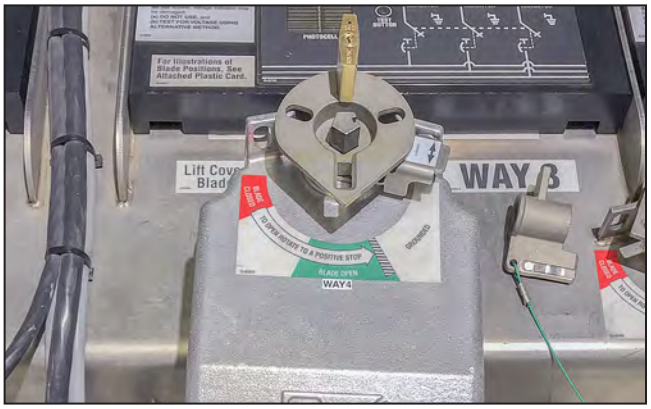


Figure 24. Locked in the Open position.

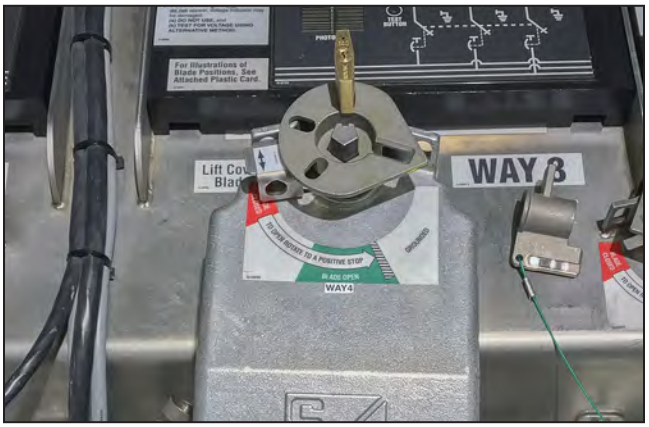


Figure 25. Locked in the Grounded position.

Electrically Opening, Closing, or Grounding a Way

NOTICE

When electrically operating a way using a motor operator more than two times in succession (for example, running multiple operations during a testing sequence), allow a 15-second period between each successive operation. Not allowing a 15-second rest period between operations may result in a missed operation.

STEP 1. The controls for the motor operators are located in the low-voltage compartment or enclosure. Each motor operator is controlled by a separate control board that includes **Close**, **Open**, and (optionally) **Ground** operation pushbuttons, switch position indicating lamps, an operations counter, a PUSH TO TEST LAMPS button, and a receptacle for the portable remote control. See Figure 26.

STEP 2. Turn the LOCAL/REMOTE switch to the **Local** position. See Figure 26.

STEP 3. Verify the position-indicating lamp on the control board matches the position of its associated motor operator. See Figures 27 and 28.

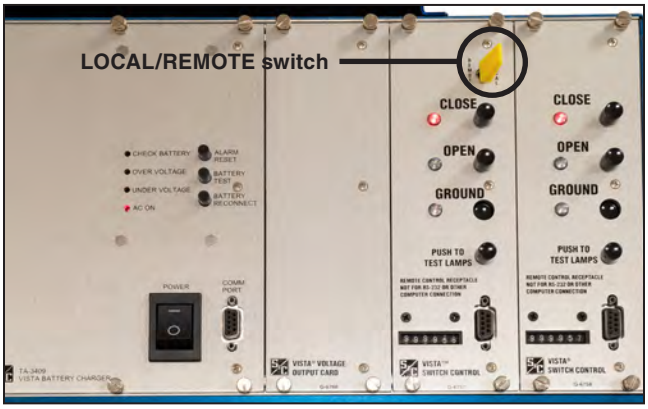


Figure 26. The motor operator control rack.

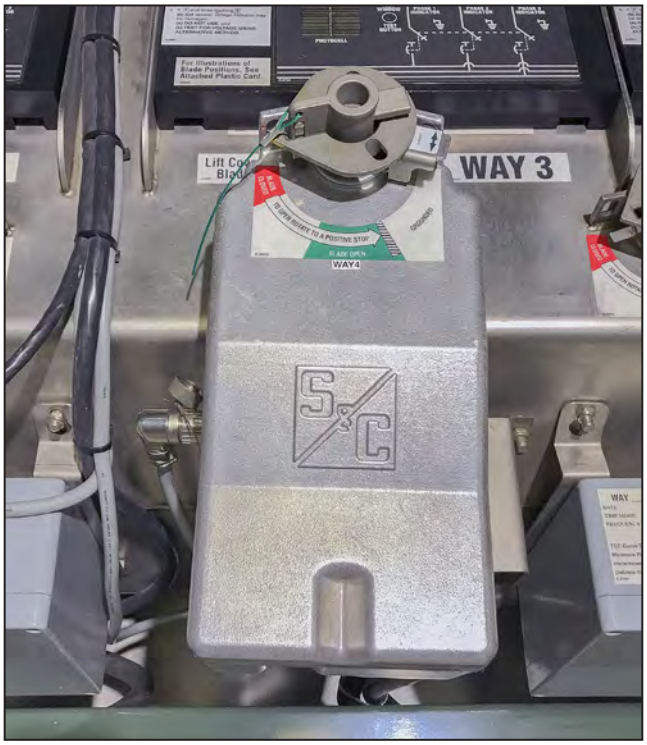


Figure 27. The Close position indicator on the motor operator.

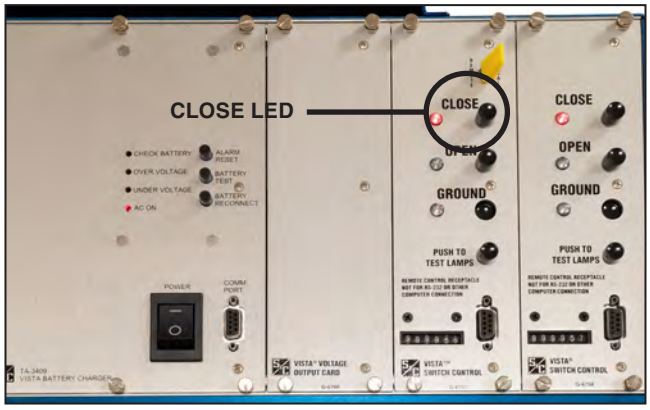


Figure 28. The Close position indicator on the motor control board matches the motor operator position.

STEP 4. Make sure the operating handle is removed from the operating disk of the motor operator. See Figure 29.

STEP 5. Make sure the electrical-operation mechanical blocking key is set in the motor operator operating disk. See Figure 30.

Figure 29. Remove the operating handle.

Figure 30. Replace the electrical-operation mechanical blocking key.

STEP 6. If the operation selector is blocking operation, rotate the operation selector out of the way, as shown in Figure 31. It may be necessary to remove the electrical-operation mechanical blocking key to move the operation selector. The operation selector prevents inadvertent operation of the motor operator. Replace the mechanical blocking key. See Figures 32 and 33.

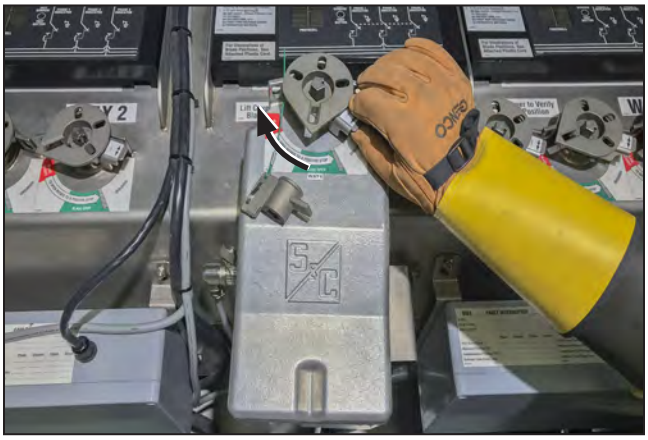


Figure 31. Rotate the operation selector out of the way.

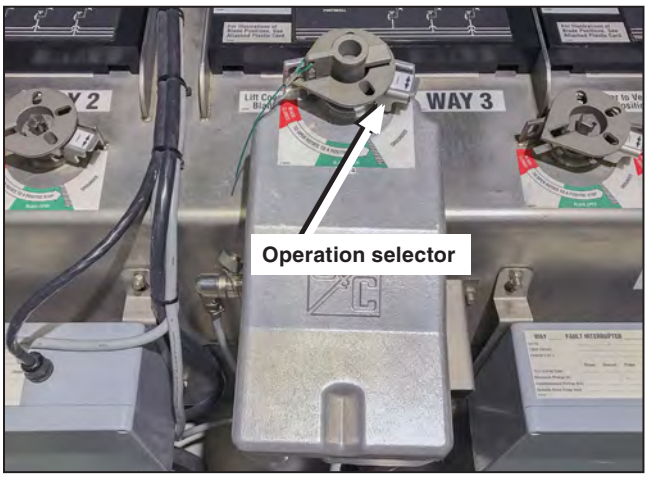


Figure 32. In the far right position, the operation selector allows operation between the Closed and Open positions.

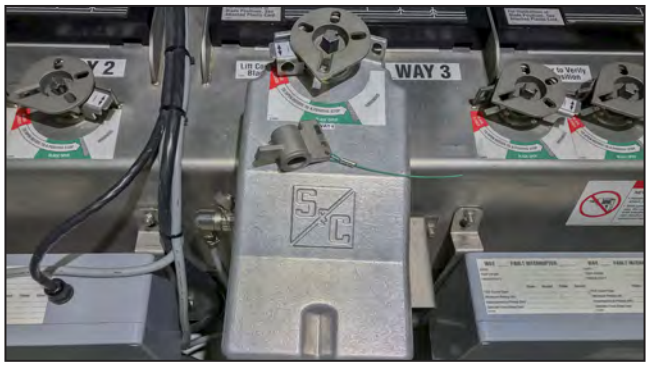


Figure 33. In the far left position, the operation selector allows operation between Open and Grounded positions.

STEP 7. Press the PUSH TO TEST LAMPS pushbutton on each motor operator control board to ensure all of the LEDs are working. See Figure 34.

STEP 8. The LOCAL/REMOTE switch should already be in the **Local** position. If the switchgear is energized and feeding load, decouple the operator before continuing. The following operations may be performed using pushbuttons, as shown in Figure 34:

- **Close** to **Open**
- **Open** to **Grounded** (optional)
- **Grounded** to **Open** (Optional)
- **Open** to **Close**

An electrical interface in the controls will not allow the motor operators to move to/from the **Close** position directly from/to the **Grounded** position.

⚠ WARNING

ALWAYS make sure the cables connected to the load-interrupter switch or fault interrupter are de-energized before selecting the **Grounded** position. **Failure to follow this precaution can result in a flashover, injury, and equipment damage.**

Figure 34. The motor operator control board pushbuttons.

Motor Operator Decoupling

STEP 1. Loosen and remove the bolt from the stop ring located on the operating disk collar. See Figure 35.

STEP 2. Lift the motor operator over the operating shaft of the gear. See Figure 36.

STEP 3. For submersible applications, do not remove the cable from the motor operator. See Figure 37.

Figure 35. Loosen the bolt.

Figure 36. Lift the motor operator.

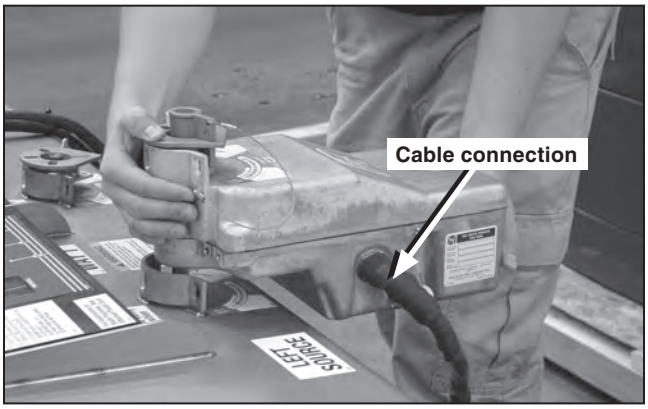


Figure 37. Do not remove cable.

STEP 4. Reposition the motor operator to one side of the operating shaft. See Figure 38.

STEP 5. Refasten the bolt to the stop ring located on the operating disk collar. See Figure 39.

Figure 38. Reposition the motor operator.

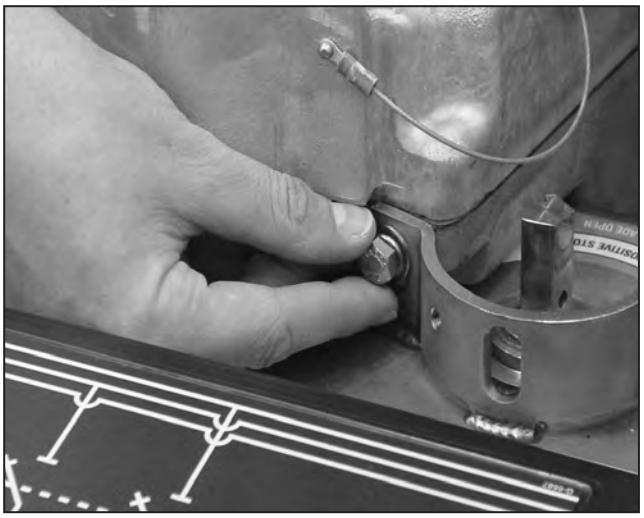


Figure 39. Refasten the bolt.

Checking for Voltage Using Optional VOLTAGE Indicator

⚠ WARNING

Before using a voltage indicator, ALWAYS test for proper operation. If the voltage indicator is not operating properly, test for voltage using an alternate method. **Failure to follow this precaution can result in an injury or equipment damage.**

NOTICE

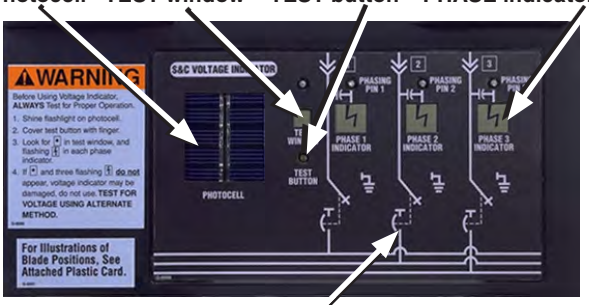
When cleaning the surface of the VOLTAGE indicator, make sure the TEST button is thoroughly cleaned of dirt and debris. If light is blocked from the photocell and the sun is bright enough to power the test circuit, the VOLTAGE indicator will be in the **Test** mode and may give a false indication that all three phases of the associated load-interrupter switch or fault interrupter are energized. The **Test** mode is indicated by a dot [●] in the **Test** window.

STEP 1. Clean the surface of the VOLTAGE indicator to remove dirt and debris. See Figure 40.

STEP 2. Check the PHASE indicators to determine whether there is any voltage at the associated bushings. See Figure 41. A flashing lightning bolt [ϟ] in the PHASE indicator means voltage is present at the bushing. A blank indicator means either:

- There is no voltage at the bushing.
- The VOLTAGE indicator is malfunctioning.

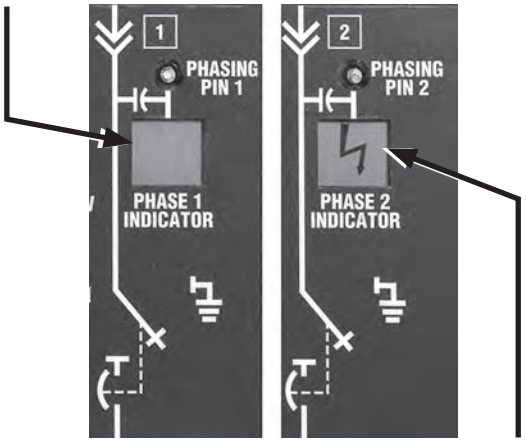
If any of the PHASE indicators are blank, proceed to Step 3 on page 25 to test the VOLTAGE indicator for proper operation. See Figure 42.



Before using the VOLTAGE indicator, thoroughly clean the surface

Figure 40. The VOLTAGE indicator with the Test feature.

A blank LCD panel indicates an absence of voltage at the associated bushing, provided the VOLTAGE indicator circuitry has been tested and determined to be operating properly.



Flashing lightning bolt indicates presence of voltage at the associated bushing

Figure 41. The VOLTAGE indicator circuitry.

PHASE indicators show presence of voltage at associated bushing

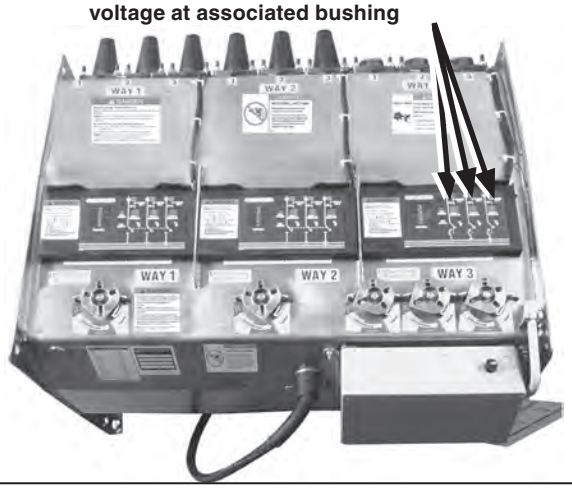


Figure 42. Each VOLTAGE indicator is provided with three PHASE indicators—one for each phase.

STEP 3. Test the VOLTAGE indicator for proper operation as follows:

(a) Shine a flashlight approximately 4 inches (102 mm) above the photocell, and simultaneously cover the TEST button with a gloved finger. See Figure 43. When the sun is shining brightly, it can be used to power the test circuit.

(b) If a dot ● appears in the TEST window and a flashing lightning bolt ϟ in each of the three PHASE indicators, then the VOLTAGE indicator is operating properly. See Figure 44.

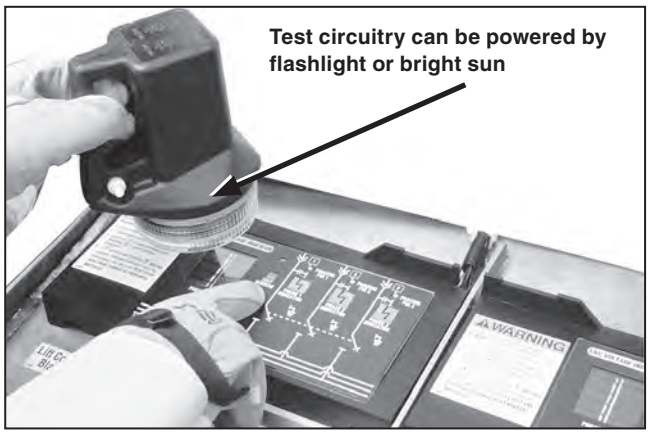


Figure 43. Place a gloved finger over the TEST button to begin testing.

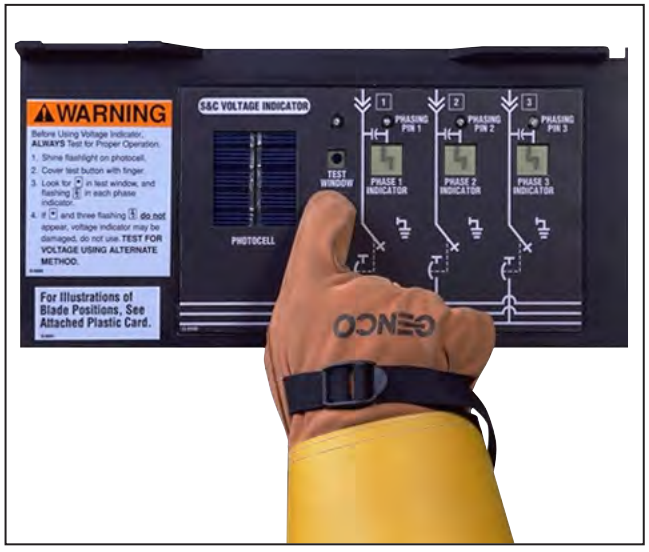


Figure 44. The VOLTAGE indicator is operating properly if a dot appears in TEST window and a flashing lightning bolt appears in each PHASE indicator.

(c) If the dot ● or any of the flashing lightning bolts ϟ do not appear, make sure the TEST button is completely covered with a gloved finger so no light shines on that photocell and there is adequate light (provided either by a flashlight or the sun) to power the test circuit. See Figure 45. If the dot ● or any of the flashing lightning bolts ϟ still do not appear, the VOLTAGE indicator may be damaged. Test for voltage using an alternate method. See Figure 46.

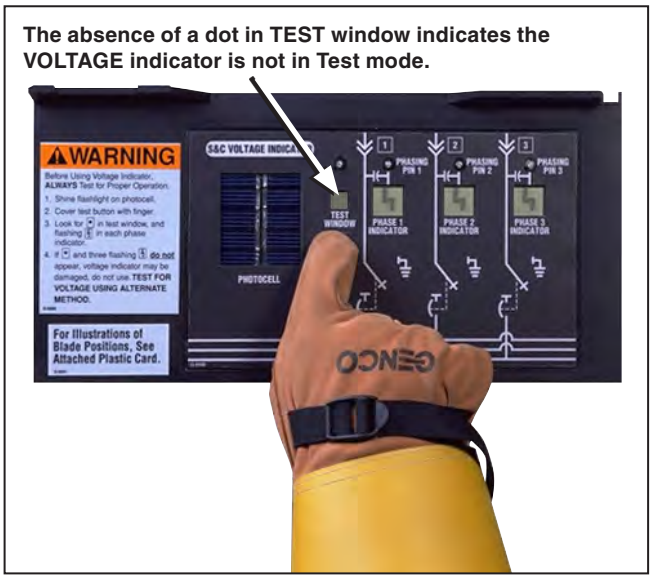


Figure 45. Make sure there is sufficient light to run the test circuitry and the TEST button is completely covered by a gloved finger.

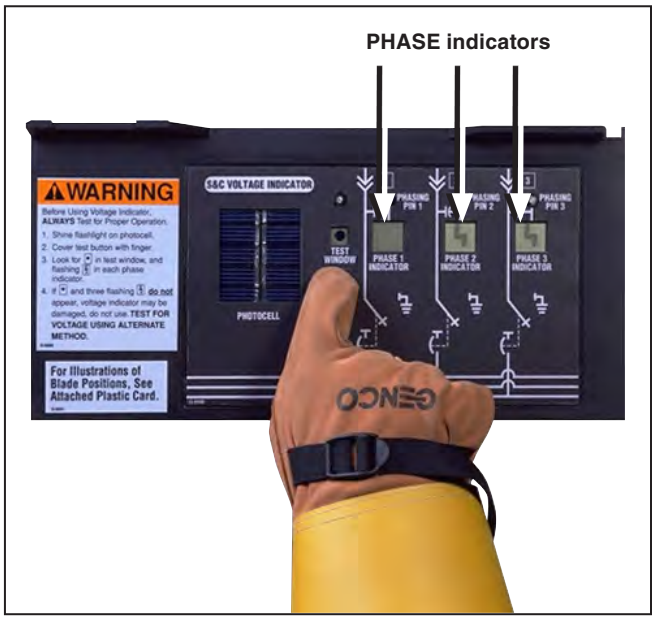


Figure 46. If one or more PHASE indicators does not show a flashing lightning bolt during testing, the VOLTAGE indicator may be damaged. Test for voltage using an alternate method.

Low-Voltage Phasing Using Optional VOLTAGE Indicator with Phasing

STEP 1. Clean the surface and phasing pins of the VOLTAGE indicator of dirt and debris. See Figure 47.

STEP 2. Test the VOLTAGE indicators for proper operation by following the "Checking for Voltage Using Optional Voltage Indicator" section on page 24. If a VOLTAGE indicator is not operating properly, phasing should be performed using an alternate method.

STEP 3. Using a high-impedance voltmeter, as shown in Figure 48, verify voltage is present and determine the phase-to-ground 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 metal tank of the switchgear to ground the voltmeter. See Figure 49.

(c) Place the other test probe on each of the phasing pins, in turn, for the two ways to be phased and measure the phase-to-ground voltage. See Figure 47. Ac voltage range is 5-8 Vac.

(d) If the voltage measured at each phasing pin is greater than zero and they are equal, proceed to Step 4 on page 28.

(e) If the voltage measured at any of the phasing pins is zero, the phases are not energized and phasing cannot be performed. If the voltages measured are not equal, the voltmeter may not be operating properly. Phasing should be performed using an alternate method.

● A "way" consists of a three-phase load-interrupter switch, a three-phase fault interrupter, a bus tap, or three single-phase fault interrupters.

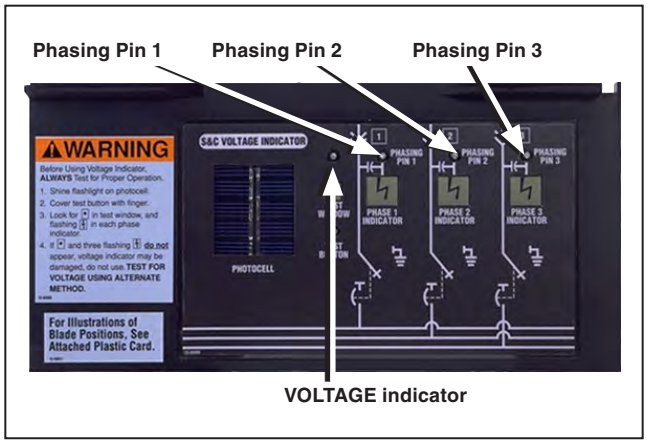


Figure 47. Before performing phasing, thoroughly clean the surface and Phasing pin.

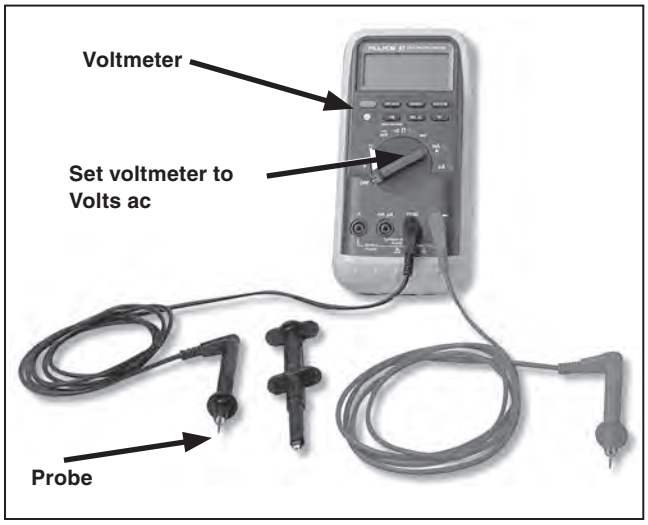


Figure 48. The high-impedance voltmeter and test probes.

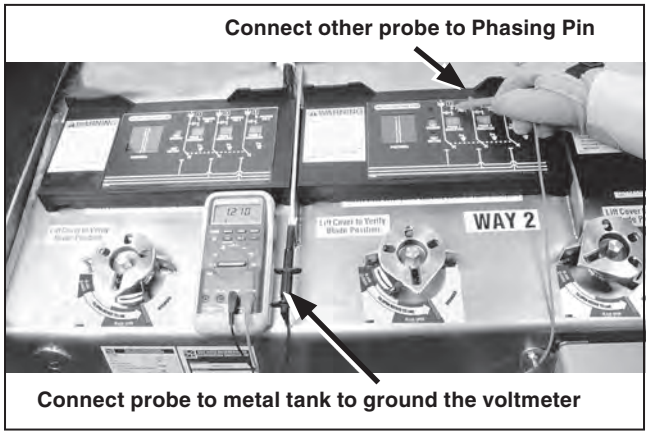


Figure 49. The test probes are connected to metal tank to ground the voltmeter and to a Phasing pin.

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 switchgear tank.

(b) Place one of the test probes on Phasing Pin 1 of the first way and place the other probe on Phasing Pin 1 of the second way. Measure the phase-to-phase voltage. See Figure 50. When comparing the same phase of the two ways, the voltage should be zero or close to zero, indicating the cables are in phase.

(c) Keep the test probe on Phasing Pin 1 of the second way and move the other test probe to Phasing Pin 2 of the first way. Measure the phase-to-phase voltage. See Figure 51. When comparing different phases of the two ways, the voltage should be 1.7 to 2 times the phase-to-ground voltage measured in Step 3 on page 27.

(d) Keep the test probe on Phasing Pin 1 of the second way and move the other test probe to Phasing Pin 3 of the first way. Measure the phase-to-phase voltage. See Figure 52. Again, when comparing different phases of the two ways, the voltage should be 1.7 to 2 times the phase-to-ground voltage measured in Step 3 on page 27.

(e) Repeat Steps 4(b) through 4(d) for Phasing Pin 2 and Phasing Pin 3 of the second way.

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

Figure 50. Measuring the phase-to-phase voltage—Phase 1 to Phase 1

Figure 51. Measuring the phase-to-phase voltage—Phase 2 to Phase 1

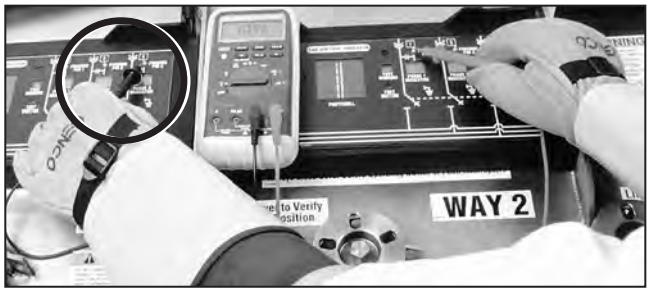


Figure 52. Measuring the phase-to-phase voltage—Phase 3 to Phase 1

Components

No maintenance is required for remote supervisory Vista Underground Distribution Switchgear. However, occasional inspection of the switchgear and exercising of the load-interrupter switches and fault interrupters are recommended. Two battery chargers are available for Vista Underground Distribution Switchgear. For information on battery charger TA-3409 and instructions for replacing the battery, see S&C Instruction Sheet 680-540. For information on battery charger TA-2646, identifiable by number G-4875 on the front panel, see S&C Data Bulletin 682-97.

⚠ DANGER

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

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

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

Returning Equipment to Service

When returning the equipment to service, the following procedures should be observed:

STEP 1. Make sure the load-interrupter switch and fault-interrupter grounding means are removed.

STEP 2. Make certain the load-interrupter switches and fault interrupters are in the correct **Open** or **Closed** positions.

STEP 3. If a pad-mounted enclosure is furnished, close and padlock the termination compartment before energizing the circuit and operating any switching devices.

STEP 4. Padlock the switchgear and low-voltage compartment or enclosure before leaving the site—even momentarily. See Figure 53. Observe this procedure even in those cases where the gear is accessible only to qualified persons.

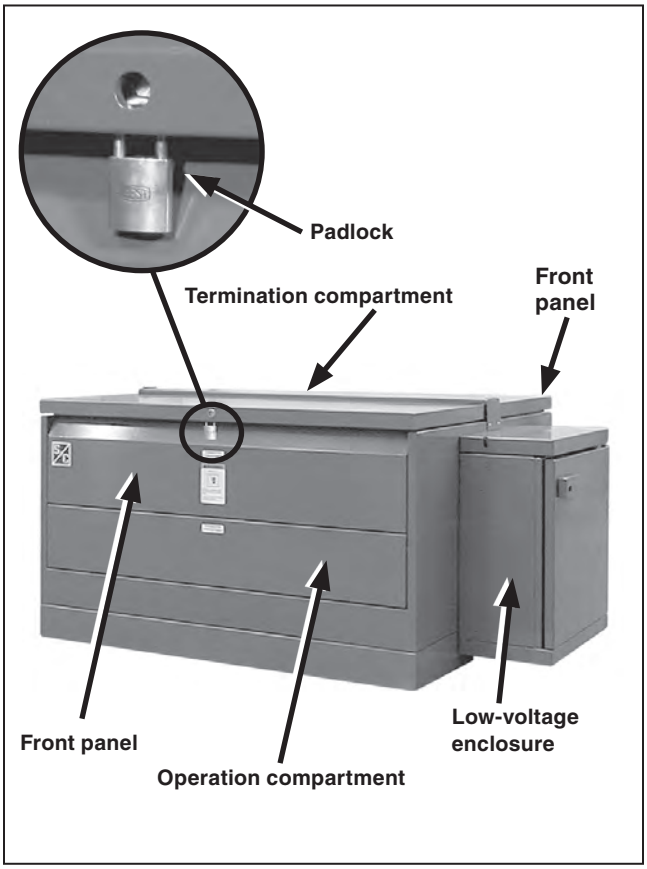


Figure 53. Lock the outer and low-voltage enclosures.

Enclosure Finish

The responsibility for ensuring that the finish protects the enclosure lies with both the manufacturer and the user. Enclosures provided are finished with S&C's Ultradur II Outdoor Finish, which provides lasting protection. To retain this protection, the user should take periodic corrective action as follows:

STEP 1. Touch-up any penetration of the finish to bare metal—such as scratches and abrasions caused by shipping or vandalism—to maintain the original integrity. S&C touch-up finish and primer are available in aerosol spray cans. See Figure 54. 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, removing any traces of rust that may be present, and make sure all edges are feathered before applying primer.

STEP 2. Provide an occasional simple wash-down—such as an automobile would be given—to remove surface contaminants. Use any ordinary mild household detergent solution.

STEP 3. In those cases where the enclosure must be refinished by the user before the finish has weathered—for example, to match other equipment—a special precaution must be taken. The entire surface must be sanded to provide a tooth to bond the new coat to the Ultradur II Outdoor Finish.

Maintenance Recommendations in Extremely Corrosive Environments

For applications involving exposure to extremely corrosive environmental conditions (i.e. industrial chemicals, $CaCl_2$, etc.) that may affect the condition of the switchgear tank, S&C's recommended periodic cleaning could provide extended life. Contact S&C if corrosion on the tank is found.

For outer pad-mount or custom-designed enclosures that have already experienced some corrosion, follow the instructions in the "Enclosure Finish" section for specific instructions. If not further exposure to a corrosive environment is expected, one treatment may be enough.

To remove accumulated contaminants, use a mild detergent and potable water. The detergent should be mild soap, not bleach or any cleaners that contain chloride. Cleaning alone may be sufficient in most cases, but the application of a water-displacing oil-based spray after washing is further recommended for extremely corrosive environments.

Figure 54. S&C touch-up finish and red-oxide primer. Order by catalog number 9999-058 for olive-green finish, 9999-080 for light gray finish, and 9999-061 for red-oxide primer.

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 switchgear are given in Table 1. These test values are significantly greater than the normal operating voltage of the switchgear and are near the flashover voltage of the gear. They should be applied only when the switchgear is completely de-energized and disconnected from all power sources.

⚠ CAUTION

On Vista switchgear equipped with internal voltage transformers (option suffix "-Y4"), do not apply test voltage greater than normal system voltage to the B phase if the switch way being tested is not open. Refer to Table 1 and Figure 55 to determine the location of the B phase. **Failure to follow this precaution can result in injury or equipment damage.**

Dielectric testing on phases A and C can be performed using standard industry practices in accordance with the warnings and maximum test voltages indicated on this page.

⚠ WARNING

When performing electrical withstand tests on Vista 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.
3. Verify that the insulating-gas pressure gauge is in the Green zone.

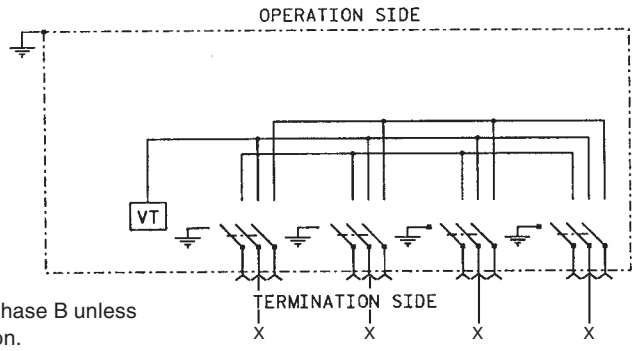
Table 1. Maximum Insulation Test Voltages

Vista Switchgear Rating, kV			Withstand Test Voltage, kV	
50 Hertz	60 Hertz	Impulse (BIL)	Power Frequency①	Dc②③
12	15.5	95	27	42
24	27	125	40	62
36	38	150	50	82

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

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

③ Dc withstand test voltages are given for reference only 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 values listed in the table are approximately equal to the ac peak test voltage.



X Do not apply test voltage to phase B unless the switch is in the **Open** position.

Figure 55. Location of B phase indicated by an X.

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," i.e., the sudden application of dc voltage from a large capacitor for the purposes 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 gear will also be subjected to the dc test voltages.

On A and C phases, cable testing can be performed using standard industry practices in accordance with the warnings and maximum test voltages indicated in Table 2. If testing is to be performed on a cable attached to phase B of any load-interrupter switch or fault-interrupter way, the voltage transformer (if provided optionally) must be isolated from the test voltage. This can be done by opening the load-interrupter switch way or fault-interrupter way connected to the cable being tested (or just open phase B if it is a single-pole fault-interrupter way).

Vista switchgear has been designed to allow dc testing of the cables with the other ways of the gear energized. The integral GROUNDING switch may be used to ground the cable. After testing, the dc test equipment should be used to discharge any stored charge on the cable before regrounding with the GROUNDING switch. The dc test voltages and dc cable thumping voltages should not exceed the voltages given in Table 1 on page 32 and Table 2.

⚠ WARNING

The dc withstand capability of the switchgear may be reduced because of aging, damage, gas leakage, 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 voltages greater than the withstand capability of the switchgear can result in a flashover, injury, and equipment damage.**

In addition, always verify the insulating-gas pressure gauge is in the Green zone before proceeding with any testing.

⚠ DANGER

Do not exceed the test voltages given in Table 1 on page 32 and Table 2. 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 of the dc test source and will result in severe personal injury or death.**

Table 2. Maximum Cable Test and Cable Thumping Voltages

Vista Switchgear Rating, kV			Dc Cable Test Voltage, kV	Dc Cable Thumping Voltage, kV①
50 Hertz	60 Hertz	Impulse (BIL)		
12	15.5	95	30	15
24	27	125	40	20
36	38	150	40	20

① The dc cable thumping voltage is 50% of the dc cable test voltage because of voltage doubling that will occur at the open end of the cable that is assumed to be a unit of the Vista 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.

Fault-Interrupter Testing

When performing dielectrical tests on Vista switchgear, the vacuum fault interrupters will not be subject to voltage across the open gap because the disconnect switch will isolate the vacuum interrupter from the test voltage. Because the vacuum interrupter will not be energized across the open gap, there is no exposure to 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.

⚠ WARNING

When it is necessary to test the cables connected to a unit of energized switchgear, proper isolation of the power-frequency source from dc test source must be maintained. Follow the recommendations by the manufacturer of the dc test equipment or fault-location equipment. The user's operating and safety procedures should be followed 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 ungrounding the cable. **Failure to follow these operating and safety procedures may result in injury or equipment damage.**

Resistance Measurement

⚠ DANGER

De-energize the Vista Underground Distribution Switchgear before performing the resistance measurements described in this procedure. Follow all applicable safety procedures. **Failure to de-energize the Vista Underground Distribution Switchgear before taking the resistance measurements will result in serious injury or death.**

Resistance measurements are used to look for areas of the gear that may exhibit poor contact between current-carrying parts.

Resistance measurements are taken using a four-terminal measuring device that provides at least 100 amperes of current to the main circuit. Resistance measurements should be taken from the bushing conductor across each way to the same phase on each way of the unit. For example, a measurement would be taken from Way 1 Phase A to Way 2 Phase A, from Way 2 Phase A to Way 3 Phase A, from Way 1 Phase A to Way 3 Phase A, from Way 1 Phase B to Way 2 Phase B, etc.

To measure resistance, perform the following procedure:

STEP 1. Clamp the two current-carrying probes of the resistance-measuring device to the bushing conductors of the current-carrying path to be measured. See Figure 56. In this example, the resistance is being taken between Way 1 Phase A and Way 2 Phase A.

STEP 2.

NOTICE

DO NOT take resistance measurements from the threaded area of the bushing stud. Resistance measurements taken through the threads of the bushing stud will be inaccurate. See Figure 57.

Clamp or touch the voltage-carrying probes of the resistance-measuring device to the flat conductive surface of the bushings that make up the current-carrying path. Make sure the measurement probe is in contact with the current-carrying flat face of the bushing conductor rod. See Figure 57. If using clamp-style probes, slide the clamp all the way up against the current-carrying face to get a good connection.

STEP 3. Record the resistance measurement. Acceptable resistance values are:

- Less than 500 microohms
- Less than 600 microohms for tie switches

Figure 56. Connecting the resistance measuring device.●

Figure 57. Take the measurement from the flat current-carrying surface of the bushing.●

● Adhere to your company's standards regarding use of hand PPE when taking resistance measurements.