Installation

This green leaf icon designates information specifically for Vista® Green Underground Distribution Switchgear that uses a CO_2 mix insulating gas. Unless otherwise designated, instructions provided apply to all manual Vista switchgear products.

Table of Contents

Introduction **2**
- Qualified Persons 2
- Read this Instruction Sheet 2
- Retain this Instruction Sheet 3
- Proper Application 3

Safety Information **4**
- Understanding Safety-Alert Messages 4
- Following Safety Instructions 4
- Replacement Instructions and Labels 4
- Location of Safety Labels 5

Safety Precautions **6**

Shipping and Handling **7**
- Packing 7
- Inspection 7
- Handling 8

Installation—Pad-Mounted Style **10**
- Enclosure Removal 10
- Tank Placement 12
- Units with Base Spacers 13
- Cable Terminations 14
- Enclosure Placement 15
- Grounding 16
- Current Sensors 18
- Fault Indicators 20
- Low-Voltage Compartment Wiring 21
- Motor Operator Installation 25
- Initial Testing of Motor Operators and Controls 26
- Setting Up the Gear for Operation 28
- Completing the Installation 29

Installation—Dry-Vault Mounted Style **30**
- Tank Placement 30
- Cable Terminations 31
- Low-Voltage Enclosure Placement 32
- Grounding 32
- Fault Indicators 32
- Current Sensors 33
- Low-Voltage Enclosure Wiring 35
- Motor Operator Installation 38
- Initial Testing of Motor Operators and Controls 39
- Setting Up the Gear for Operation 41

Installation—Wet-Vault Mounted Style **42**
- Tank Placement 42
- Cable Terminations 43
- Low-Voltage Enclosure Placement 44
- Grounding 44
- Fault Indicators 44
- Current Sensors 45
- Low-Voltage Enclosure Wiring 47
- Motor Operator Installation 50
- Initial Testing of Motor Operators and Controls 51
- Setting Up the Gear for Operation 53

Installation—UnderCover™ Style **54**
- Tank Placement 54
- Cable Terminations 55
- Low-Voltage Enclosure Placement 56
- Grounding 56
- Current Sensors 57
- Low-Voltage Enclosure Wiring 59
- Motor Operator Installation 62
- Initial Testing of Motor Operators and Controls 63
- Setting Up the Gear for Operation 64

Gas-Pressure Gauge **65**
- Understanding the Gas-Pressure Gauge 65
- Gauge Needle Fluctuations from Rapid Ambient Temperature Changes 66

Dielectric Testing **67**
- Routine Switchgear Testing 67
- DC Cable Testing and Fault Locating 67
- Very Low Frequency (VLF) Cable Testing 68
- Fault-Interrupter Testing 70
- Resistance Measurement 70

Long-Term Storage **72**
- Pad-Mounted Style Remote Supervisory Vista Switchgear 72
- UnderCover and Vault-Style Remote Supervisory Vista Switchgear 72
- Low-Voltage Enclosures (LVE) 72

© S&C Electric Company 1999–2026, all rights reserved

Qualified Persons

⚠ WARNING

Only qualified persons knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone trained and competent in:

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

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

Read this Instruction Sheet

NOTICE

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing or operating the remote supervisory Vista Underground Distribution Switchgear. Become familiar with the "Safety Information" section on pages 4 through 5 and "Safety Precautions" section on page 6. The latest version of this publication is available online in PDF format at **sandc.com/en/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/contact-us/product-literature/**.

Proper Application

⚠ WARNING

The equipment in this publication is only intended for a specific application. The application must be within the ratings furnished for the equipment. Ratings for the remote supervisory Vista Underground Distribution Switchgear are listed in the ratings table in 682-31. The ratings are also on the nameplate affixed to the product.

● Orders shipped prior to October/November 2023 may use a different battery charger than the present TA-3409 model. Contact S&C technical support if there are any questions.

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,** or call the S&C Technical Assistance Center at 1-888-762-1100.

NOTICE

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

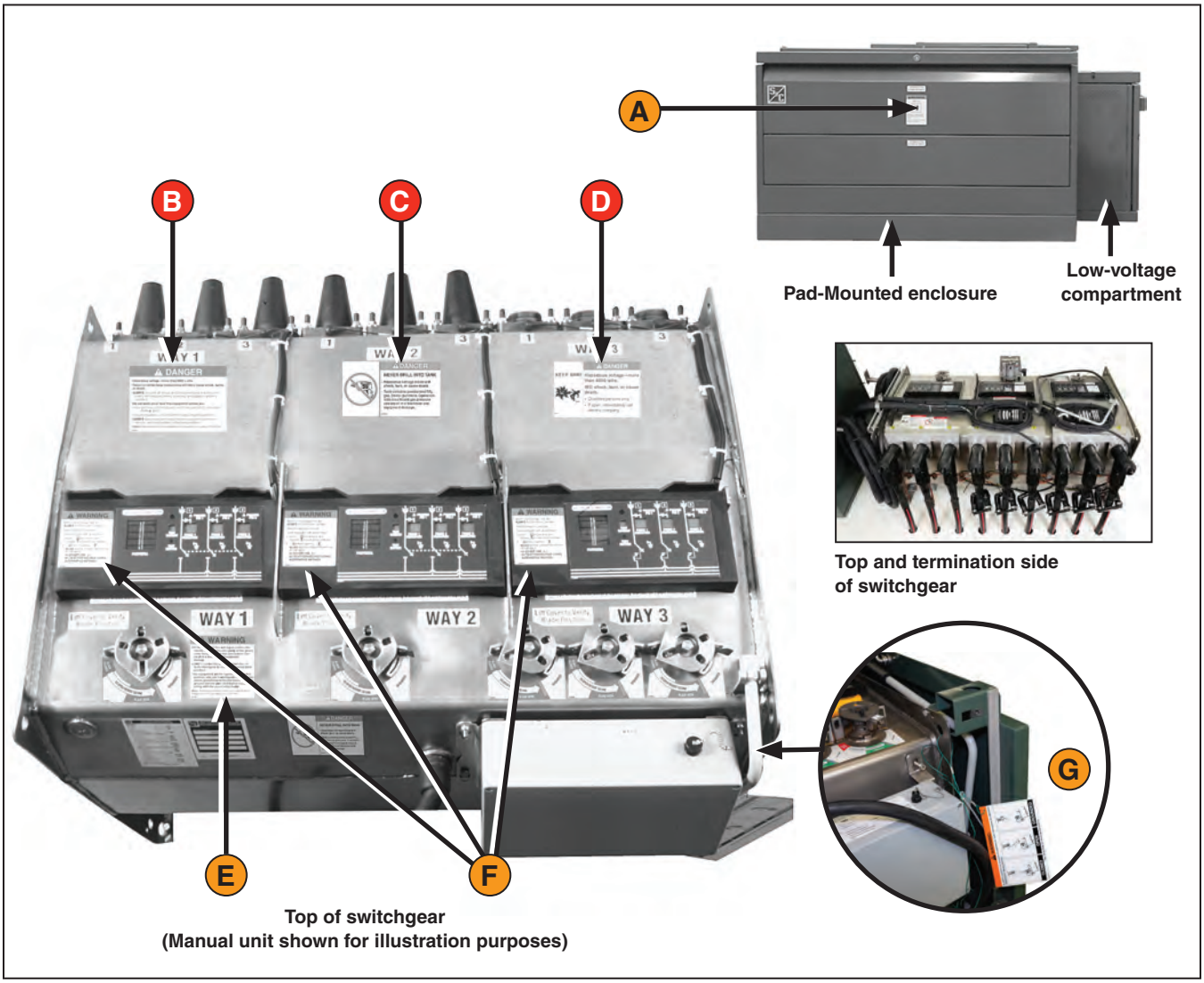


Replacement Instructions and Labels

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

⚠ DANGER



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

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

1. **QUALIFIED PERSONS.** Access to 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 that are to be inspected, replaced, serviced, or repaired.
11. **LOAD-INTERRUPTER SWITCH OR FAULT-INTERRUPTER POSITION.**
    - Always confirm the **Ground/Open/Closed** position of the load-interrupter switch or fault interrupter by visually observing the position of the isolating disconnect.
    - Be aware that the load-interrupter switch or fault interrupter may be energized by backfeed.
    - Be aware that 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 Vista switchgear consists of the gas-tight tank (SF_6) or hermetically sealed tank (CO_2-mix) 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.

Vault-mounted and UnderCover™ style switchgear consists of the tank and the low-voltage enclosure. Each is fastened to its own wooden skid and the tank is crated. 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 shipping temporary grounding leads. Optional current sensors are shipped attached to the gear by the required wiring.

UnderCover Style and vault-mounted style Vista Underground Distribution Switchgear are shipped in a wooden crate. 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 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 or 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.

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.

NOTICE

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

⚠ 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 page 10 and page 11.

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

STEP 1. Remove and retain the anchor brackets tie wrapped to the enclosure or tank grounding pad. Use 6-foot (183-cm) or longer hoist slings of equal length to prevent damage to the enclosure or tank during lifting. (Four-foot (122-cm) hoist slings are acceptable for two-way and three-way enclosures and tanks.) See Figure 1, Figure 2, Figure 3 on this page and Figure 4, Figure 5, and Figure 6 on page 9.

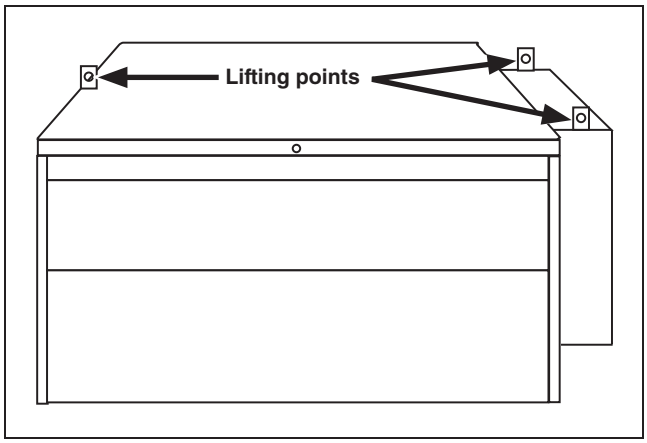


Figure 1. The enclosure for pad-mounted style.

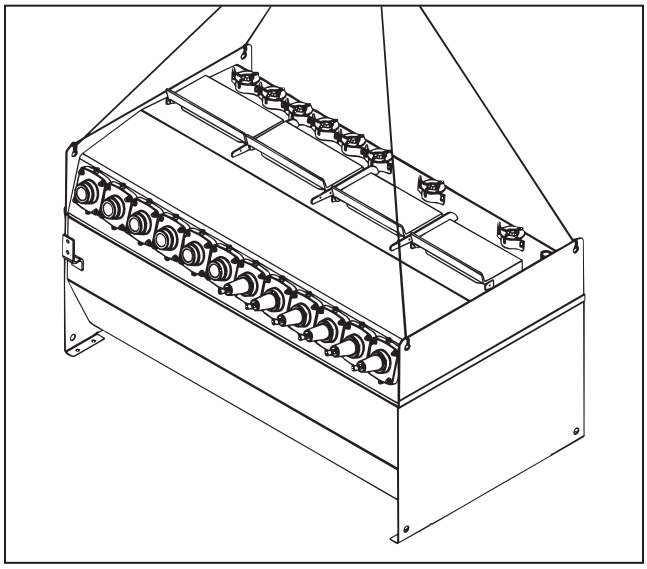


Figure 2. A properly slung tank for the typical pad-mounted and UnderCover style.

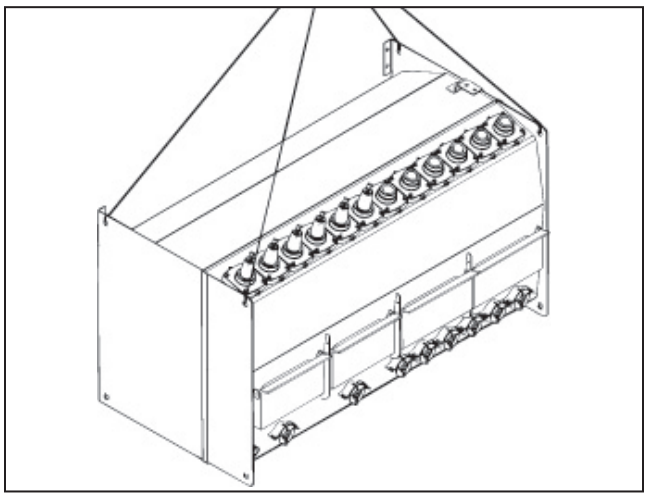


Figure 3. A properly slung tank for the typical vault-mounted style.

STEP 2. Arrange the hoist slings so the lifting forces are equally distributed between the lifting tabs.

STEP 3. Lift the tank or enclosure into position per the appropriate installation section. Avoid sudden starts and stops.

NOTICE

The low-voltage enclosure is not submersible. For vault-mounted and UnderCover styles the enclosure should be mounted above ground or in a dry location.



Figure 4. A properly slung low-voltage enclosure for dry-vault mounted style switchgear.



Figure 5. A properly slung low-voltage enclosure for wet-vault-mounted style Vista switchgear.



Figure 6. A properly slung low-voltage enclosure for UnderCover Style switchgear.

Enclosure Removal

NOTICE

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 or equipment damage may result.

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 7.

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. See Figure 12 on page 13.

STEP 3. Lift the hinged roofs upward and secure them with the holders. See Figure 8.

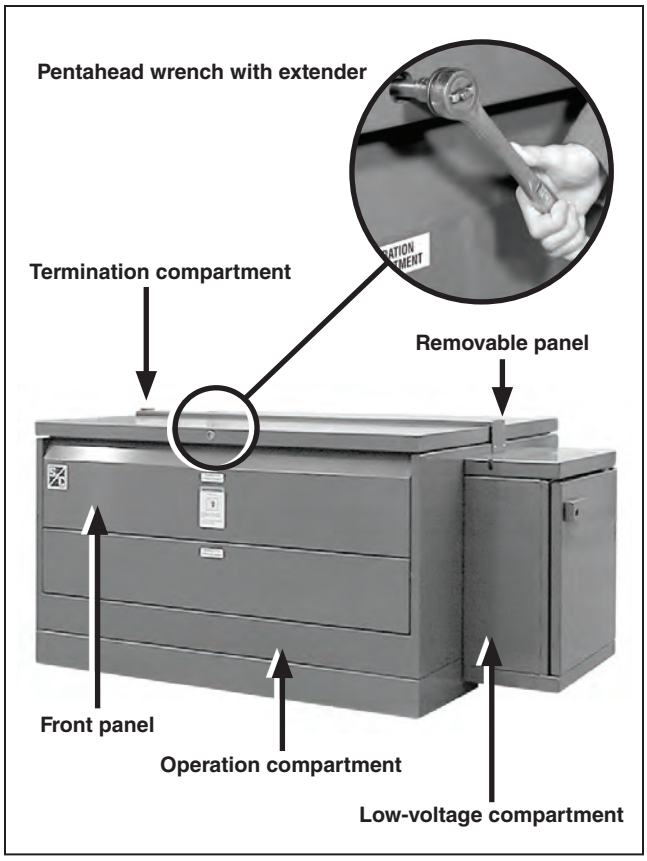


Figure 7. A pad-mounted Vista switchgear enclosure with the roofs closed.



Figure 8. A pad-mounted Vista switchgear enclosure with the roofs open.

STEP 4. Remove the removable panel from the operation compartment and the upper removable panel from the termination compartment by loosening the fasteners securing the panels in place and lifting the panels upward. Set the panels aside in a safe, clean place. See Figure 9.

It is important to keep track of which side of the enclosure is the termination side and which side is the operation side after the panels are removed. The operation side has the larger opening and uses the larger panel.

STEP 5. Unbolt the enclosure from the skid.

STEP 6. Before lifting the enclosure, close the hinged roofs. Make sure the low-voltage compartment door is closed.

STEP 7. Remove the enclosure, observing the precautions given under the "Handling" section on page 8 Use a three-point lifting scheme to properly balance the enclosure. See Figure 10.

STEP 8. Set the enclosure aside in a protected area.

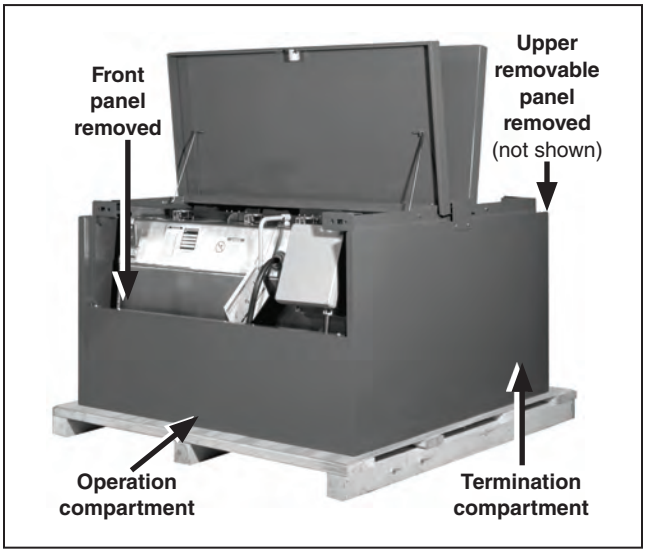


Figure 9. Remove the front panel and upper front panel. (Manual model shown for illustration purposes.)

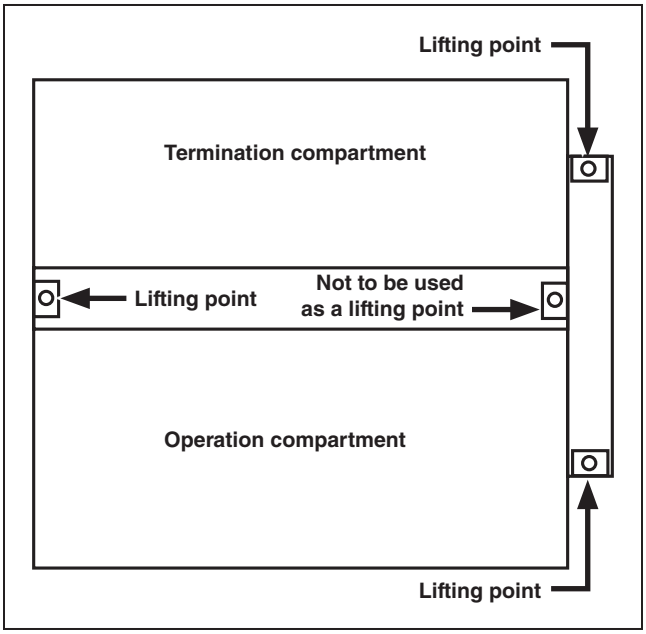


Figure 10. A top view of pad-mounted style switchgear, displaying three-point lifting.

Tank Placement

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

STEP 1. Remove any packing or foam from around the viewing window and check the gas-pressure gauge to make sure it is in the Green zone. Contact S&C Electric Company if the gas-pressure gauge is not in the Green zone. See the "Gas-Pressure Gauge" section on page 65 for more information.

STEP 2. Unbolt the tank from the skid and lift it above the mounting pad, observing the precautions given in the "Handling" section on page 8. See Figure 11. 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 16 on page 15.

NOTICE

Be sure to prevent any damage to the termination bushings or bushing wells. **Failure to comply with damage prevention will result in the tank needing to be returned to the factory for repair.**

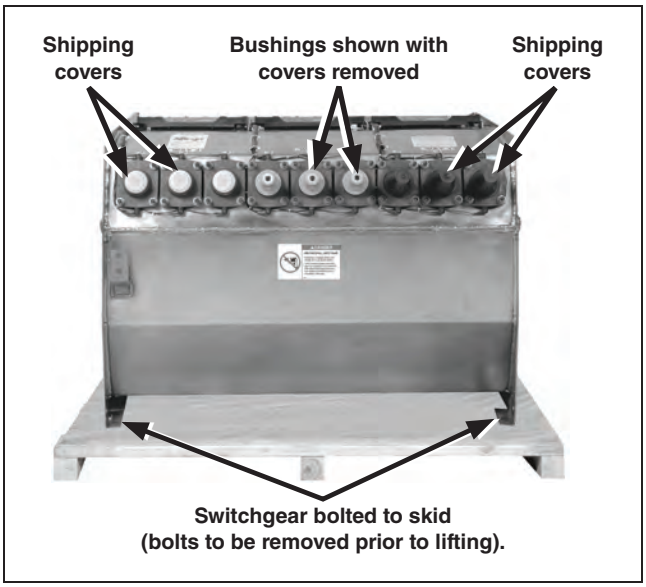


Figure 11. A Vista switchgear tank bolted to a skid for shipment (Manual unit shown for illustration purposes.)

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 Figure 12 and Figure 13.



Figure 12. A pad-mounted style high-voltage enclosure being removed from the base spacer.

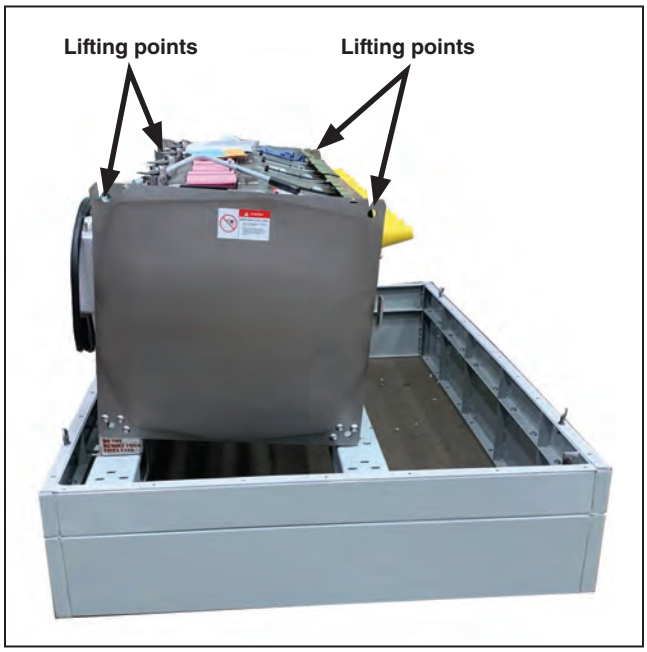


Figure 13. A pad-mounted Vista switchgear tank attached to the support rails of the base spacer for lifting as one unit.

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.

⚠ 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.

Complete the following steps for terminating cables:

STEP 1. Remove the shipping covers from the bushings and bushing wells. See Figure 14.

STEP 2. Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 15.

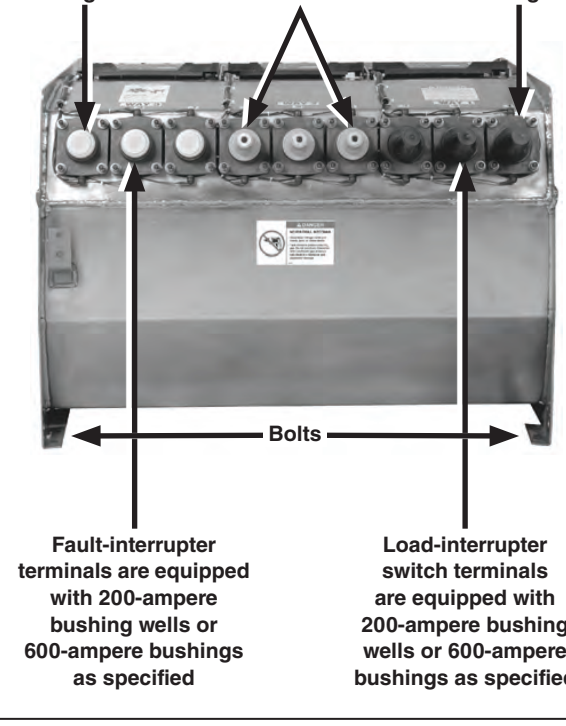


Figure 14. The switchgear tank, as shipped. (Illustration excludes typical cabling and motor operator provisions to emphasize the location of shipping covers and bolts.)

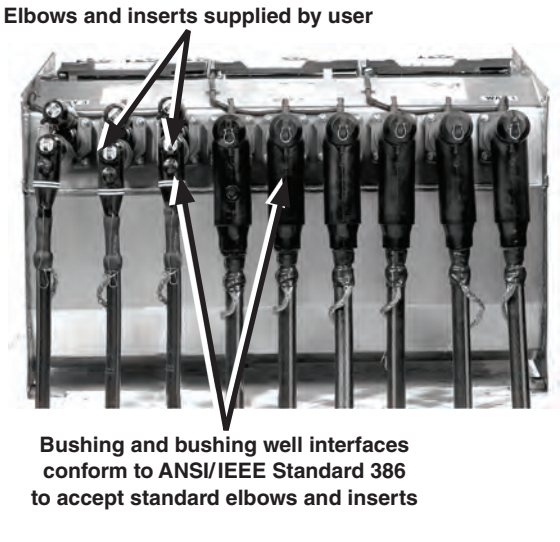


Figure 15. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)

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.

Complete 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 16.

NOTICE

Carefully follow the catalog drawing during enclosure placement. The position of the enclosure on the skid should not be used as a guide for placing the enclosure on the pad.

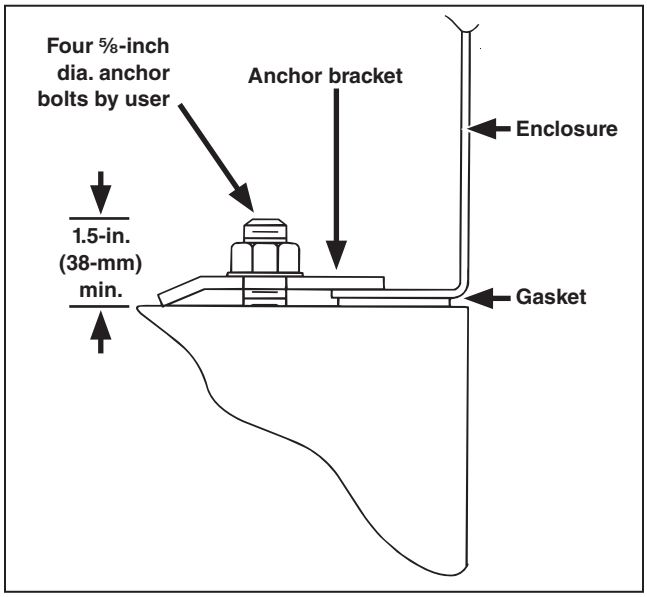


Figure 16. A proper anchor-bracket placement.

Grounding

Complete 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 of the tank and 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 Figure 17, Figure 18, and Figure 19 on page 17.

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.

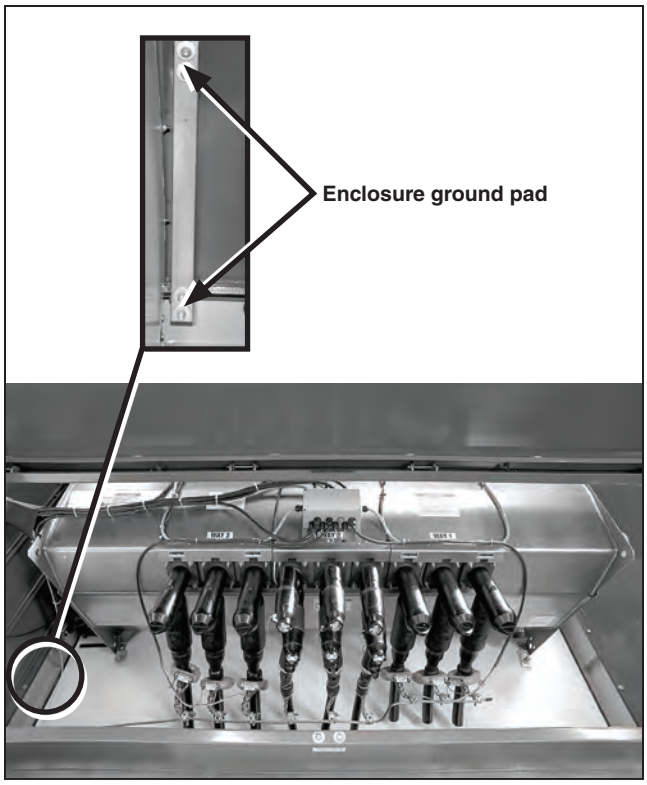


Figure 17. The pad-mounted enclosure ground pad orientation.

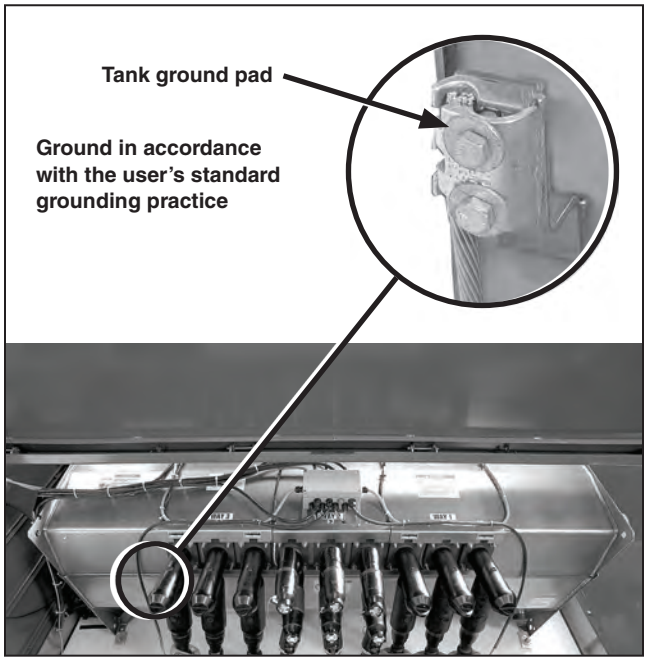


Figure 18. Use of the pad-mounted enclosure ground pad.

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.

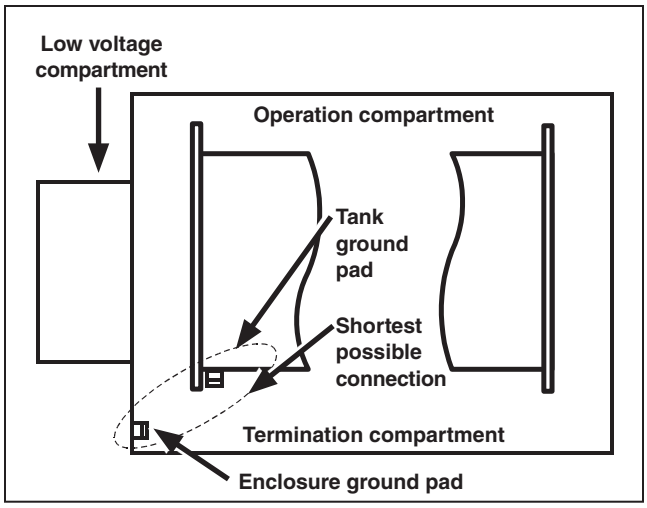


Figure 19. The tank and enclosure ground pads.

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, complete 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 20.

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.

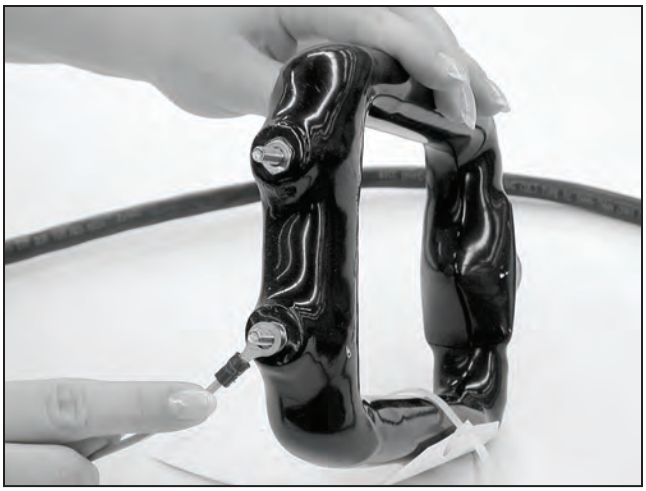


Figure 20. Attach current sensors to required wiring.

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 21.

(b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 22.

STEP 8. Install the set's two other current sensors by repeating Step 5 through Step 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 21. A current sensor placed around the cable's grounded concentric neutral.



Figure 22. 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 23.

If mounting provisions are specified, mount the fault indicators on the mounting brackets and attach the associated sensors to the cables below the cable terminations. See Figure 24.

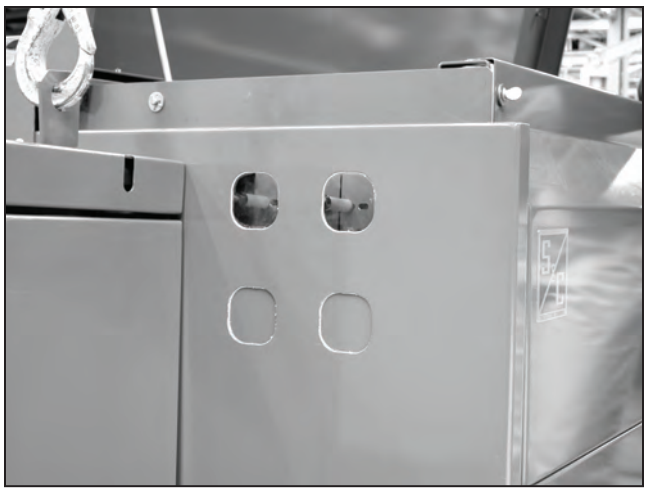


Figure 23. The mounting provisions for user-furnished fault indicators.



Figure 24. The mounting brackets for user-furnished fault indicators.

Low-Voltage Compartment Wiring

NOTICE

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

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

STEP 1. Uncoil the junction box main cables that will be routed to the low-voltage compartment. See Figure 25. 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:

(a) Insert the three-inch PVC pipe through each access port. See Figure 26. Make sure equal lengths of pipe show in the low-voltage compartment and in the pad-mounted enclosure.

(b) 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 27.

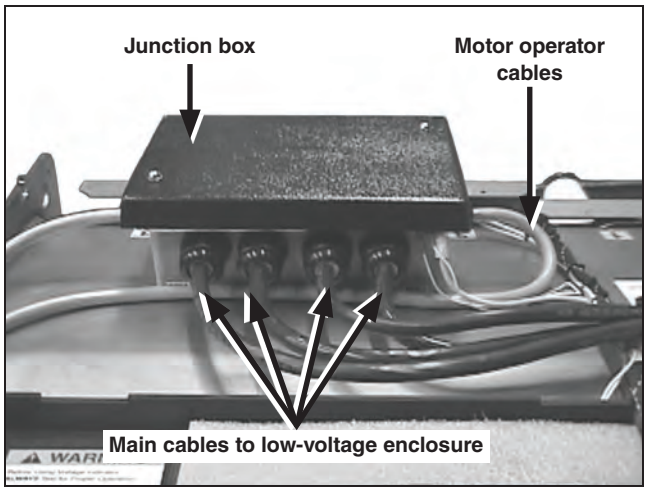


Figure 25. The junction box wiring.

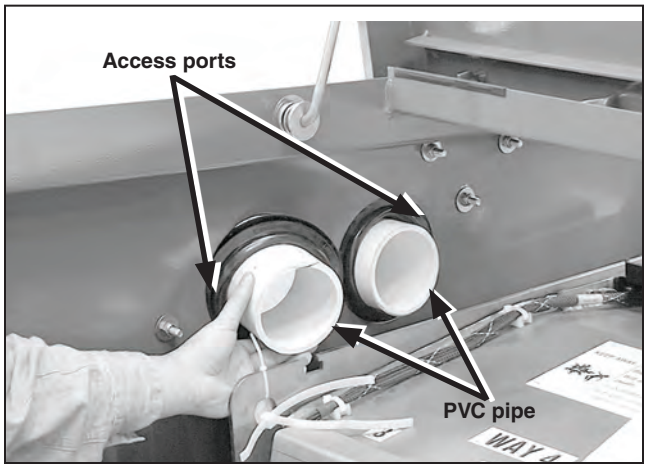


Figure 26. The PVC pipes inserted through the access ports.

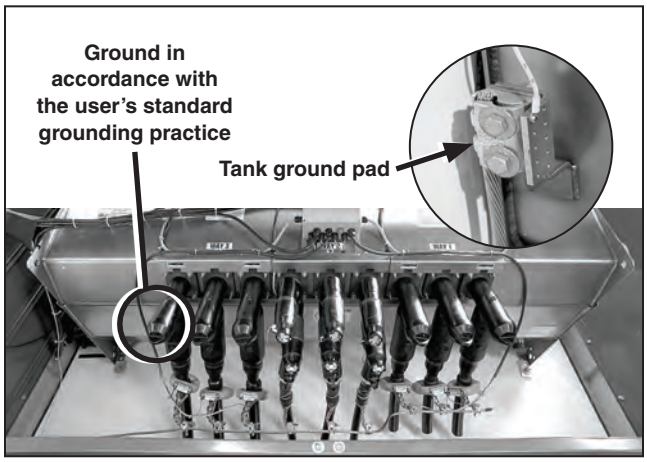


Figure 27. The ground wire G1 attached to the tank.

(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 28. 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 28. 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 29. Then, route the larger main cables through the PVC pipe: attach connectors to the Vista switchgear rack backplane board using the drawings provided. See Figure 30 and Figure 31 on page 23.

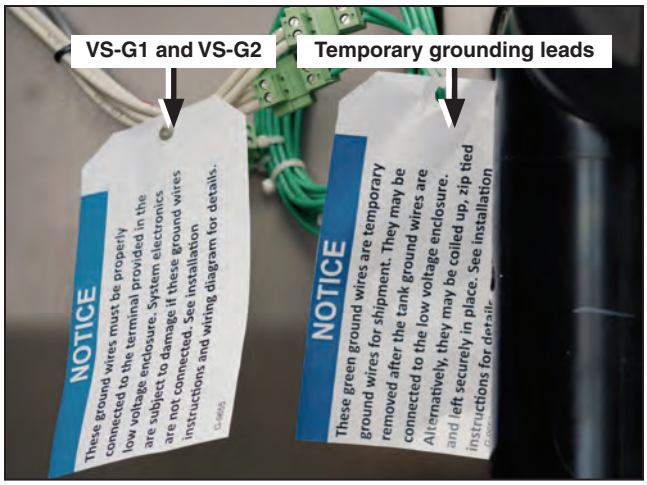


Figure 28. The Notice tags for temporary grounding leads and VS-G1 and VS-G2 ground wires.

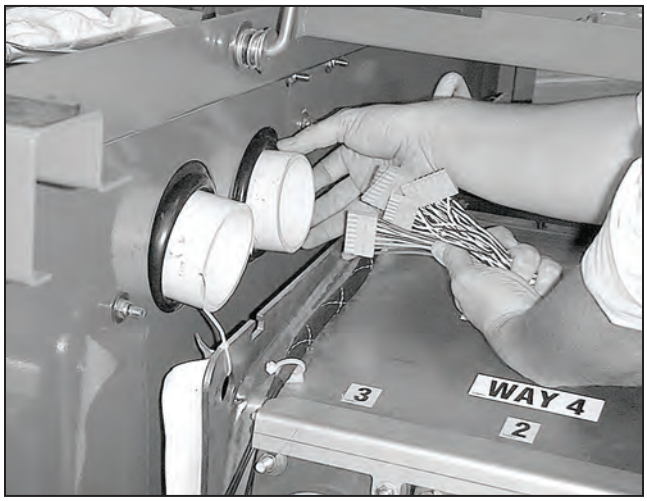


Figure 29. The cables being inserted through the PVC pipes.

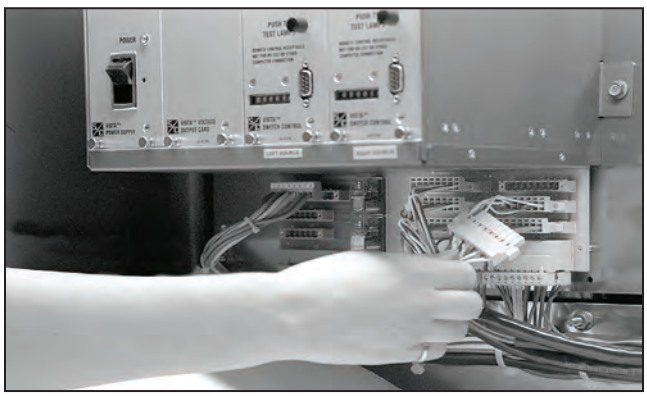


Figure 30. The connectors being attached to the Vista switchgear Rack Backplane Board.

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 Figure 31. An example of a conductor pin that is backed out is shown in connection 5 in Figure 32.

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 33. 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.

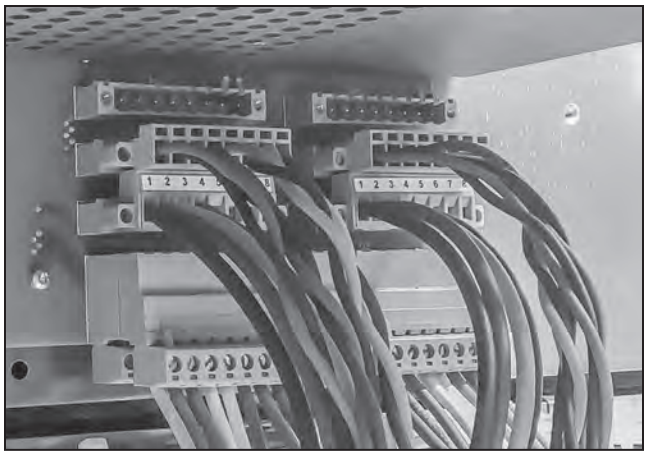


Figure 31. A close-up of the Vista switchgear rack backplane board connectors.

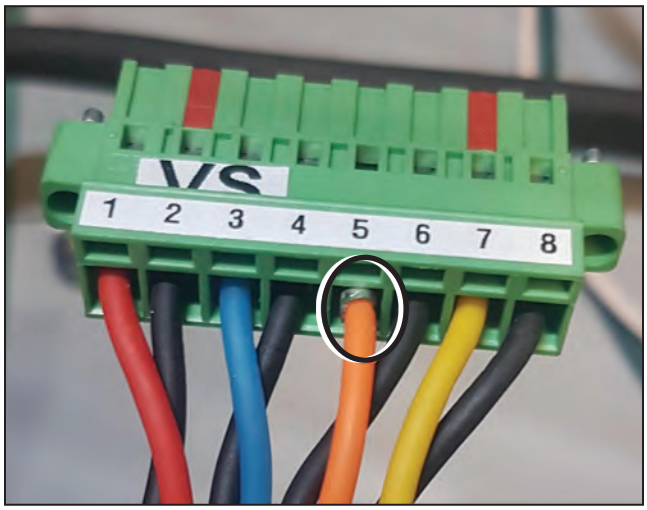


Figure 32. An example of an improper connection that is backed out.

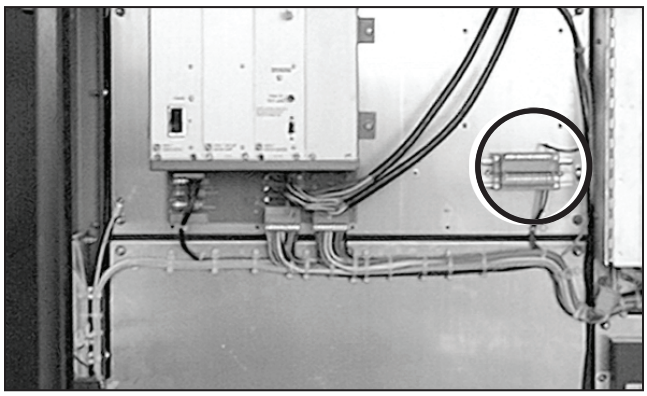


Figure 33. The ground wires attached to the terminal block.

(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 34.

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 35.

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.

⚠ WARNING

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. **Failure to follow these instructions may result in serious personal injury or equipment damage.**

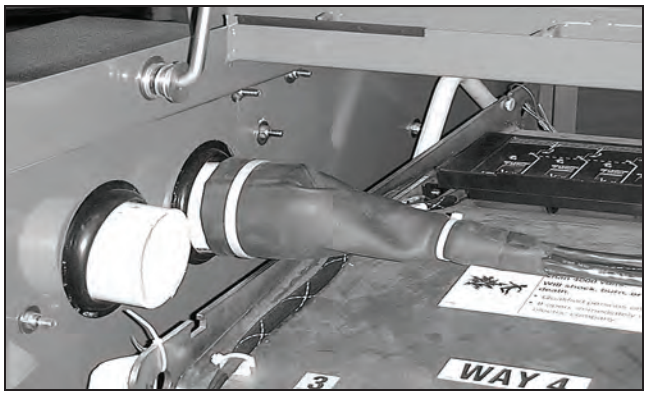


Figure 34. The tubing and cable bundle secured with tie wraps.

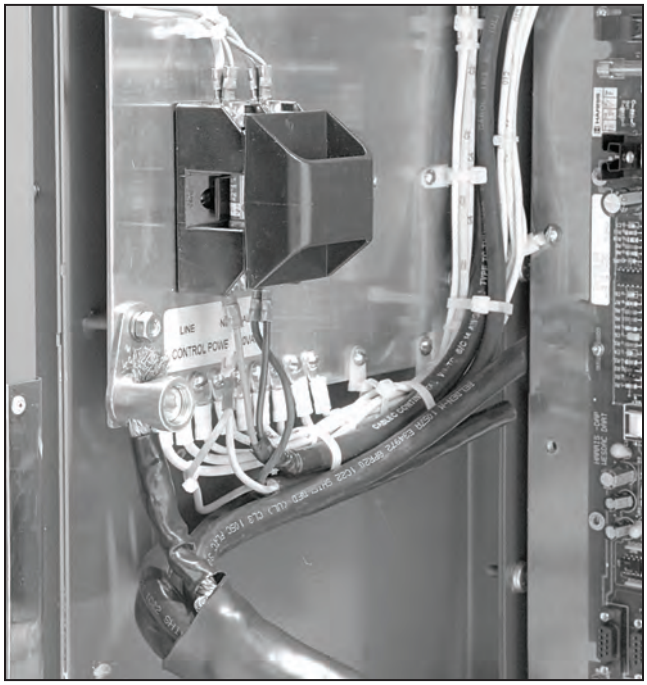


Figure 35. The fuse block.

Motor Operator Installation

Complete 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 36.

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 37.

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 38.

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 39.



Figure 36. Placing the motor operator over the operating shaft on the gear.

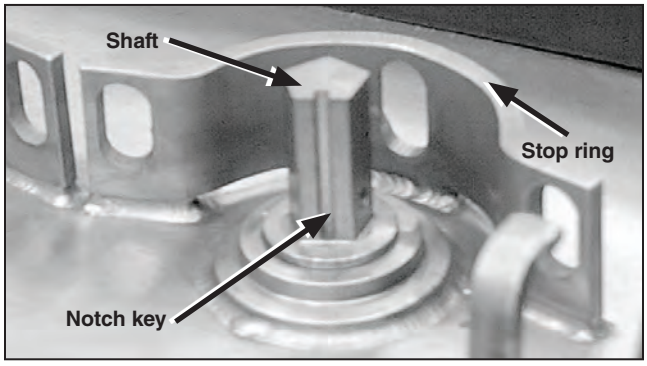


Figure 37. The shaft notch key.

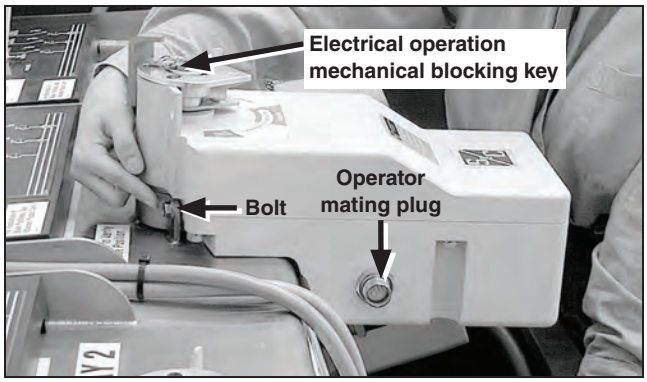


Figure 38. The motor operator installed on the operating shaft.



Figure 39. 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 40. 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. See Figure 41 and Figure 42. If equipped with a 6800 Series Automatic Switch Control, the Vista switchgear 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 40.

NOTICE

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

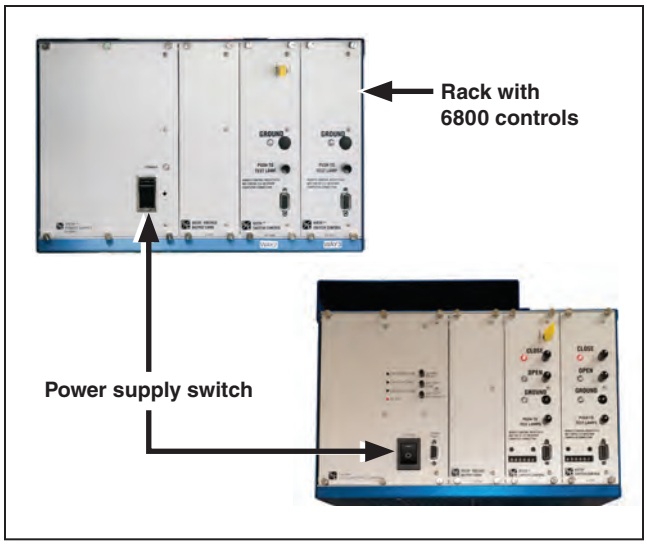


Figure 40. There are two Vista switchgear rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; the other has only a GROUND indicator and is used with a 6800 Series Automatic Switch Control.

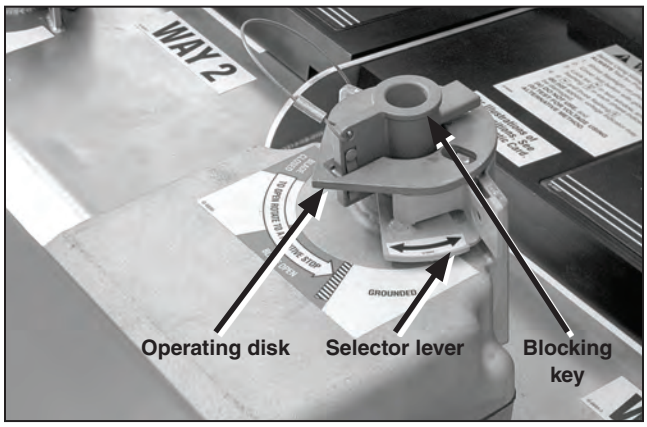


Figure 41. The OPEN position indication on the motor operator.

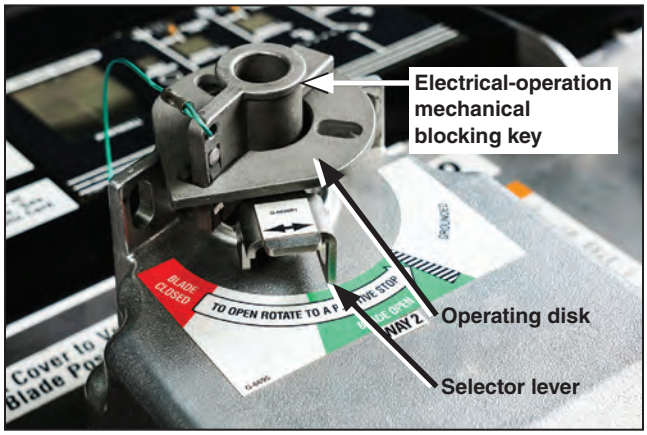


Figure 42. The CLOSE indication on motor control board matches motor operator position.

STEP 3. Verify all LEDs are functional by pressing the PUSH TO TEST LAMPS button on each control board. See Figure 43.

STEP 4. Perform the following operations using the control board buttons as shown in Figure 43:

See Figure 41 and Figure 42 on page 26. 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 44.

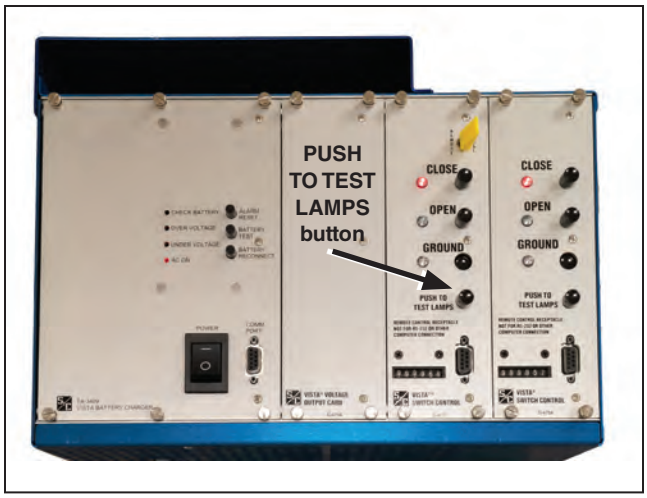


Figure 43. The PUSH TO TEST LAMPS button on the control board.



Figure 44. 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 44 on page 27.

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 45 for location of motor operator controls.

STEP 3. Follow the battery charger initial set up procedure detailed in S&C instruction sheet 680-540.

Note: If this set up procedure is not performed, the batter charger event logs will not have the accurate date and time stamp.



Figure 45. The location of the motor operator controls.

Completing the Installation

NOTICE

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.

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.

Follow these steps to complete the installation:

STEP 1. Caulk around the bottom of the enclosure; a weatherproof silicon-rubber room temperature vulcanizing (RTV) compound is recommended. See Figure 46.

STEP 2. 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.

STEP 3. Reinstall the front and rear panels of the operation and termination compartments.

STEP 4. Lower the hinged roofs and secure them with the pentahead bolts, and then insert a padlock into each hasp.

STEP 5. Lock the low-voltage compartment or enclosure. See Figure 47.

STEP 6. Wipe down the exterior of the enclosure with a clean, damp cloth.

STEP 7. Refinish any scratches or abrasions with S&C touch-up finish and red-oxide primer which are available in aerosol spray cans. See Figure 48. See S&C Specification Bulletin 682-31 for catalog number information used for ordering. No other finish or primer is approved.

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

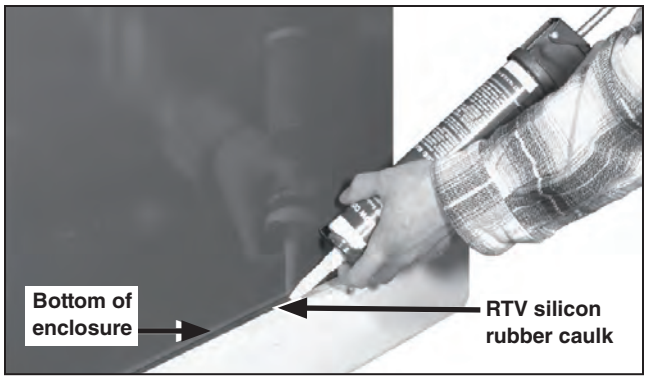


Figure 46. Caulking around the bottom of enclosure.

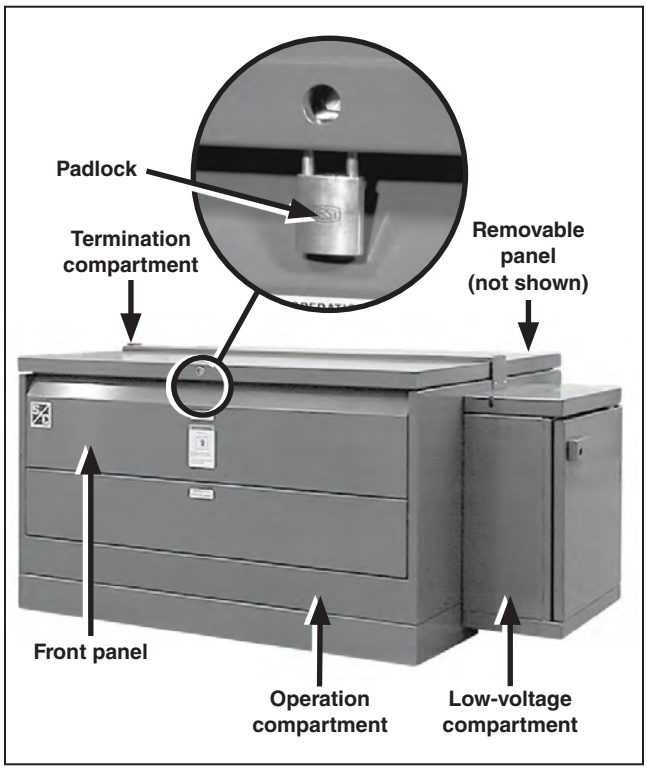


Figure 47. The switchgear secured with a padlock.



Figure 48. S&C red-oxide primer and touch-up finish.

Tank Placement

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

STEP 1. Remove any packing or foam from around the viewing window and check the gas-pressure gauge to make sure it is in the Green zone. Contact S&C Electric Company if the gas-pressure gauge is not in the Green zone. See the "Gas-Pressure Gauge" section on page 65 for more information.

STEP 2. Unbolt the tank from the skid, remove the switchgear from its crate, and lift the gear into place, observing the precautions given in the "Handling" section on page 8. See Figure 3 on page 8 and Figure 49.

STEP 3. Secure the switchgear in place in accordance with the pull box or wall brackets provided by the user.

NOTICE

Be sure to prevent any damage to the termination bushings or bushing wells. **Failure to comply with damage prevention will result in the tank needing to be returned to the factory for repair.**

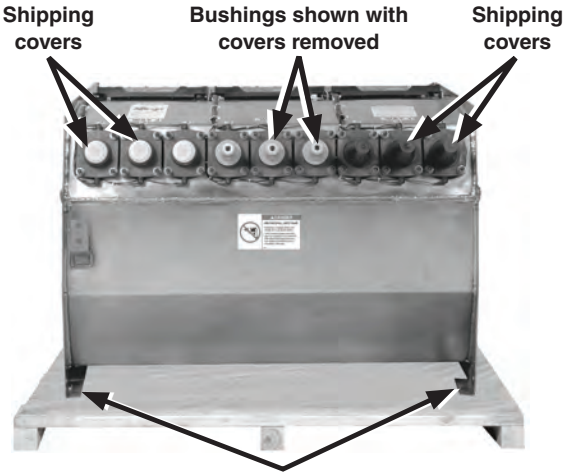


Figure 49. A Vista switchgear tank bolted to a skid for shipment. (Manual unit shown for illustration purposes.)

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.

⚠ 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.

Complete the following steps for terminating cables:

STEP 1. Remove the shipping covers from the bushings and bushing wells. See Figure 50.

STEP 2. Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 51.



Figure 50. A Vista switchgear tank with shipping covers. (Manual unit shown for illustration purposes.)

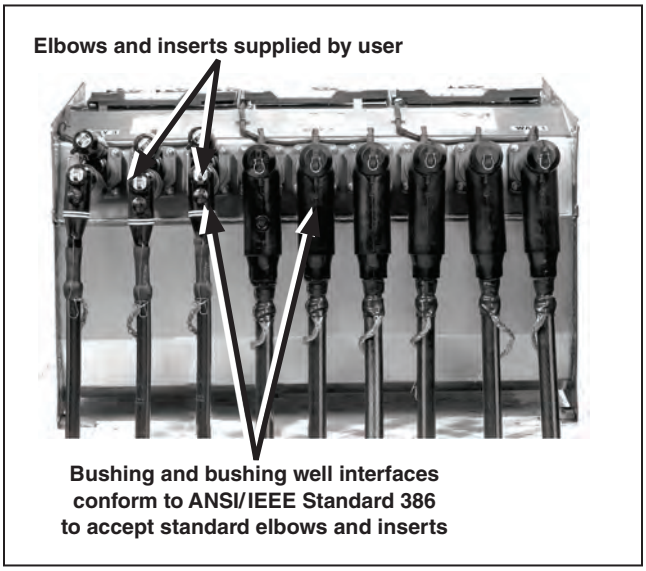


Figure 51. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)

Low-Voltage Enclosure Placement

Complete 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 8.

STEP 2. Use a two-point lifting scheme to properly balance the enclosure. See Figure 4 on page 9.

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

Complete 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 52.

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 53. 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.

Fault Indicators

Fault indicators are to be furnished by the user and installed in accordance with the manufacturer's instructions.

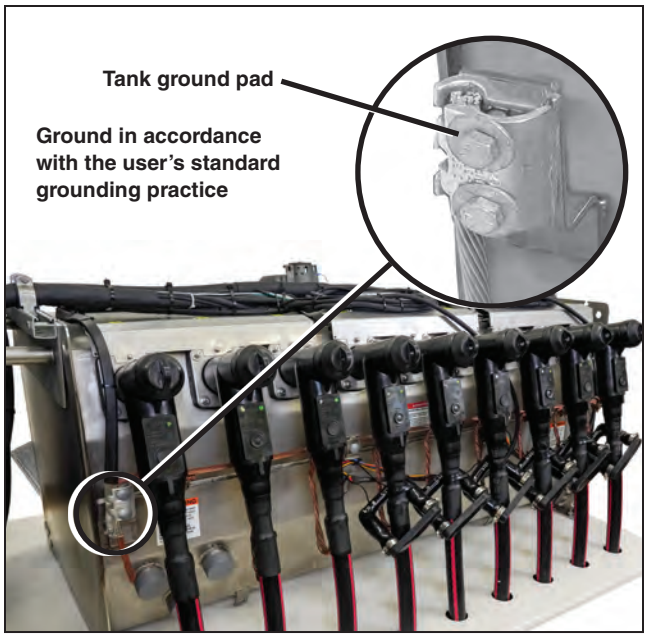


Figure 52. The tank ground pad.



Figure 53. 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, complete 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 54.

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 54. Attach current sensors to required wiring.

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 55.

(b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 56.

STEP 8. Install the set's two other current sensors by repeating Step 5 through Step 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 55. A current sensor placed around the cable's grounded concentric neutral.



Figure 56. A current sensor placed above the 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.

Complete 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 57. 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 58.

(b) Put the holding brackets in the grooved channel of the conduit as shown in Figure 59.

(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 60.

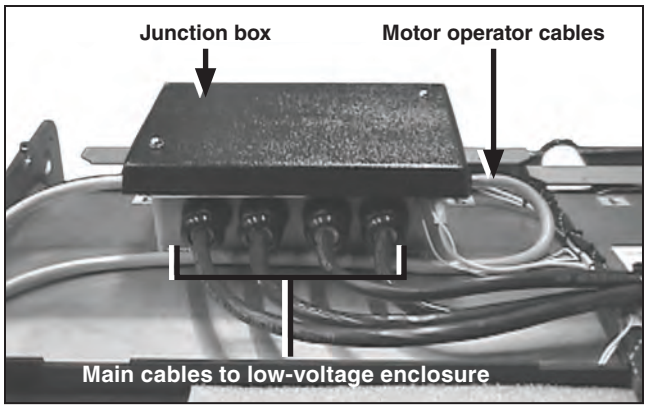


Figure 57. The junction box wiring.



Figure 58. The conduit/tubing bracket assembly kit, shipped with gear.

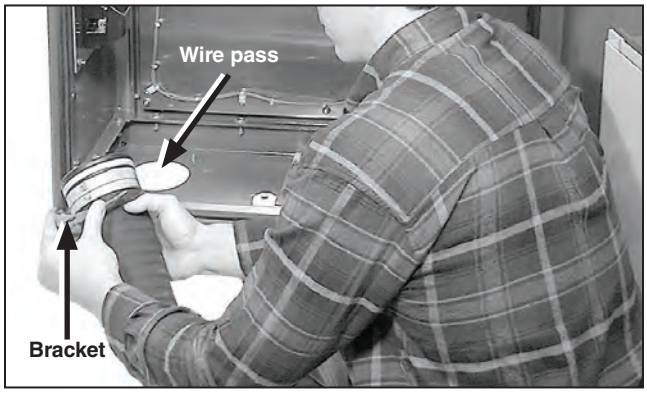


Figure 59. Placing the holding brackets in the grooved channel of the conduit.



Figure 60. Installing and securing 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 61.

(e) Route the cables in the low-voltage enclosure and attach all connectors to the Vista switchgear rack backplane board using the drawings provided. See Figure 62 and Figure 63. **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 64.



Figure 61. Inserting the cables into the low-voltage enclosure via the tubing and conduit.



Figure 62. Attaching the connectors to the backplane board.

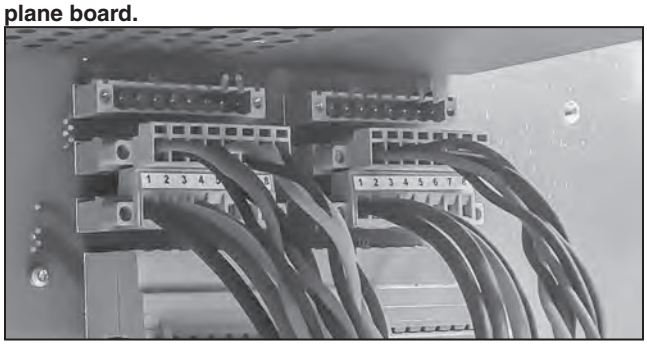


Figure 63. A close-up of the rack backplane board connectors.

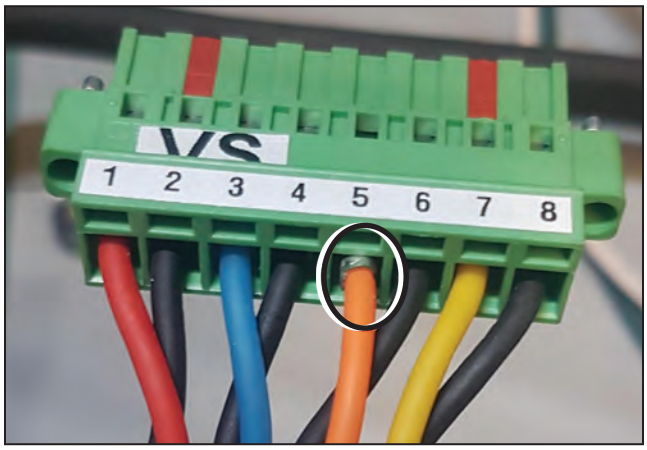


Figure 64. An example of an improper connection that is backed out.

(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 65.

(g) Connect the heavy-shielded cable to the copper lug on the low-voltage enclosure grounding plate. See Figure 66.

(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 66.

⚠ WARNING

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. **Failure to follow these instructions may result in serious personal injury or equipment damage.**

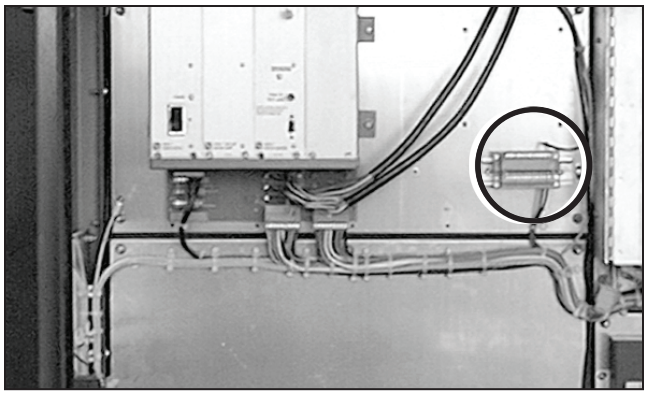


Figure 65. Attaching the ground wires to the terminal block.

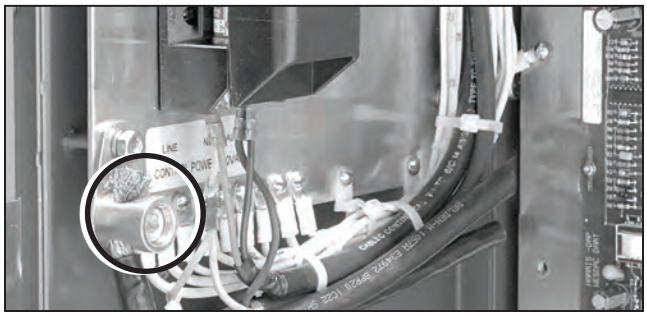


Figure 66. The copper lug and the fuse block.

Motor Operator Installation

Complete 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 67.

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 68.

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 69.

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 70.



Figure 67. Placing the motor operator over the operating shaft on the gear.

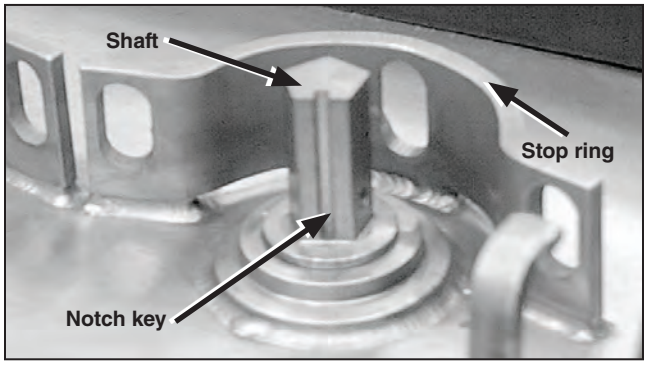


Figure 68. The shaft notch key.

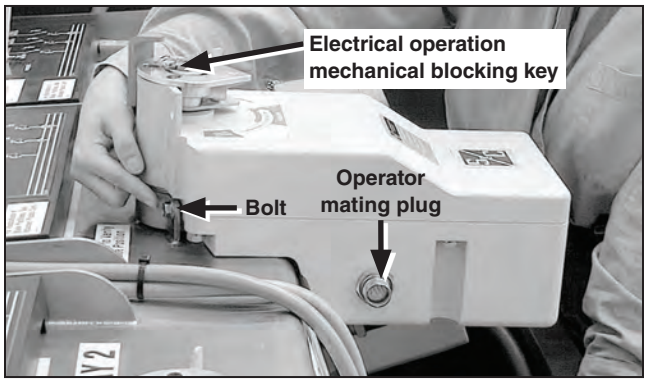


Figure 69. The motor operator installed on the operating shaft.



Figure 70. The mechanical blocking key.

Initial Testing of Motor Operators and Controls

NOTICE

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

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 71. 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 Figure 73 and Figure 74 on page 40. If equipped with a 6800 Series Automatic Switch Control, the Vista switchgear rack will only show the **Ground** status. The **Open** and **Close** status and the operating controls are on the switch control. See Figure 71.

STEP 2. Verify all LEDs are functional by pressing the PUSH TO TEST LAMPS button on each control board. See Figure 72.

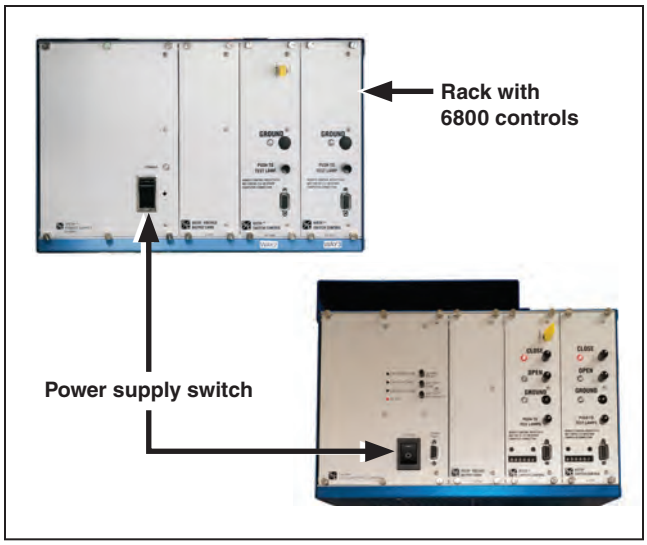


Figure 71. There are two Vista switchgear rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; the other has only a GROUND indicator and is used with a 6800 Series Automatic Switch Control.

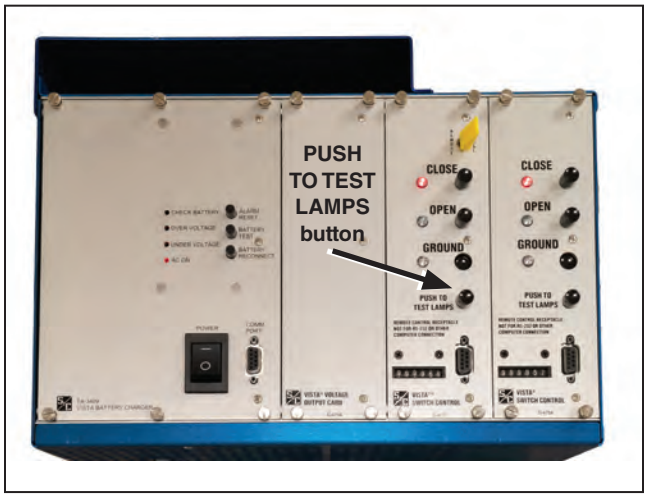


Figure 72. The PUSH TO TEST LAMPS button on the control board.

STEP 3. Perform the following operations using the control board buttons as shown in Figure 73.

Verify the motor operator moves to the desired position among the four noted below and the control board LEDs also indicate the proper position. See Figure 74. (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 75.



Figure 73. The Open indication on the motor control board matches the motor operator position.

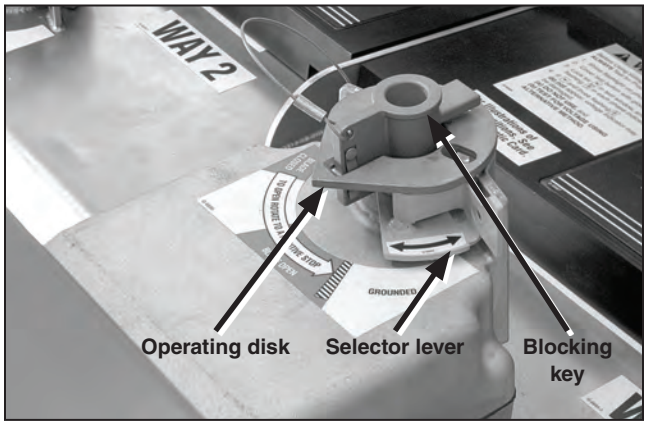


Figure 74. The OPEN position indication on the motor operator.



Figure 75. 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 75 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. Follow the battery charger initial set up procedure detailed in S&C instruction sheet 680-540.

Note: If this set up procedure is not performed, the batter charger event logs will not have the accurate date and time stamp.

STEP 4. Lock the low-voltage enclosure. See Figure 76.



Figure 76. A vault-style low-voltage enclosure shown with a 6802 Automatic Switch Control and provision for communications.

Tank Placement

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

STEP 1. Remove any packing or foam from around the viewing window and check the gas-pressure gauge to make sure it is in the Green zone. Contact S&C Electric Company if the gas-pressure gauge is not in the Green zone. See the "Gas-Pressure Gauge" section on page 65 for more information.

STEP 2. Unbolt the tank from the skid, remove the switchgear from its crate, and lift the gear into place, observing the precautions given in the "Handling" section on page 8. See Figure 3 on page 8 and Figure 77.

STEP 3. Secure the switchgear in place in accordance with the pull box or wall brackets provided by the user.

NOTICE

Be sure to prevent any damage to the termination bushings or bushing wells. **Failure to comply with damage prevention will result in the tank needing to be returned to the factory for repair.**

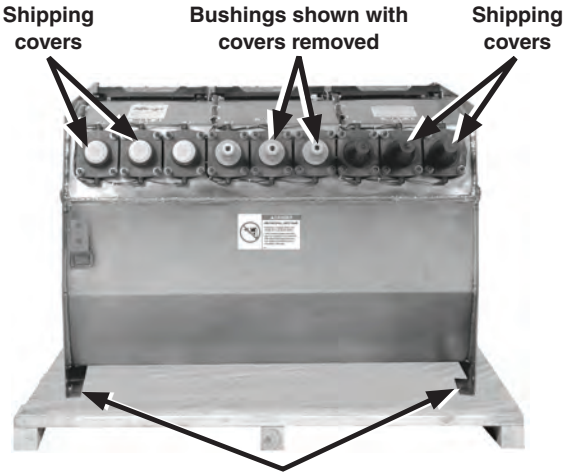


Figure 77. A Vista switchgear tank bolted to a skid in four places for shipment. (Manual unit shown for illustration purposes.)

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.

⚠ 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.

Complete the following steps for terminating cables:

STEP 1. Remove the shipping covers from the bushings and bushing wells. See Figure 78.

STEP 2. Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 79.



Figure 78. A Vista switchgear tank with shipping covers. (Manual unit shown for illustration purposes.)

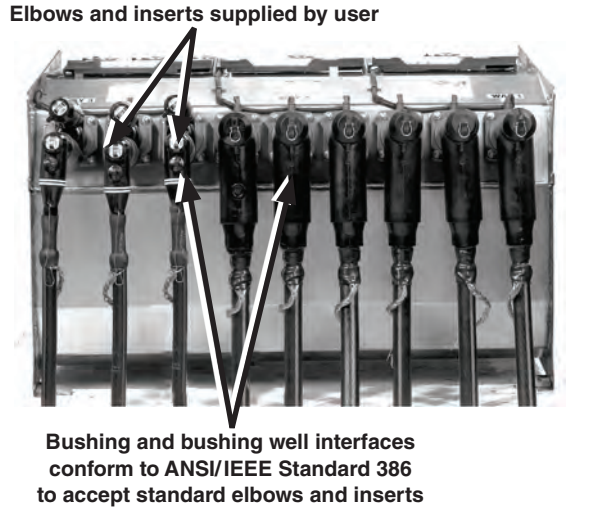


Figure 79. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)

Low-Voltage Enclosure Placement

The standard low-voltage enclosure is not submersible. Complete 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 8.

STEP 2. Use a two-point lifting scheme to properly balance the enclosure. See Figure 5 on page 9.

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

Complete 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 80.

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 80.

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.

STEP 3. 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 81.

Fault Indicators

Fault indicators are to be furnished by the user and installed in accordance with the manufacturer's instructions.

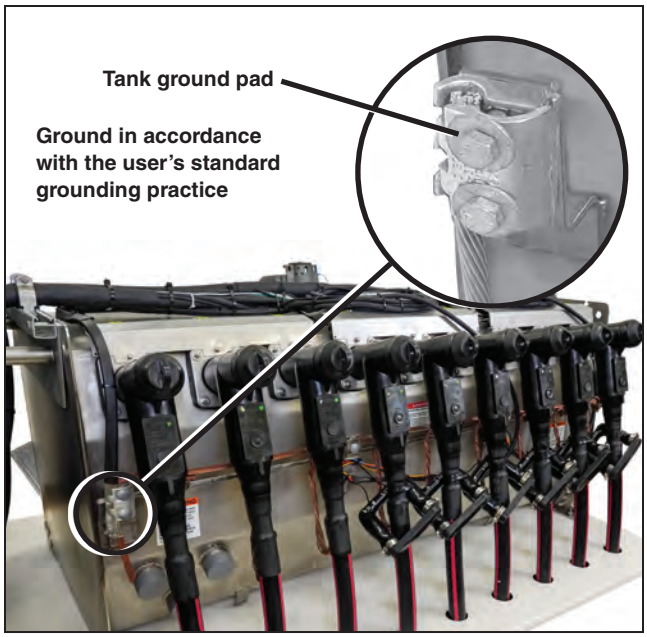


Figure 80. The tank ground pad.



Figure 81. The shielded cable connected to the 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.

Complete 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 82. 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.

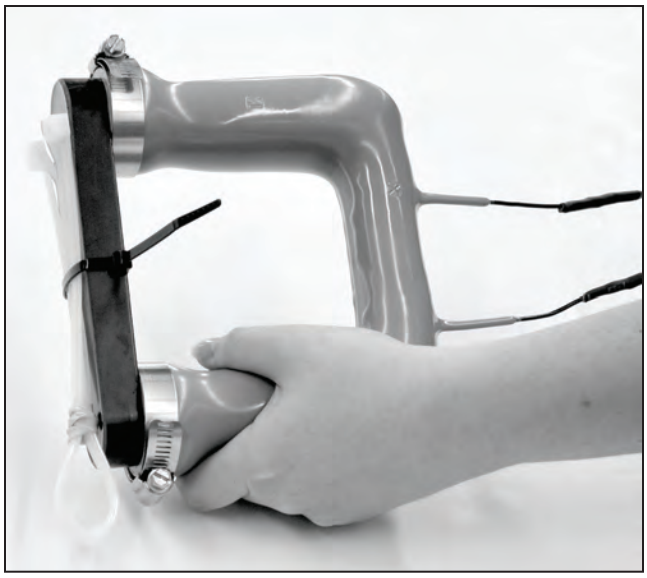


Figure 82. The wiring is already attached to the current sensors.

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 83.

(b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 84.

STEP 5. Install the set's other two current sensors by repeating Step 3 on page 45 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 83. A current sensor placed around the cable's grounded concentric neutral.●



Figure 84. A current sensor placed above the cable's grounded concentric neutral.●

● Current sensors for dry locations are shown only to indicate the installation position on the cable.

Low-Voltage Enclosure Wiring

Complete 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 85.

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.

(a) Locate the conduit/tubing assembly and the two holding brackets and bolts as shown in Figure 86.

(b) Put the holding brackets in the grooved channel of the conduit as shown in Figure 87.

(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 88.

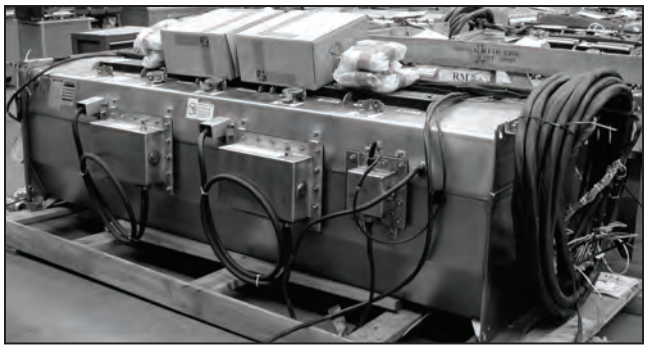


Figure 85. The main cables for the switchgear.



Figure 86. The conduit/tubing bracket assembly kit, shipped with gear.

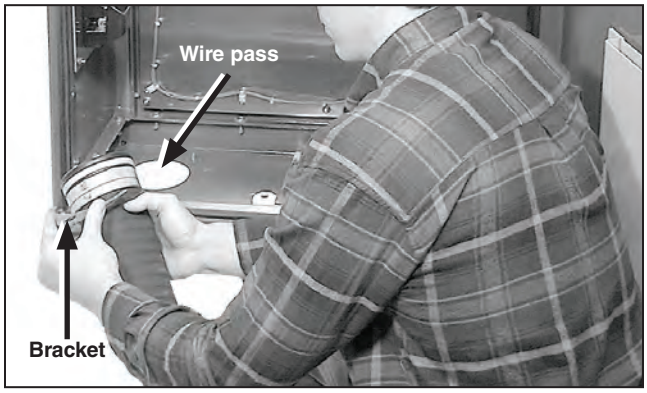


Figure 87. Placing the holding brackets in the grooved channel of the conduit.



Figure 88. Installing and securing 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 89.

(e) Route the cables into the low-voltage enclosure and attach all connectors to the Vista switchgear rack backplane board using the drawings provided. See Figure 90 and Figure 91. 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 92.



Figure 89. Inserting the cables into the low-voltage enclosure via the tubing and conduit.

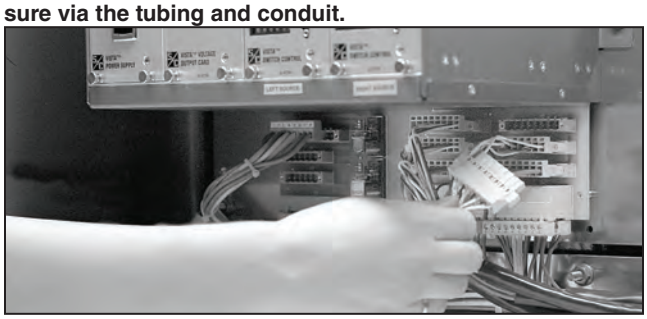


Figure 90. Attaching the connectors to the backplane board.

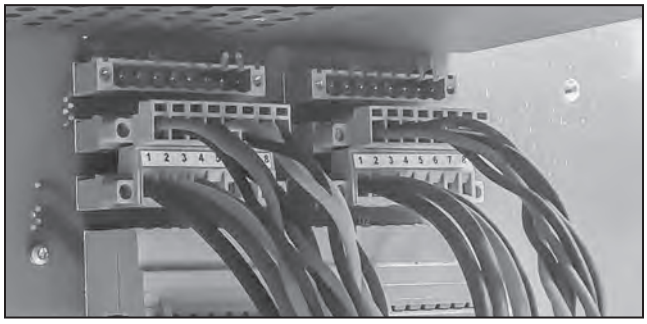


Figure 91. A close-up of Vista switchgear rack backplane board connectors.

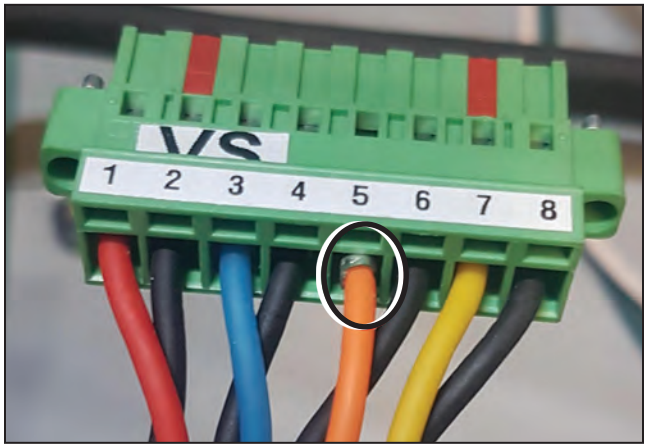


Figure 92. An example of an improper connection that is backed out.

(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 93.

(g) Connect the heavy shielded cable to the copper lug on the low-voltage enclosure grounding plate. See Figure 94.

(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.

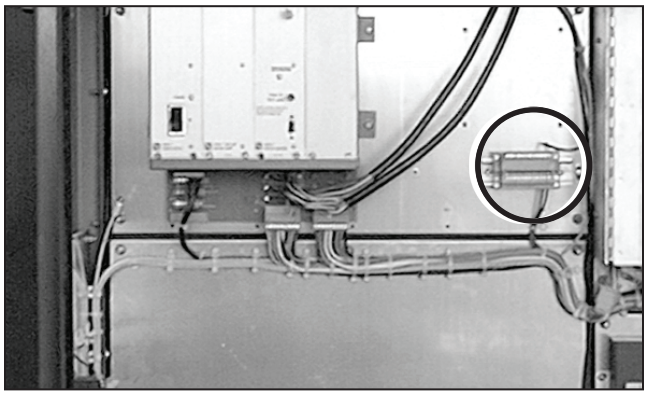


Figure 93. Attaching the ground wires to the terminal block.

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. Refer to the "Grounding" section on page 44.

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 94.

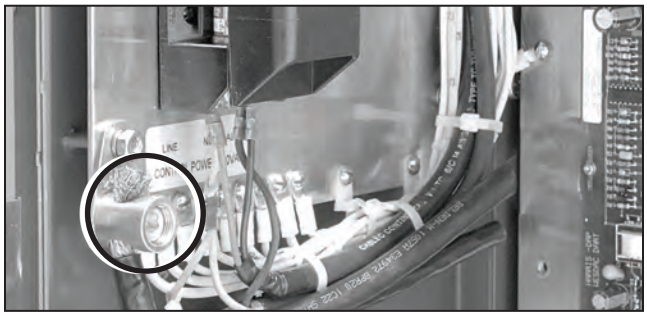


Figure 94. The copper lug and the fuse block.

⚠ WARNING

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. **Failure to follow these instructions may result in serious personal injury or equipment damage.**

Motor Operator Installation

Complete 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 95.

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 96.

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 97.

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 98.

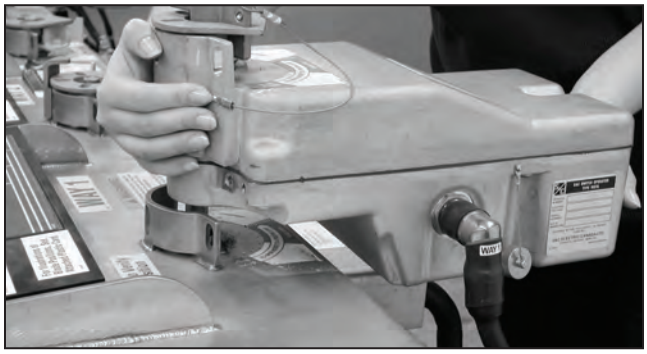


Figure 95. The motor operator placed over the operating shaft on the gear.

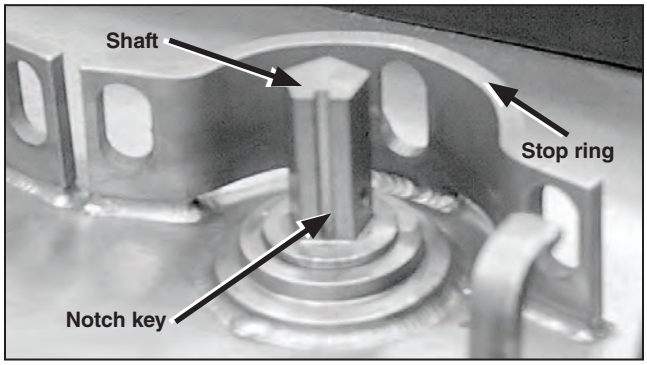


Figure 96. The shaft notch key.

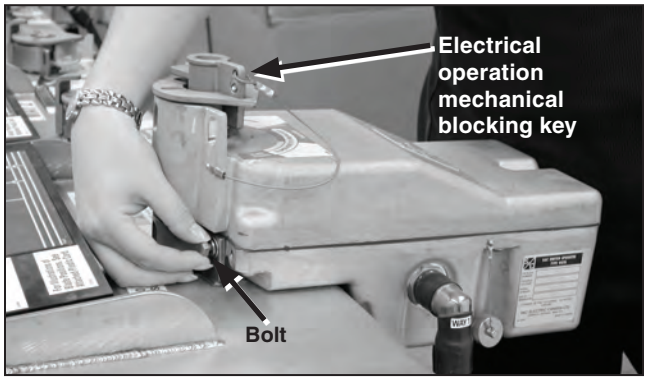


Figure 97. The motor operator installed on the operating shaft.



Figure 98. The mechanical blocking key.

Initial Testing of Motor Operators and Controls

NOTICE

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

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 99.

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 Figure 100 and Figure 101.

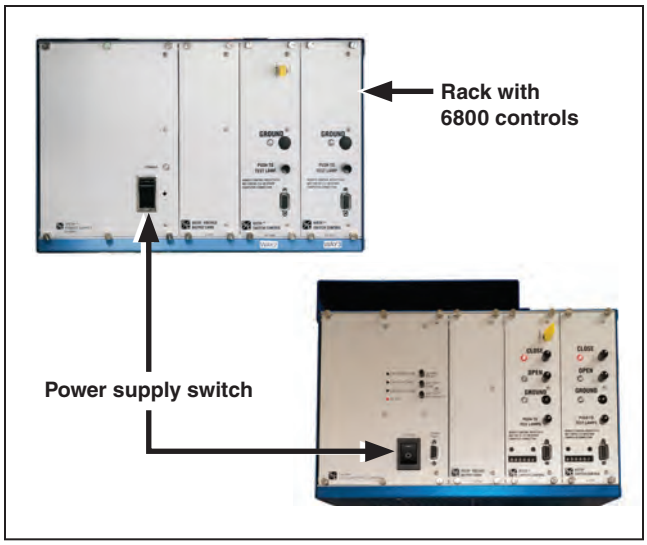


Figure 99. There are two Vista switchgear rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; the other has only a GROUND indicator and is used with a 6800 Series Automatic Switch Control.

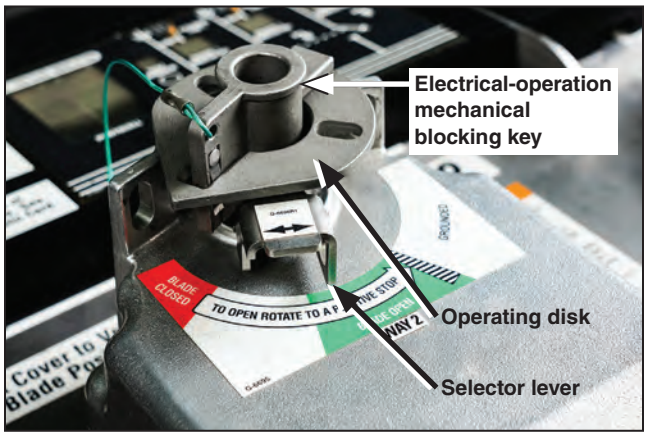


Figure 100. The CLOSE indication on motor control board matches motor operator position.

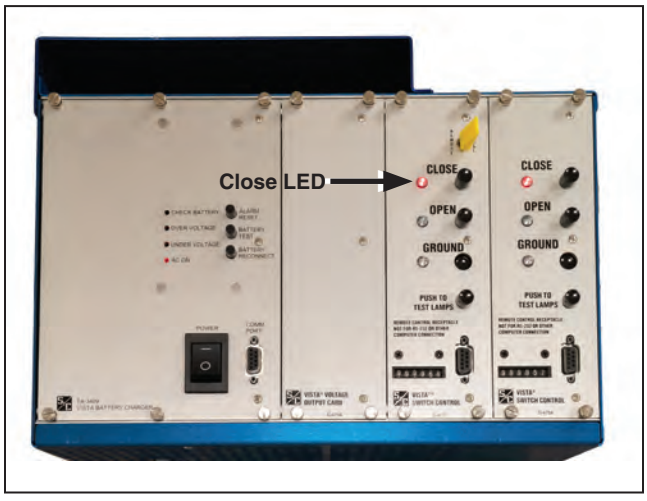


Figure 101. The CLOSE indication on the motor control board matches the motor operator position.

STEP 2. Verify all LEDs are functional by pressing the PUSH TO TEST LAMPS button on each control board. See Figure 102.

STEP 3. Perform the following operations using the control board buttons, as shown in Figure 103. 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 105 on page 53.

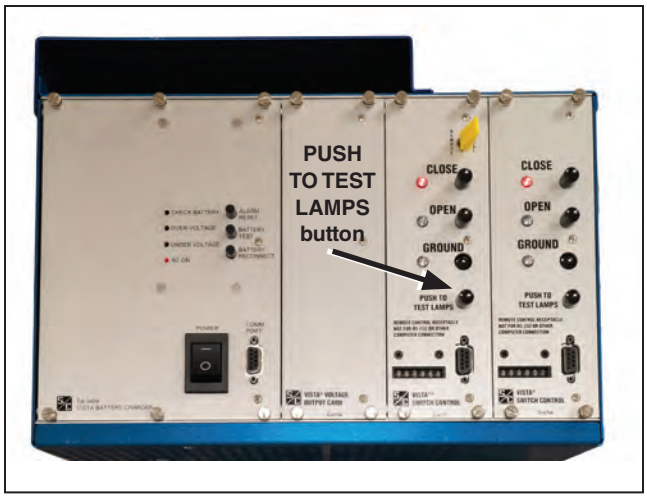


Figure 102. The PUSH TO TEST LAMPS button on the control board.



Figure 103. The location of the motor operator controls.

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. See Figure 104.

Note: The electrical-operation mechanical blocking key must be removed so it does not interfere with the selector lever during operation. See Figure 105.

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. Follow the battery charger initial set up procedure detailed in S&C instruction sheet 680-540.

Note: If this set up procedure is not performed, the batter charger event logs will not have the accurate date and time stamp.

STEP 4. Lock the low-voltage enclosure.



Figure 104. A vault-style low-voltage enclosure shown with provisions for a remote terminal unit and communications.



Figure 105. The mechanical blocking key.

Tank Placement

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

STEP 1. Remove any packing or foam from around the viewing window and check the gas-pressure gauge to make sure it is in the Green zone. Contact S&C Electric Company if the gas-pressure gauge is not in the Green zone. See the "Gas-Pressure Gauge" section on page 65 for more information.

STEP 2. Unbolt the tank from the skid, remove the switchgear from its crate, and lift the gear into place, observing the precautions given in the "Handling" section on page 8. See Figure 2 on page 8 and Figure 106.

STEP 3. Secure the switchgear in place in accordance with the pull box or wall brackets provided by the user.

NOTICE

Be sure to prevent any damage to the termination bushings or bushing wells. **Failure to comply with damage prevention will result in the tank needing to be returned to the factory for repair.**

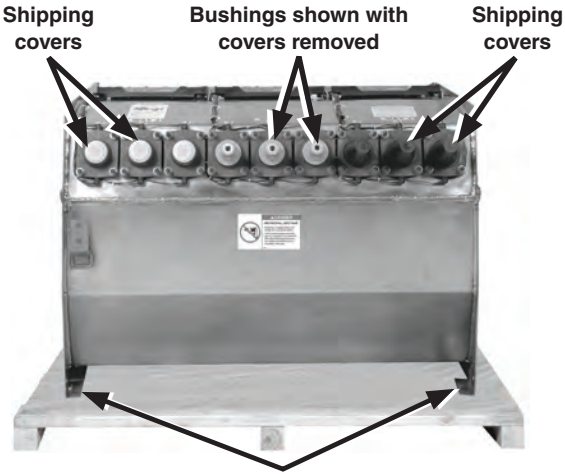


Figure 106. A Vista tank bolted to a skid in four places for shipment. (Manual unit shown for illustration purposes.)

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.

⚠ 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.

Complete the following steps for terminating cables:

STEP 1. Remove the shipping covers from the bushings and bushing wells. See Figure 107.

STEP 2. Terminate the cables with elbows following the elbow manufacturer's instructions. See Figure 108.



Figure 107. A Vista switchgear tank with shipping covers. (Manual unit shown for illustration purposes.)

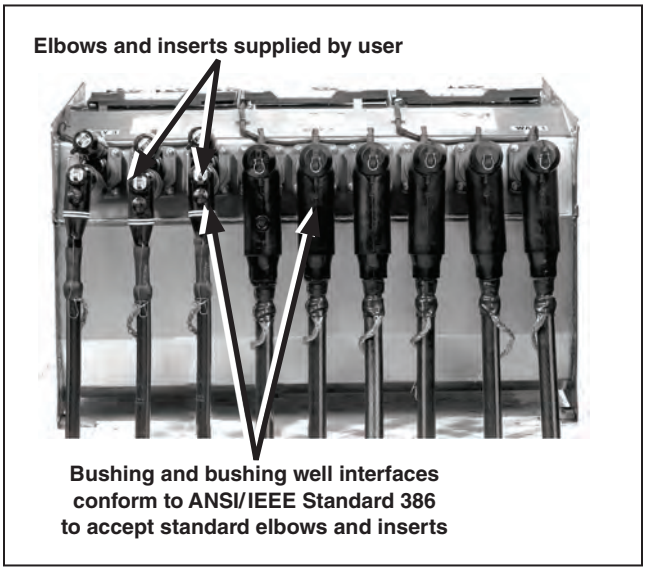


Figure 108. A Vista switchgear tank shown with user-supplied cables and elbows. (Manual unit shown for illustration purposes.)

Low-Voltage Enclosure Placement

Complete 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 8.

STEP 2. Use a two-point lifting scheme to properly balance the enclosure. See Figure 6 on page 9.

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.

Grounding

Complete 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 109.

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 110.

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.

STEP 3. 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 110.

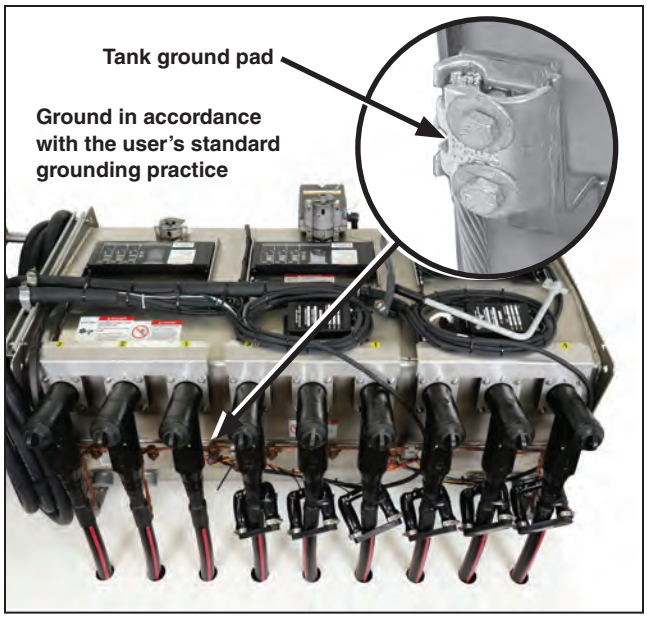


Figure 109. The tank ground pad.



Figure 110. The shielded cable connected to the 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.

Complete 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 111. 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 111. 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 112.

(b) It may be placed above the concentric neutral, in which case the terminator drain wire must be brought through the sensor. See Figure 113.

STEP 5. Install the set's other two current sensors by repeating Step 3 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 112. A current sensor placed around the cable's grounded concentric neutral.●



Figure 113. A current sensor placed above the cable's grounded concentric neutral.●

● Current sensors for dry locations are shown only to indicate the installation position on the cable.

Low-Voltage Enclosure Wiring

Complete 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 114.

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.

(a) Locate the conduit/tubing assembly and the two holding brackets and bolts as shown in Figure 115.

(b) Put the holding brackets in the grooved channel of the conduit as shown in Figure 116.

(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 117.

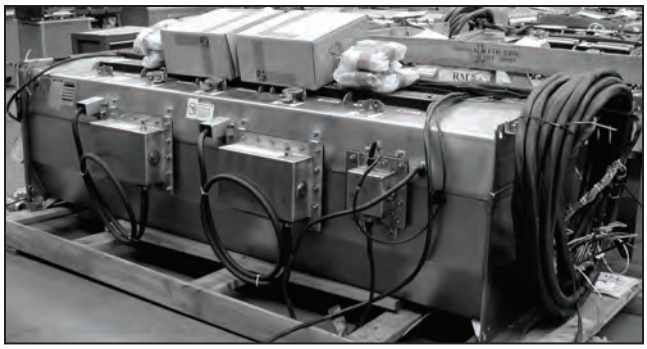


Figure 114. The main cables for the switchgear.

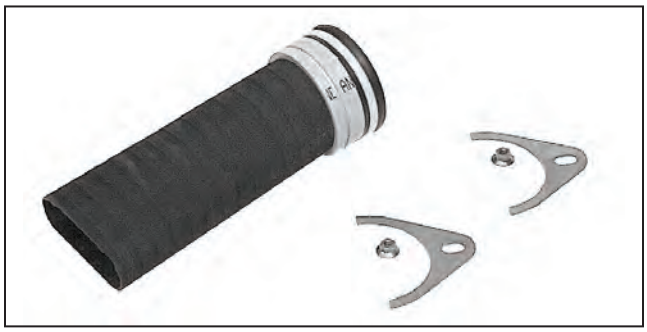


Figure 115. The conduit/tubing bracket assembly kit, shipped with gear.

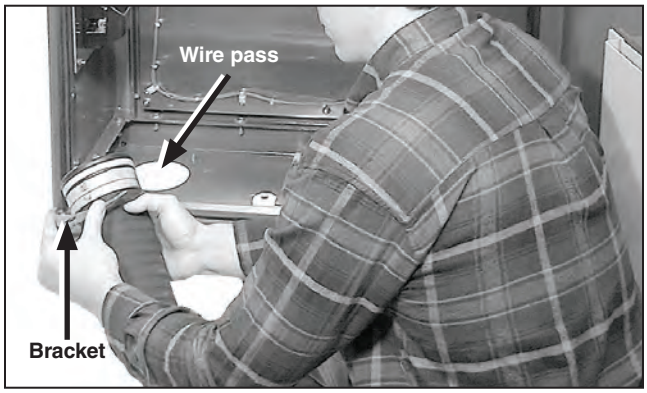


Figure 116. Placing the holding brackets in the grooved channel of the conduit.



Figure 117. Installing and securing 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 118.

(e) Route the cables into the low-voltage enclosure and attach all connectors to the Vista switchgear rack backplane board using the drawings provided. See Figure 119 and Figure 120. 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 121.



Figure 118. Inserting the cables into the low-voltage enclosure via the tubing and conduit.



Figure 119. Attaching the connectors to the backplane board.

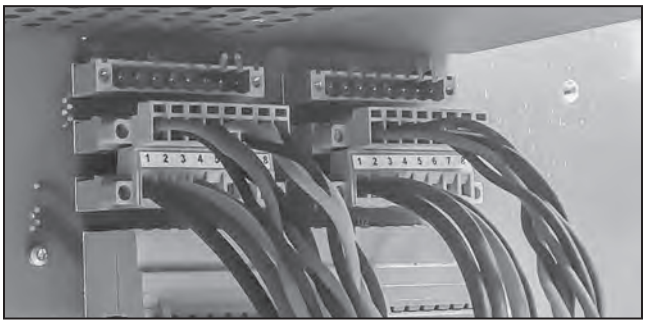


Figure 120. A close-up of Vista switchgear rack backplane board connectors.

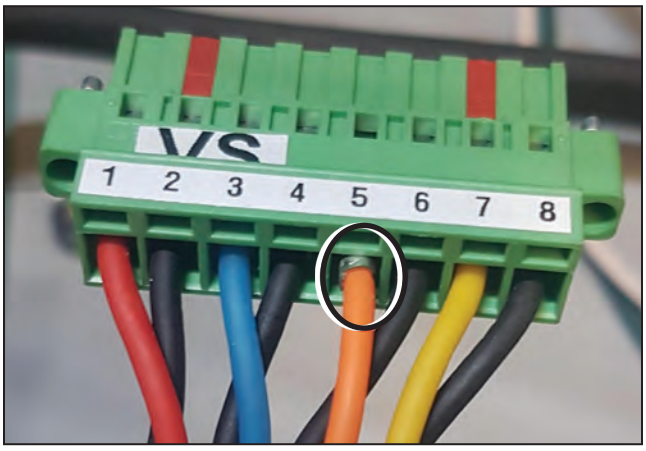


Figure 121. An example of an improper connection that is backed out.

(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 122.

(g) Connect the heavy shielded cable to the copper lug on the low-voltage enclosure grounding plate. See Figure 123.

(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.

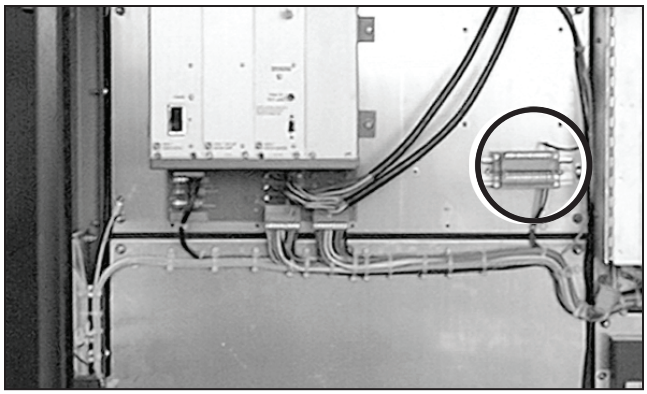


Figure 122. Attaching the ground wires to the terminal block.

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 56.

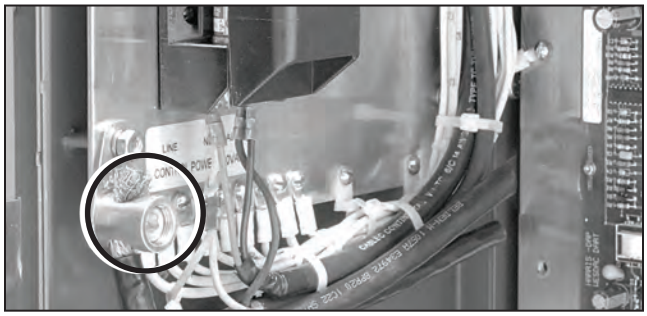


Figure 123. The copper lug and the fuse block.

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 123.

⚠ WARNING

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. **Failure to follow these instructions may result in serious personal injury or equipment damage.**

Motor Operator Installation

Complete 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 124.

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 125.

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 126.

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 127.

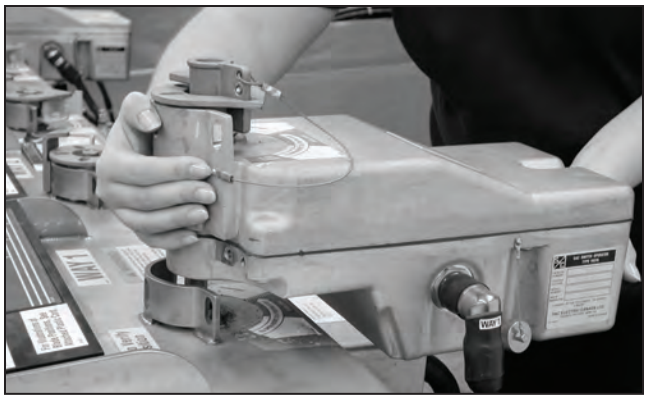


Figure 124. Placing the motor operator over the operating shaft on the gear.

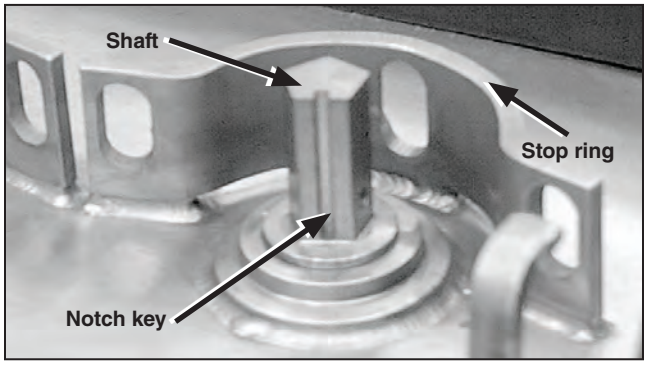


Figure 125. The shaft notch key.

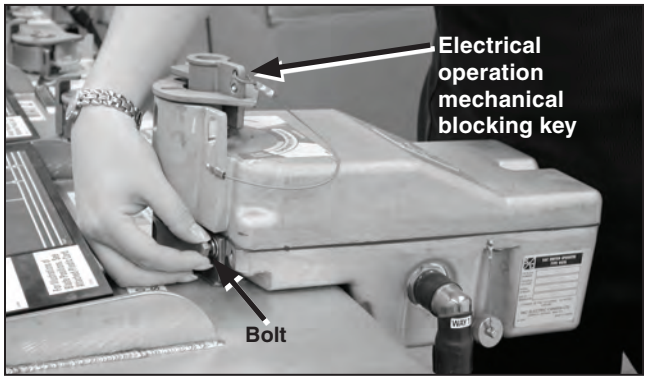


Figure 126. The motor operator installed on the operating shaft.



Figure 127. The mechanical blocking key.

Initial Testing of Motor Operators and Controls

NOTICE

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

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 128. 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 Figure 129 and Figure 130.

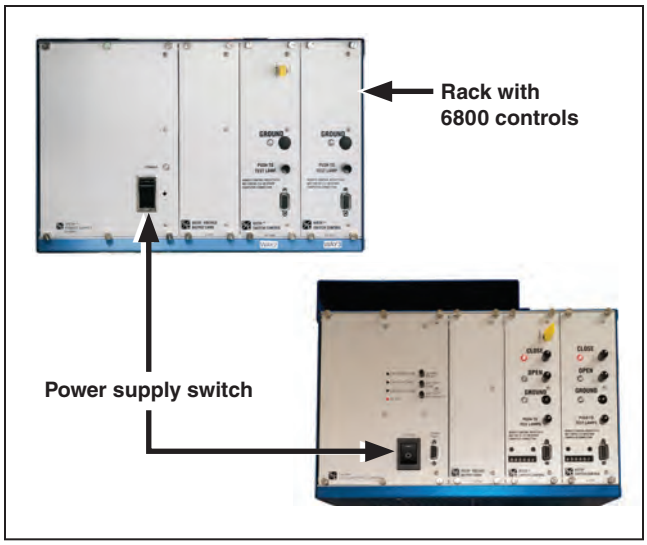


Figure 128. There are two Vista switchgear rack options, depending on the control configuration. One rack has OPEN/CLOSE/GROUND indicators; the other has only a GROUND indicator and is used with a 6800 Series Automatic Switch Control.

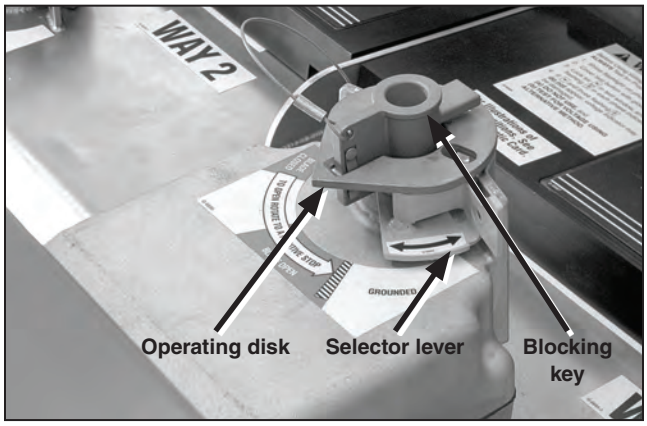


Figure 129. The OPEN position indication on the motor operator.

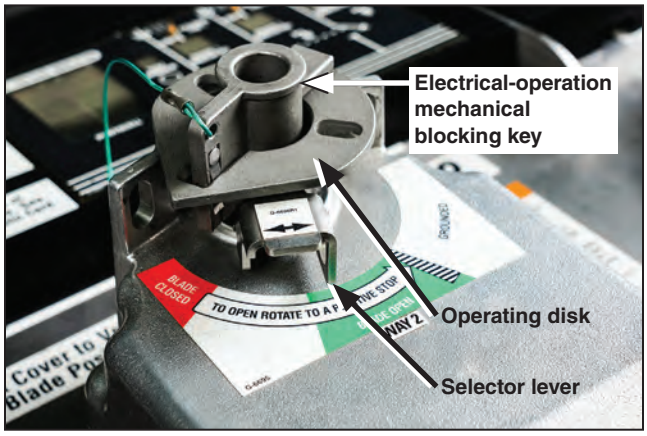


Figure 130. The CLOSE indication on motor control board matches motor operator position.

STEP 2. Verify all LED displays are functional by pressing the PUSH TO TEST LAMPS button on each control board. See Figure 131.

STEP 3. Perform the following operations using the control board buttons as shown in Figure 131:

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 127 on page 62.

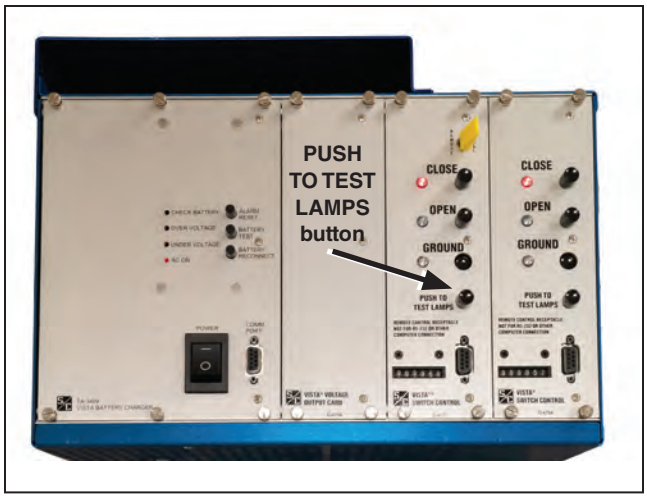


Figure 131. The PUSH TO TEST LAMPS button on the control board.

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. Follow the battery charger initial set up procedure detailed in S&C instruction sheet 680-540.

Note: If this set up procedure is not performed, the batter charger event logs will not have the accurate date and time stamp.

STEP 4. 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 Figure 132, Figure 133 and Figure 134 on page 66.

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

Green zone:

The Vista switchgear unit is OK to operate.

Green/Yellow zone:

The Vista switchgear unit may have lost some gas but is still OK to operate.

For SF_6 models: The unit should be evaluated to determine whether it needs to be refilled with SF_6 gas via the field-accessible fill-port and repaired accordingly. Contact S&C for assistance.

Vista Green switchgear models (CO_2-mix) are hermetically sealed. The gas-fill port is not accessible in the field as standard. Contact S&C for assistance.

Red zone:

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

Orange zone:

The Vista switchgear unit has been overfilled or has a defective pressure gauge. For SF_6 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 models (CO_2-mix) are hermetically sealed. The gas-fill port is not accessible in the field as standard. Contact S&C for assistance.

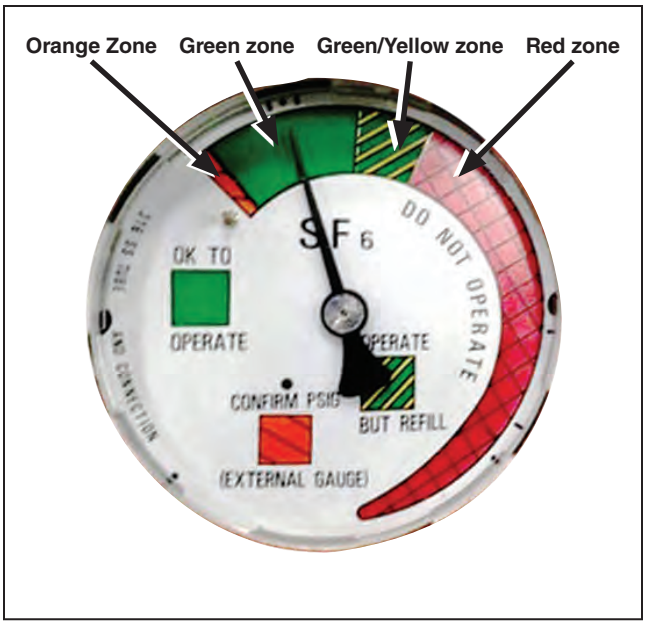


Figure 132. The internal gas-pressure gauge for most Vista switchgear models.

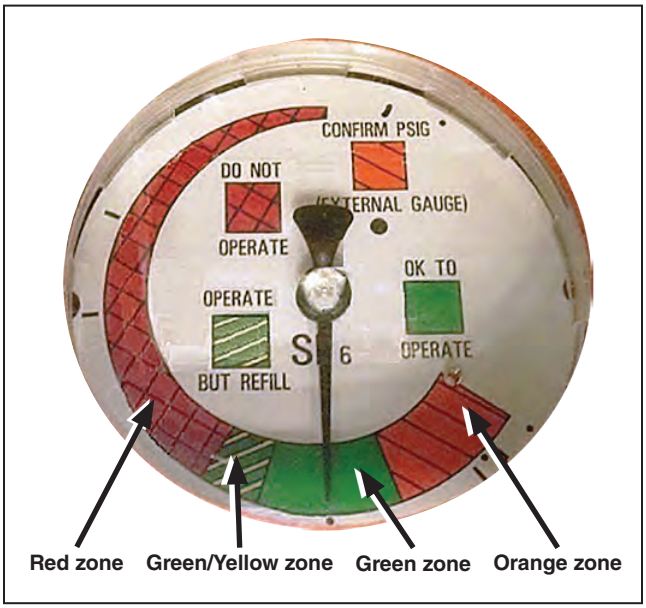


Figure 133. The internal gas-pressure gauge for Vista switchgear models rated 15 kV, 12.5 kA sym. short circuit that have catalog numbers ending in R1.

Gauge Needle Fluctuations from Rapid Ambient Temperature Changes

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

The gas-pressure gauge uses a small reference gas chamber filled with helium to compensate for ambient temperature and altitude without applying correction factors. The gauge indicates tank pressure by measuring the pressure differential between the gas in the tank and the gas in the gauge.

When the tank experiences rapid ambient temperature changes, the smaller volume of gas inside the gauge can change temperature more quickly than the larger volume of gas in the tank, which can lead to temporary movement of the needle. When the temperature stabilizes, the needle will return to its previous position within 1-2 hours.

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

Vista Green switchgear models (CO_2-mix) are hermetically sealed. The gas-fill port is not accessible in the field as standard. Contact S&C for assistance.

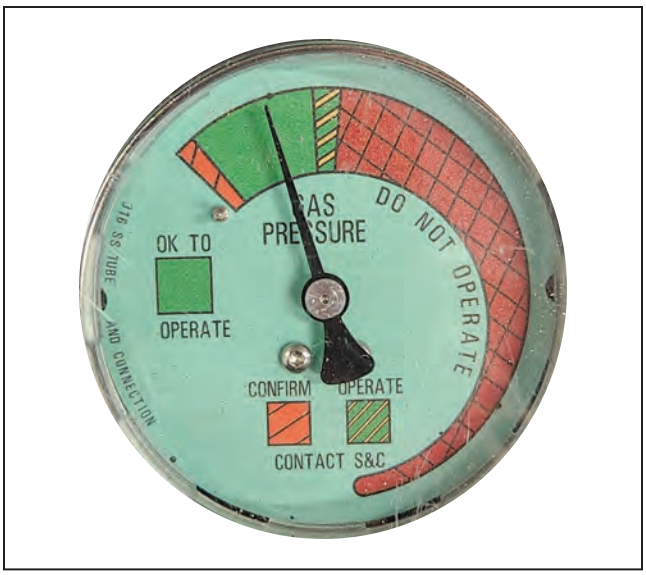


Figure 134. The internal gas-pressure gauge for Vista Green switchgear models (CO_2-mix), "-GRN" catalog numbers.

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 68. 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 Frequency①	DC②③
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, kV①
50 Hertz	60 Hertz	Impulse (BIL)		
12	15.5	95	30	15
24	27	125	40	20
36	38	150	40	20

① The DC cable thumping voltage is 50% of the DC cable test voltage because 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.

Very Low Frequency (VLF) Cable Testing

⚠ 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 69. 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

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.

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

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

VLF cable testing may subject the 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 Voltages①②				
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

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

② 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 135. In this example the resistance is being taken between Way 1 Phase A and Way 2 Phase A.

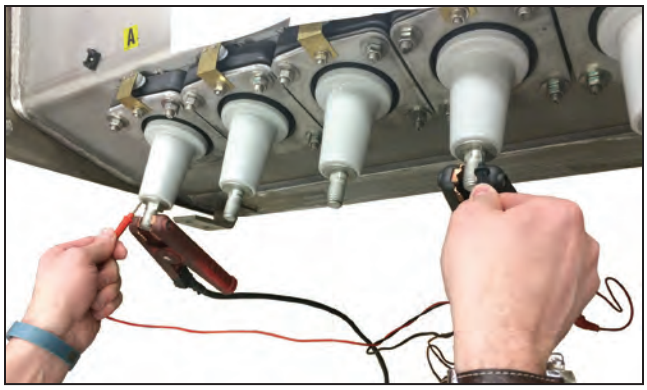


Figure 135. Connecting the resistance measuring device.●

● 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 136.

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 136.

STEP 2. Record the resistance measurement. Acceptable resistance values are:

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

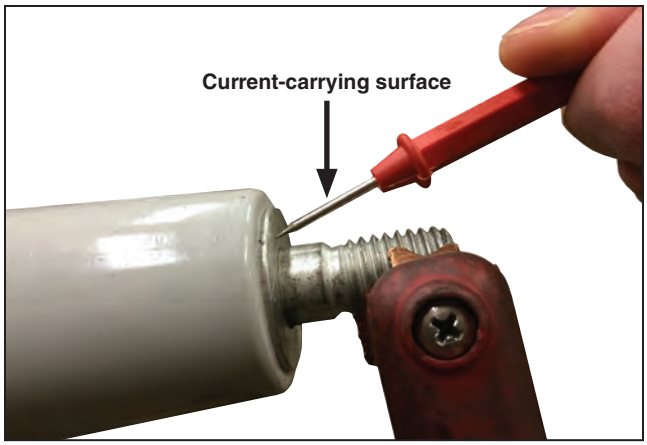


Figure 136. Take the measurement from the flat current-carrying surface of the bushing.●

● 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-mounted applications are designed to be placed underground in a vault, basement, or indoor electrical room. Coverage for long-term storage of uninstalled units is necessary.

For long-term outdoor storage of UnderCover and Vault-style tanks, an ultraviolet (UV)-protection canopy is required to protect cabling and other UV-sensitive components to prevent unit damage. Failure to provide adequate UV-protection may result in unit damage that is not covered by the warranty.

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 (2-way–4 way)	CUA-9514-2

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.