

# Installation



This green leaf icon designates information specifically for Vista® Green Underground Distribution Switchgear that uses a CO<sub>2</sub> mix insulating gas. Unless otherwise designated, instructions provided apply to all manual Vista switchgear products.

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### Qualified Persons

#### **WARNING**

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

- The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed
- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

### Read this Instruction Sheet

#### **NOTICE**

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing or operating 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 [sandc.com/en/support/product-literature/](http://sandc.com/en/support/product-literature/).

**Note:** Instruction sheets covering the installation and operations of remote supervisory Vista Underground Distribution Switchgear are included in the “Installation and Operation Information Kit” provided with each switchgear assembly. A catalog dimensional drawing showing cable location and anchor-bolt dimensions is also provided in the information kit. All personnel involved with installation and operation of the gear should be thoroughly familiar with the contents of this kit.

This instruction sheet covers the installation of Vista Underground Distribution Switchgear.

Along with this instruction sheet are copies of:


- S&C Instruction Sheet 682-510, “Remote Supervisory Vista® Underground Distribution Switchgear, Pad-Mounted, Dry-Vault Mounted, Wet-Vault Mounted, and UnderCover™ Styles: *Operation*”
- S&C Instruction Sheet 681-530, “Vista® Underground Distribution Switchgear: *Programming*”
- For models with batteries: S&C Instruction Sheet 680-540, “Remote Supervisory Vista® and Vista® Green Underground Distribution Switchgear and Source-Transfer Vista® Underground Distribution Switchgear, Vista Battery Charger – Model TA-3409: *Operation and Battery Replacement*”
- Reference drawings detailing the installation of cable-support brackets and wiring diagrams for the current transformers

Various optional features are available for remote supervisory Vista switchgear. The catalog number stamped on the nameplate affixed to the switchgear is suffixed with letter-number combinations applicable to the gear furnished.

**Retain this  
Instruction  
Sheet**

This instruction sheet is a permanent part of remote supervisory Vista Underground Distribution Switchgear. Designate a location where users can easily retrieve and refer to it. The latest version is available online in PDF format at [sandc.com/en/support/product-literature/](http://sandc.com/en/support/product-literature/).

**Proper  
Application**

 <b>WARNING</b>
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 remote supervisory Vista Underground Distribution Switchgear are listed in the ratings table in Specification Bulletin 682-31. Ratings for this gear are listed on a ratings label at the front of the switchgear tank.

**Warranty**

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

**Warranty  
Qualifications**

The seller’s standard warranty does not apply to components not of S&C manufacture, such as remote terminal units and communication devices, including hardware, software, resolution of protocol-related matters, and notification of upgrades or fixes for those devices supplied and installed by the purchaser or to the ability of the seller’s equipment to work with such components.

## Safety Information

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### Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to remote supervisory Vista Underground Distribution Switchgear. Become familiar with these types of messages and the importance of these various signal words:

#### **DANGER**

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

#### **WARNING**

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

#### **CAUTION**

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

#### **NOTICE**

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

### Following Safety Instructions

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

#### **NOTICE**

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

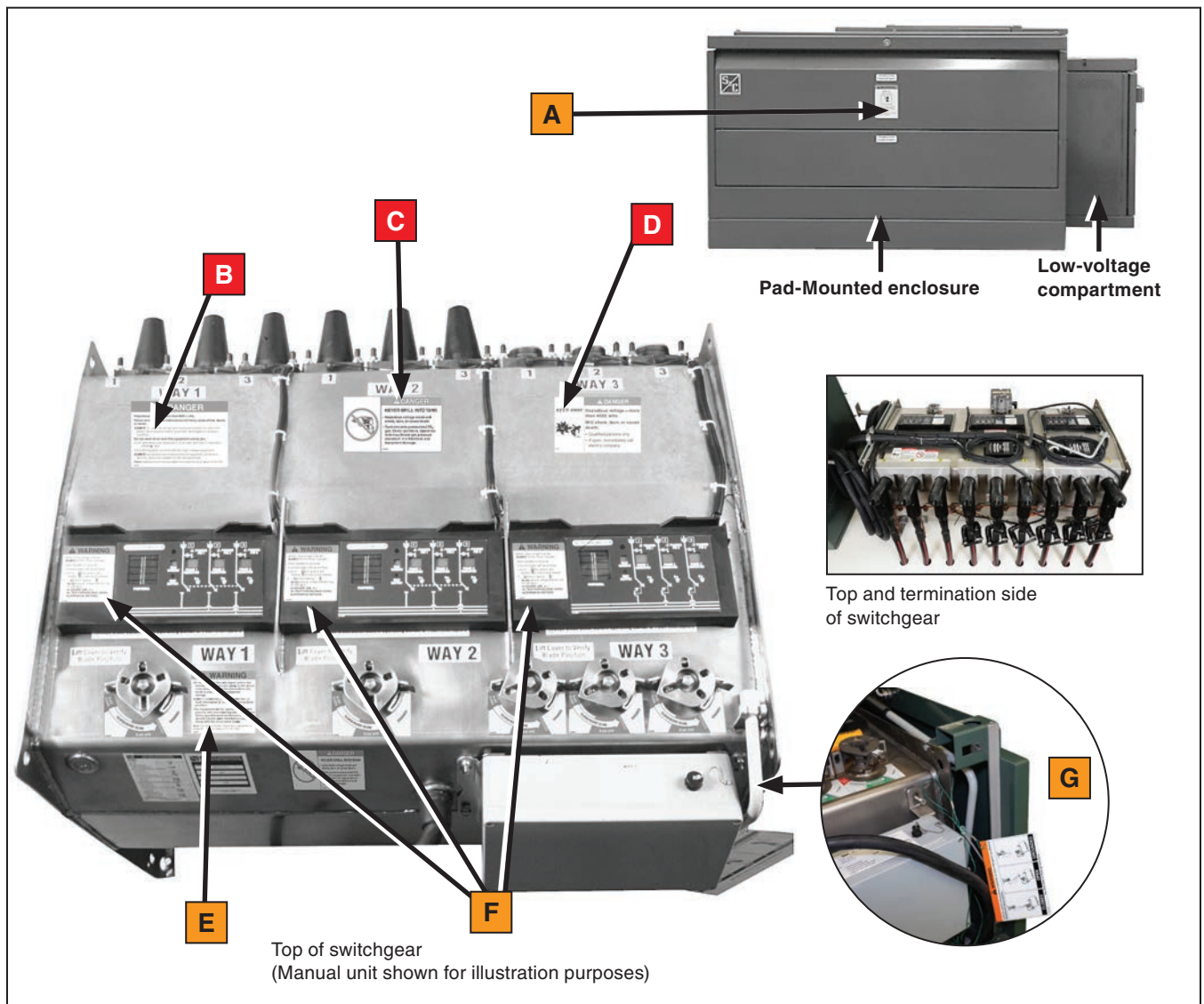


### Replacement Instructions and Labels

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	<b>⚠ WARNING</b>	Keep Out—Hazardous Voltage Inside.	G-6681
B	<b>⚠ DANGER</b>	Hazardous Voltage—Always Consider Circuits and Components Live . . .	G-6700
C	<b>⚠ DANGER</b>	Never Drill Into Tank—Hazardous Voltage Contains Pressurized SF6 Gas	G-6682
D	<b>⚠ DANGER</b>	Keep Away—Hazardous Voltage (“Mr. Ouch”)	G-6699
E	<b>⚠ WARNING</b>	Check Gas Pressure Before Operating Switchgear	G-6686
F	<b>⚠ WARNING</b>	Always Test Voltage Indicator For Proper Operation	G-6689
G	<b>⚠ WARNING</b>	Always Visually Confirm Blade Position	G-6693 G-6694 (Option “-L2”)

### ⚠ DANGER



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

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

1. **QUALIFIED PERSONS.** Access to 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 operating procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **DOORS.** High-voltage compartment doors must be securely closed and latched, with padlocks in place at all times unless work is being performed inside the enclosure.
6. **KEY INTERLOCKS.** Optional key interlocks, if furnished, must be in place. Check the operating sequence of key interlocks to verify proper sequencing. After the switchgear is installed, destroy all duplicate keys or make them accessible only to authorized persons so the key-interlock scheme will not be compromised.
7. **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.
8. **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 the load-interrupter switch or fault interrupter is grounded.
9. **BACKFEED.** Bushings, cables, load-interrupter switches and fault interrupters may be energized by backfeed.
10. **GROUNDING.** Vista 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 to be inspected, replaced, serviced, or repaired.
11. **LOAD-INTERRUPTER SWITCH OR FAULT-INTERRUPTER POSITION.** Always confirm the **Open/Closed** position of the load-interrupter switch or fault interrupter by visually observing the position of the isolating disconnect. 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.
12. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.



### Packing

Pad-mounted style switchgear consists of the hermetically sealed tank and the outer enclosure, which has the low-voltage compartment attached to it. Both are fastened to a wooden skid, with the tank shipped within the outer enclosure. Motor operators are individually packed and shipped in boxes. Optional current sensors are packaged three per box and are shipped separate from the gear.

All current-sensor, voltage-sensor, and motor-operator wiring is routed to the low-voltage compartment through a junction box mounted on the tank. These wires and cables are neatly coiled and set on the tank for user installation. Two ground wires per voltage sensor way are attached to the shipping temporary grounding leads.

At the first opportunity, remove all packing materials (cardboard, paper, foam padding, etc.) from the outside of the pad-mounted enclosure. This will prevent the finish from being damaged by rainwater absorbed by the packing materials and will also prevent wind-induced abrasion from loose cardboard.

### Inspection

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

If there is visible loss and/or damage:

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

If concealed damage is discovered:

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

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

## Shipping and Handling—Pad-Mounted Style

### Handling

#### **⚠ WARNING**

When handling an enclosure or tank with an overhead hoist, observe standard lifting practices and the general instructions below.

**Failure to follow these precautions can result in serious personal injury or equipment damage.**

When lifting, use 6-foot (183-cm) or longer hoist slings of equal length to prevent damaging the pad-mounted style enclosure or tank during lifting. Arrange the hoist slings so the lifting forces are equally distributed between the lifting tabs. Avoid sudden starts and stops. See Figures 1 and 2.

#### **⚠ WARNING**

Do **NOT** lift the pad-mounted enclosure while it is bolted to the skid with the tank. The lifting tabs on the pad-mounted enclosure will not support the combined weight of the pad-mounted enclosure and the tank. Before lifting with slings, follow the directions under the “Enclosure Removal” section on pages 9 and 10.

**Failure to follow these precautions can result in serious personal injury or equipment damage.**

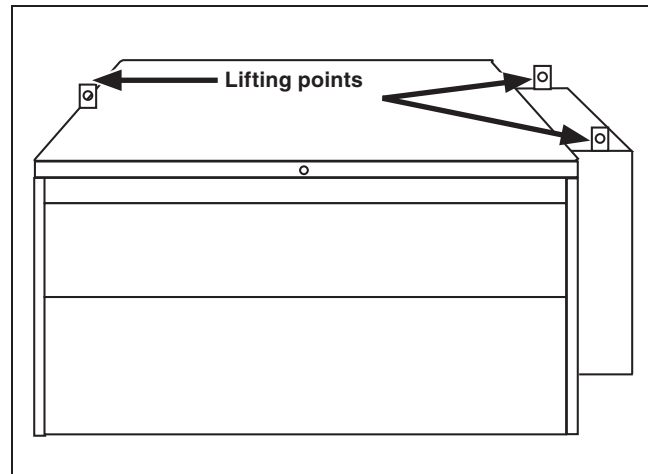


Figure 1. The enclosure for pad-mounted style.

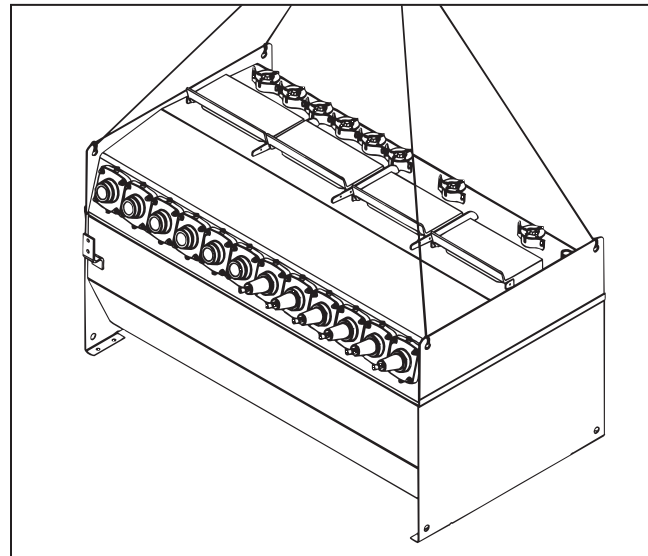


Figure 2. A properly slung tank for pad-mounted style switchgear.



**Enclosure Removal**

For pad-mounted style Vista switchgear, follow these steps to remove the enclosure:

- STEP 1.** Loosen the pentahead bolts securing the hinged roofs to the enclosure using a pentahead socket wrench with extender or a pentahead tool. See Figure 3.
- STEP 2.** If the Vista switchgear has been ordered with optional base spacers with integral tank supports (“-W” options), remove the bolts from the base spacers.
- STEP 3.** Lift the hinged roofs upward and secure them with the holders. See Figure 4.

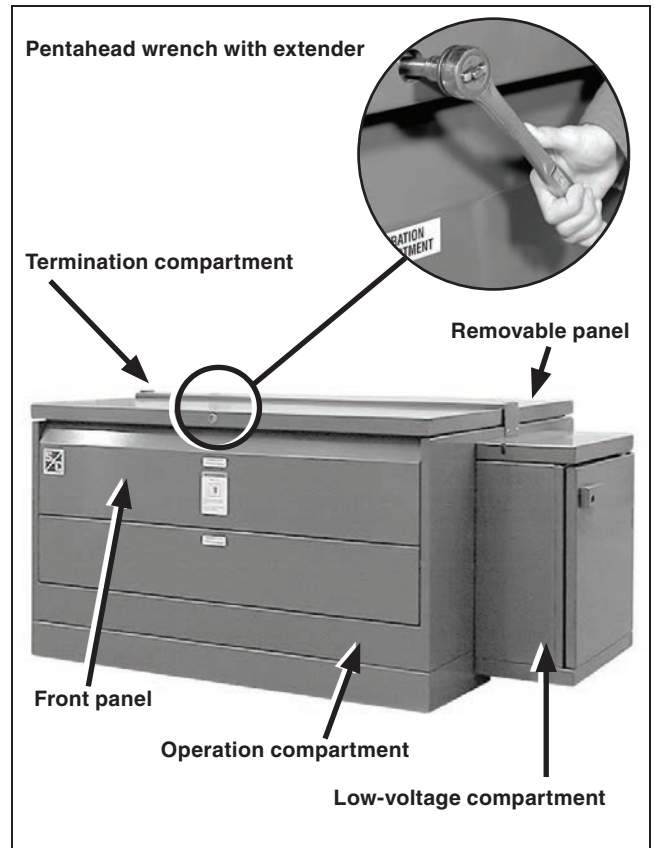


Figure 3. The pad-mounted style enclosure—roofs closed.

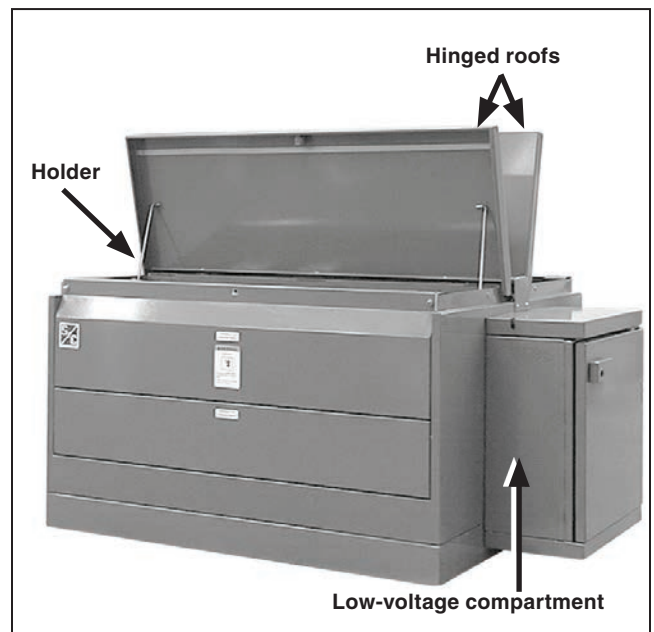


Figure 4. The pad-mounted style enclosure—roofs open.

## Installation—Pad-Mounted Style

- STEP 4.** Unbolt the enclosure from the skid and remove it, observing the precautions given in the “Handling” section on page 8. Use a three-point lifting scheme to properly balance the enclosure. See Figure 5.
- STEP 5.** Before lifting the enclosure, close the hinged roofs. Make sure the low-voltage compartment door is closed.
- STEP 6.** Set the enclosure aside in a protected area.

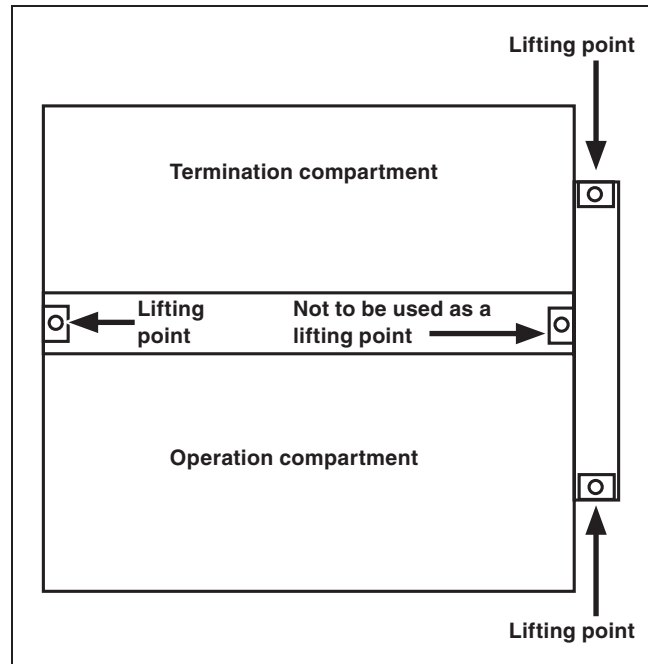


Figure 5. Top view of pad-mounted style switchgear, displaying three-point lifting.



Figure 6. Remove the high voltage enclosure from the base spacer.



Figure 7. Leave the tank attached to the support rails. The tank and base spacers are designed to be lifted as one unit.

**Tank Placement**

For pad-mounted style Vista switchgear, use the following steps for tank placement:

- STEP 1.** Unbolt the tank from the skid and lift it above the mounting pad, observing the precautions given in the “Handling” section on page 8.
- STEP 2.** Use a four-point lifting scheme to properly balance the gear. See Figure 2 on page 8.
- STEP 3.** Verify the tank is positioned correctly with respect to the cables and anchor bolts.
- STEP 4.** Lower the tank into place.
- STEP 5.** Secure the tank to the pad using the anchor brackets provided. See Figure 10 on page 13.

**Note:** Custom-engineered single-lift designs are available so the tank and enclosure can be lifted together. Unless a custom single-lift design has been specified, the enclosure must be removed from the tank to be lifted.

**Units with Base Spacers**

**Note:** Pad-mounted Vista switchgear with base spacers is also designed to accommodate a two-lift installation. When installing pad-mounted Vista switchgear with base spacers, the enclosure above the base-spacer connection should be removed first. The base spacers and tank-support rails remain connected to the base of the tank. The tank attached to the base spacer should be lifted as one unit during tank installation. See Figures 6 and 7 on page 10.

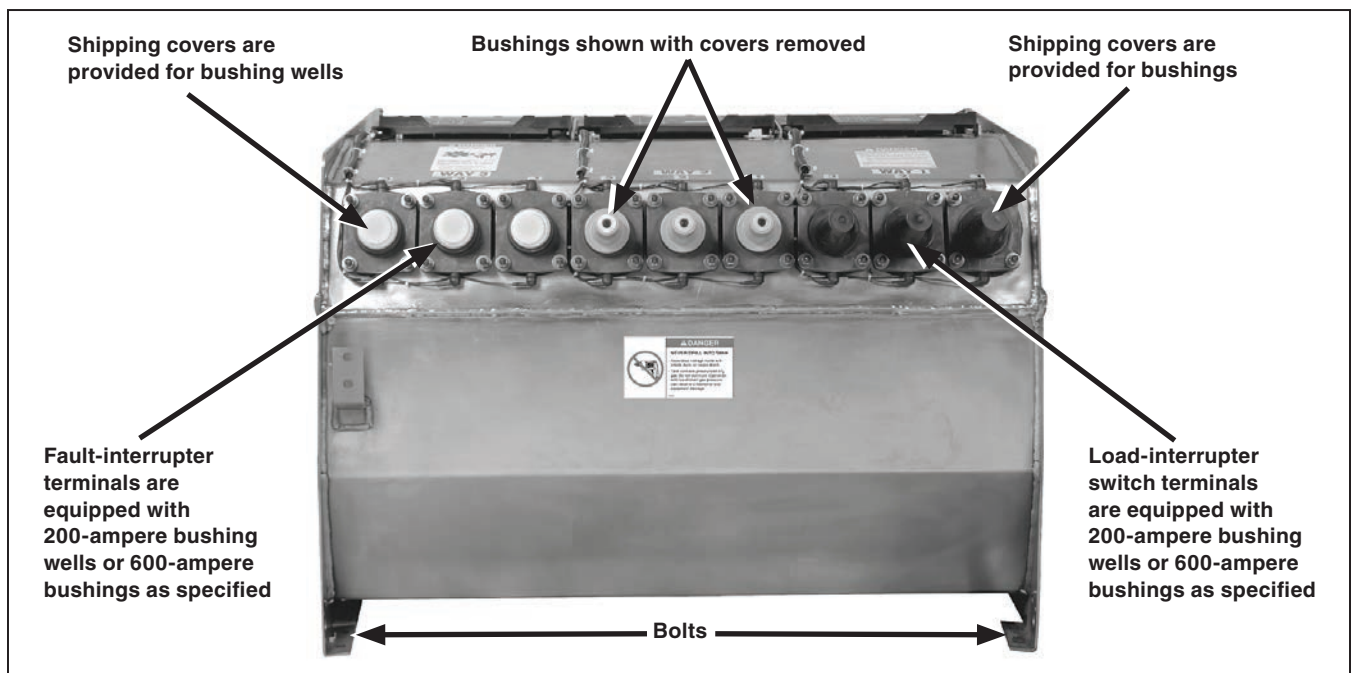


Figure 8. The switchgear tank, as shipped. (Illustration excludes typical cabling and motor operator provisions to emphasize the location of shipping covers and bolts.)

## Installation—Pad-Mounted Style

### Cable Terminations

#### **⚠ DANGER**

Before energizing the switchgear, replace the shipping covers on all bushings and bushing wells with elbows or insulated protective caps.

**Failure to replace the shipping covers on all bushings with elbows or caps can result in a flashover and serious personal injury or death.**

Use the following steps for terminating cables:

- STEP 1.** Remove the shipping covers from the bushings and bushing wells. See Figure 8 on page 11.

#### **⚠ CAUTION**

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

**Failure to follow these precautions can result in minor injury as well as damage to the bushings and bushing wells and subsequent leakage of insulating gas.**

- STEP 2.** Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 9.

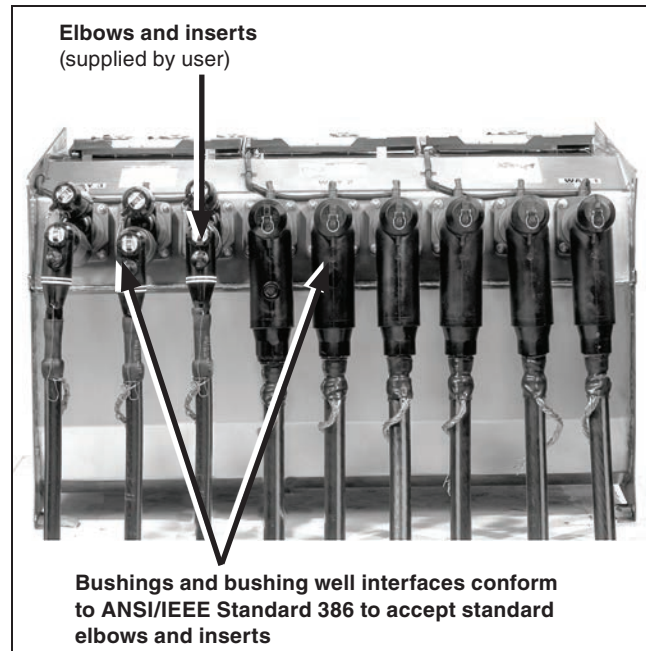


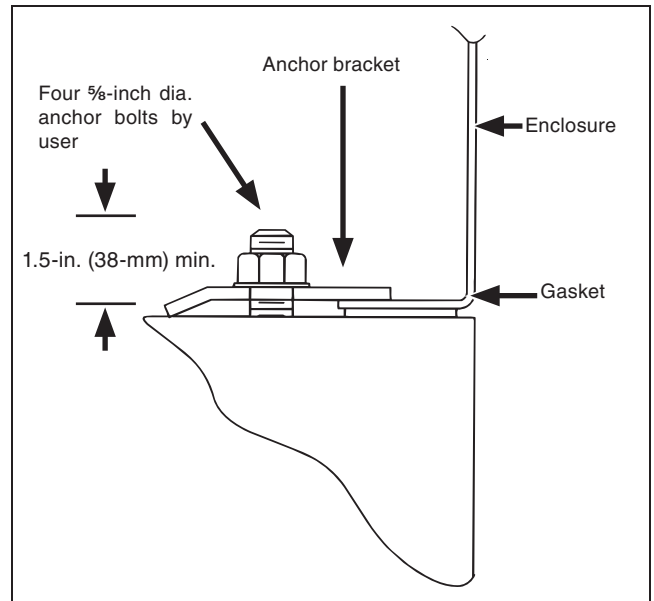
Figure 9. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)

### Enclosure Placement

**Note:** When installing the pad-mounted enclosure over the tank, place the side of the enclosure with the “Termination Compartment” label over the terminators and the side of the enclosure with the “Operation Compartment” label over the operating mechanisms. This will ensure the compartments are properly identified and the panels are in their correct locations. The operation compartment side panel is larger.

Use the following steps to place the enclosure for pad-mounted style Vista switchgear:

- STEP 1.** Lift the enclosure into place over the tank, observing the precautions given under the “Handling” section on page 8. Use a three-point lifting scheme to properly balance the enclosure.
- STEP 2.** Refer to the catalog dimensional drawing furnished and verify the enclosure compartments are positioned correctly and the enclosure is properly aligned with respect to the anchor bolts.
- STEP 3.** Secure the enclosure to the pad using the anchor brackets provided. See Figure 10.



**Figure 10. A proper anchor-bracket placement.**

## Installation—Pad-Mounted Style

### Grounding

Use the following steps to properly ground pad-mounted style Vista switchgear:

- STEP 1.** Connect the cable concentric-neutral ground wires to the grounding system as appropriate.
- STEP 2.** Connect the ground pad inside the enclosure to the system ground facility in accordance with the user's standard grounding practice. Connect with the shortest possible connection. See Figures 11 and 12, and Figure 13 on page 15.

#### NOTICE

To ensure proper operation of the components inside the low-voltage enclosure, connect the tank ground pad and the enclosure ground pad provided near the low-voltage enclosure to the system ground facility.

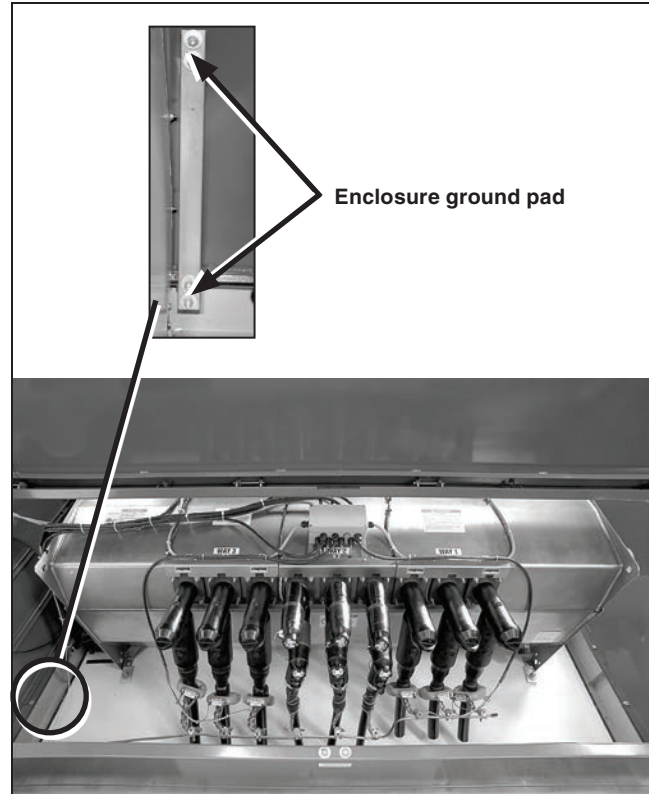


Figure 11. The pad-mounted enclosure ground pad orientation.

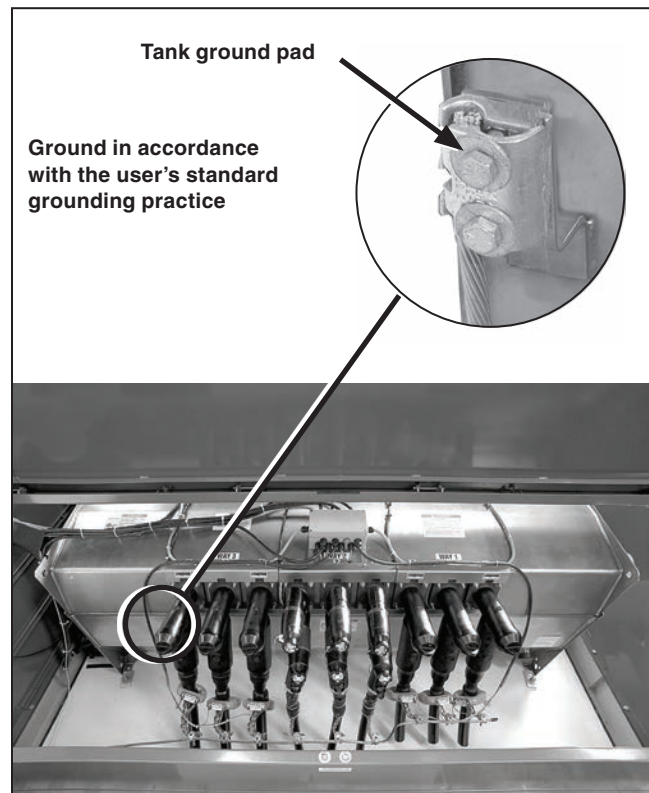


Figure 12. Use of the pad-mounted enclosure ground pad.



**STEP 3.** Use the equivalent of 4/0 copper (or cable sized in accordance with the user's standard practice) in either a single or multiple connection to realize the maximum momentary rating of the switchgear. For a multiple connection, cables smaller than 1/0 copper or equivalent should not be used.

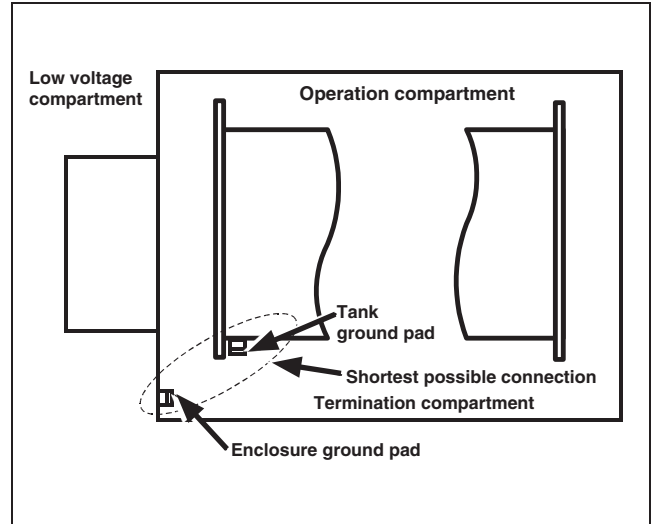


Figure 13. The tank and enclosure ground pads.

### Current Sensors

#### NOTICE

Each S&C current sensor has a unique magnitude ratio and phase-angle shift. These values are used to calibrate the current-sensing inputs to the user-supplied remote terminal unit (RTU). The magnitude ratio and phase-angle shift of each current sensor must be recorded on the yellow card provided in accordance with the way and phase on which the current sensor will be installed. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor itself.

When S&C Current Sensors are not already installed, use the following steps to attach them for pad-mounted Vista switchgear (optional current sensors are packaged three in a box; please consult your operating practices if third-party current transformers are specified instead of S&C Current Sensors):

- STEP 1.** Remove the current sensors, hardware, and wiring harness from the box marked “S&C Current Sensors.”
- STEP 2.** Connect the current sensors to the wiring harness as shown on the interconnection wiring diagram provided with the gear. See Figure 14.
- STEP 3.** Place each current sensor in front of the phase of the way on which it will be installed.  
**Note:** Way and phase numbers are located above the bushing on the termination side.
- STEP 4.** Record the magnitude ratio and phase angle shift of each current sensor in the appropriate location (in accordance with the way and phase on which the current sensor will be installed) on the yellow card provided with wiring diagrams and installation and operation documentation in the low-voltage enclosure. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor.



Figure 14. Attach current sensors to required wiring.

- STEP 5.** Remove the ¼-20 gap nut on the current sensor. Open the sensor and place it around the appropriate high-voltage cable. There is an “H” polarity mark embossed on the current sensor. All three current sensors for each way must be installed with the polarity marks facing in the same direction. Consult the wiring diagram.
- STEP 6.** When installed, replace and tighten the gap nut.
- STEP 7.** Secure the current sensor to the high-voltage cable below the cable terminator using the plastic tie wraps furnished. If the cable has a grounded concentric neutral, the current sensor must be secured in one of the following ways:
- (a) It may be placed around the concentric neutral, in which case the concentric neutral must be brought back through the current sensor. See Figure 15.
  - (b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 16.
- STEP 8.** Install the set’s two other current sensors by repeating Steps 5 through 7.
- STEP 9.** Cross-check the magnitude ratio and phase-angle shift of each current sensor with the information recorded on the yellow card.
- STEP 10.** Remove and discard the attached tags.



**Figure 15.** A current sensor placed around the cable’s grounded concentric neutral.



**Figure 16.** A current sensor placed above the cable’s grounded concentric neutral.

### Fault Indicators

Fault indicators are to be furnished by the user and installed in accordance with the manufacturer's instructions. Optional mounting provisions for fault indicators (catalog number suffix "-F1," "-F2," "-F3," or "-F4") are available. See Figure 17. If mounting provisions are specified, mount the fault indicators on the mounting brackets. See Figure 18.



**Figure 17.** The mounting provisions for user-furnished fault indicators.



**Figure 18.** The mounting brackets for user-furnished fault indicators.

### Low-Voltage Compartment Wiring

Use the following steps to route the low-voltage compartment wiring for pad-mounted style Vista switchgear:

#### NOTICE

Failure to follow wiring and grounding instructions will result in electronic damage and may cause nuisance operation.

- STEP 1.** Uncoil the junction box main cables that will be routed to the low-voltage compartment. See Figure 19. These cables have low-voltage connectors on the ends.
- STEP 2.** Using the pipe and sealing kit provided, feed the junction box cables and ground wires through the access port between the main enclosure and the low-voltage compartment as follows:
- Insert the three-inch PVC pipe through each access port. See Figure 20. Make sure equal lengths of pipe show in the low-voltage compartment and in the pad-mounted enclosure.
  - The G1 ground wire is labeled and located in the low-voltage compartment. Carefully insert the G1 wire from the low-voltage compartment through the PVC pipe into the main enclosure. Connect the ground wire G1 to the copper ground pad located on the tank. See Figure 21.

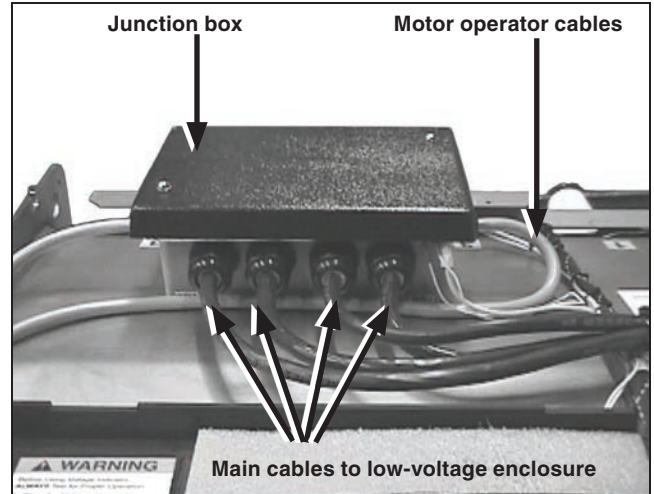


Figure 19. The junction box wiring.

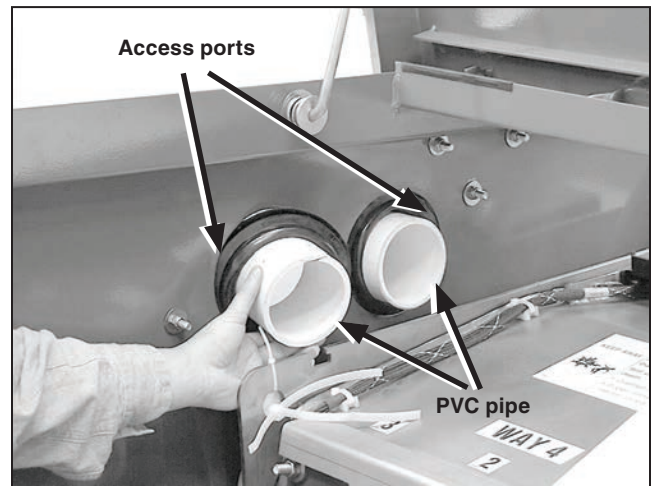


Figure 20. Insert PVC pipe through each access port.

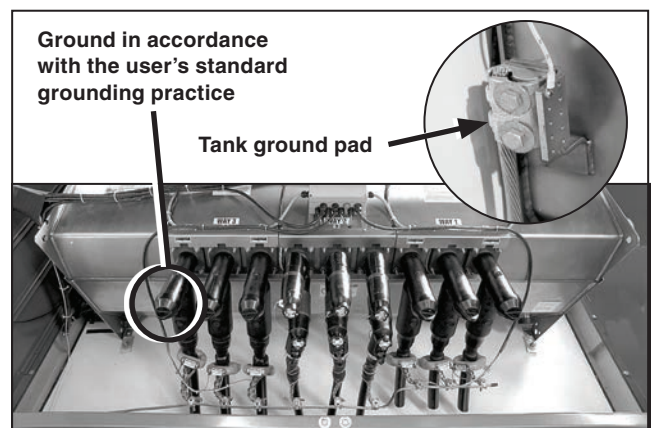
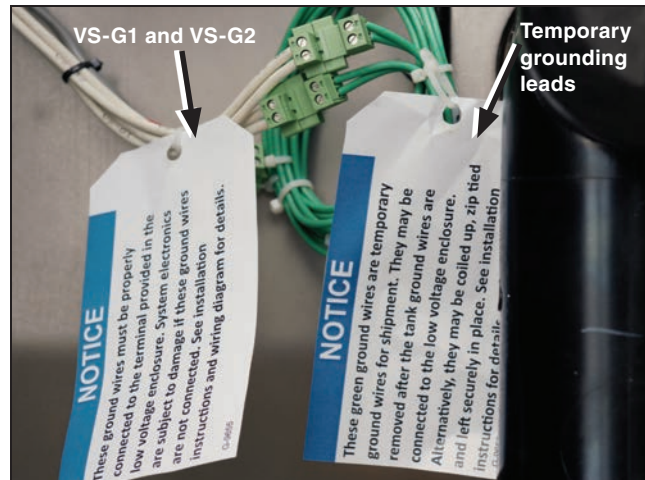


Figure 21. Attach the ground wire G1 to the tank.

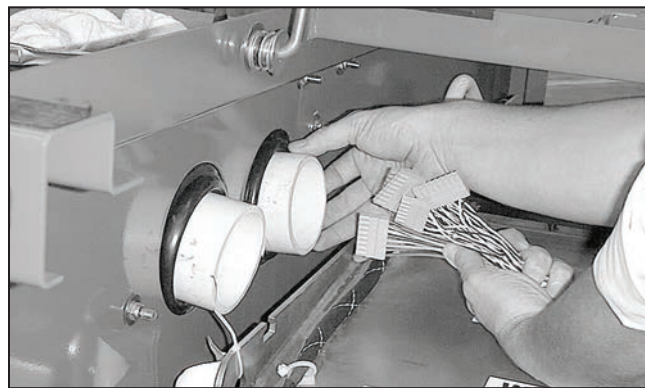


## Installation—Pad-Mounted Style

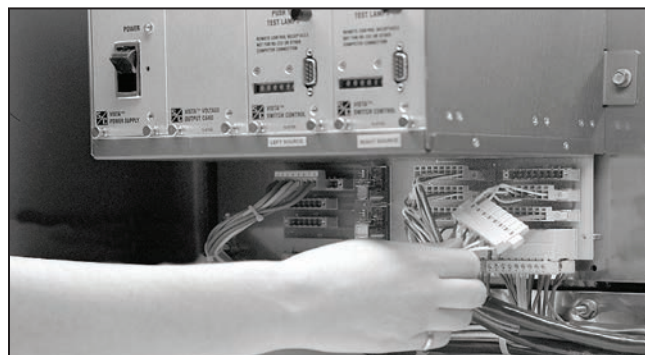
- (c) Up to three pairs of ground wires, VS-G1 and VS-G2, are included in the main enclosure. See your wiring diagram for details. VS-G1 and VS-G2 wires are marked with a hanging Notice tag. See Figure 22. Disconnect the VS-G1 and VS-G2 ground wires from the temporary grounding leads and route them into the low-voltage enclosure. The temporary grounding leads are green wires on the tank marked with a hanging Notice tag. See Figure 22. The temporary green wires can either be removed or coiled, zip tied and left in place.
- (d) If applicable, route the VS-G1 and VS-G2 wires into the low-voltage compartment through the PVC pipe. See Figure 23. Then, route the larger main cables through the PVC pipe: attach connectors to the Vista Rack Backplane Board using the drawings provided. See Figure 24. Fully seat each plug, and tighten the retaining screws for each connector, making sure none of the individual conductor's pins were backed out during seating. See Figures 25 and 26 on page 21.



**Figure 22.** Review the Notice tags for temporary grounding leads and VS-G1 and VS-G2 ground wires.



**Figure 23.** Insert the cables through the PVC pipe.



**Figure 24.** Attach the connectors.



An example of a conductor pin that is backed out is shown in connection 5 in Figure 26. If applicable, attach the VS-G1 and VS-G2 ground wires to the terminal block specified in the drawings provided and fully tighten the retaining screws. See Figure 27. Make sure VS-G1 and VS-G2 connections are made before and are not removed whenever the gear is energized.

### NOTICE

Do not remove the VS-G1 and VS-G2 wire connections while the gear is energized. This will result in equipment damage and may cause a nuisance operation.

- (e) When all connections are made, straighten the cables within the low-voltage compartment and bundle them neatly by installing tie-wraps. When applying tie-wraps, do not tension the cables so much they become a significant load on the connectors.

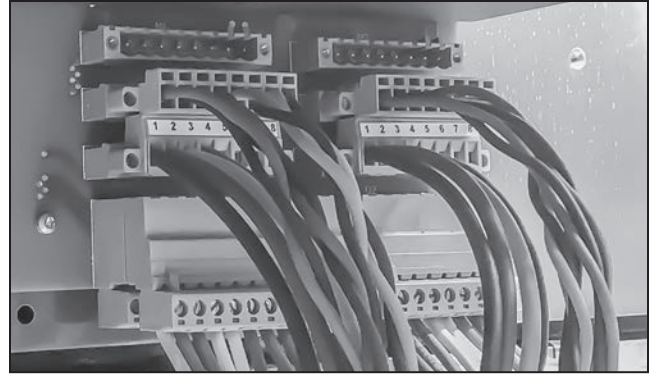


Figure 25. Close-up of Vista rack backplane board connectors.

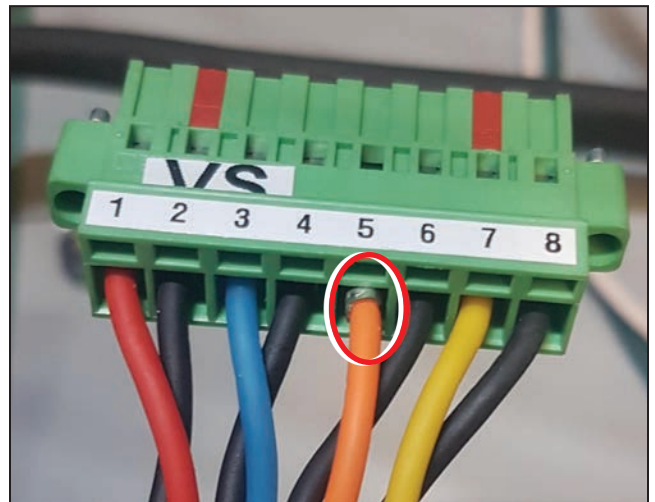


Figure 26. Example of improper connection that is backed out.

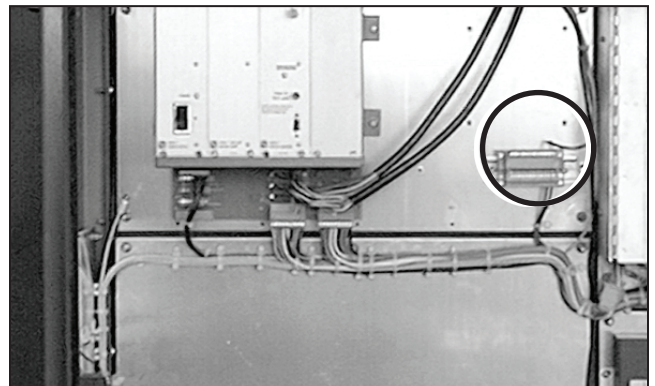


Figure 27. Attach the ground wires to the terminal block.

## Installation—Pad-Mounted Style

- (f) Gather and twist the butyl tubing around the PVC pipe and attach the largest cable tie. Gather the excess butyl tubing around the cable and attach the smaller cable tie. See Figure 28.

**STEP 3.** To connect external control power, connect the line and neutral to the fuse block. See label under the fuse block. Refer to Figure 29.

### NOTICE

Before connecting external power to the fuse block, reference the wiring diagrams included in the switchgear shipment to make sure polarity is correct.

Failure to follow these precautions can cause damage to the equipment.

### NOTICE

Do not ground the low-voltage enclosure to the external control power building grounding. PVC, non-metallic Seal-Tite, or other connection methods should be used to avoid bonding the low-voltage enclosure to the building ground when connecting external control power.

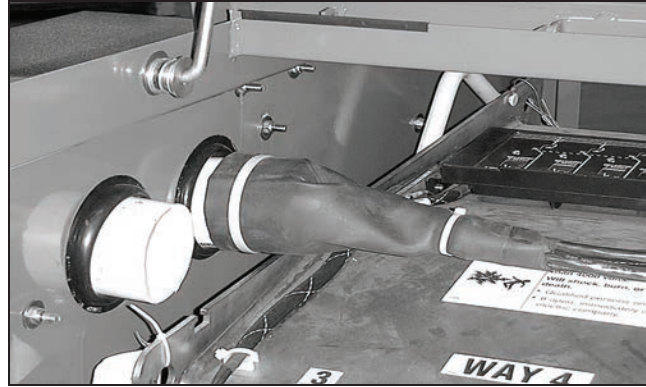


Figure 28. Secure the tubing and cable bundle with tie wraps.

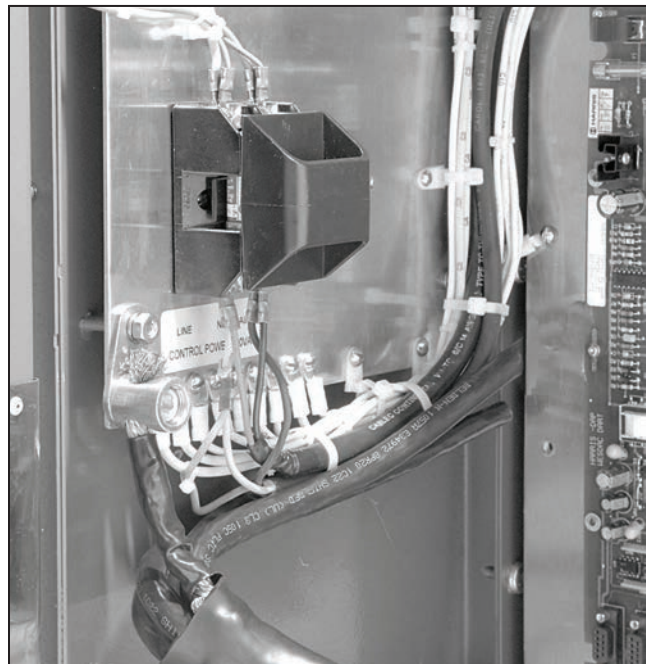


Figure 29. The fuse block.

### Motor Operator Installation

Use the following steps to install the motor operator(s) for pad-mounted Vista switchgear:

- STEP 1.** Place each motor operator over the operating shaft on the gear. See Figure 30.  
**Note:** It may be necessary to manually rotate the motor operator shaft (by twisting the operating disk) to line up the operator key with the shaft notch key. See Figure 31.
- STEP 2.** Remove the protective cap from the motor operator mating plug.
- STEP 3.** Insert the motor operator cable connector onto mating plug on the operator, making sure the connector is keyed in properly.
- STEP 4.** Thoroughly tighten the connector onto the mating plug. If resistance occurs while the connection is engaging, push the connector toward the mating plug.
- STEP 5.** Secure each motor operator to the stop ring on the tank using the bolt provided. There is no specific torque requirement: tighten the bolt and then back off one-half turn. See Figure 32.
- STEP 6.** An electrical operation mechanical blocking key is attached to the back of the motor operator with a chain. Fit the key into the operating disk. See Figure 33.

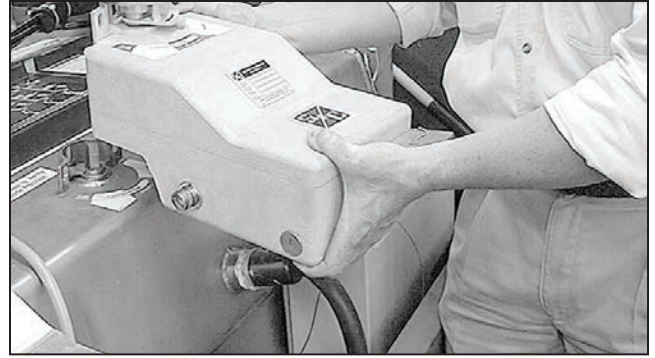


Figure 30. Place the motor operator over the operating shaft on the gear.

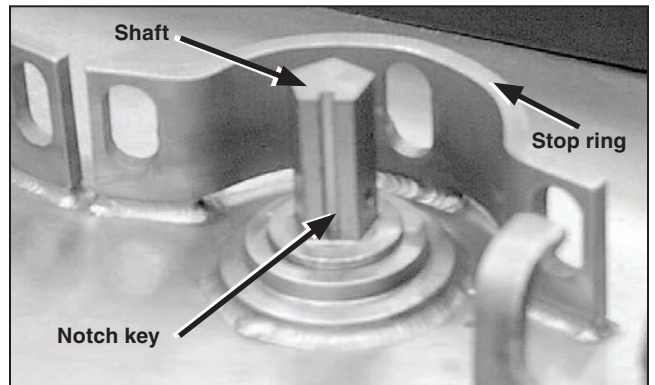


Figure 31. Line up the operator key with the shaft notch key.

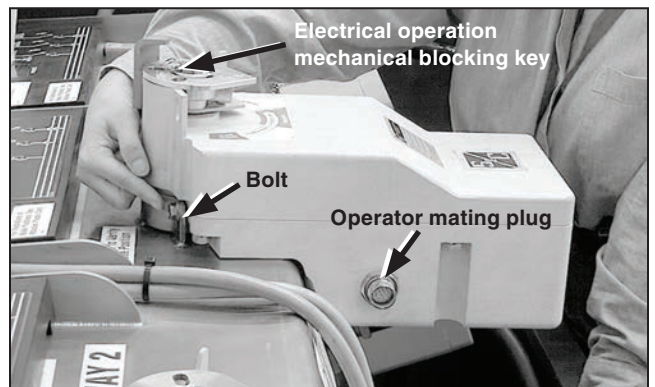


Figure 32. Connect the motor operator cable to the mating plug on the operator.



Figure 33. Insert the mechanical blocking key.



## Initial Testing of Motor Operators and Controls

Where voltage transformers internal to the tank provide power for the motor operators and controls, test accessory TA-2669 is necessary to power the controls when the gear is not energized. Refer to S&C Instruction Sheet 515-510 for instructions on how to connect and operate the test accessory.

If test accessory TA-2669 is not specified, medium-voltage connections must be made to power the controls.

Follow these steps to conduct initial testing of motor operators and controls:

- STEP 1.** When all of the preceding steps have been successfully completed, turn on the power supply power switch. See Figure 34. This will connect ac power to the battery charger and to the motor operator controls.
- STEP 2.** The motor operator controls indicate the position of the motor operators and mechanism operating shafts via LEDs on the front panel assembly. If equipped with a 6800 Series Automatic Switch Control, the Vista rack only shows the **Ground** status. The **Open** and **Close** status and the operating controls are on the 6800 switch control. Automatic operation controls are on the switch control unit. See Figure 34.

### NOTICE

Do not test switchgear without batteries connected. This can result in a misoperation.

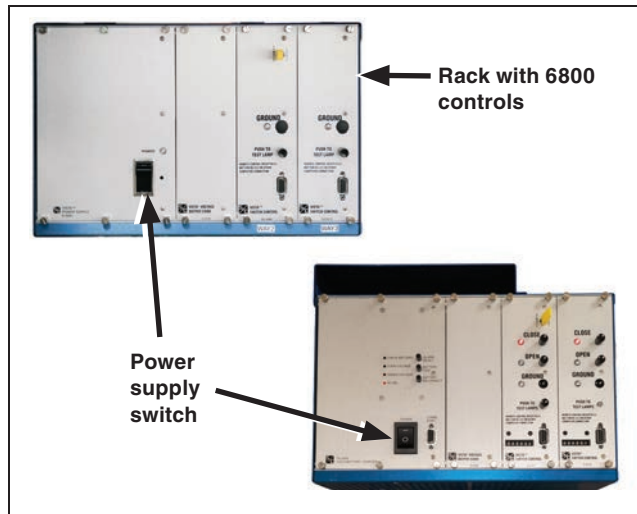


Figure 34. There are two Vista rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; the other has only a GROUND indicator and is used with a 6800 Series Automatic Switch Control.

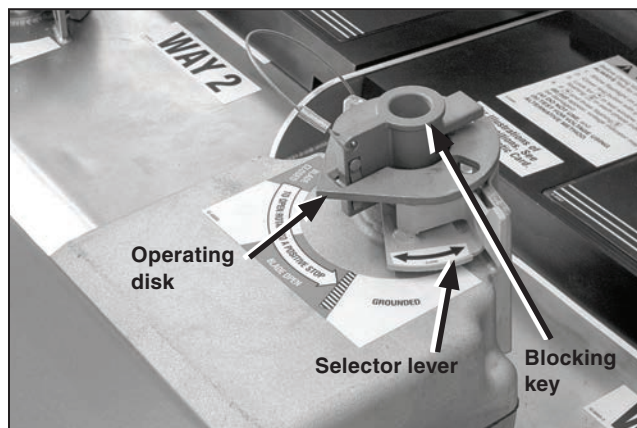


Figure 35. The OPEN position indication on the motor operator.

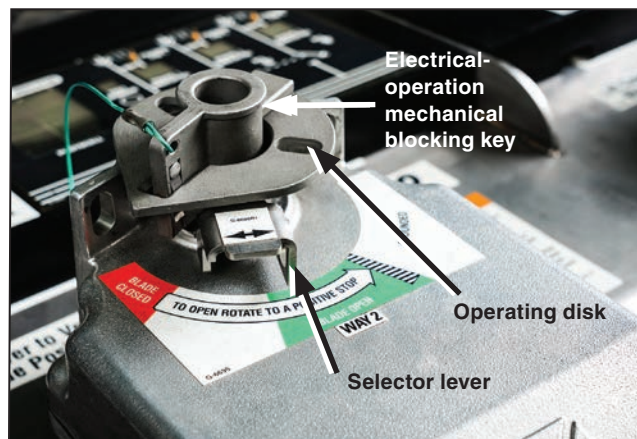


Figure 36. The CLOSE indication on motor control board matches motor operator position.

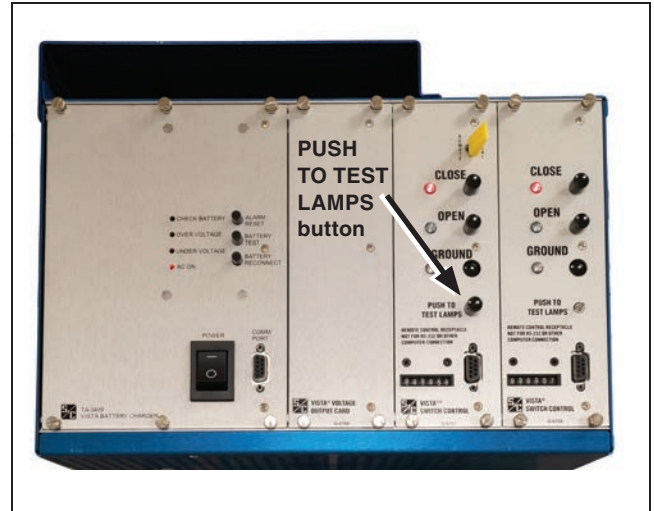
**STEP 3.** Verify all LEDs are functional by pressing the PUSH TO TEST LAMPS pushbutton on each control board. See Figure 37.

**STEP 4.** Perform the following operations using the control board buttons as shown in Figure 37:

See Figures 35 and 36 on page 24. Verify the motor operator moves to the desired position among the four noted below and the control board LEDs also indicate the proper position (There is an electrical interface in the controls that will not allow the user to move to/from the **Close** position directly from/to the **Ground** position.):

- **Close-to-Open**
- **Open-to-Ground**
- **Ground-to-Open**
- **Open-to-Close**

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 38.



**Figure 37.** Testing the LEDs and performing test operations.



**Figure 38.** Remove the mechanical blocking key.

### Setting Up the Gear for Operation

Follow these steps to set up the switchgear for operation:

- STEP 1.** Use the motor operator controls or the manual handle to place the load switches and fault interrupters in their desired operating positions.

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 38 on page 25.

- STEP 2.** Program the Vista overcurrent control 2.0 per S&C Instruction Sheet 681-530. Write the control settings on the label provided on the overcurrent control enclosure. See Figure 39 for location of motor operator controls.



**Figure 39.** The location of the motor operator controls.



### Completing the Installation

Follow these steps to complete the installation:

<b>NOTICE</b>
<p>A resilient closed-cell gasket on the bottom flange of the enclosure protects the finish from being scratched during installation and isolates it from the alkalinity of a concrete foundation. This gasket also helps to seal the enclosure to the foundation to guard against the entry of rodents, insects, or weeds, and to discourage tampering.</p> <p>In the event the gasket does not compensate for irregularities in the foundation, grout the bottom of the enclosure as necessary. Any grout applied should be recessed enough to permit caulking.</p>

To complete the installation, caulk around the bottom of the enclosure; a weatherproof silicon-rubber room temperature vulcanizing (RTV) compound is recommended. Apply the caulk to fill the spaces between the cable and the conduit, and cap all empty conduits to prevent the entry of moisture and rodents. See Figure 40. Reinstall the front and rear panels of the operation and termination compartments.

- STEP 1.** Lower the hinged roofs and secure them with the pentahead bolts, and then insert a padlock into each hasp.
- STEP 2.** Lock the low-voltage compartment or enclosure. See Figure 41.
- STEP 3.** Wipe down the exterior of the enclosure with a clean, damp cloth.
- STEP 4.** Refinish any scratches or abrasions with S&C touch-up finish and red-oxide primer which are available in aerosol spray cans. See Figure 42. Order catalog number 9999-058 for olive green finish, 9999-080 for light gray finish, and 9999-061 for red-oxide primer. 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 that all edges are feathered before applying primer. It is not necessary to remove all coating levels to the bare metal.

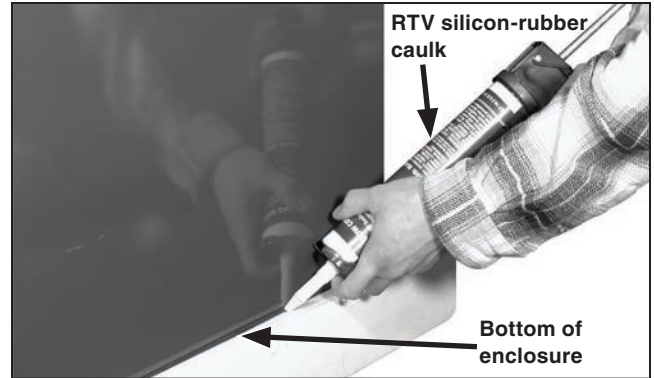


Figure 40. Caulk around the bottom of enclosure.

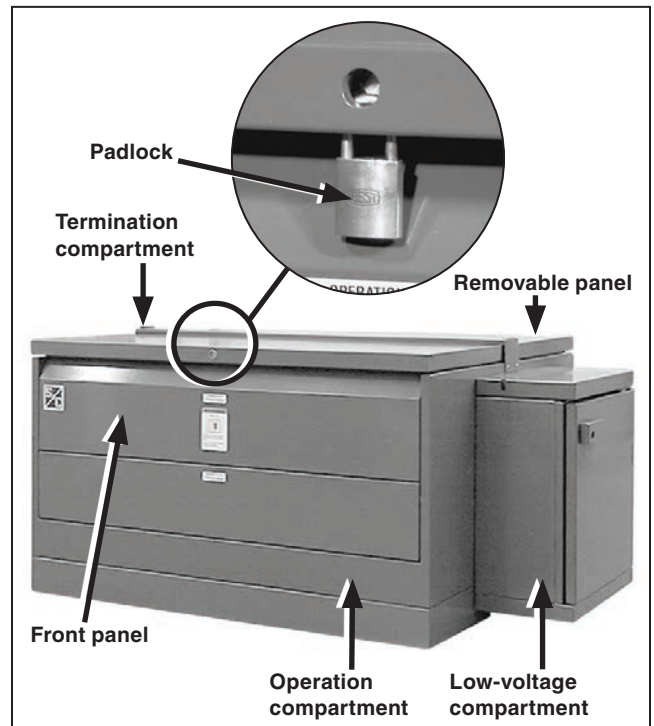


Figure 41. Lock the gear.



Figure 42. Use S&C red-oxide primer and touch-up finish.

### Packing

Dry vault-mounted style switchgear consists of the tank and the low-voltage enclosure. Each is fastened to its own wooden skid. Motor operators are individually packed and shipped in boxes.

All external wiring is coiled at the end of the tank for user installation. Two ground wires per voltage sensor way are attached to the shipping temporary grounding leads.

At the first opportunity, remove all packing materials (cardboard, paper, foam padding, etc.) from the outside of the low-voltage enclosure. This will prevent the finish from being damaged by rainwater absorbed by the packing materials and will also prevent wind-induced abrasion from loose cardboard.

### Inspection

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

If there is visible loss and/or damage:

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

If concealed damage is discovered:

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

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

### Storage

If prolonged outdoor storage is required (longer than one month), storage covers are available from S&C to provide UV protection.

#### **NOTICE**

Do not store outside. Weather and UV may damage uninstalled electrical components over an extended period of time without a UV protective cover.

### Handling

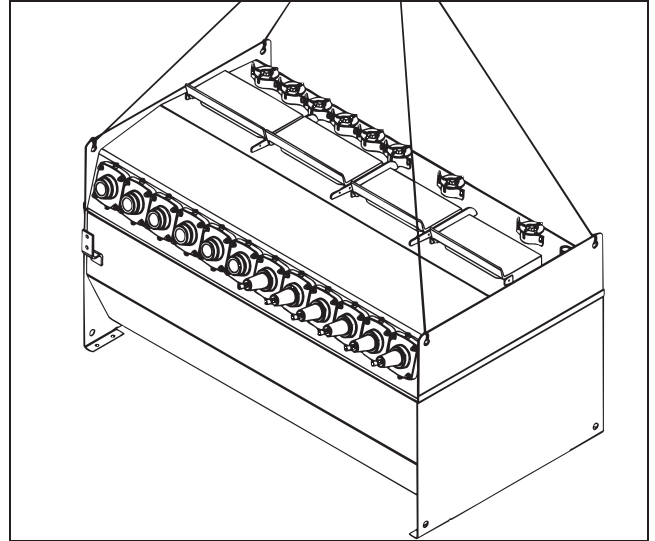
#### **⚠ WARNING**

When handling an enclosure or tank with an overhead hoist, observe standard lifting practices and the general instructions below.

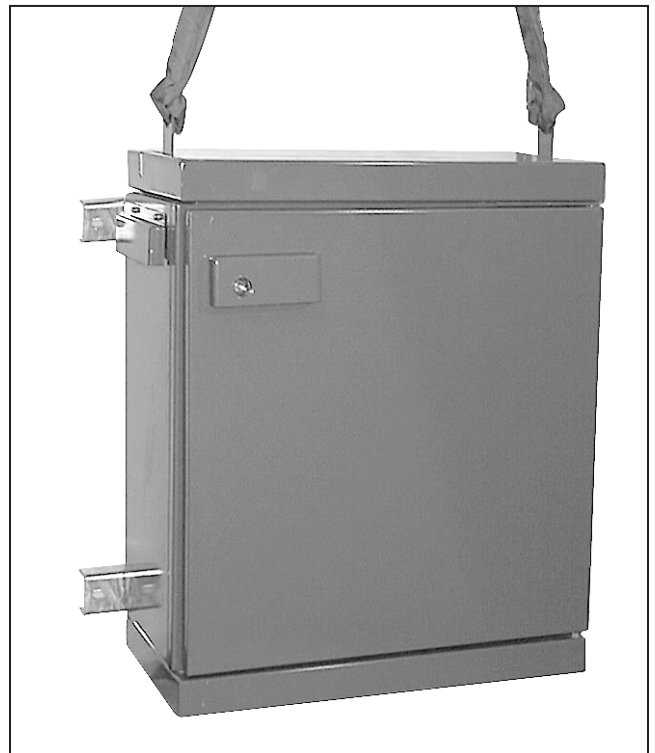
**Failure to follow these precautions can result in serious personal injury or equipment damage.**

When lifting, use 6-foot (183-cm) or longer hoist slings of equal length to prevent damaging the dry-vault mounted style Vista switchgear tank or the low-voltage enclosure during lifting.

Arrange the hoist slings so the lifting forces are equally distributed between the lifting tabs. Avoid sudden starts and stops. See Figures 43 and 44.



**Figure 43. A properly slung tank for dry-vault mounted style switchgear. (Floor-mount lifting scheme shown.)**



**Figure 44. A properly aligned low-voltage enclosure for dry-vault mounted style switchgear.**

## Installation—Dry-Vault Mounted Style

### Cable Terminations

#### **⚠ DANGER**

Before energizing the switchgear, replace the shipping covers on all bushings and bushing wells with elbows or insulated protective caps.

**Failure to replace the shipping covers on all bushings with elbows or insulated protective caps can result in a flashover and serious personal injury or death.**

Use the following steps for terminating cables:

**STEP 1.** Remove the shipping covers from the bushings and bushing wells. See Figure 45.

#### **⚠ CAUTION**

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

**Failure to follow these precautions can result in minor injury as well as damage to the bushings and bushing wells and subsequent leakage of insulating gas.**

**STEP 2.** Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 46.

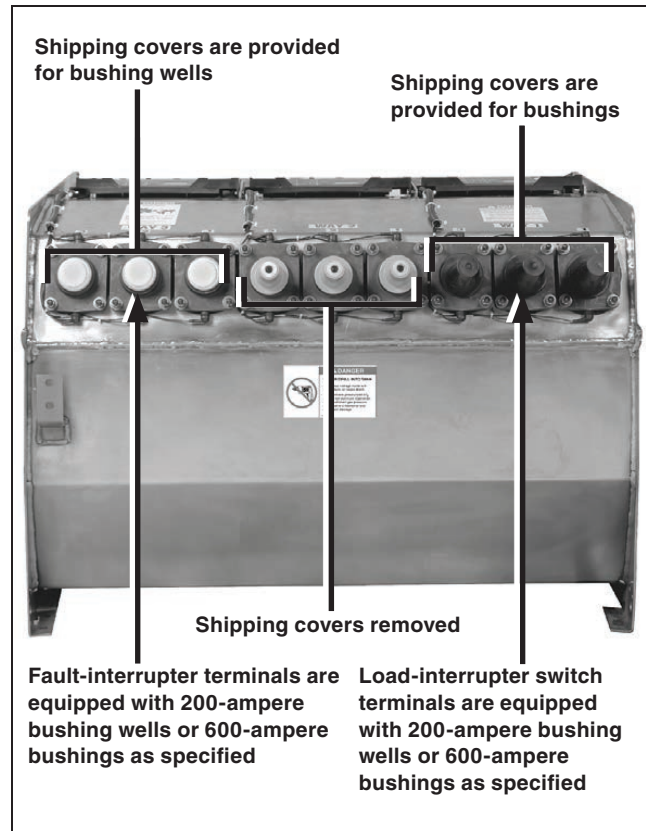


Figure 45. A Vista switchgear tank with shipping covers. (Manual unit shown for illustration purposes.)

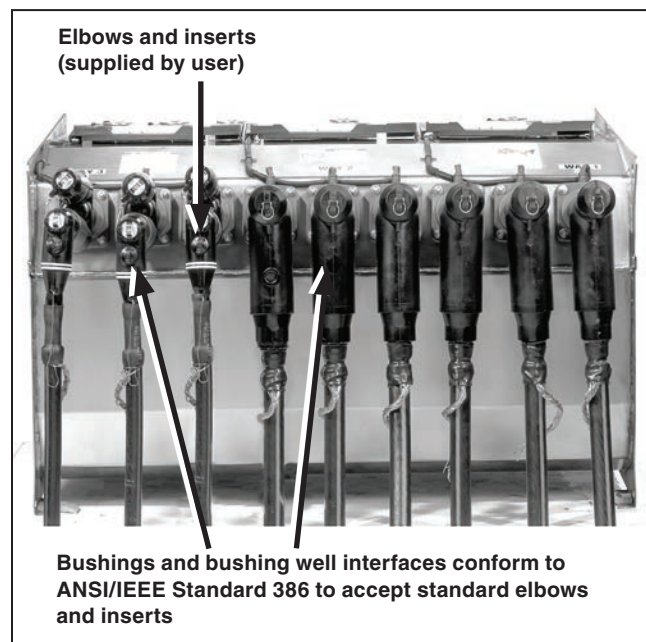


Figure 46. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)

### Tank Placement

Use the following steps to place the tank for dry vault-mounted style Vista switchgear:

- STEP 1.** Unbolt the switchgear from its crate and lift the gear, observing the precautions given in the “Handling” section on page 29. See Figure 47.
- STEP 2.** Secure the switchgear in place in accordance with the pull box or wall brackets provided by the user.

### Low-Voltage Enclosure Placement

Use the following steps to place the enclosure for dry-vault mounted style Vista switchgear:

- STEP 1.** Unbolt the low-voltage enclosure from its skid and set it upright if necessary, observing the precautions given in the “Handling” section on page 29.
- STEP 2.** Use a two-point lifting scheme to properly balance the enclosure.
- STEP 3.** Verify the enclosure is positioned correctly for mounting to the wall or post.
- STEP 4.** Secure the low-voltage enclosure to the wall or post.

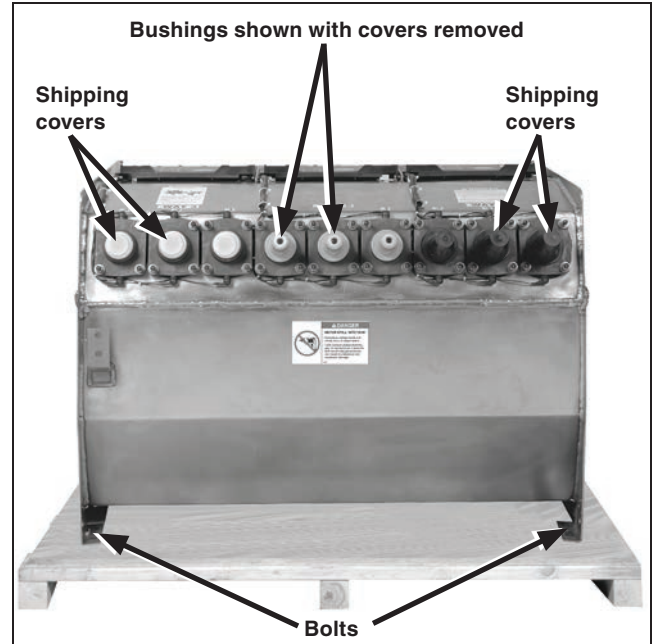


Figure 47. The switchgear is bolted to skid in four places for shipment.



## Installation—Dry-Vault Mounted Style

### Grounding

Use the following steps to properly ground dry-vault mounted style Vista switchgear:

- STEP 1.** Connect the cable concentric-neutral ground wires to the grounding system as appropriate. See Figure 48.
- STEP 2.** Connect the ground pad of the tank to the system ground facility in accordance with the user's standard grounding practice. See Figure 49. Use the equivalent of 4/0 copper (or cable sized in accordance with the user's standard practice) in either a single or multiple connection to realize the maximum momentary rating of the switchgear. For a multiple connection, cables smaller than 1/0 copper or equivalent should not be used.

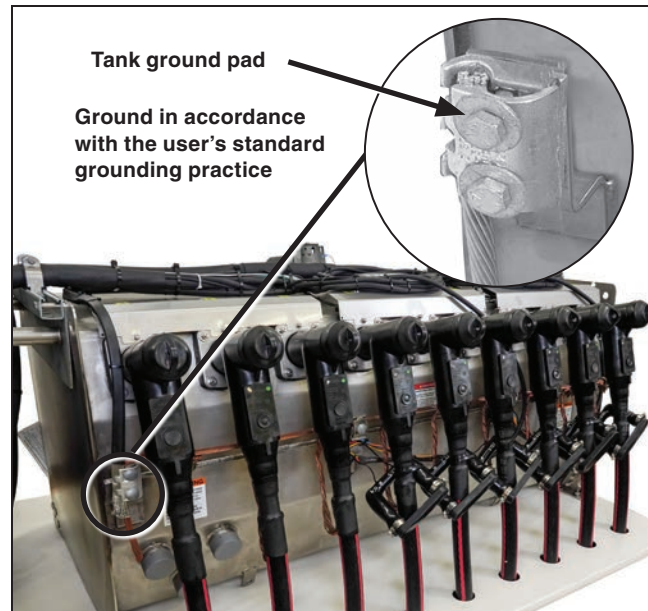


Figure 48. The tank ground pad.

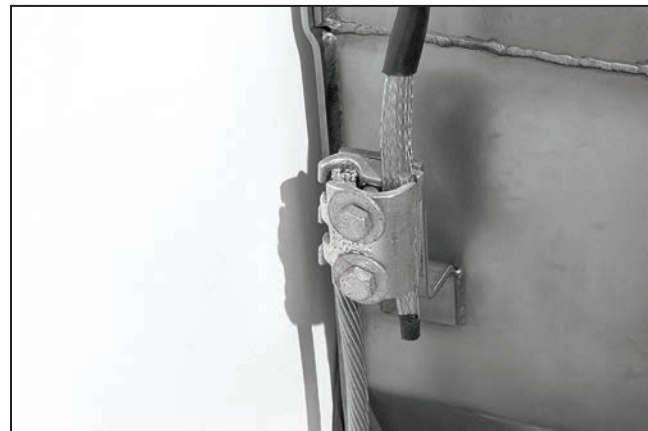


Figure 49. Connect shielded cable to tank ground.



**Current Sensors**

**NOTICE**

Each S&C current sensor has a unique magnitude ratio and phase-angle shift. These values are used to calibrate the current-sensing inputs to the user-supplied remote terminal unit (RTU). The magnitude ratio and phase-angle shift of each current sensor must be recorded on the yellow card provided in accordance with the way and phase on which the current sensor will be installed. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor itself.

If S&C Current Sensors are not already installed at factory shipment, use the following steps to attach them for dry-vault mounted style Vista switchgear (Consult your operating practices if third-party current transformers are specified instead of S&C Current Sensors.):

- STEP 1.** Remove the current sensors, hardware, and wiring harness from the box marked “S&C Current Sensors.”
- STEP 2.** Connect the current sensors to the wiring harness as shown on the interconnection wiring diagram provided with the gear. See Figure 50.
- STEP 3.** Place each current sensor in front of the phase of the way on which it will be installed.  
**Note:** Way and phase numbers are located above the bushing on the termination side.
- STEP 4.** Record the magnitude ratio and phase angle shift of each current sensor in the appropriate location (in accordance with the way and phase on which the current sensor will be installed) on the yellow card provided with wiring diagrams and installation and operation documentation in the low-voltage enclosure. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor.



**Figure 50.** Attach current sensors to required wiring.

## Installation—Dry-Vault Mounted Style

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**STEP 5.** Remove the ¼–20 gap nut on one of the current sensors. Open the sensor and place it around the appropriate high-voltage cable. There is an “H” polarity mark embossed on the current sensor. All three current sensors for each way must be installed with the polarity marks facing in the same direction. Consult your wiring diagram.

**STEP 6.** Replace and tighten the gap nut.

**STEP 7.** Secure the current sensor to the high-voltage cable below the cable terminations using the plastic tie wraps furnished. If the cable has a grounded concentric neutral, the current sensor must be secured in one of the following ways:

- (a) It may be placed around the concentric neutral, in which case the concentric neutral must be brought back through the current sensor. See Figure 51.
- (b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 52.

**STEP 8.** Install the set’s two other current sensors by repeating Steps 5 through 7.

**STEP 9.** Cross-check the magnitude ratio and phase-angle shift of each current sensor with the information recorded on the yellow card.

**STEP 10.** Remove and discard the attached tags.



**Figure 51.** A current sensor placed around cable's grounded concentric neutral.



**Figure 52.** A current sensor placed above cable's grounded concentric neutral.

## Low-Voltage Enclosure Wiring

### NOTICE

Failure to follow wiring and grounding instructions will result in electronic damage, and may cause nuisance operation.

Use the following steps to route the low-voltage compartment wiring for dry vault-mounted style Vista switchgear.

**STEP 1.** Uncoil the main cables that will be routed to the low-voltage enclosure. See Figure 53. These cables have low-voltage connectors on the ends.

**STEP 2.** Using the conduit/tubing/bracket kit provided, feed the junction box main cables with connectors through the access port into the low-voltage enclosure, as follows:

- (a) Locate the conduit/tubing assembly and the two holding brackets and bolts as shown in Figure 54.
- (b) Put the holding brackets in the grooved channel of the conduit as shown in Figure 55.
- (c) Slide the assembly through the wire pass (located in the bottom of the low-voltage enclosure). Bolt the brackets down to the enclosure floor as shown in Figure 56.

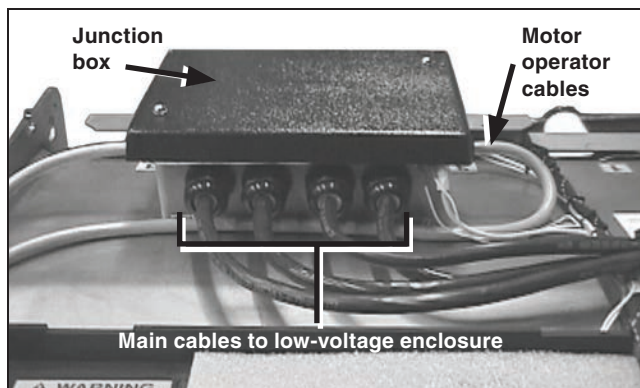


Figure 53. The junction box wiring.



Figure 54. The conduit/tubing bracket assembly kit, shipped with gear.

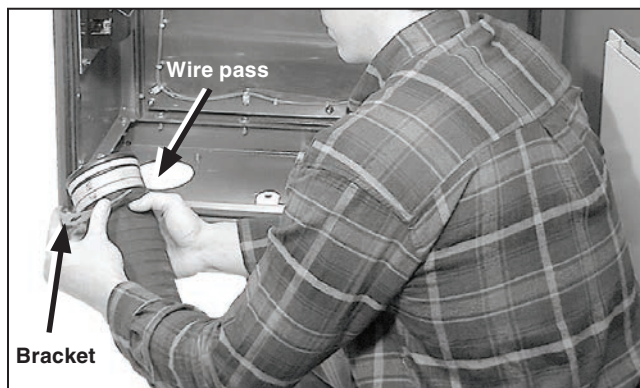


Figure 55. Place the holding brackets in the grooved channel of the conduit.



Figure 56. Install and secure the assembly through the wire pass.

## Installation—Dry-Vault Mounted Style

- (d) Gather the ends of the cables together and carefully insert the connectors and cables through the tubing and conduit, pushing them up into the low-voltage enclosure as shown in Figure 57.
- (e) Route the cables in the low-voltage enclosure and attach all connectors to the rack backplane board using the drawings provided. See Figures 58 and 59. **Fully seat each plug and tighten the set screws for each connector, making sure none of the individual conductor's pins were backed out during seating.** An example of a conductor pin that is backed out is seen in connection 5 in Figure 60.



Figure 57. Channel cables through wire pass.

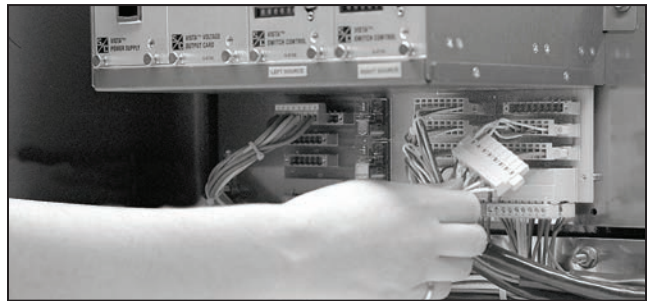


Figure 58. Attach the connectors.

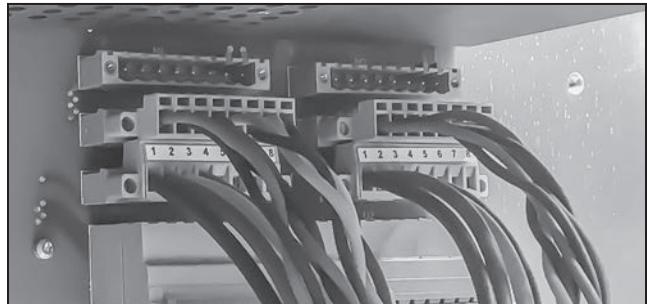


Figure 59. A close-up of the rack backplane board connectors.

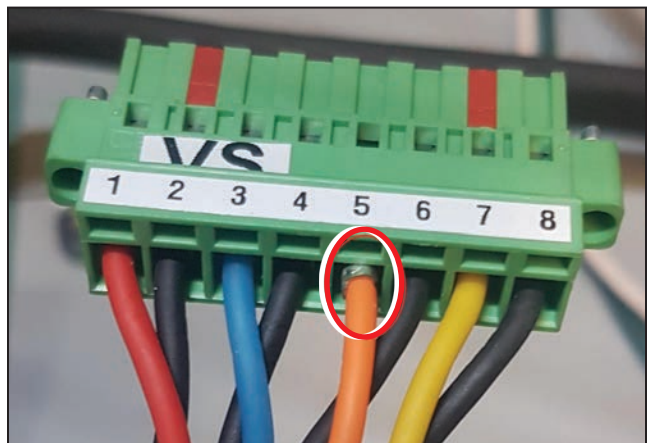


Figure 60. An example of an improper connection that is backed out.



- (f) Up to three pairs of ground wires, VS-G1 and VS-G2, are included. See the wiring diagram for details. Disconnect the ground wires from the temporary grounding leads and route them into the low-voltage enclosure. Attach the ground wires to the terminal block specified in the drawings provided, and fully tighten the set screws. Figure 61.
- (g) Connect the heavy-shielded cable to the copper lug on the low-voltage enclosure grounding plate. See Figure 62.
- (h) When all connections are made, straighten the cables within the low-voltage enclosure and bundle them neatly by installing tie wraps.
- (i) Gather and twist the butyl tubing around the cable bundle and apply tie wraps along the length of the excess tubing.

**STEP 3.** When grounding the low-voltage enclosure to the Vista switchgear tank, it is important to have one solid ground connection from the low-voltage enclosure to the Vista switchgear tank. Provisions for grounding wires and clamps on the low-voltage enclosure are on the bottom mounting channel. Refer to the “Grounding” section on page 32.

### NOTICE

Before connecting external power to the fuse block, reference the wiring diagrams included in the switchgear shipment to make sure the polarity is correct.

**Failure to follow these precautions can result in damage to the equipment.**

To connect external control power, connect the line and neutral to the fuse block. See the label under the fuse block. See Figure 62.

### NOTICE

Do not ground the low-voltage enclosure to the external control power building grounding. PVC, non-metallic Seal-Tite, or other connection methods should be used to avoid bonding the low-voltage enclosure to the building ground when connecting external control power.

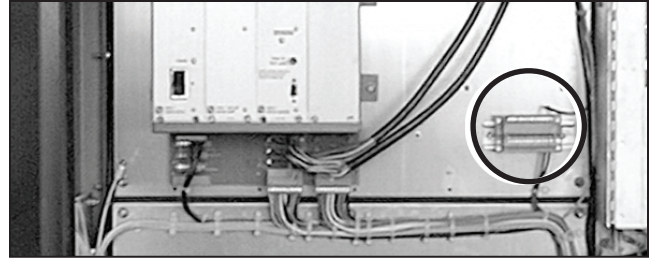


Figure 61. Attach ground wires to terminal block.



Figure 62. Copper lug and fuse block.

## Installation—Dry-Vault Mounted Style

### Motor Operator Installation

Use the following steps to install the motor operator(s) for dry vault-mounted style Vista switchgear:

**STEP 1.** Place each motor operator over the operating shaft on the gear. See Figure 63.

**Note:** It may be necessary to manually rotate the motor operator shaft (by twisting the operating disk) to line up the operator key with the shaft notch key. See Figure 64.

**STEP 2.** Remove the protective cap from the motor operator mating plug.

**STEP 3.** Insert the motor operator cable connector onto mating plug on the operator, making sure the connector is keyed in properly.

**STEP 4.** Thoroughly tighten the connector onto the mating plug. If resistance occurs while the connection is engaging, push the connector toward the mating plug.

**STEP 5.** Secure each motor operator to the stop ring on the tank using the bolt provided. There is no specific torque requirement: tighten the bolt and then back off one-half turn. See Figure 65.

**STEP 6.** An electrical operation mechanical blocking key is attached to the back of the motor operator with a chain. Fit this key into the operating disk. See Figure 66.

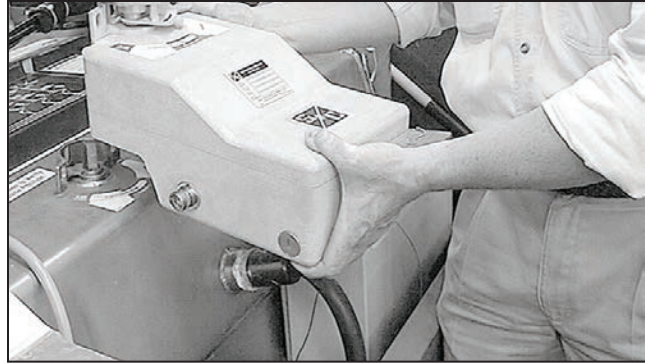


Figure 63. Place the motor operator over the operating shaft on the gear.

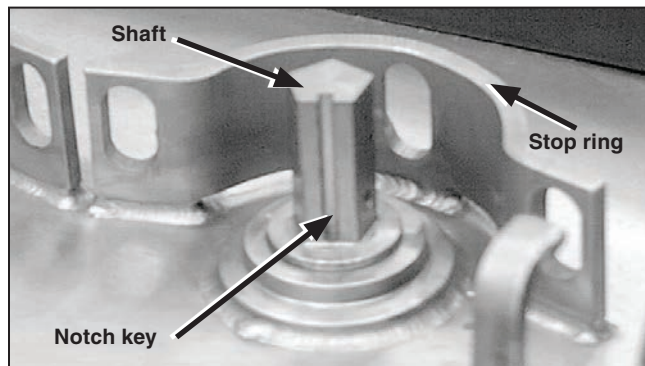


Figure 64. Line up the operator key with the shaft notch key.

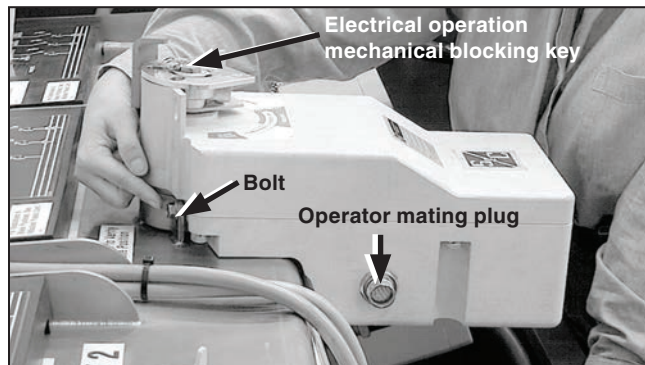


Figure 65. Connect the motor operator cable to the mating plug on the operator.



Figure 66. Insert the mechanical blocking key.



### Initial Testing of Motor Operators and Controls

Where voltage transformers internal to the tank provide power for the motor operators and controls, test accessory TA-2669 is necessary to power the controls when the gear is not energized. Refer to S&C Instruction Sheet 515-510 for instructions on how to connect and operate the test accessory.

If test accessory TA-2669 is not specified, medium-voltage connections must be made to power the controls.

Follow these steps to conduct initial testing of motor operators and controls:

**STEP 1.** When all of the preceding steps have been successfully completed, turn on the power supply power switch. See Figure 67. This will connect ac power to the battery charger and motor operator controls.

The motor operator controls will indicate the position of the motor operators and mechanism operating shafts via LEDs on the front panel assembly. See Figures 69 and 70 on page 40. If equipped with a 6800 Series Automatic Switch Control, the Vista rack will only show the **Ground** status. The **Open** and **Close** status and the operating controls are on the switch control. See Figure 67.

<b>NOTICE</b>
Do not test switchgear without batteries connected. This can result in a misoperation.

**STEP 2.** Verify all LEDs are functional by pressing the PUSH TO TEST LAMPS pushbutton on each control board. See Figure 68.

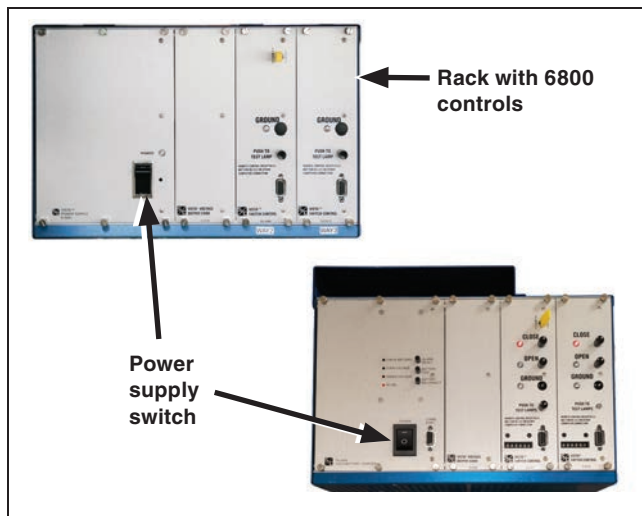


Figure 67. There are two Vista rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; the other has only a GROUND indicator for use with 6800 Series Automatic Switch Controls.

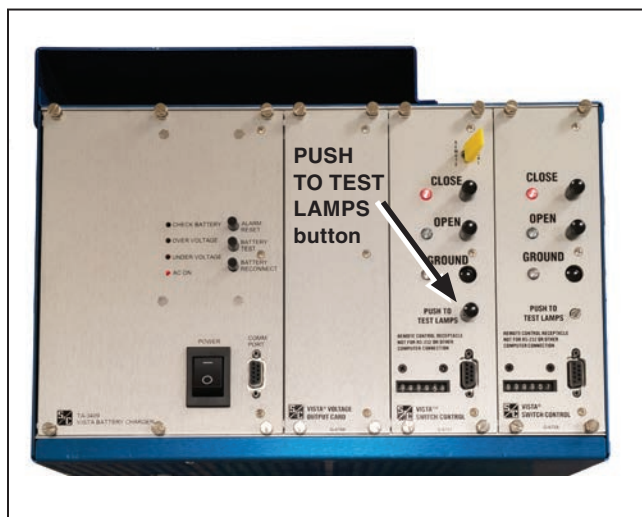


Figure 68. Testing the LEDs and performing test operations.

## Installation—Dry-Vault Mounted Style

**STEP 3.** Perform the following operations using the control board buttons as shown in Figures 69 and 70.

Verify the motor operator moves to the desired position among the four noted below and the control board LEDs also indicate the proper position (There is an electrical interface in the controls that will not allow the user to move to/from the **Close** position directly from/to the **Ground** position.):

- **Close-to-Open**
- **Open-to-Ground**
- **Ground-to-Open**
- **Open-to-Close**

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 71.



Figure 69. The Open indication on the motor control board matches the motor operator position.

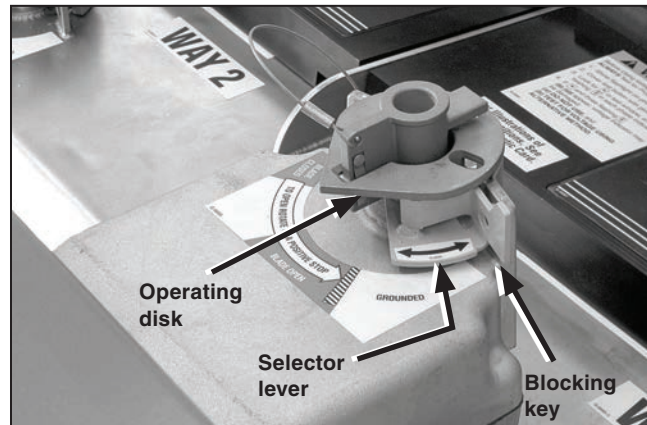


Figure 70. The Open position indication on motor operator.



Figure 71. Remove the mechanical blocking key.

### Setting Up the Gear for Operation

Follow these steps to set up the switchgear for operation:

- STEP 1.** Use the motor operator controls or the manual handle to place the load switches and fault interrupters in their desired operating positions.

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 71 on page 40.

- STEP 2.** Program the Vista overcurrent control 2.0 per S&C Instruction Sheet 681-530. Write the control settings on the label provided on the overcurrent control enclosure.

- STEP 3.** Lock the low-voltage enclosure. See Figure 72.



**Figure 72.** A vault-style low-voltage enclosure shown with a 6802 Automatic Switch Control and provision for communications.

### Packing

Wet-vault mounted style switchgear consists of the tank and the low-voltage enclosure. Each is fastened to its own wooden skid. Motor operators are individually packed and shipped in boxes. Optional current sensors are shipped attached in the gear by the required wiring.

All external wiring is coiled at the end of the tank for user installation. Two ground wires per voltage sensor way are attached to shipping temporary grounding leads.

At the first opportunity, remove all packing materials (cardboard, paper, foam padding, etc.) from the outside of the low-voltage enclosure. This will prevent the finish from being damaged by rainwater absorbed by the packing materials and will also prevent wind-induced abrasion from loose cardboard.

### Inspection

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

If there is visible loss and/or damage:

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

If concealed damage is discovered:

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

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

### Storage

If prolonged outdoor storage is required (longer than one month), storage covers are available from S&C to provide UV protection.

#### **NOTICE**

Do not store outside. Weather conditions may damage uninstalled electrical components over an extended period of time without UV protective cover.

## Handling

### **⚠ WARNING**

When handling an enclosure or tank with an overhead hoist, observe standard lifting practices and the general instructions below.

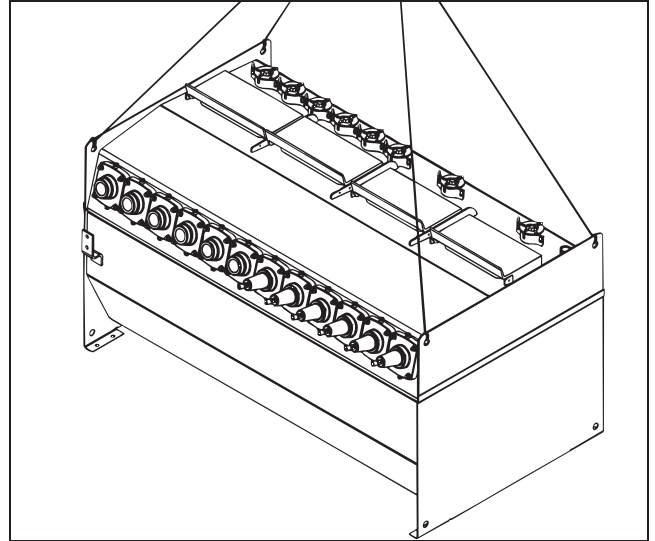
**Failure to follow these precautions can result in serious personal injury or equipment damage.**

When lifting, use 6-foot (183-cm) or longer hoist slings of equal length to prevent damaging the wet-vault mounted style Vista switchgear tank or low-voltage enclosure during lifting.

Arrange the hoist slings so the lifting forces are equally distributed between the lifting tabs. Avoid sudden starts and stops. See Figures 73 and 74.

### **NOTICE**

The low-voltage enclosure is not submersible. The enclosure should be mounted above ground or in a dry location.



**Figure 73. A properly slung tank for vault-mounted style switchgear. (Floor-mount lifting scheme shown.)**



**Figure 74. A properly slung low-voltage enclosure for vault-mounted style Vista switchgear.**



## Installation—Wet-Vault Mounted Style

### Cable Terminations

#### **⚠ DANGER**

Before energizing the switchgear, replace the shipping covers on all bushings and bushing wells with elbows or insulated protective caps.

**Failure to replace the shipping covers on all bushings with elbows or insulated protective caps can result in a flashover and serious personal injury or death.**

Use the following steps for terminating cables:

- STEP 1.** Remove the shipping covers from the bushings and bushing wells. See Figure 75.

#### **⚠ CAUTION**

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

**Failure to follow these precautions can result in minor injury as well as damage to the bushings and bushing wells and subsequent leakage of insulating gas.**

- STEP 2.** Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 76.

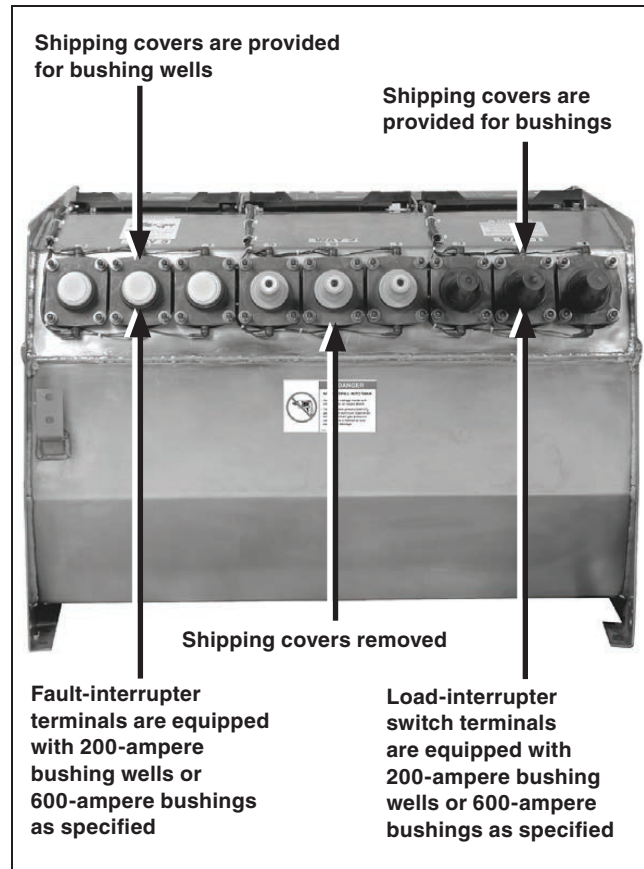


Figure 75. A Vista switchgear tank with shipping covers. (Manual unit shown for illustration purposes.)

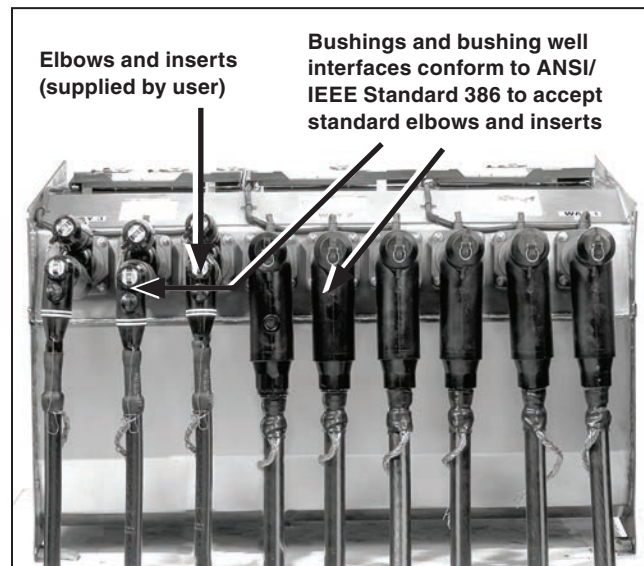


Figure 76. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)



## Tank Placement

Use the following steps to place the tank for wet-vault mounted style Vista switchgear:

- STEP 1.** Unbolt the switchgear from its crate and lift the gear, observing the precautions in the “Handling” section on page 43. See Figure 77.
- STEP 2.** Secure the switchgear in place in accordance with the pull box or wall brackets provided by the user.

## Low-Voltage Enclosure Placement

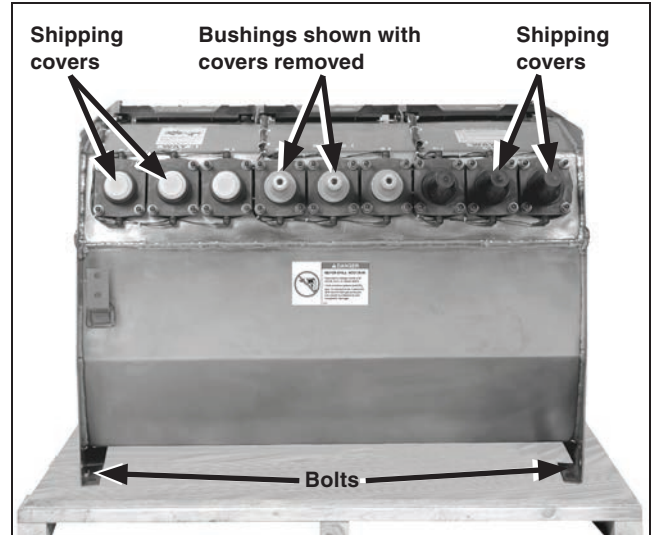
The standard low-voltage enclosure is not submersible. Use the following steps to place the enclosure for wet-vault mounted style Vista switchgear:

- STEP 1.** Unbolt the low-voltage enclosure from its skid and set it upright if necessary, observing the precautions given in the “Handling” section on page 43.
- STEP 2.** Use a two-point lifting scheme to properly balance the enclosure.
- STEP 3.** Verify the enclosure is positioned correctly for mounting to the wall or post.
- STEP 4.** Secure the low-voltage enclosure to the wall or post.

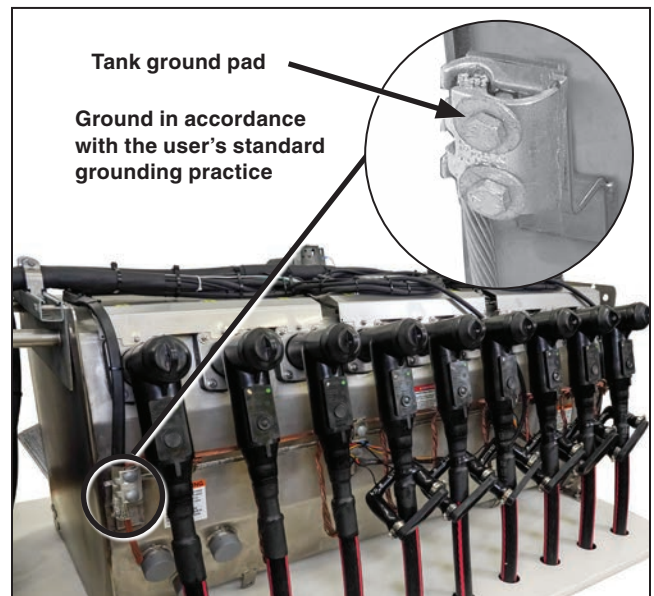
## Grounding

Use the following steps to properly ground wet-vault mounted style Vista switchgear:

- STEP 1.** Connect the cable concentric-neutral ground wires to the grounding system as appropriate. See Figure 78.
- STEP 2.** Connect the heavy-shielded cable tails from each of the main cables to the tank ground pad using the clamshell connector provided. The shortest possible connection should be made. There is one heavy-shielded cable tail per motor operated way. See Figure 79.



**Figure 77.** The switchgear is bolted to skid in four places for shipment.



**Figure 78.** The tank ground pad.



**Figure 79.** Connect the shielded cable to tank ground.

### Current Sensors

#### NOTICE

Each S&C current sensor has a unique magnitude ratio and phase-angle shift. These values are used to calibrate the current sensing inputs to the user-supplied RTU. The magnitude ratio and phase-angle shift of each current sensor must be recorded on the yellow card provided in accordance with the way and phase on which the current sensor will be installed. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor.

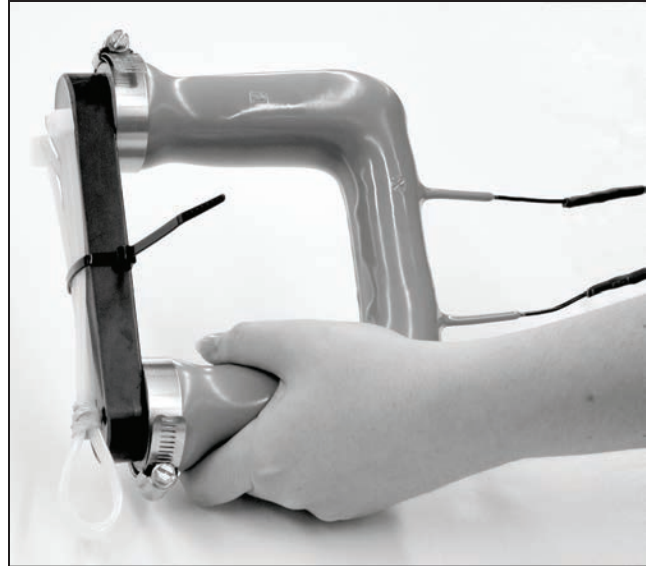
Use the following steps to attach S&C current sensors for wet-vault mounted style Vista switchgear. (Optional current sensors are already attached to the required wiring. See Figure 80. Consult your operating practices if third-party current transformers are specified instead of S&C Current Sensors.)

**STEP 1.** Place each current sensor in front of the phase of the way on which it will be installed.

**Note:** Way and phase numbers are located above the bushing on the termination side.

**STEP 2.** Record the magnitude ratio and phase angle shift of each current sensor in the appropriate location (in accordance with the way and phase on which the current sensor will be installed) on the yellow card provided with wiring diagrams and installation and operation documentation in the low-voltage enclosure. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor.

**STEP 3.** Open the sensor with the sensor-release tool provided. Place the sensor around the appropriate high-voltage cable. There is an “H” polarity mark embossed on the current sensor. All three current sensors for each way must be installed with the polarity marks facing in the same direction. Consult the wiring diagram. When done, close the sensor.



**Figure 80.** The wiring is already attached to the current sensors.

**STEP 4.** Secure the current sensor to the high-voltage cable below the cable terminator using the plastic tie wraps furnished. If the cable has a grounded concentric neutral, the current sensor must be secured in one of the following ways:

- (a) It may be placed around the concentric neutral, in which case the concentric neutral must be brought back through the current sensor. See Figure 81.
- (b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 82.

**STEP 5.** Install the set's other two current sensors by repeating Step 3 on page 46 and Step 4.

**STEP 6.** Cross-check the magnitude ratio and phase-angle shift of each current sensor with the information recorded on the yellow card.

**STEP 7.** Remove and discard the attached tags.



**Figure 81.** A current sensor placed around cable's grounded concentric neutral.●



**Figure 82.** A current sensor placed above cable's grounded concentric neutral.●

● Non-waterproof current sensor shown only for location position.

## Installation—Wet-Vault Mounted Style

### Low-Voltage Enclosure Wiring

Use the following steps to route the low-voltage compartment wiring for wet-vault mounted style Vista switchgear:

- STEP 1.** Uncoil the main cables to be routed to the low-voltage enclosure. These cables have low-voltage connectors on their ends. See Figure 83.
- STEP 2.** Using the conduit/tubing/bracket kit provided, feed the main cables with connectors through the access port into the low-voltage enclosure, as follows.
- Locate the conduit/tubing assembly and the two holding brackets and bolts as shown in Figure 84.
  - Put the holding brackets in the grooved channel of the conduit as shown in Figure 85.
  - Slide the assembly through the wire pass (located in the bottom of the low-voltage enclosure.) Bolt the brackets down to the enclosure floor as shown in Figure 86.

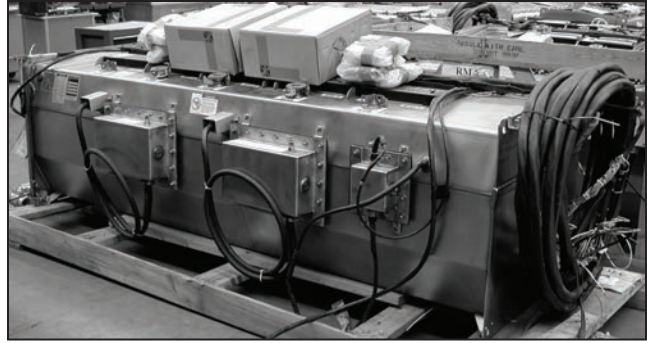


Figure 83. The main cables for the switchgear.



Figure 84. The conduit/tubing bracket assembly kit, shipped with gear.



Figure 85. Place the holding brackets in the grooved channel of the conduit.



Figure 86. Install and secure the assembly through the wire pass.



- (d) Gather the ends of the cables together and carefully insert the connectors and cables through the tubing and conduit, pushing them up into the low-voltage enclosure as shown in Figure 87.
- (e) Route the cables into the low-voltage enclosure and attach all connectors to the Vista Rack Backplane Board using the drawings provided. See Figure 88 and Figure 89. Fully seat each plug and tighten the set screws for each connector, making sure none of the individual conductor's pins were backed out during seating. An example of a conductor pin that is backed out is shown in connection 5 in Figure 90.



Figure 87. Channel the cables through the wire pass.

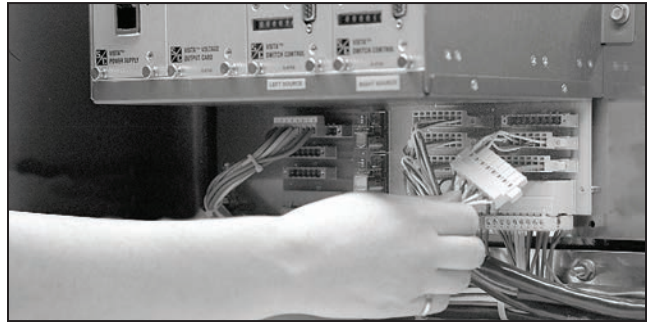


Figure 88. Attach the connectors.

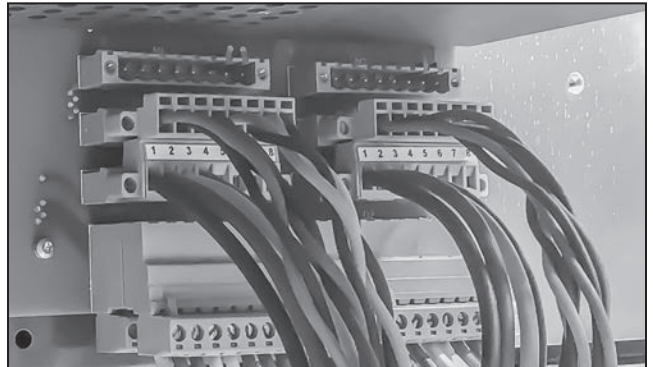


Figure 89. A close-up of Vista Rack Backplane Board connectors.

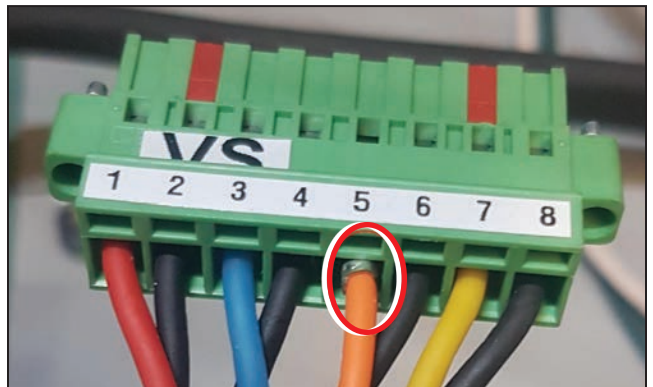


Figure 90. An example of improper connection that is backed out.



## Installation—Wet-Vault Mounted Style

- (f) Up to three pairs of ground wires, VS-G1 and VS-G2, are included. See the wiring diagram for details. Attach the ground wires to the terminal block specified in the drawings provided, and fully tighten the set screws. See Figure 91.
- (g) Connect the heavy shielded cable to the copper lug on the low-voltage enclosure grounding plate. See Figure 92.
- (h) When all connections are made, straighten the cables in the low-voltage enclosure and bundle them neatly by installing tie wraps.
- (i) Gather and twist the butyl tubing around the cable bundle and apply tie wraps along the length of the excess tubing.

**STEP 3.** When grounding the low-voltage enclosure to the Vista switchgear tank, it is important to have one solid ground connection from the low-voltage enclosure to the Vista switchgear tank. Provisions for grounding wires and clamps on the low-voltage enclosure are provided on the bottom mounting channel. Refer to the “Grounding” section on page 45.

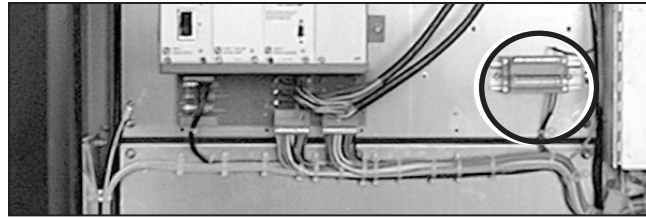


Figure 91. Attach the ground wires to the terminal block.



Figure 92. Copper lug and fuse block.

### NOTICE

Before connecting external power to the fuse block, reference the wiring diagrams included in the switchgear shipment to make sure polarity is correct.

Failure to follow these precautions can result in damage to the equipment.

To connect external control power, connect the line and neutral to the fuse block. See the label under the fuse block. See Figure 92.

### NOTICE

Do not ground the low-voltage enclosure to the external control power building grounding. PVC, non-metallic Seal-Tite, or other connection methods should be used to avoid bonding the low-voltage enclosure to the building ground when connecting external control power.

## Motor Operator Installation

Use the following steps to install the motor operator(s) for wet vault-mounted style Vista switchgear:

**STEP 1.** Place each motor operator over the operating shaft on the gear. See Figure 93.

**Note:** It may be necessary to manually rotate the motor operator shaft (by twisting the operating disk) to line up the operator key with the shaft notch key. See Figure 94.

**STEP 2.** Secure each motor operator to the stop ring on the tank using the bolt provided. There is no specific torque requirement: tighten the bolt and then back off one-half turn. See Figure 95.

**STEP 3.** An electrical operation mechanical blocking key is attached to the back of the motor operator with a chain. Fit this key into the operating disk. See Figure 96.



Figure 93. Place the motor operator over the operating shaft on the gear.

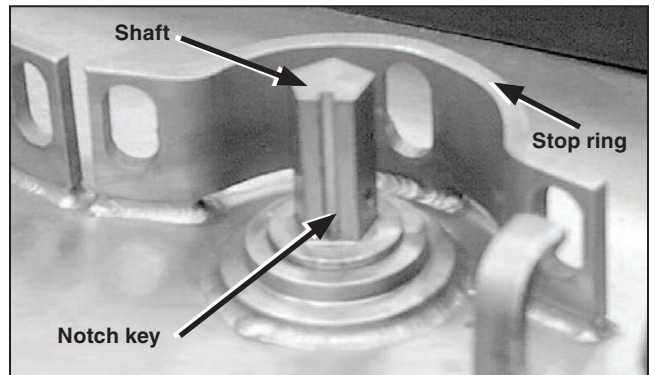


Figure 94. Line up the operator key with the shaft notch key.

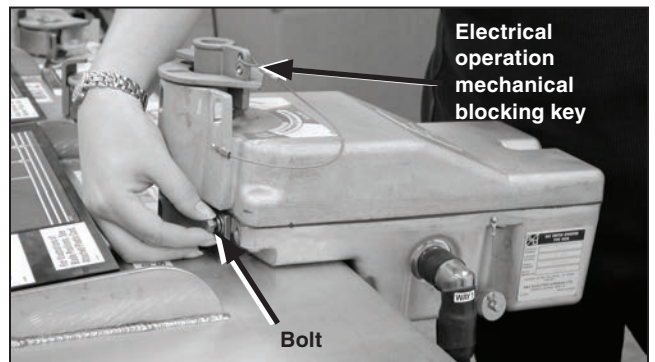


Figure 95. Secure the motor operator to the stop ring.



Figure 96. Insert the mechanical blocking key.

## Initial Testing of Motor Operators and Controls

Where voltage transformers internal to the tank provide power for the motor operators and controls, test accessory TA-2669 is necessary to power the controls when the gear is not energized. Refer to S&C Instruction Sheet 515-510 for instructions on how to connect and operate the test accessory.

If test accessory TA-2669 is not specified, medium-voltage connections must be made to power the controls.

Follow these steps to conduct initial testing of motor operators and controls:

**STEP 1.** When all of the preceding steps have been successfully completed, turn on the power supply power switch. See Figure 97.

The motor operator controls will indicate the position of the motor operators and mechanism operating shafts via LEDs on the front panel assembly. If equipped with a 6800 Series Automatic Switch Control, the motor operator controls only show the **Ground** status. The **Open** and **Close** status and the operating controls are on the switch control. See Figures 98 and 99.

<b>NOTICE</b>
Do not test switchgear without batteries connected. This can result in a misoperation.

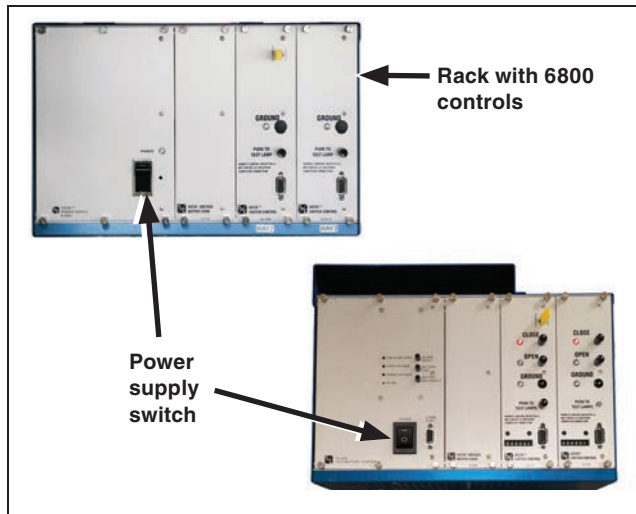


Figure 97. There are two Vista rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; the other has only a GROUND indicator for use with 6800 Series Automatic Switch Controls.

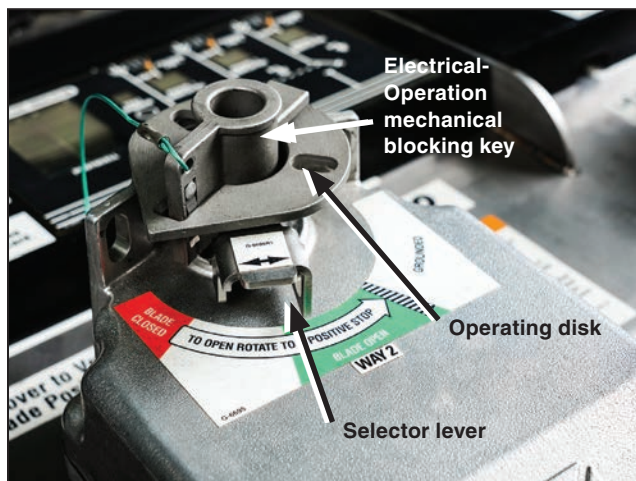


Figure 98. “Close” position indication on motor operator.

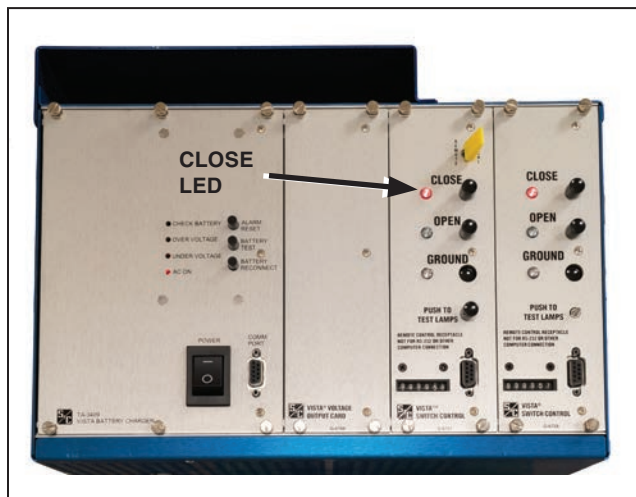


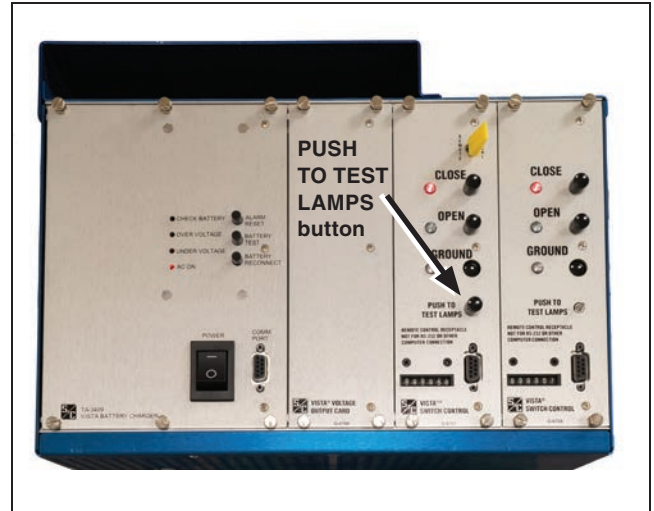
Figure 99. CLOSE indication on the motor control board matches motor operator position.

**STEP 2.** Verify all LEDs are functional by pressing the PUSH TO TEST LAMPS pushbutton on each control board. See Figure 100.

**STEP 3.** Perform the following operations using the control board buttons, as shown in Figure 100. Verify the motor operator moves to the desired position among the four noted below and the control board LEDs also indicate the proper position (There is an electrical interface in the controls that will not allow the user to move to/ from the **Close** position directly from/to the **Ground** position.):

- **Close-to-Open**
- **Open-to-Ground**
- **Ground-to-Open**
- **Open-to-Close**

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 101 on page 54.



**Figure 100.** Testing the LEDs and performing test operations.



## Installation—Wet-Vault Mounted Style

### Setting Up the Gear for Operation

Follow these steps to set up the switchgear for operation:

**STEP 1.** Use the motor operator controls or the manual handle to place the load switches and fault interrupters in their desired operating positions.

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 101.

**STEP 2.** Program the Vista overcurrent control 2.0 per S&C Instruction Sheet 681-530. Write the control settings on the label provided on the overcurrent control enclosure.

**STEP 3.** Lock the low-voltage enclosure. See Figure 102.



Figure 101. Remove the mechanical blocking key.



Figure 102. A vault-style low-voltage enclosure shown with provisions for a remote terminal unit and communications.



### Packing

UnderCover Style switchgear consists of the tank and the low-voltage enclosure. Each is fastened to its own wooden skid. Motor operators are individually packed and shipped in boxes. Optional current sensors are shipped attached to the gear by the required wiring.

All external wiring is coiled at the end of the tank for user installation. Two ground wires per voltage sensor way are attached to the shipping temporary grounding leads.

At the first opportunity, remove all packing materials (cardboard, paper, foam padding, etc.) from the outside of the low-voltage enclosure. This will prevent the finish from being damaged by rainwater absorbed by the packing materials and will also prevent wind-induced abrasion from loose cardboard.

### Inspection

#### **NOTICE**

Do not store outside. Weather and UV may damage uninstalled electrical components over an extended period of time without protective cover.

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

If there is visible loss and/or damage:

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

If concealed damage is discovered:

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

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

### Handling

#### **⚠ WARNING**

When handling a low-voltage enclosure or tank with an overhead hoist, observe standard lifting practices and the general instructions below.

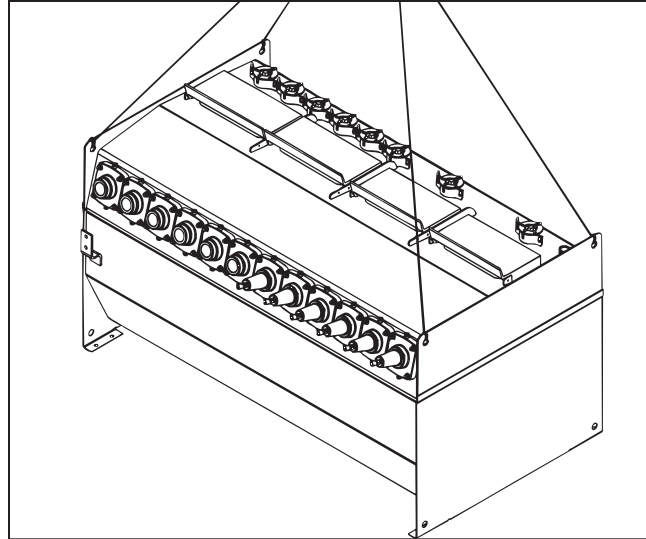
**Failure to follow these precautions can result in serious personal injury or equipment damage.**

When lifting, use 6-foot (183-cm) or longer hoist slings of equal length to prevent damaging the low-voltage enclosure or tank during lifting.

Arrange the hoist slings so the lifting forces are equally distributed between the lifting tabs. Avoid sudden starts and stops. See Figures 103 and 104.

#### **NOTICE**

The low-voltage enclosure is not submersible. The enclosure must be mounted above ground.



**Figure 103. A properly slung tank for UnderCover Style switchgear.**



**Figure 104. A properly slung low-voltage enclosure for UnderCover Style switchgear.**

**Cable Terminations**

**⚠ DANGER**

Before energizing the switchgear, replace the shipping covers on all bushings and bushing wells with elbows or insulated protective caps.

**Failure to replace the shipping covers on all bushings with elbows or insulated protective can result in a flashover and serious personal injury or death.**

Use the following steps for terminating cables:

**STEP 1.** Remove the shipping covers from the bushings and bushing wells. See Figure 105.

**⚠ CAUTION**

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

**Failure to follow these precautions can result in minor injury as well as damage to the bushings and bushing wells and subsequent leakage of insulating gas.**

**STEP 2.** Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 106.

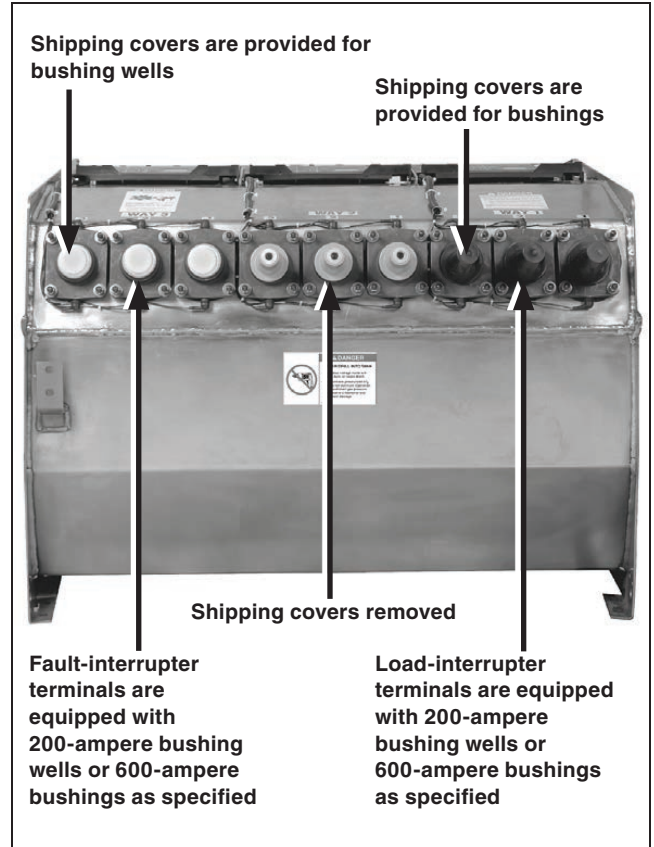


Figure 105. A Vista switchgear tank with shipping covers. (Manual unit shown for illustration purposes.)

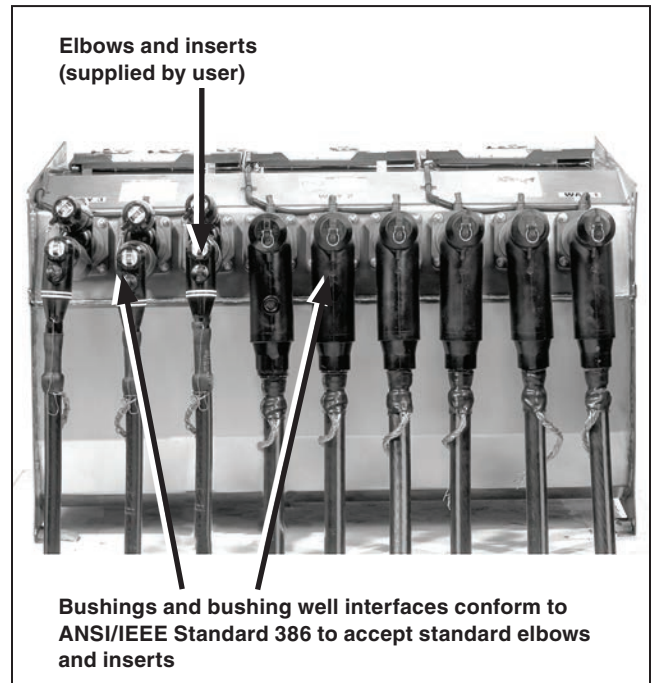


Figure 106. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)

### Tank Placement

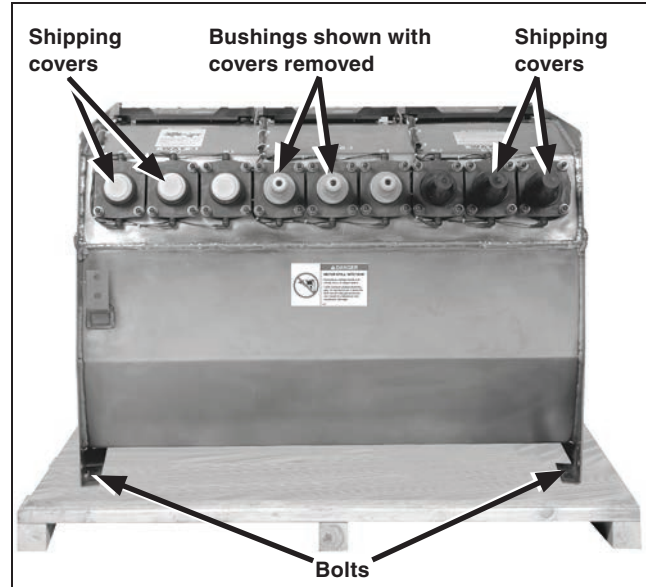
Use the following steps to place the tank for UnderCover Style Vista switchgear:

- STEP 1.** Unbolt the switchgear from its crate and lift the gear, observing the precautions given in the “Handling” section on page 56. See Figure 107.
- STEP 2.** Secure the switchgear in place in accordance with the pull box or wall brackets provided by the user.

### Low-Voltage Enclosure Placement

Use the following steps to place the low-voltage enclosure for UnderCover Style Vista switchgear:

- STEP 1.** Unbolt the low-voltage enclosure from its skid and set it upright if necessary, observing the precautions given in the “Handling” section on page 56.
- STEP 2.** Use a two-point lifting scheme to properly balance the enclosure.
- STEP 3.** Verify the enclosure is positioned correctly for placement on the user pad.
- STEP 4.** Secure the low-voltage enclosure to the user-supplied pad.



**Figure 107.** The switchgear is bolted to the skid in four places for shipment.

## Grounding

Use the following steps to properly ground the UnderCover Style Vista switchgear:

- STEP 1.** Connect the cable concentric-neutral ground wires to the grounding system as appropriate. See Figure 108.
- STEP 2.** Connect the heavy-shielded cable tails from each of the main cables to the tank ground pad using the clamshell connector provided. The shortest possible connection should be made. There is one heavy-shielded cable tail per motor operated way. See Figure 109.

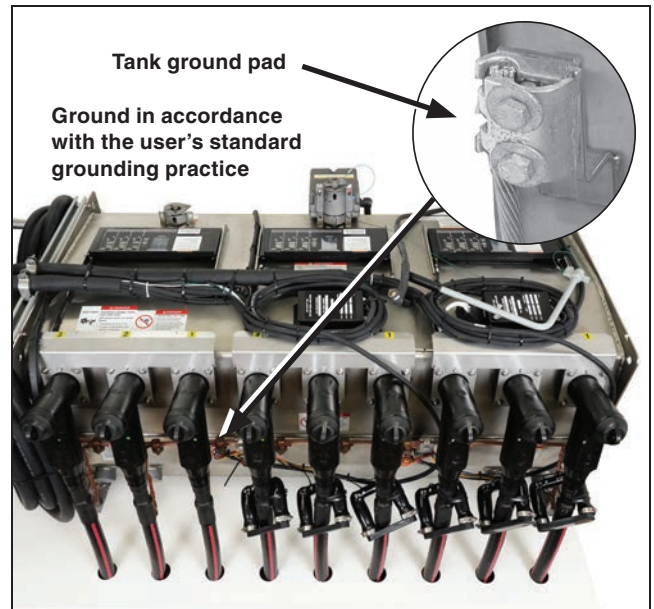


Figure 108. The tank ground pad.



Figure 109. Connect shielded cable to tank ground.



### Current Sensors

#### NOTICE

Each S&C current sensor has a unique magnitude ratio and phase-angle shift. These values are used to calibrate the current sensing inputs to the user-supplied RTU. The magnitude ratio and phase-angle shift of each must be recorded on the yellow card provided in accordance with the way and phase on which the current sensor will be installed. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor.

Use the following steps to attach S&C current sensors for UnderCover Style Vista switchgear (Optional current sensors are already attached to the required wiring. See Figure 110. Consult your operating practices if third-party current transformers are specified instead of S&C Current Sensors.):

**STEP 1.** Place each current sensor in front of the phase of the way on which it will be installed.

**Note:** Way and phase numbers are located above the bushing on the termination side.

**STEP 2.** Record the magnitude ratio and phase angle shift of each current sensor in the appropriate location (in accordance with the way and phase on which the current sensor will be installed) on the yellow card provided with wiring diagrams and installation and operation documentation in the low-voltage enclosure. The magnitude ratio and phase-angle shift of each current sensor are written on a tag attached to the sensor and on the sensor.



**Figure 110.** Wiring is already attached to the current sensors.

- STEP 3.** Open the sensor with the sensor-release tool provided. Place the sensor around the appropriate high-voltage cable. All three current sensors for each way must be installed with the polarity marks facing in the same direction. There is an “H” polarity mark embossed on the current sensor. Consult the wiring diagram. When done, close the sensor.
- STEP 4.** Secure the current sensors to the high-voltage cable below the cable terminator using the plastic tie wraps furnished. If the cable has a grounded concentric neutral, the current sensor must be secured in one of the following ways:
- (a) It may be placed around the concentric neutral, in which case the concentric neutral must be brought back through the current sensor. See Figure 111.
  - (b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 112.
- STEP 5.** Install the set’s other two current sensors by repeating Steps 3 and 4.
- STEP 6.** Cross-check the magnitude ratio and phase-angle shift of each current sensor with the information recorded on the yellow card.
- STEP 7.** Remove and discard the attached tags.



**Figure 111.** A current sensor placed around the cable’s grounded concentric neutral.●



**Figure 112.** A current sensor placed above the cable’s grounded concentric neutral.●

● Non-waterproof current sensor shown only for location position.

### Low-Voltage Enclosure Wiring

Use the following steps to route the low-voltage compartment wiring for UnderCover Style Vista switchgear:

- STEP 1.** Uncoil the main cables that will be routed to the low-voltage enclosure. These cables have low-voltage connectors on the ends. See Figure 113.
- STEP 2.** Position the low-voltage enclosure on the customer-supplied pad so the cable entrances are properly aligned.
- STEP 3.** Using the conduit/tubing/bracket kit provided, feed the main cables with connectors through the access port into the low-voltage enclosure, as follows.
- Locate the conduit/tubing assembly and the two holding brackets and bolts as shown in Figure 114.
  - Put the holding brackets in the grooved channel of the conduit as shown in Figure 115.
  - Slide the assembly through the wire pass (located in the bottom of the low-voltage enclosure). Bolt the brackets down to the enclosure floor as shown in Figure 116.

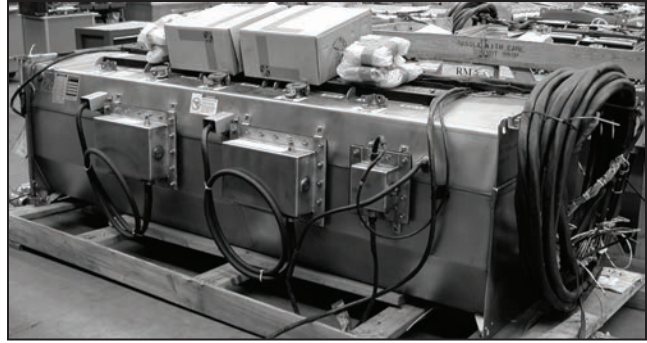


Figure 113. The main cables for the switchgear.



Figure 114. The conduit/tubing bracket assembly kit, shipped with gear.



Figure 115. Place the holding brackets in the grooved channel of the conduit.



Figure 116. Install and secure the assembly through the wire pass.

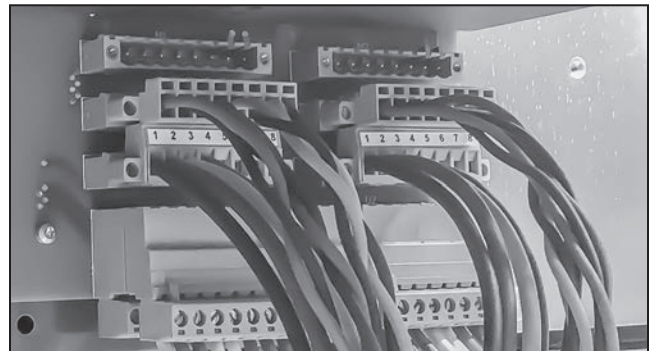
- (d) Gather the ends of the cables together and carefully insert the connectors and cables through the tubing and conduit, pushing them up into the low-voltage enclosure as shown in Figure 117.
- (e) Route the cables into the low-voltage enclosure and attach all connectors to the Vista Rack Backplane Board using the drawings provided. See Figures 118 and 119. Fully seat each plug and tighten the set screws for each connector, making sure none of the individual conductor's pins were backed out during seating. An example of a conductor pin that is backed out is shown in connection 5 in Figure 120.



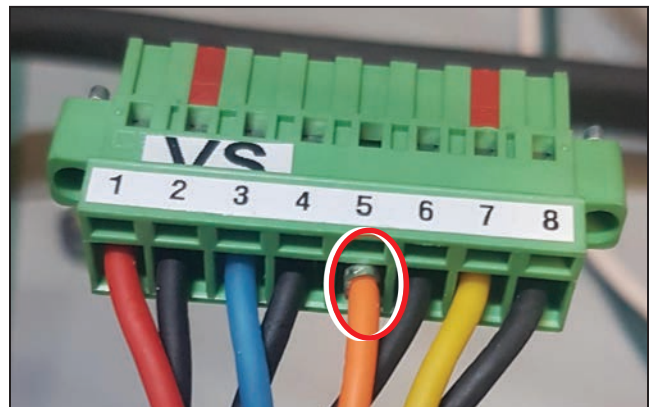
**Figure 117.** Channel the cables through the wire pass.



**Figure 118.** Attach the connectors.



**Figure 119.** A close-up of rack backplane board connectors.



**Figure 120.** An example of an improper connection that is backed out.



- (f) Up to three pairs of ground wires, VS-G1 and VS-G2, are included. See the wiring diagram for details. Attach the ground wires to the terminal block specified in the drawings provided, and fully tighten the set screws. See Figure 121.
- (g) Connect the heavy shielded cable to the copper lug on the low-voltage enclosure grounding plate. See Figure 122.
- (h) When all connections are made, straighten the cables in the low-voltage enclosure and bundle them neatly by installing tie wraps.
- (i) Gather and twist the butyl tubing around the cable bundle and apply tie wraps along the length of the excess tubing.

**STEP 4.** When grounding the low-voltage enclosure to the Vista switchgear tank, it is important to have one solid ground connection from the low-voltage enclosure to the Vista switchgear tank. Provisions for grounding wires and clamps on the low-voltage enclosure are provided on the bottom mounting channel. See the “Grounding” section on page 59.

### NOTICE

Before connecting external power to the fuse block, reference the wiring diagrams included in the switchgear shipment to make sure the polarity is correct.

Failure to follow these precautions can result in damage to the equipment.

**STEP 5.** Connect the line and neutral to the fuse block. See the label under the fuse block. See Figure 122.

### NOTICE

Do not ground the low-voltage enclosure to the external control building grounding. PVC, non-metallic Seal-Tite, or other connection methods should be used to avoid bonding the low-voltage enclosure to the building ground when connecting 120-Vac power.

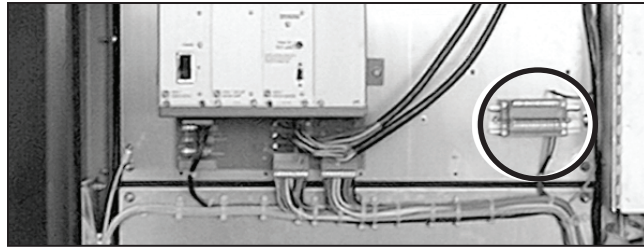


Figure 121. Attach the ground wires to the terminal block.



Figure 122. The copper lug and fuse block.



### Motor Operator Installation

Use the following steps to install the motor operator(s) for UnderCover Style Vista switchgear:

**STEP 1.** Place each motor operator over the operating shaft on the gear. See Figure 123.

**Note:** It may be necessary to manually rotate the motor operator shaft (by twisting the operating disk) to line up the operator key with the shaft notch key. See Figure 124.

**STEP 2.** Secure each motor operator to the stop ring on the tank using the bolt provided. There is no specific torque requirement; tighten the bolt and then back off one-half turn. See Figure 125.

**STEP 3.** An electrical operation mechanical blocking key is attached to the back of the motor operator with a chain. Fit this key into the operating disk. See Figure 126.



Figure 123. Place the motor operator over the operating shaft on the gear.

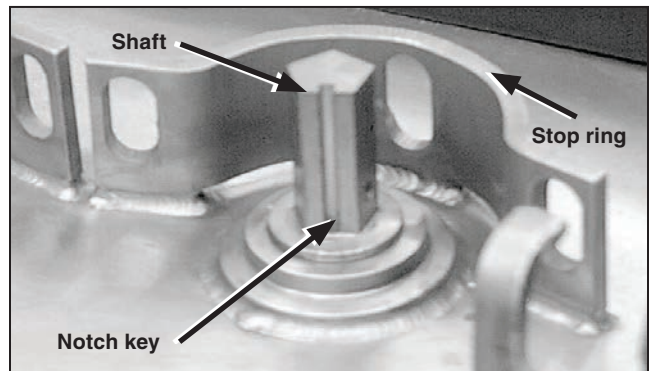


Figure 124. Line up the operator key with the shaft notch key.

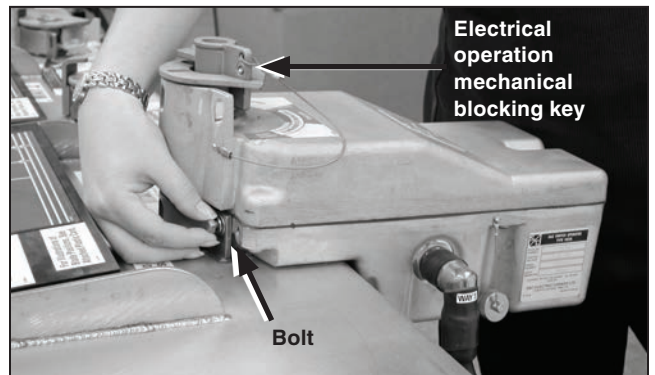


Figure 125. Secure the motor operator to the stop ring.



Figure 126. Insert the mechanical blocking key.

## Initial Testing of Motor Operators and Controls

Where voltage transformers internal to the tank provide power for the motor operators and controls, test accessory TA-2669 is necessary to power the controls when the gear is not energized. Refer to S&C Instruction Sheet 515-510 for instructions on how to connect and operate the test accessory.

If test accessory TA-2669 is not specified, medium-voltage connections must be made to power the controls.

Follow these steps to conduct initial testing of motor operators and controls:

**STEP 1.** When all of the preceding steps have been successfully completed, turn on the power supply power switch. See Figure 127. This will connect ac power to the battery charger and to the motor operator controls.

The motor operator controls indicate the correct position of the motor operators and mechanism operating shafts via LEDs on the front panel assembly. If equipped with a 6800 Series Automatic Switch Control, the motor operator controls only show the **Ground** status. The **Open** and **Close** status and the operation controls are on the switch control. See Figures 128 and 129 and Figure 130 on page 66.

**NOTICE**

Do not test switchgear without batteries connected. This can result in a misoperation.

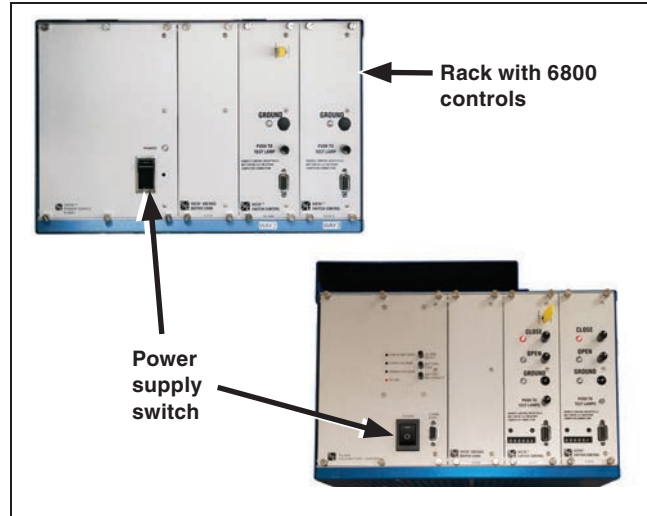


Figure 127. There are two Vista rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; another has only a GROUND indicator for use with 6800 Series Automatic Switch Controls.

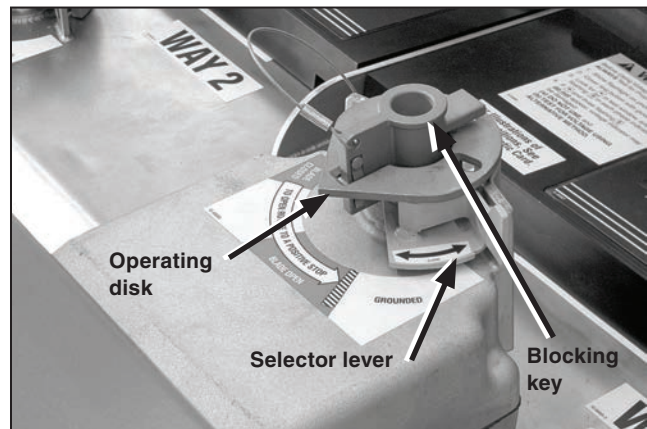


Figure 128 The Open position indication on motor operator.

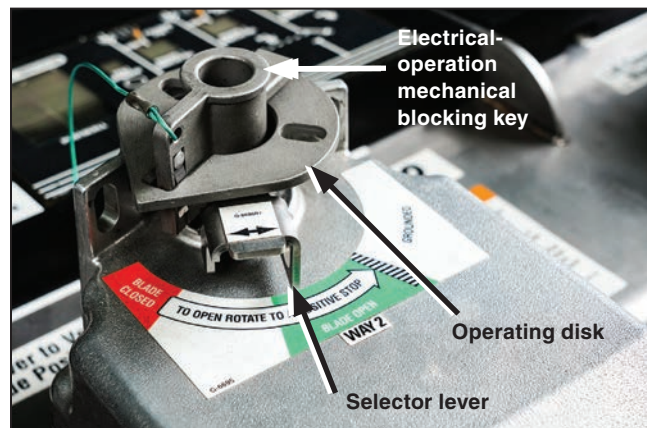


Figure 129. The Closed position indication on the motor operator.

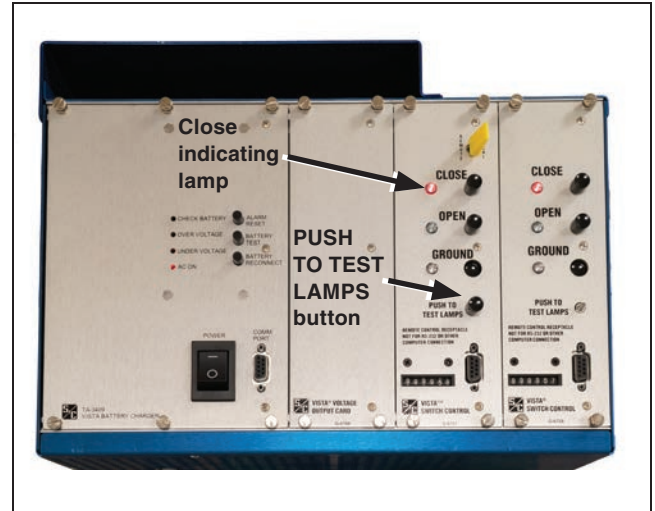
**STEP 2.** Verify all LED displays are functional by pressing the PUSH TO TEST LAMPS pushbutton on each control board. See Figure 130.

**STEP 3.** Perform the following operations using the control board buttons as shown in Figure 130:

**Verify** the motor operator moves to the desired position among the four noted below and the control board LED displays also indicate the proper position (There is an electrical interface in the controls that will not allow the user to move to/from the **Close** position directly from/to the **Ground** position.):

- **Close-to-Open**
- **Open-to-Ground**
- **Ground-to-Open**
- **Open-to-Close**

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 126 on page 65.



**Figure 130.** Testing the LEDs and performing test operations.

### Setting Up the Gear for Operation

Follow these steps to set up the switchgear for operation:

**STEP 1.** Use the motor operator controls or the manual handle to place the load-interrupter switches and fault interrupters in their desired operating positions.

**Note:** The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation.

**STEP 2.** Program the Vista overcurrent control 2.0 per S&C Instruction Sheet 681-530. Write the control settings on the label provided on the overcurrent control enclosure.

**STEP 3.** Lock the low-voltage enclosure.



### 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 131 and 132 as well as Figure 133 on page 70.

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<sub>6</sub> models:** The unit should be evaluated to determine whether it needs to be refilled with SF<sub>6</sub> 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 SF<sub>6</sub> 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 for assistance.

**Orange zone:**

The Vista switchgear unit has been overfilled or has a defective pressure gauge. For SF<sub>6</sub> Vista switchgear with field-accessible gas-fill 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 (CO<sub>2</sub>-mix) models are hermetically sealed. The gas-fill port is not accessible in the field as standard. Contact S&C for assistance.

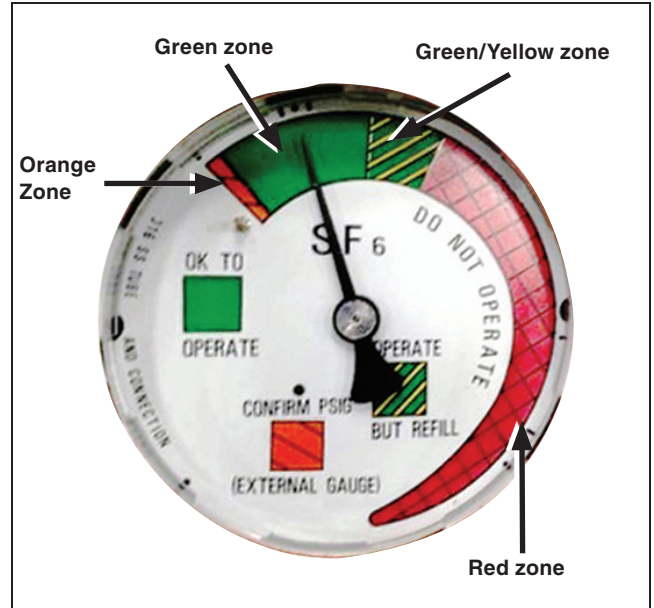


Figure 131. The internal gas-pressure gauge for most Vista switchgear models.

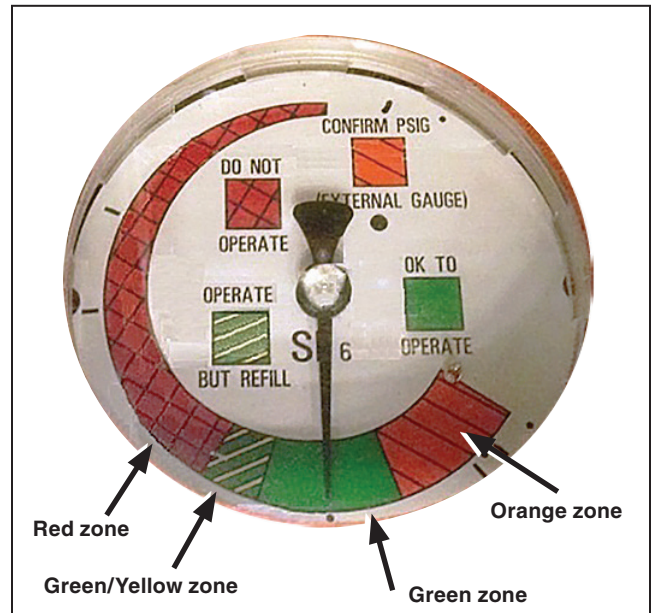


Figure 132. Internal gas-pressure gauge for Vista switchgear models rated 15 kV, 12.5 kA sym. short circuit that have catalog numbers ending in R1.



### Gauge Needle Fluctuations from Rapid Ambient Temperature Changes

When the Vista 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 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.

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.

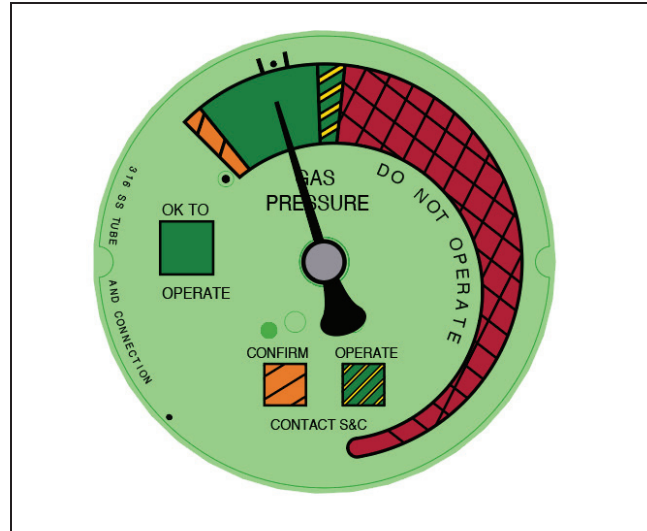


Figure 133. Internal gas-pressure gauge for Vista Green switchgear models, “-GRN” catalog numbers.

## 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 Underground Distribution Switchgear are given in Table 1 and in Table 2 on page 73. 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.

### WARNING

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

1. Completely de-energize the switchgear and disconnect it from all power sources.
2. Terminate bushings with an insulated cap or other appropriate cable termination capable of withstanding the test voltage.
3. Verify the insulating gas pressure gauge is in the green zone.

**Table 1. Maximum Insulation Test Voltages of Vista Underground Distribution Switchgear**

Vista Switchgear Rating, kV			Withstand Test Voltage, kV	
50 Hertz	60 Hertz	Impulse (BIL)	Power Frequency <sup>①</sup>	Dc <sup>②③</sup>
12	15.5	95	27	42
24	27	125	40	62
36	38	150	50	82

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 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.

### 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 like 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 gear will also be subjected to the dc test voltages.

#### **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 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.**

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 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 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 operating and safety procedures may result in injury or equipment damage.**

Vista Underground Distribution 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 grounding with the grounding switch. 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 of Vista Underground Distribution Switchgear**

Vista Switchgear Rating, kV			Dc Cable Test Voltage, kV	Dc Cable Thumping Voltage, kV <sup>①</sup>
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 voltage doubling will occur at the open end of the cable, which is assumed to be a unit of Vista 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

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.

#### **WARNING**

The VLF ac withstand capability of the switchgear may be reduced due to aging, damage, gas leakage, 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.**

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 3 on page 75. Exceeding the test voltages can cause a flashover of the isolating gap or phase-to-phase insulation of the switchgear. **This can lead to a power-frequency fault in the gear or the VLF test source, and result in severe personal injury or death.**

#### **WARNING**

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

VLF cable testing may subject the Vista Underground Distribution Switchgear to the ac test voltage when the cables are attached to the switchgear. S&C recommends the Vista switchgear be completely de-energized and disconnected from all power sources when performing VLF cable testing. Before proceeding with the VLF cable testing, verify that the Vista switchgear insulating gas pressure gauge is in the green zone.

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

The VLF sinusoidal waveform test voltages applied to the Vista switchgear must not exceed the voltages listed in Table 3.

**Table 3. Low-Frequency Cable Testing**

Vista Switchgear Very Low Frequency (0.01 to 1 Hz) Sinusoidal Waveform Maximum Test Voltages <sup>①</sup> <sup>②</sup>				
Vista Switchgear System Class, kV	Acceptance Test (phase to ground)		Maintenance Test (phase to ground)	
	kV, RMS	kV, Peak	kV, RMS	kV, Peak
15.5	21	30	16	22
27	32	45	24	34
38	44	62	33	47

<sup>①</sup> Per IEEE Std. 400.2. The most commonly used, commercially available VLF test set frequency is 0.1 Hz.

<sup>②</sup> Do not exceed the test voltage recommended by the cable manufacturer.

### Fault-Interrupter Testing

When performing dielectrical tests on Vista 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.

### Resistance Measurement

#### **⚠ DANGER**

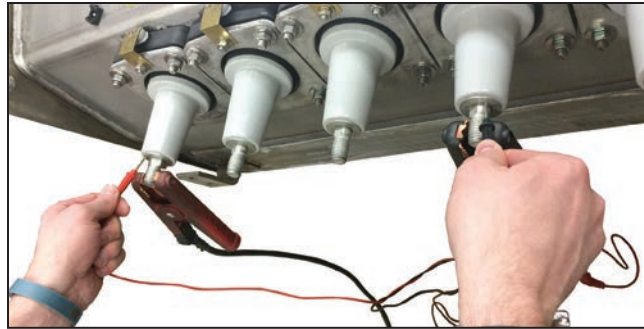
De-energize the Vista Underground Distribution Switchgear before performing the resistance measurements described in this procedure. Follow all applicable safety procedures. **Failure to de-energize the Vista Underground Distribution Switchgear before taking resistance measurements can result in serious 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 134. In this example the resistance is being taken between Way 1 Phase A and Way 2 Phase A.



**Figure 134. Connecting the resistance measuring device.●**

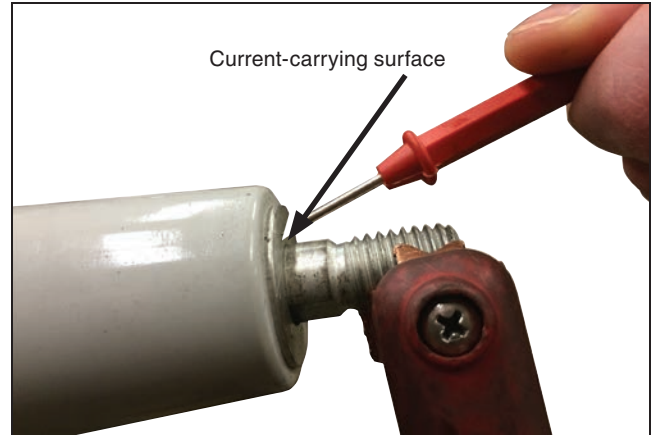
- Resistance measurements shown without safety gloves. Please adhere to your company's standards in regards to using hand PPE when taking resistance measurements.

**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 135.

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. If using clamp-style probes, slide the clamp all the way up against the current-carrying face to get a good connection. See Figure 135.

- STEP 2.** Record the resistance measurement. Acceptable resistance values are:
- Less than 500 microohms
  - Less than 600 microohms for tie switches



**Figure 135. Take the measurement from the flat current-carrying surface of the bushing.●**

● Resistance measurements shown without safety gloves. Please adhere to your company's standards in regards to using hand PPE when taking resistance measurements.

### Pad-Mounted Style Remote Supervisory Vista Switchgear

Vista switchgear tanks are designed to be either in a pad-mounted enclosure, vault, or UnderCover™ Style application. Pad-mounted remote supervisory Vista switchgear can be stored outdoors on its shipping skid until installation. The tank should remain as shipped, i.e. inside the pad-mount enclosure. (See the “Low-Voltage Enclosures (LVE)” section for long-term storage information for the low-voltage enclosure.)

### UnderCover and Vault-Style Remote Supervisory Vista Switchgear

Remote supervisory Vista switchgear tanks for UnderCover Style and vault applications are designed to be placed underground in a vault, basement, or indoor electrical room. S&C highly recommends providing coverage for long-term storage of uninstalled units.

For long-term outdoor storage of the tank, S&C highly recommends using an ultraviolet (UV)-protection canopy to protect cabling and other UV-sensitive components. S&C offers a UV-protection canopy for Vista switchgear tanks in two sizes. See Table 4.

**Table 4. Vista Switchgear UV-Protection Canopies**

Product	Canopy Size	Catalog Number
UV protection canopy	Vista switchgear (4-way–6 way)	CUA-9514-1
	Vista switchgear (4-way–6 way)	CUA-9514-1

### Low-Voltage Enclosures (LVE)

Low-voltage enclosures contain the remote supervisory control components. The LVE includes a wiring harness used to connect the LVE to key components inside and outside of the Vista switchgear tank. When installed, control power is needed to provide power to options such as space heaters, fans, and humidity control.

Based on the ambient environment, to prevent damage to the wiring harness and condensation inside an uninstalled LVE, S&C advises storing a spare or uninstalled LVE indoors. Special care must be taken to prevent damage to the wiring-harness cabling and connectors when handling and storing LVEs.