

Installation

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Introduction

Qualified Persons

WARNING

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

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

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

Read this Instruction Sheet

NOTICE

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing or operating S&C Voltage Sensors. Become familiar with the Safety Information on page 3 and Safety Precautions on page 4. The latest version of this publication is available online in PDF format at <https://www.sandc.com/en/contact-us/product-literature/>.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the S&C Voltage Sensor. Designate a location where users can easily retrieve and refer to this publication.

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 S&C Voltage Sensors are listed in the ratings table in Specification Bulletin 591-31. The ratings are also on the nameplate affixed to the product.

Warranty

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

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the product. 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 Global Support and Monitoring Center at 1-888-762-1100.

NOTICE	
Read this instruction sheet thoroughly and carefully before installing S&C Voltage Sensors.	

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.

⚠ DANGER



S&C Voltage Sensors 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 an S&C Voltage Sensor 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. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded. The S&C Voltage Sensor contains components that can retain a voltage charge for many days after it has been de-energized and can derive a static charge when in close proximity to a high-voltage source. Voltage levels can be as high as the peak line-to-ground voltage last applied to the unit. Units that have been energized or installed near energized lines should be considered live until tested and grounded.
6. **GROUNDING.** The S&C Voltage Sensor base must be connected to a suitable earth ground at the base of the utility pole, or to a suitable building ground for testing, before energizing an S&C Voltage Sensor and at all times when energized.
7. 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 that the local earth ground, or building ground, cannot be severed or removed.
8. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.

The S&C Outdoor Voltage Sensor is a capacitance-type voltage-monitoring device intended only for neutral-to-ground connection applications on ungrounded wye-connected shunt capacitor banks. It is typically used with the Bankgard™ Relay for protection of small to medium-sized station-type banks on 60-Hertz● systems rated through 25 kV. See Figure 1.

The Outdoor Voltage Sensor has relay accuracy over an ambient temperature range of -40°F (-40°C) to +160°F (+71°C). It is a constant-current-output device similar to a current transformer so, as with a current transformer, a resistive burden is required. This burden is provided by a fixed resistor and capacitor located in the conduit-junction box and factory connected to the secondary of the outdoor voltage sensor's transformer.

The impedance value of the burden selected provides a nominal input-to-output ratio of 110:1 for a 14.4-kV outdoor voltage sensor, when connected to a high-impedance device such as the Bankgard Relay. The precise voltage ratio for each voltage sensor, as measured with an applied primary voltage of 1000 Vac RMS, is stamped on the device nameplate. Neutral-sensing applications with other solid-state, low-burden devices may be permissible.■

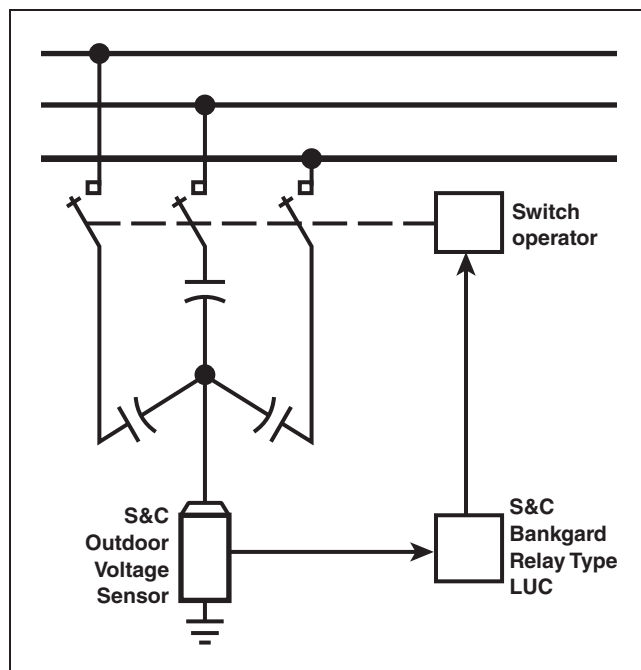


Figure 1. Application diagram.

● For 50-Hertz applications, refer to the nearest S&C Sales Office.
 ■ Refer to the nearest S&C Sales Office.

Construction

The outdoor voltage sensor is a Cypoxy™ Insulator-encapsulated assembly consisting of a high-voltage capacitor series-connected to the primary side of a dry-type transformer. For surge protection, an internal gas-filled spark gap is provided in parallel with the primary winding to limit transient overvoltages at the transformer.

A hanger bracket with a backup member and mounting bolts is furnished for clamp mounting to a horizontal structural member, or the hanger bracket can be attached directly to a structure. An eyebolt connector accommodating conductors from number 6 solid through 250 kc mil stranded copper or aluminum, or 4/0 ACSR, is included for the high-voltage input termination. See Figure 2.

Secondary leads, stripped for wire-nut interconnection with the protective relay, are provided in the conduit-junction box attached to the low-voltage end of the voltage sensor.

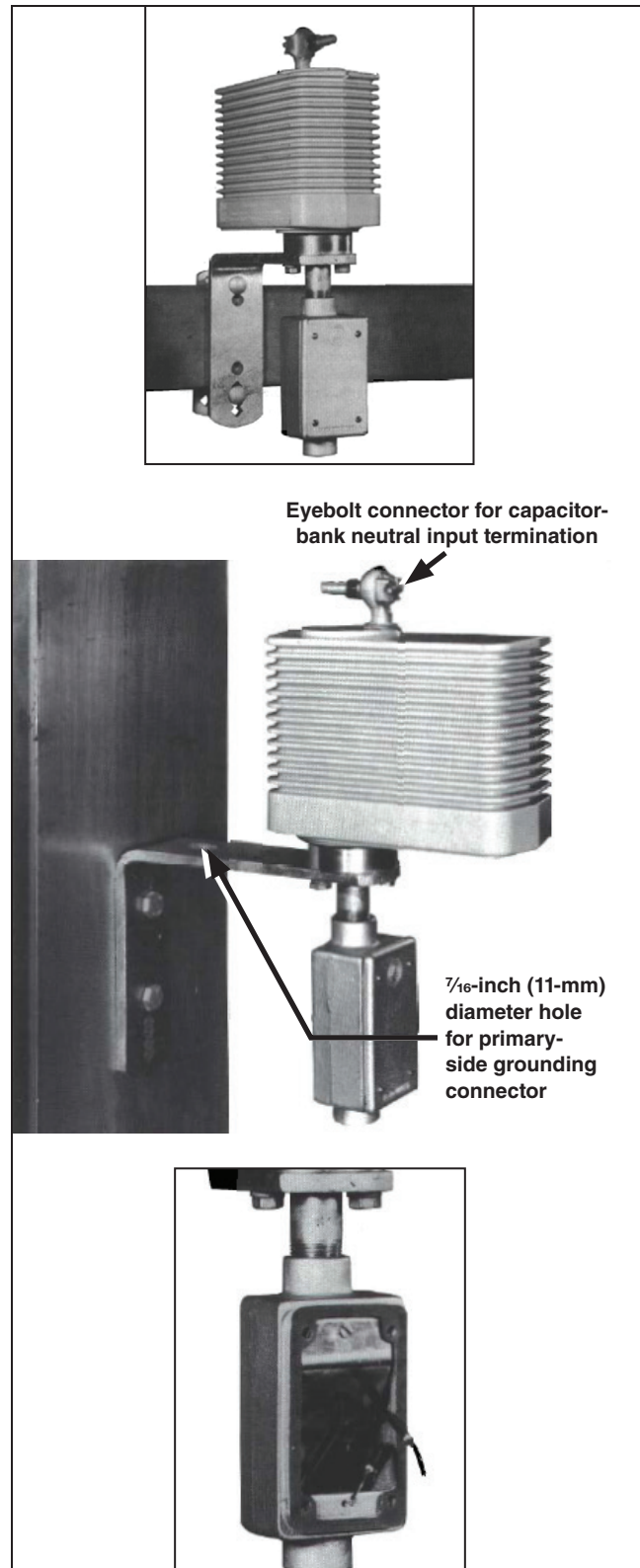


Figure 2. An S&C Outdoor Voltage Sensor clamp-mounted on a horizontal structural member (top inset) and bolted directly to a vertical structural member (middle). Note: For bolting directly to a structure, the voltage sensor is turned 180 degrees to provide additional electrical clearance. Bottom inset photo shows secondary leads within the conduit-junction box.

Follow these steps to install an S&C Voltage Sensor:

- STEP 1.** If the voltage sensor is to be clamp-mounted on a horizontal structural member, use the backplate and $\frac{3}{8}$ -16 \times 5-inch carriage bolts furnished.
- If the voltage sensor is to be attached directly to a structure, the unit must first be reconfigured to provide additional electrical clearance between the encapsulation and ground. Remove the two bolts that fasten the voltage sensor to the mounting bracket and turn the voltage sensor 180 degrees with respect to the bracket. Then, replace the bolts. Mount the bracket to the structure using $\frac{1}{2}$ -inch diameter bolts (not furnished).
- STEP 2.** Connect the voltage sensor mounting bracket to a suitable earth ground. The bracket is provided with a $\frac{7}{16}$ -inch (11-mm) diameter hole for attachment of a suitable connector.
- STEP 3.** Install conduit between the voltage sensor conduit-junction box and the Bankgard Relay.
- STEP 4.** Make the secondary connections in accordance with the wiring diagram furnished with the Bankgard Relay. See Figure 3 and Figure 4. The secondary circuit should be grounded at one point only, preferably at the Bankgard Relay. Other locations of the single grounding point are permissible, however, such as at the voltage sensor. See Figure 1 on page 5.
- STEP 5.** Make sure the capacitor-bank switching device is locked open and the bank is grounded. Then, connect the capacitor-bank neutral to the voltage sensor high-voltage terminal.
- STEP 6.** Remove the temporary grounds from the capacitor bank.
- STEP 7.** Because there is essentially no voltage present between the energized capacitor-bank neutral and ground on a normally functioning bank, if verification of voltage sensor operation is desired, it will be necessary to remove capacitor-unit fuses (simulating isolation of faulted capacitor units by operation of their associated fuses) to obtain a voltage sensor output signal. De-energize and ground the capacitor bank. Then, follow the procedures described in the "Operation and Adjustment" and "Verification of Calculated Lockout Level" sections of S&C Instruction Sheet 532-500 for the Type LUC Bankgard Relay.

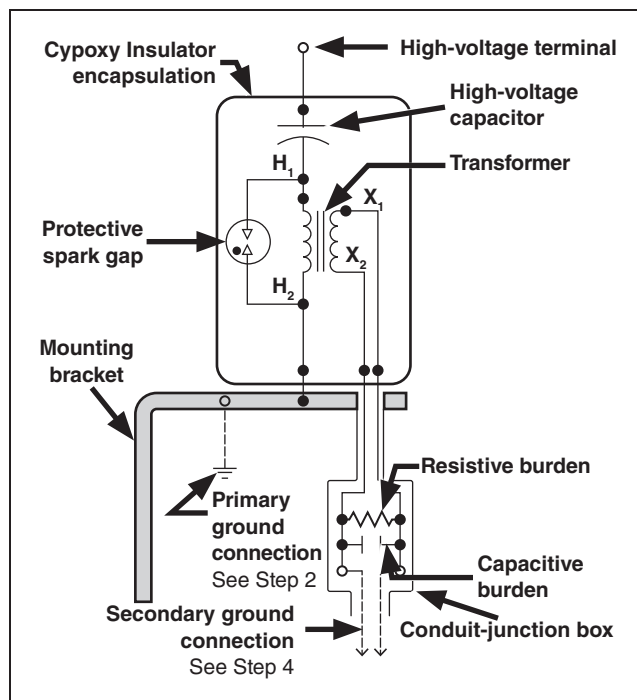


Figure 3. A schematic diagram of S&C Outdoor Voltage Sensor with a standard resistive and secondary capacitive burden.

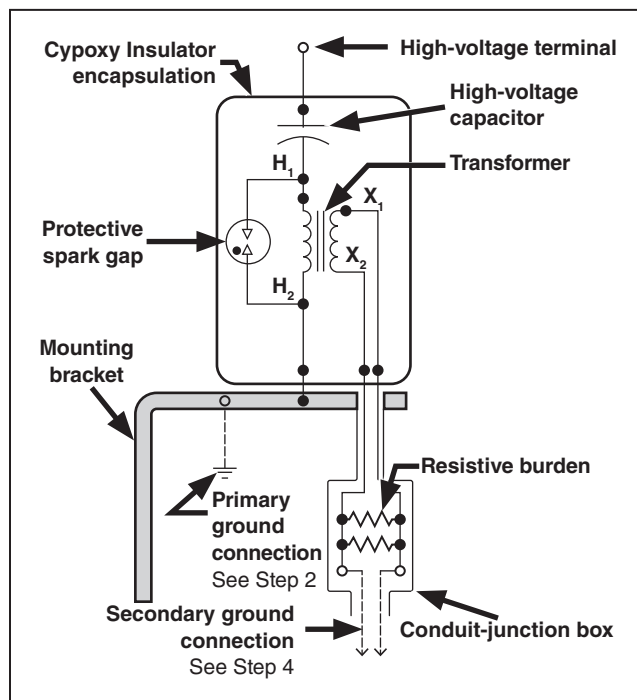


Figure 4. A schematic diagram of an S&C Outdoor Voltage Sensor with a standard resistive burden.