

# Instructions for Installation, Operation, Maintenance, and Configuration

**Table of Contents**

<b>Section</b>	<b>Page</b>	<b>Section</b>	<b>Page</b>
<b>Introduction</b>		<b>Operation</b>	
Qualified Persons . . . . .	2	Loss of Power Alarm . . . . .	18
Read this Instruction Sheet . . . . .	2	Pushbutton Operation . . . . .	18
Retain this Instruction Sheet . . . . .	2	Remote Operation . . . . .	18
Proper Application . . . . .	2	Disconnect Operation . . . . .	19
Warranty . . . . .	2	Emergency Manual Operation . . . . .	20
<b>Safety Information</b>		<b>Maintenance</b>	
Understanding Safety-Alert Messages . . . . .	3	Periodic Battery and Battery Charger Inspection . . . . .	21
Following Safety Instructions . . . . .	3	Charging Voltage . . . . .	22
Replacement Instructions and Labels . . . . .	3	Charging the Battery Packs . . . . .	23
Location of Safety Labels and Tags . . . . .	4	Battery Pack Replacement . . . . .	24
<b>Safety Precautions . . . . .</b>	<b>5</b>	<b>Specifications</b>	
<b>Shipping and Handling</b>		S&C Battery Charger . . . . .	25
Inspection . . . . .	6	Monobloc Battery Packs in Plastic Outer Case . . . . .	25
Packing . . . . .	6	S&C 5800 Series Automatic Switch Control . . . . .	26
Storage . . . . .	6	Cyclon Battery Packs in Metal Outer Case . . . . .	26
<b>Components . . . . .</b>		<b>Calibration</b>	
<b>Installation</b>		Calibrating the Voltage- and Current-Sensor Outputs . . . . .	27
Installing the Communication and Control Unit . . . . .	9	Alternate Location of Data . . . . .	28
Connecting the Control Cable . . . . .	11	Additional Calibration Factors for Self-Powered Units . . . . .	29
Installing and Connecting a User-Supplied Communication Device . . . . .	13		
Connecting an Antenna . . . . .	14		
Connecting a Land-Line Interface . . . . .	14		
Connecting Control Power . . . . .	15		
Connecting Remote Terminal Unit Hardware Status Inputs . . . . .	16		
Testing the Remote Terminal Unit . . . . .	16		
Placing the Communication and Control Unit into Operation . . . . .	17		

For instructions on installation and operation of Scada-Mate Switches, refer to S&C Instruction Sheet 768-500.



## Introduction

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### Qualified Persons

#### **WARNING**

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

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

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

### Read this Instruction Sheet

#### **NOTICE**

Read this instruction sheet thoroughly and carefully before installing or operating the communication and control unit. Familiarize yourself with the Safety Information and Safety Precautions on pages 3 through 5. The latest version of this publication is available online in PDF format at [sandc.com/en/support/product-literature/](http://sandc.com/en/support/product-literature/).

### Retain this Instruction Sheet

This instruction sheet is a permanent part of your Scada-Mate Switching System communication and control unit. Designate a location where you can easily retrieve and refer to this publication.

### Proper Application

#### **WARNING**

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the selected equipment.

### 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 attached to the communication and control unit. Familiarize yourself with these types of messages and the importance of these various signal words:

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


<b>⚠ WARNING</b>
<p>“WARNING” identifies hazards or unsafe practices that <i>can</i> result in serious personal injury or death if instructions, including recommended precautions, are not followed.</p>

<b>⚠ CAUTION</b>
<p>“CAUTION” identifies hazards or unsafe practices that <i>can</i> result in minor personal injury if instructions, including recommended precautions, are not followed.</p>

<b>NOTICE</b>
<p>“NOTICE” identifies important procedures or requirements that <i>can</i> result in product or property damage if instructions are not followed.</p>

**Following  
Safety Instructions**

If you do not understand any portion of this instruction sheet and need assistance, contact your nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C’s website [sandc.com](http://sandc.com), or call S&C Headquarters at (773) 338-1000; in Canada, call S&C Electric Canada Ltd. at (416) 249-9171.

<b>NOTICE</b>	
<p>Read this instruction sheet thoroughly and carefully before installing or operating your Scada-Mate Switching System communication and control unit.</p>	

**Replacement  
Instructions and  
Labels**

If you need additional copies of this instruction sheet, contact your 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 your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

# Safety Information

## Location of Safety Labels and Tags



### Reorder Information for Safety Information

Location	Safety Alert Message	Description	Part Number
A	<b>! IMPORTANT</b>	Place in operation or charge batteries in this equipment . . .	G-6227▲
B	<b>! IMPORTANT</b>	Place in operation or charge batteries in this equipment . . .	G-6226▲
C	<b>! WARNING</b>	Electrical Shock—Before energization and at all times when energized . . .	G-6289▲
D	<b>! WARNING</b>	Electrocution Hazard—Failure to follow these instructions can cause serious injury or death . . .	G-6815▲
E	<b>! WARNING</b>	Electrocution Hazard—Failure to follow these instructions can cause serious injury or death . . .	G-6814

▲ This part is a tag to be removed and discarded after the control unit is installed and adjusted.

**⚠ DANGER**



**S&C Scada-Mate Switching Systems contain 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.

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <ol style="list-style-type: none"> <li>1. <b>QUALIFIED PERSONS.</b> Access to switches and controls must be restricted only to qualified persons. See "Qualified Persons" on page 2.</li> <li>2. <b>SAFETY PROCEDURES.</b> Always follow safe operating procedures and rules.</li> <li>3. <b>PERSONAL PROTECTIVE EQUIPMENT.</b> Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, arc-flash clothing, and fall protection, in accordance with safe operating procedures and rules.</li> <li>4. <b>SAFETY LABELS.</b> Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels and tags. Remove tags ONLY if instructed to do so.</li> <li>5. <b>OPERATING MECHANISM AND BASE.</b> The stored-energy operating mechanism and switch base contain fast-moving parts that can severely injure fingers. Do not remove or disassemble the operating mechanism or remove access panel on the switch base unless directed to do so by S&amp;C Electric Company.</li> <li>6. <b>ENERGIZED COMPONENTS.</b> Always consider all parts live until de-energized, tested, and grounded.</li> </ol> | <ol style="list-style-type: none"> <li>7. <b>GROUNDING.</b> Before energization and at all times when energized, the switch base and control unit enclosure must be connected to suitable earth ground at the pole base in accordance with the S&amp;C instruction sheet furnished with this device.<br/><br/>The switch base ground must also be connected to the system neutral. If the system neutral is not present, proper precautions must be taken to ensure the local earth ground cannot be severed or removed.</li> <li>8. <b>LOAD-INTERRUPTER SWITCH POSITION.</b> Always confirm the Open/Close position of load-interrupter switches by visually observing the indicator.<br/><br/>Interrupters and terminal pads may be energized from either terminal.<br/><br/>Interrupters and terminal pads may be energized with the interrupters in any position.</li> <li>9. <b>MAINTAINING PROPER CLEARANCE.</b> Always maintain proper clearance from energized components.</li> </ol> |
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# Shipping and Handling

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## Inspection

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

If there is visible loss and/or damage:

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

If concealed damage is discovered:

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

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

## Packing

The communication and control unit is packaged and crated appropriately to avoid damage during shipment. A catalog drawing and wiring diagram for the communication and control unit is located in a water-resistant envelope in the instruction manual holder inside the control unit enclosure. Similarly, a catalog drawing and wiring diagram for the selected S&C Scada-Mate Switch is located in a water-resistant envelope attached to the switch. Study these drawings carefully and check the parts list to verify all parts are at hand.

A complete S&C Scada-Mate Switching System includes the following:

1. Switch
2. Communication and control unit
  - Optional remote terminal unit
  - Optional communication device
  - Stainless steel enclosure
  - Miscellaneous parts and pieces
3. Control cable
4. Optional features not assembled to switch
5. Yellow card—sensor data for switch
6. Instruction manual

## Storage

If the communication and control unit will not be placed into service by the date marked on the control, the batteries will require charging. See the "Charging the Battery Packs" section on page 25.

## CCU-SP—Communication and Control Unit Self-Powered by S&C Voltage Sensor

See Figures 1 and 2.

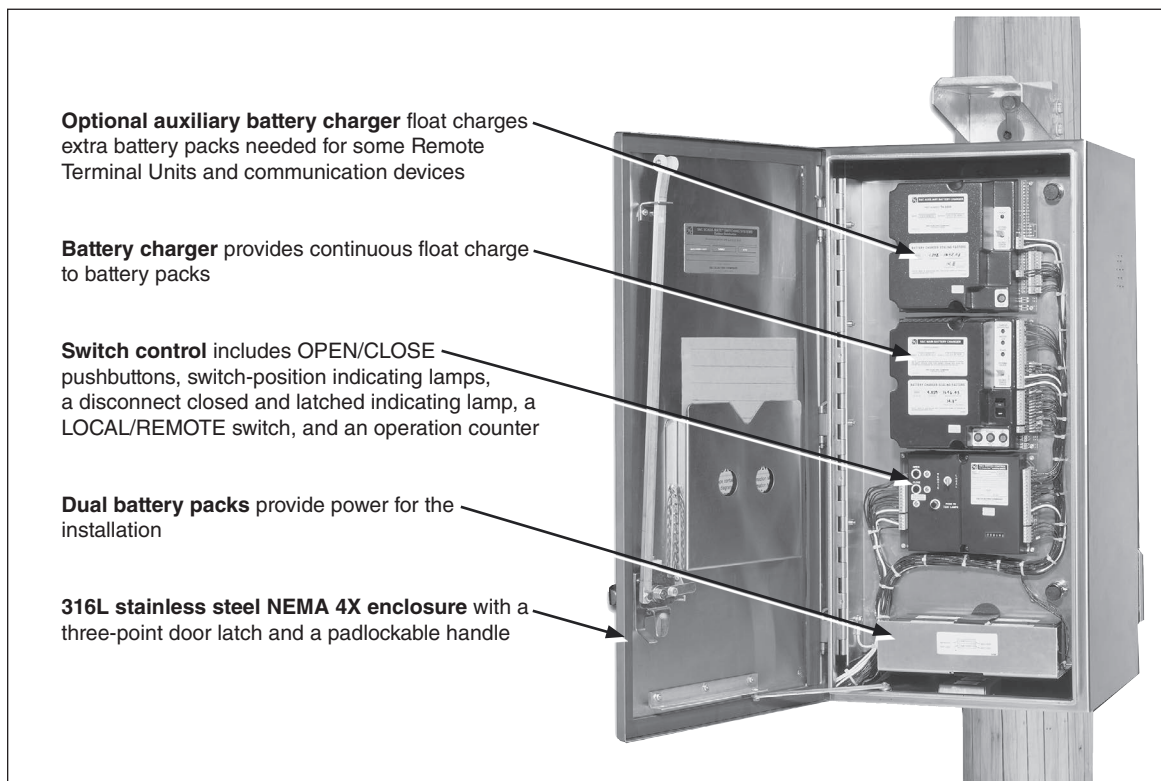


Figure 1. The Type CCU-SP Unit component location.

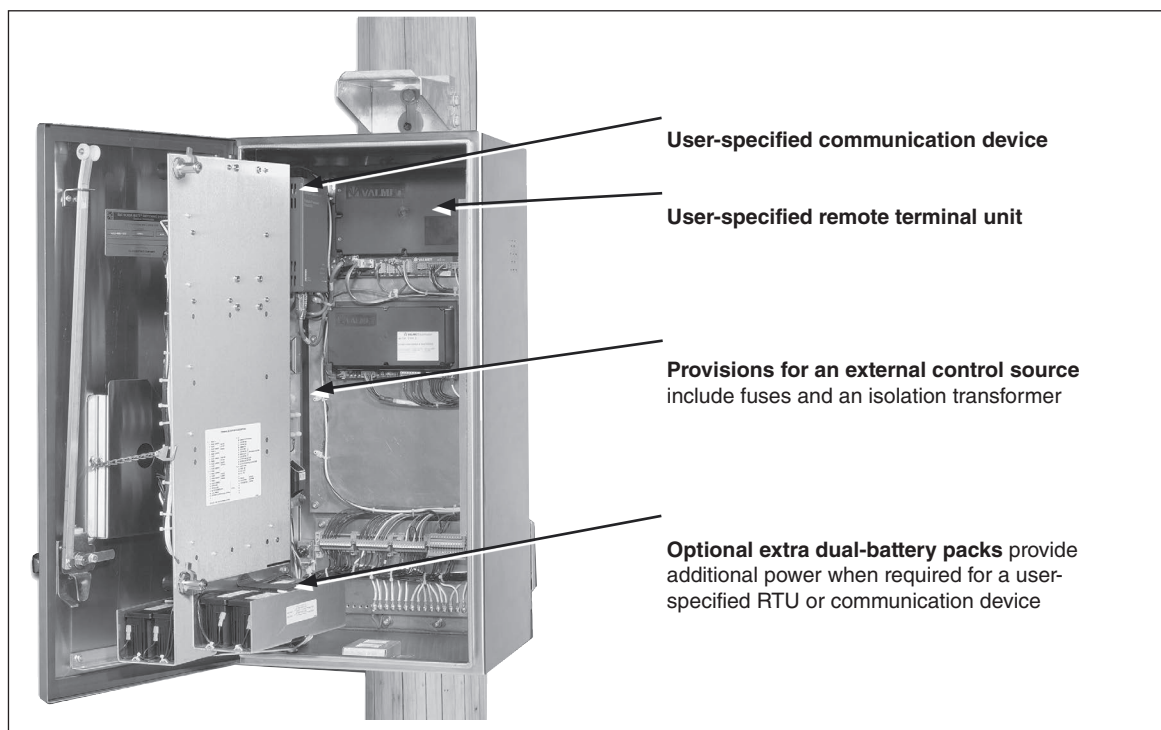


Figure 2. The Type CCU-SP Unit with the weing-out panel open.

## Components

### CCU-XP—Communication and Control Unit Externally Powered by Ac Source

See Figures 3 and 4.

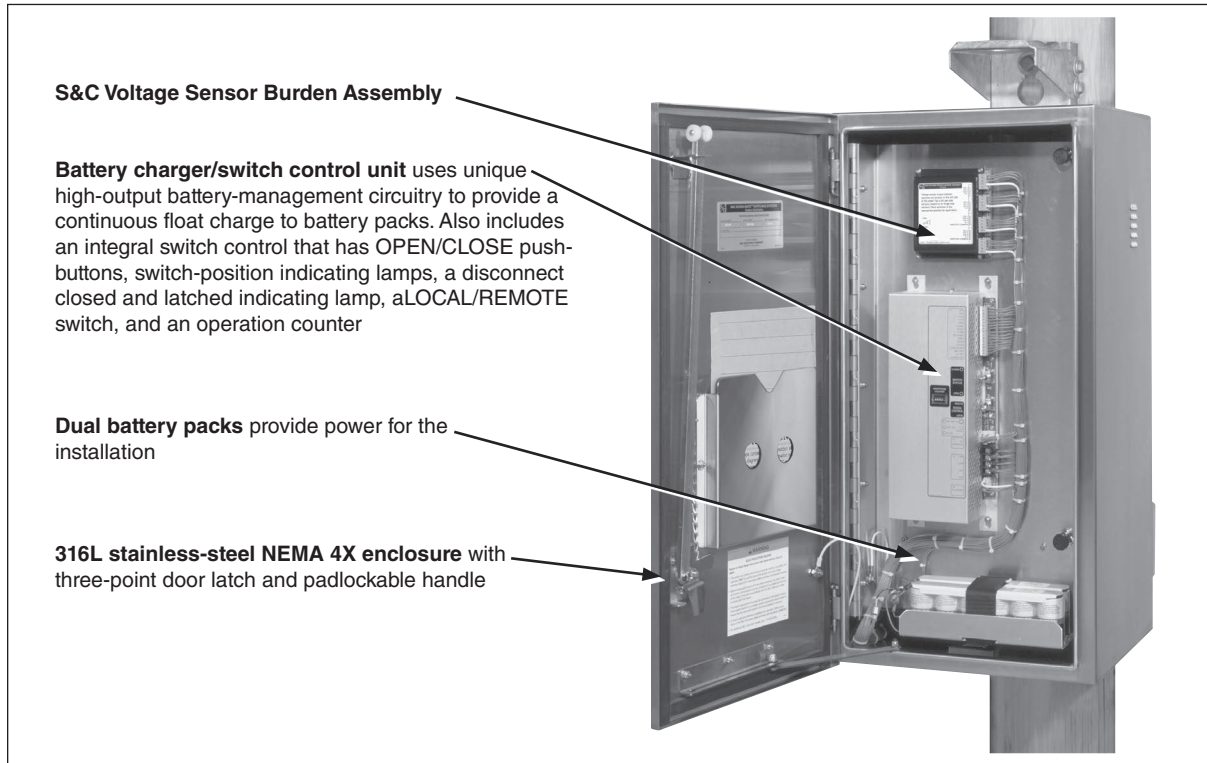


Figure 3. The Type CCU-XP Unit component location.

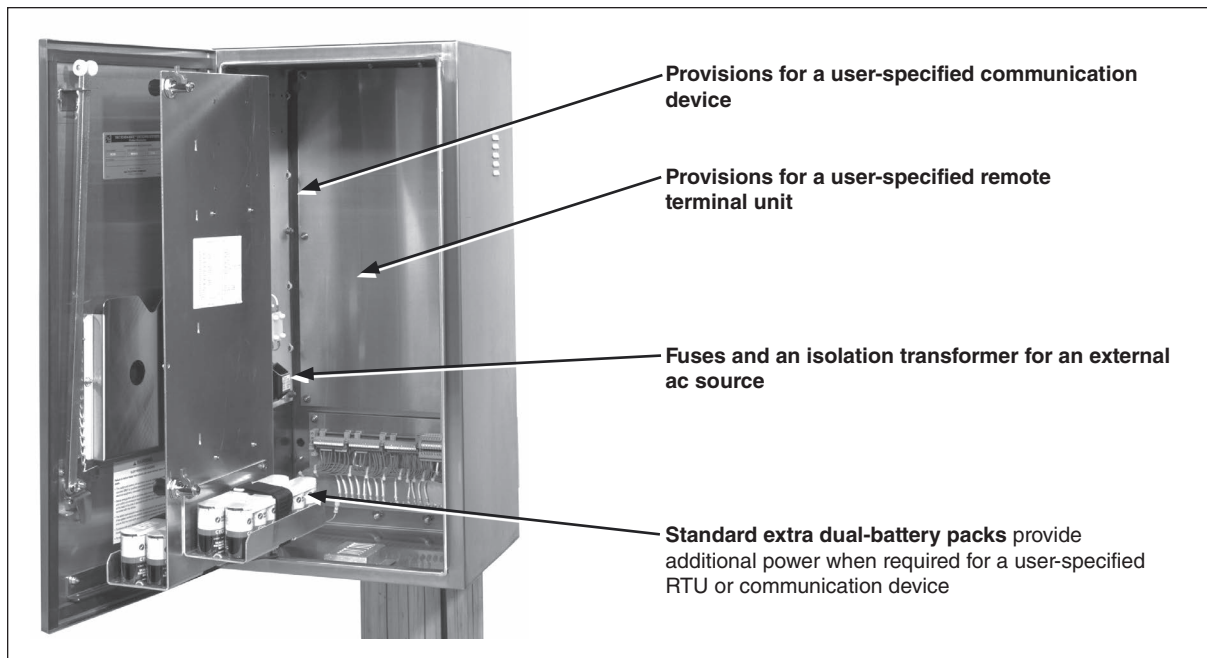


Figure 4. The Type CCU-XP Unit with the weing-out panel open.



## Installing the Communication and Control Unit

Before installing the communication and control unit, install the S&C Scada-Mate Switch in accordance with Instruction Sheet 768-500, shipped with the switch.

**STEP 1.** Drill two  $\frac{11}{16}$ -inch diameter holes  $9\frac{3}{8}$  inches apart in the center of the utility pole and at the desired height for mounting the communication and control unit. The communication and control unit should be mounted at least 10-feet (305 cm) above ground level to minimize exposure to vandals. See Figure 5.

The maximum permissible distance between the lower through-bolt of the switch and the top through-bolt of the communication and control unit, when using the standard 35-foot (1067-cm) control cable, is 28 feet 4 inches (864 cm) for switches in the upright, vertical, and pole-top mounting configurations, or 32 feet 6 inches (991 cm) for switches in the tiered-outboard mounting configuration.

These dimensions should be increased by 10 feet (305 cm) when the switch is supplied with optional 45-foot (1372 cm) length control cable (catalog number suffixes “-C45” or “-G45”). The above dimensions should be reduced by 10 feet (302 cm) when the switch is supplied with an optional 25-foot (762 cm) length control cable (catalog number suffixes “-C25” or “-G25”).



**Figure 5.** To minimize exposure to vandals the communication and control unit should be mounted at least 10 feet (305 cm) above ground level.

## Installation

- STEP 2.** Insert two  $\frac{5}{8}$ -inch diameter through-bolts (supplied by others) in the holes drilled in Step 1. Secure these bolts loosely with the necessary washers and nuts so the heads of the bolts project sufficiently (approximately 3 inches (76 mm) from the face of the pole) to engage the enclosure mounting frame. For installation with a switch in the vertical mounting configuration, mount the communication and control unit on the face of the pole opposite the switch to allow space for the cable riser.
- STEP 3.** Attach an appropriate lifting sling and slowly raise the sling so it becomes taut. Carefully raise the control unit to the mounting height and guide it so the through-bolts projecting from the utility pole slip into the two keyholes in the enclosure mounting frame. Lower the enclosure slightly so it bears on the through-bolts. Fully tighten the bolts and make sure the washer for each bolt is between the bolt head and the mounting frame.
- STEP 4.** Ground the enclosure by solidly connecting one No. 6AWG wire (or wires of equivalent cross-sectional area) to the ground lug on the back of the enclosure. See Figure 6. Solidly connect the other end of the enclosure ground wire to the switch ground wire(s).

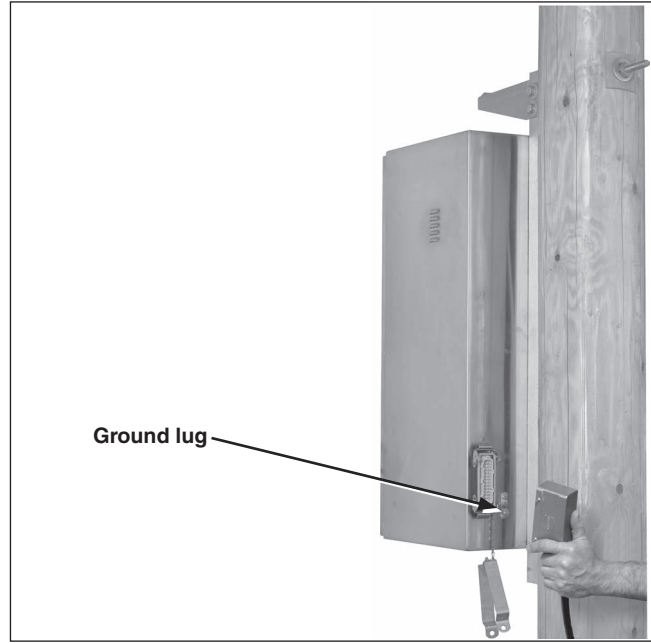


Figure 6. The enclosure ground lug is on the pole side.

## Connecting the Control Cable

**STEP 5.** A shielded control cable is included with the Scada-Mate Switch for connecting the switch to the communication and control unit. Remove the control cable from its shipping carton. The control cable is provided with multi-pin connector plugs—male for connecting to the switch and female for connecting to the control unit. Locate the receptacle on the back of the switch base and remove the dust cover. Remove the sensor shorting blocks from the receptacle and attach the control cable plug. Secure the plug with the connector clips. Refer to Instruction Sheet 768-500. Retain the dust cover and sensor shorting blocks for future use. See Figure 7.

**STEP 6.** Locate the connector plug on the back of the communication and control unit enclosure, remove the dust cover, and attach the control cable plug. Secure the plug with the connector clips. Retain the dust cover for future use. See Figure 8.

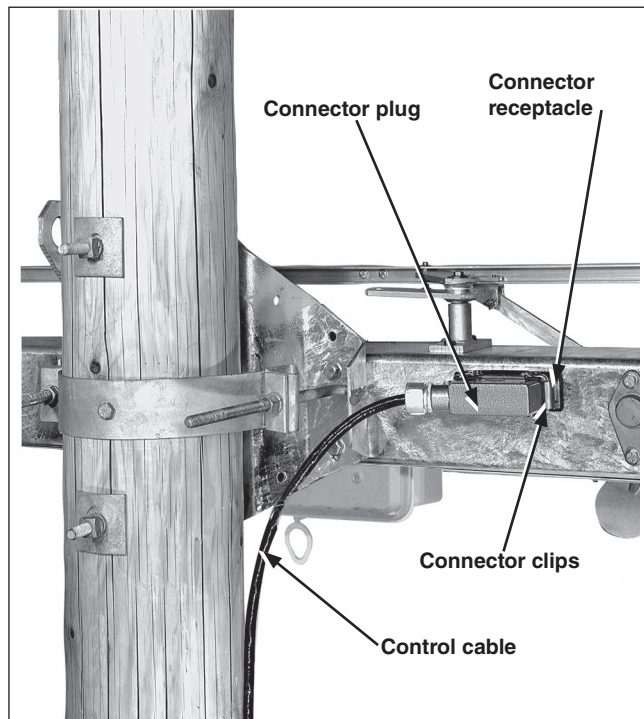


Figure 7. Connect the control cable to the switch. (A Scada-Mate Switch in the upright mounting configuration is shown.)

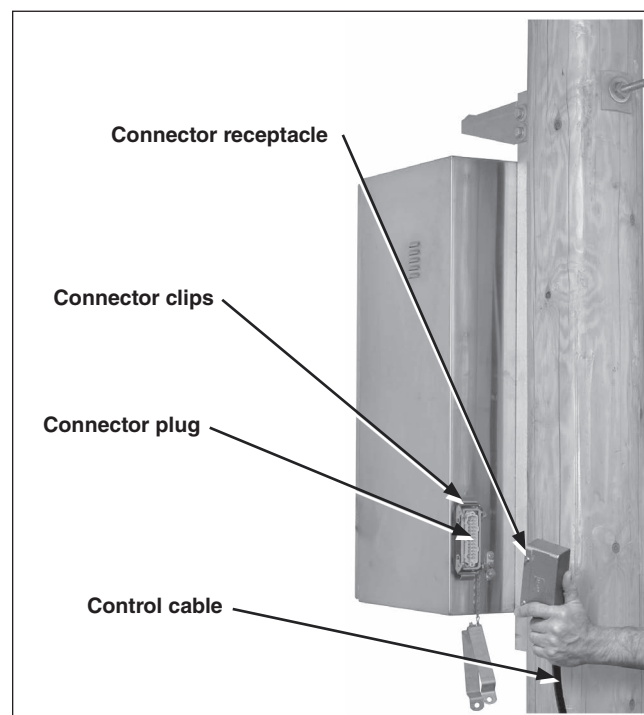


Figure 8. Connect the control cable to the communication and control unit.

## Installation

**STEP 7.** A stainless steel security belt is included with the communication and control unit for padlocking the connector. Place the security belt around the connector, between the connector clips and the enclosure. Insert a padlock (not furnished) through the security belt holes. See Figure 9.

**STEP 8.** Form a drip loop in the control cable where it attaches to the control unit. Maintain a 9-inch (229-mm) minimum radius when bending the control cable at the drip loop and at the switch connection. Adjust the control cable along the length of the utility pole and form a coil with any excess cable (maintaining a 9-inch (229-mm) minimum radius). Secure the control cable to the utility pole using suitable guards or clamps. See Figure 10.

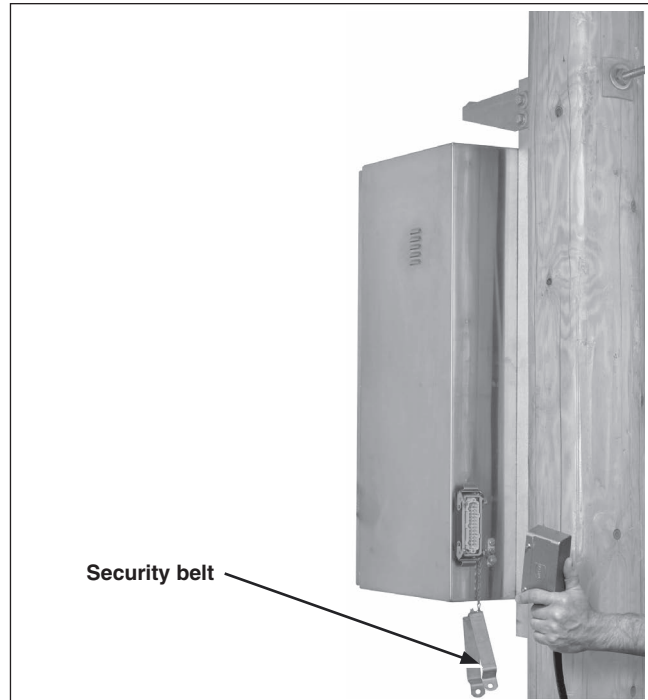


Figure 9. Secure the connector at the control unit.

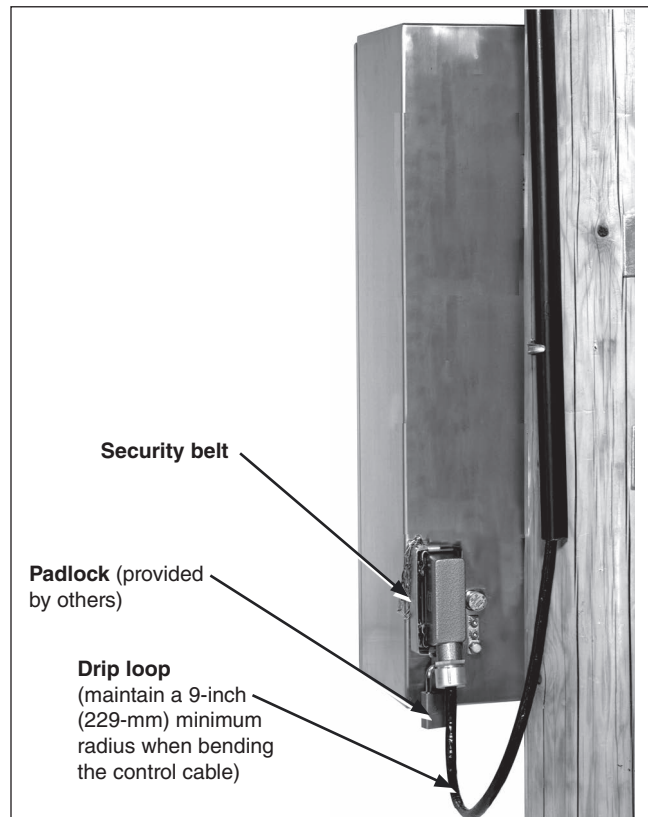


Figure 10. Connecting the control cable to the utility pole.

## Installing and Connecting a User-Supplied Communication Device

**STEP 9.** Mounting provisions are provided inside the communication and control unit for a user-specified communication device. Consult your nearest S&C Sales Office for mounting-configuration availability.

**When installing a 12-volt dc communication device in the field:** Connect power to the communication device by wiring terminals “37” and “38” on terminal block T4 to the power input terminals on the communication device. See Figure 7.

**When installing 24-volt dc communication device in the field:** Connect power to the communication device by wiring terminals “37” and “40” on terminal block T4 to the power input terminals on the communication device. See Figure 11.

### NOTICE

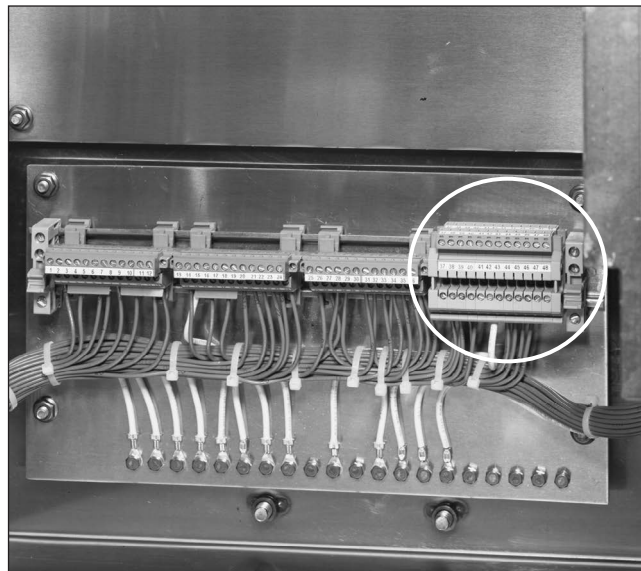
When the communication device is supplied by others, use of a surge suppressor between the antenna and the communication device is recommended to prevent damage from lightning surges. Contact the communication device manufacturer for recommended surge suppressors.

### NOTICE

The battery charger float charge is factory-calibrated to accommodate the loads installed in the communication and control unit at the time of shipment. If additional loads are subsequently added, recalibration of charger output is recommended to ensure optimal battery life. Please refer to the included S&C Battery Charger recalibration Procedure RD-3808.

### NOTICE

Make sure the communication port on the RTU is isolated from the power supply. Failure to do so can result in a short circuit and cause equipment damage.



**Figure 11.** Connect power to the communication device using the indicated terminal block.

## Installation

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### Connecting an Antenna

**STEP 10. When S&C supplied the communication device:**

An antenna surge suppressor is included in the enclosure, as shown in Figure 12. Attach the antenna cable (not furnished) to the female Type N connector on the surge suppressor.

**When the communication device is supplied by others:** Prepare a weather-tight entrance in the bottom or on the rear of the enclosure in accordance with utility practice. Install the appropriate surge suppressor, wiring, connectors, and entrance fittings (all supplied by others).

### Connecting a Land-Line Interface

**STEP 11.** Prepare a weather-tight entrance in the bottom or at the rear of the enclosure, in accordance with utility practice.

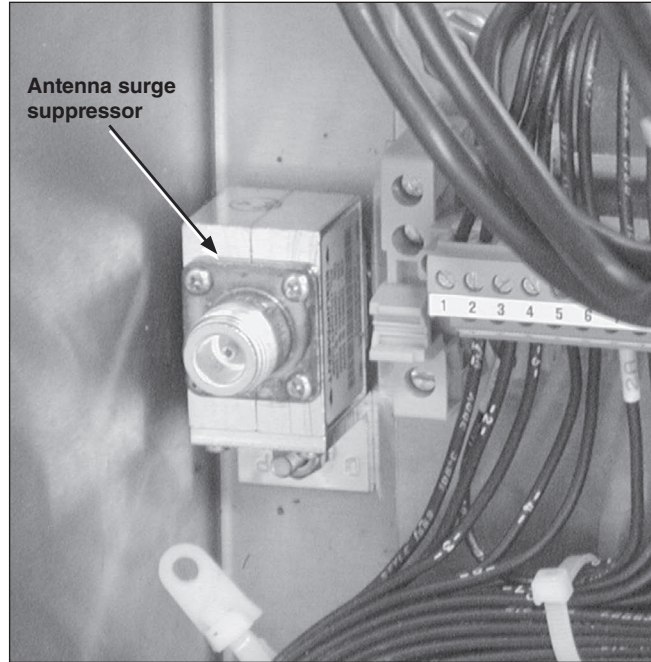


Figure 12. Antenna surge suppressor.

## Connecting Control Power

### ⚠ CAUTION

Make sure the control cable is grounded before connecting user-supplied 120 Vac.

#### STEP 12. For Type CCU-SP:

The communication and control unit is powered by the S&C Voltage Sensor on the Scada-Mate Switch. All control power connections are pre-wired.

External ac control power should not be used to continuously power the device except when options “U1” or “U3” are supplied and also in certain custom designs where adequate surge protection and isolation are provided.

In all other instances, the “external ac” input on the S&C Battery Charger is for use only when configuring the remote terminal unit in accordance with the remote terminal unit instructions. Refer to the included wiring diagram for connections if “external ac” is required. Note: On the S&C Battery Charger, Pins 34 and 35 are for external ac input. Terminal 34 is the line terminal.

#### For Type CCU-XP:

The communication and control unit is powered by user-supplied 120-Vac control power. To connect control power, attach the line and neutral to the terminals on the bottom of the fuse block. See Figure 13. Then, connect the ground wire to the left side plate. Refer to the wiring diagram for details. The unit is energized when control power is connected. Batteries are shipped disconnected and can be connected when the control unit has ac power.



Figure 13. Connect external ac control power to the fuse block.

### Connecting Remote Terminal Unit Hardware Status Inputs

#### NOTICE

S&C status inputs are dry contacts and S&C Control Outputs are wetted with 24 Vdc.

**Note:** The control output contact must be maintained for a minimum of one second to ensure switch operation.

**STEP 13. When the RTU is supplied by S&C:** All hardware status inputs are prewired to the remote terminal unit. No additional load should be connected to these inputs because they are designed for use with low-power devices and connecting additional load may cause damage to components.

**When the RTU is supplied by others:** Refer to the included wiring diagrams for status inputs.

### Testing the Remote Terminal Unit

**STEP 14.** After configuring the RTU (if furnished), testing functionality of the communication and control unit and the automated switch (if connected to the communication and control unit via the control cable) can be accomplished with a personal computer and suitable user-supplied protocol test software.

#### NOTICE

In some computers, the communication port signal ground is internally connected to the chassis ground to reduce electromagnetic interference (EMI). If such a computer is used to test a communication device-equipped communication and control unit, a ground loop is created that will short-circuit one of the battery packs.

To avoid short-circuiting the battery pack in the event your computer has this internal connection, temporarily disconnect the power connector of the communication device. After the communication and control unit has been tested, reconnect the power connector to the communication device.

Test the remote terminal unit in accordance with the manufacturer's standards.



## Placing the Communication and Control Unit into Operation

### **⚠ WARNING**

Before energizing the switch and at all times when energized, the Scada-Mate Switch base and control unit enclosure must be connected to a suitable earth ground at the base of the pole in accordance with the S&C instruction sheets furnished. The switch base ground must also be connected to the system neutral. If the system neutral is not present, proper precautions must be taken to make sure the local earth ground cannot be severed or removed. Failure to observe these instructions can result in serious personal injury due to electrical shock.

**STEP 15.** Energize the automated switch in accordance with standard operating practices.

#### **For Type CCU-SP:**

Confirm that the battery charger input selector switch is in the **Voltage Sensor Source** position. Then, place the battery charger power switch in the **On** position and confirm that the POWER LED display is lit and the CHARGER OVERVOLTAGE and BATTERY LOW LED displays are not lit.

When the control unit is first powered, the mechanism on the automated switch may begin charging the spring if it was not fully charged. The mechanism will take approximately 3 seconds to charge after each operation. See Figure 14.

#### **For Type CCU-XP:**

When ac power is connected to the control unit, it will be energized.

When the control unit is first powered, the mechanism on the automated switch may begin charging the spring if it was not fully charged. The mechanism will take approximately 3 seconds to charge after each operation. See Figure 14.

For a vertical configuration switch, or if the “H” option was specified, it may take 30 seconds to one minute for the mechanism to charge after each operation.

**STEP 16.** If the remote terminal unit is provided with a power switch, verify that the switch is in the **On** position.

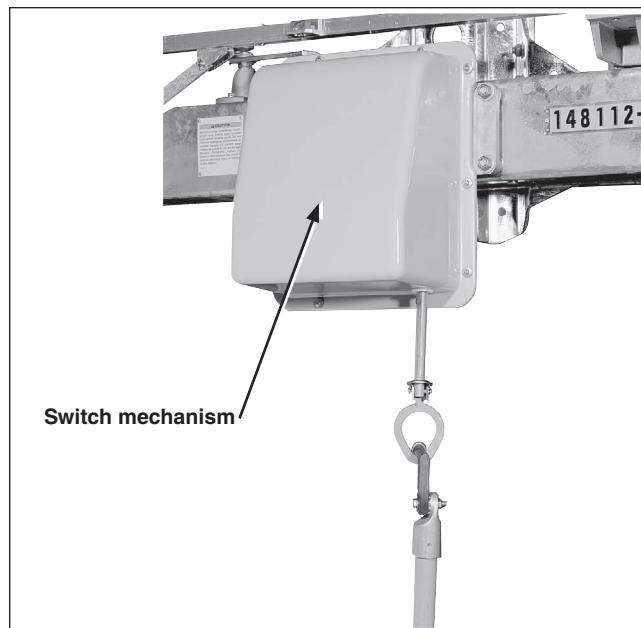


Figure 14. The switch mechanism.

# Operation

## Loss of Power Alarm

### For CCU-SP:

Enable the **Loss of Ac Source** alarm. The battery charger **Loss of Ac Source** alarm is shipped in the **Disabled** state. To enable it, remove the battery charger cover and find the jumper near the pins labeled “w.” Move the jumper from the right side to the left side.

### For CCU-XP:

The battery charger/switch control combination unit has a **Charger Off** alarm shipped in the **Enabled** state. Just connect control power.

## Pushbutton Operation

Place the LOCAL/REMOTE switch inside the communication and control unit in the **Local** mode. See Figures 15 and 16. Then, press the OPEN or CLOSE pushbutton as required.

The interrupter OPEN/CLOSED indicator on the end of the switch base indicates interrupter position. The target with an “O” indicates the interrupters are open; the target with a “C” indicates the interrupters are closed. The indicator does not show the status of the disconnect. Refer to Instruction Sheet 768-500, “S&C Scada-Mate Switching Systems: Outdoor Distribution (14.4 kV through 34.5 kV).” See Figure 17.

## Remote Operation

Place the LOCAL/REMOTE switch inside the communication and control unit in the **Remote** mode. See Figures 15 and 16.

Operation can only occur now by remote supervisory control or manually by using a hookstick.

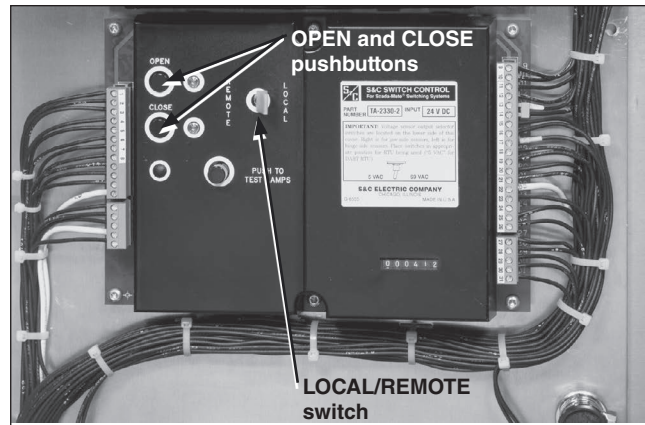


Figure 15. The Type CCU-SP control.

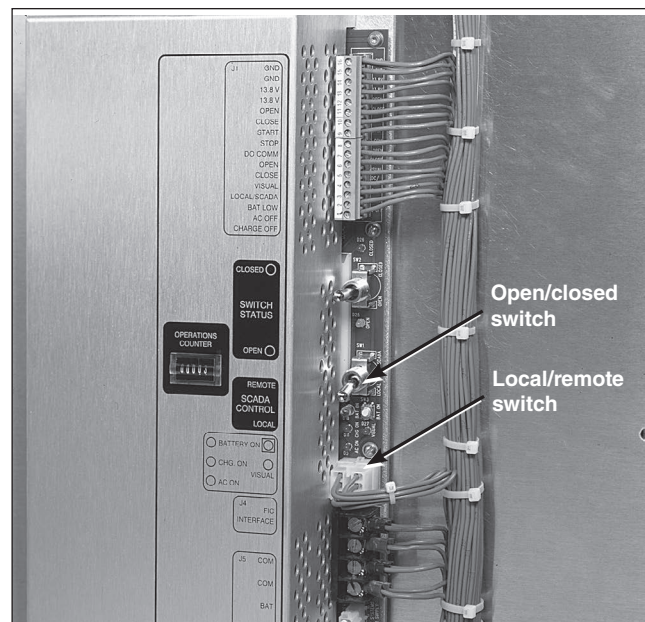


Figure 16. The Type CCU-XP control.

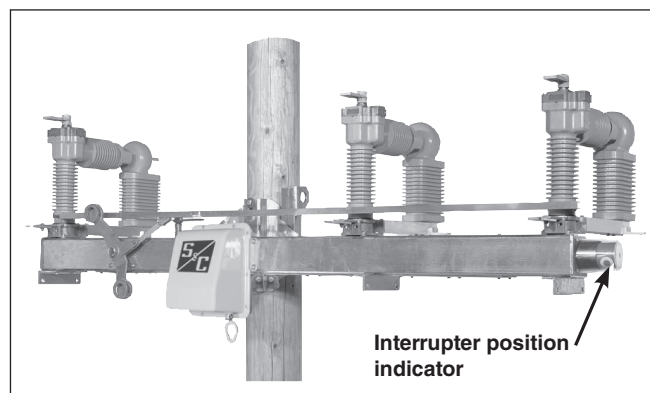


Figure 17. A Scada-Mate Switch shown in the Open position.

## Disconnect Operation

An integral hookstick-operated, three-pole disconnect is built into every Scada-Mate Switching System to provide visible air-gap isolation of switched-open circuits.

Follow these steps to open the disconnect:

- STEP 1.** Place the LOCAL/REMOTE switch inside the communication and control unit in **Local** mode. Operation can only occur now by local control or manually by using a hookstick.
- STEP 2.** Open the interrupter contacts by pressing the OPEN pushbutton.
- STEP 3.** Open the disconnect by pulling on the disconnect operating lever with a suitable hookstick. The disconnect will not open unless the interrupter contacts are in the **Open** position. Refer to Instruction Sheet 768-500, "S&C Scada-Mate Switching Systems: Outdoor Distribution (14.4 kV through 34.5 kV)."
- STEP 4.** Provision for tagging the three-pole disconnect are provided when the disconnect is in the open position. Refer to Instruction Sheet 768-500, "S&C Scada-Mate Switching Systems: Outdoor Distribution (14.4 kV through 34.5 kV)."

**Note:** For a Type CCU-SP, the DISCONNECT-NOT-LATCHED indicator is lit when the disconnect is not fully closed. See Figure 18. For a Type CCU-XP, the VISUAL-BREAK indicator is lit when the disconnect is not fully closed. See Figure 19.

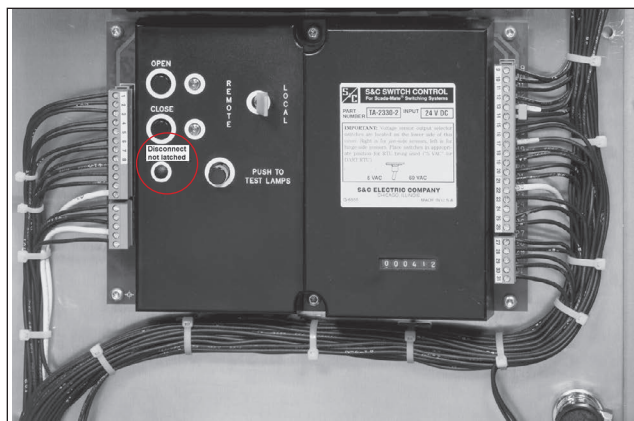


Figure 18. The Type CCU-SP DISCONNECT NOT LATCHED indicator is lit when the disconnect is not fully closed.

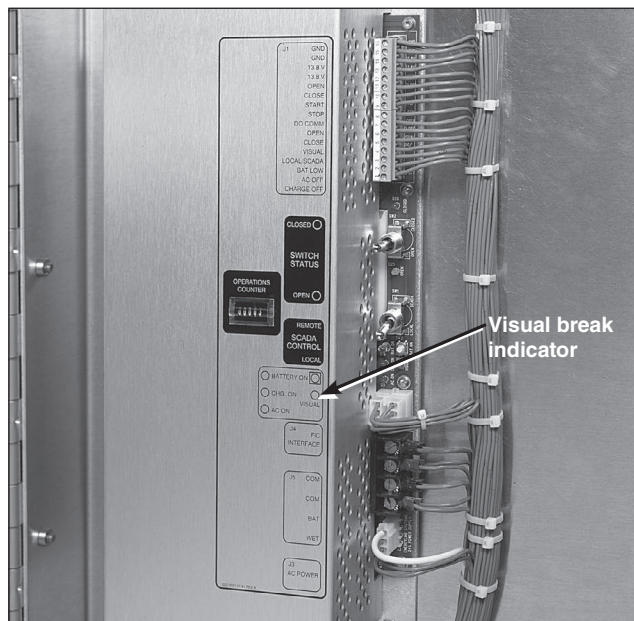


Figure 19. The Type CCU-XP VISUAL BREAK indicator is lit when the disconnect is not fully closed.

## Operation

**STEP 5.** To close the disconnect: pull down on the disconnect operating lever with a hookstick. See Figure 20. Closing the disconnect does not close the interrupter contacts. The switch must be closed electrically or by hookstick to close the interrupter contacts.

**Note:** The switch must be open before opening the disconnect, except for vertical-configuration switches or if the “H” option was specified.

### **⚠ DANGER**

The interrupters and terminal pads of a Scada-Mate Switch may be energized with the interrupters in any position. Before inspecting, servicing, or repairing this switch or working on the conductors on either side of the switch, test for voltage using proper high-voltage test equipment. Then install suitable grounding equipment. Failure to observe these precautions may result in serious injury or death.

### Emergency Manual Operation

In the event of electrical power loss, a standard or extendible hookstick is used to open and close the interrupters. When the spring is fully discharged, pull on the operating mechanism pull-ring with the hookstick seven to nine times to effect a change of state. If the spring is partially charged, just a single pull will change the interrupter position. Refer to Figure 21.

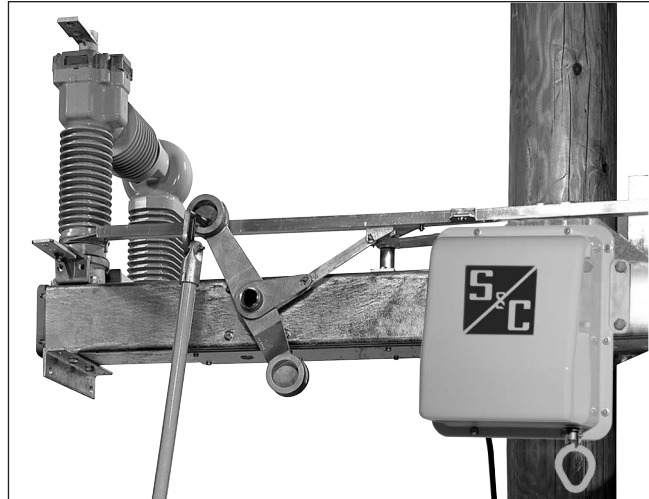


Figure 20. Pull down on the disconnect operating lever with the hookstick

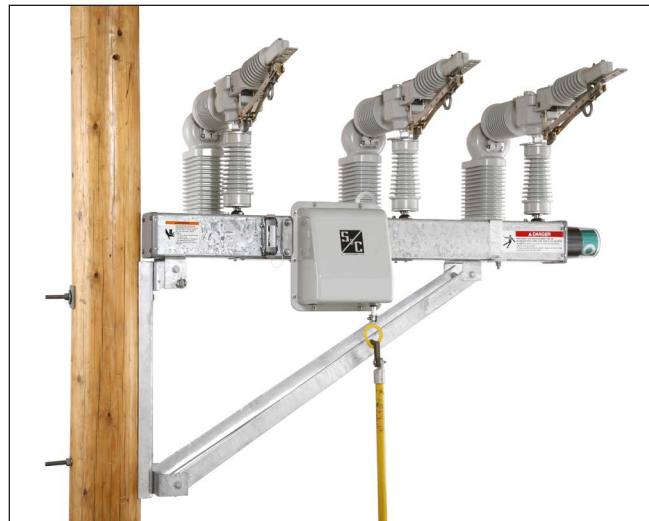


Figure 21. Manual operation using a hookstick. A Scada-Mate CX™ Switch is shown.

## Periodic Battery and Battery Charger Inspection

An annual inspection of the battery system is recommended to ensure reliable performance.

The annual inspection of factors such as the battery's physical appearance and the charging voltage can play an important part in determining whether the batteries are at or nearing the end of life.

### Equipment required

- A dc voltmeter (3½ digit)
- Battery ID labels that are user furnished and show the date of battery manufacture and a unique battery identification number
- A thermometer

### Initial preparation

Good record-keeping is important for obtaining optimal results at the lowest cost. The objective is to establish a base line for the measured values and watch for trend changes. Record the following:

- Battery identification number
- Date of installation
- Battery charging voltage
- Ambient temperature
- Date removed from service
- Battery appearance

### Physical appearance

Examine the battery for signs of corrosion, particularly at the battery terminals. On some battery installations it may be necessary to slide back the retaining device, such as the plate or strap, to see the termination points.

Replace every battery that shows signs of terminal corrosion, even if other measurements are okay. Corrosion usually appears as white powder at or near the terminal posts. It may be necessary to replace the associated corroded "Faston" connectors. Corrosion indicates the battery case has been breached. Normally, a positive pressure exists in the battery. When the battery case is breached, electrolyte can ooze out and air will enter. The introduction of air significantly affects battery chemistry and rapidly results in battery end of life.

## Maintenance

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### Charging Voltage

The correct charging voltage improves battery life expectancy. For every 0.6 volts in excess of the recommended charging voltage, the life of these 12-volt batteries can be reduced by up to 50 percent. Undercharging causes sulfation, which shortens life expectancy. Measure the battery charger output voltage with load connected and batteries disconnected. Account for the temperature compensation factor. If necessary reset the charging voltage.

For instructions about recalibrating S&C Battery Chargers typically used in the Type CCU-SP, refer to S&C Battery Charger Recalibration Procedure RD-3808.

The battery charger/switch control typically used in the Type CCU-XP does not require recalibration; therefore, a procedure is not referenced.

### New Battery Preparation

The replacement batteries must be in good condition. New batteries are received with an unknown history of handling and storage and may not have been optimally conditioned to reach full-capacity charge. To condition a battery to use its full capacity, it must be given multiple charge/discharged cycles under controlled conditions. Automated charging equipment is available from a number of manufacturers. If batteries are not preconditioned this way, they may not provide full capacity when installed and may take several months to reach full capacity.

Install a battery ID label on each battery in a visible location.

Recommendations for battery storage are located in the "Specifications" section on pages 28 and 29.

## Charging the Battery Packs

If the communication and control unit will not be placed in service by the date marked on the control unit or shipping container tag, the battery charger (Type CCU-SP) or the battery charger/switch control (Type CCU-XP) must be connected to an isolated 120-Vac power source to charge the battery packs.

### ⚠ CAUTION

The control unit enclosure must be properly grounded before connecting a 120-Vac source to the battery charger (Type CCU-SP) or the battery charger/switch control (Type CCU-XP). Failure to ground the enclosure can result in electrical shock.

### For Type CCU-SP:

Follow these steps to charge the batteries:

- STEP 1.** Make sure that the power switch on the battery charger is in the **Off** position.
- STEP 2.** Ground the enclosure using the ground lug on the back of the enclosure.
- STEP 3.** Place the battery charger input selection switch in the **External Source** position.
- STEP 4.** Connect an isolated 120-Vac source to the two terminals marked EXT/AC, or to the fuse blocks if either the “U1” or “U3” external ac control options are provided. See Figure 22.
- STEP 5.** Place the power switch on the battery charger in the **On** position and allow the battery packs to charge for 24 hours.
- STEP 6.** After charging the battery packs, place the power switch on the battery charger in the **Off** position. Then, disconnect the 120-Vac power source and return the battery-charger input-selector switch to the **Voltage Sensor Source** position.



Figure 22. Fuse block for connection of ac control power.

## Control Setup

### For Type CCU-XP:

- (a) Ground the enclosure using the ground lug on the back of the enclosure.
- (b) Connect an isolated 120-Vac source to the fuse blocks provided. See Figure 22 on page 23.
- (c) Attach the battery terminals to the batteries, since they are not connected during shipping.
- (d) Allow the battery packs to charge for 24 hours.
- (e) After charging the battery packs, disconnect the 120-Vac power source. Then, disconnect the terminals from the battery packs.

### Battery Pack Replacement

To replace the battery packs, proceed as follows:

- (a) For Type CCU-SP: Place the battery charger in the **External Source** position. Then, put the power switch in the **Off** position.
- (b) For Type CCU-XP: Disconnect the fuse block. Then after 15-30 seconds, disconnect the following wires from the battery pack:
  - Battery 1 – positive
  - Battery 2 – negative
  - Battery 3 – positive
  - Battery 4 – negative
- (c) Refer to the enclosed wiring diagrams for details.
- (d) Unfasten the Velcro strap securing the battery packs. See Figure 23.
- (e) Remove the connectors from the battery pack terminals, noting the appropriate “+” and “-” terminals, as well as to which battery pack each connector is attached. Then, remove the old battery packs.
- (f) Place the new battery packs in the enclosure and attach the connectors to the correct terminals.
- (g) Refasten the Velcro strap and secure the battery packs.

#### NOTICE

Reconnecting batteries improperly may cause equipment damage.

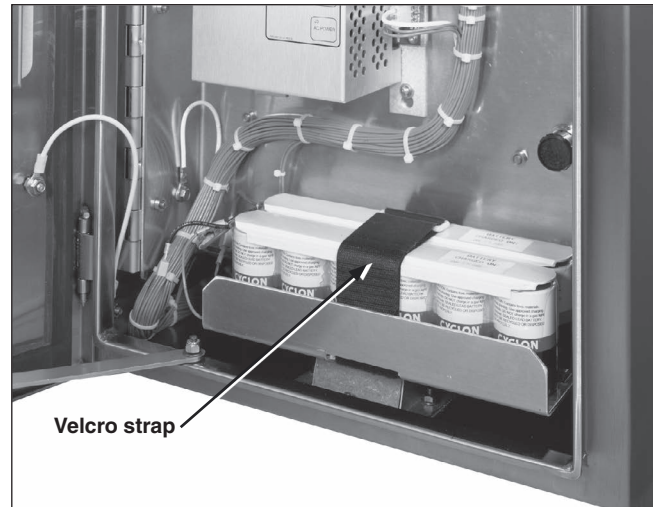


Figure 23. Unfasten the Velcro strap securing the battery packs.



**Table 1. Self-Powered Communication and Control Unit**

Item	Catalog Number	Net Wt., Lbs.
Type CCU-SP Communication and Control Unit, self-powered—Includes one S&C Battery Charger, a switch control, mounting space for a user-specified remote terminal unit (RTU) and communication device connection, and 36-inch (914-mm) × 18-inch (457-mm) × 16-inch (406-mm) enclosure	54215	130

**S&C Battery Charger**

Manufacturer	S&C Electric Company
Type	Constant-voltage temperature compensated
Operating Temperature Range	-40°C to +70°C (-40°F to +158°F)
Input Voltage	120 Volts, 50/60 Hz
Number of Battery Charging Outputs	2
Float Charge Voltage	13.5 Volts at +25°C (77°F)
Low-Voltage Load Disconnect	11.8 Volts at +25°C (77°F)
Low-Voltage Alarm-Contact Opening	12.1 Volts at +25°C (77°F)
Charger Overvoltage Alarm-Contact Opening	15.5 Volts at +25°C (77°F)
Loss of AC Source Alarm♦ (field selectable, shipped in <b>Disabled</b> mode)	0.0 Volts
Maximum Time to Recharge Battery Packs Upon Return of AC Source	24 hours
Dc Output Fuse	Type 3 AG, 10 A
Ac Input Fuse	Type 3 AG, 3/8 A

**Monobloc Battery Packs in Plastic Outer Case**

Manufacturer	Hawker Energy Products
Type	Rechargeable, sealed-lead, starved-electrolyte
Part Number	0809-0016 (S&C # 9931-267)
Nominal Voltage (each battery pack)	12 Vdc at +25°C (77°F)
Rated Capacity (10-Hour Rate)	.5 ampere-hour at +25°C (77°F)
Operating Temperature Range	-40°C to +40°C (-40°F to +104°F)
Life Expectancy★	2-6 years
Maximum Recommended Interval Between Charge	6 months
Deep Discharge Limit (12-Volt pack)	10.2 Volts
Deep Discharge Limit (24-Volt pack)	21.6 Volts
Maximum Storage Temperature	+40°C (+104°F)

**Operating Time▲ (when disconnected from ac source)**

For 1-Watt Radio at -40°C	7 hours
For 1-Watt Radio at +25°C	13 hours
For 5-Watt Radio at -40°C	4 hours
For 5-Watt Radio at +25°C	9 hours

♦ To enable loss of ac source alarm, remove cover from battery charger and move jumper in upper left-hand corner from position “W1” to “W2.”

★ Dependent on storage conditions, charger settings, temperature, and type of load.

▲ The values shown represent the approximate length of time that S&C Scada-Mate Switching Systems will function before the low-voltage load-disconnect circuit in the battery charger operates to prevent deep discharge of the battery packs. These time values are based on continuous operation of the RTU drawing 3 watts and occasional recharging of the switch-operating mechanism.

# Specifications

**Table 2. Externally Powered Communication and Control Unit**

Item	Catalog Number	Net Wt., Lbs.
Type CCU-XP Communication and Control Unit, externally powered—Includes one battery charger/switch control combination unit, mounting space for a user-specified remote terminal unit (RTU) and communication device, a terminal block for RTU and communication device connection, and 36-inch (914-mm) × 18-inch (457-mm) × 16-inch (406-mm) enclosure	54216	130

## S&C 5800 Series Automatic Switch Control

Manufacturer	S&C Electric Company
Type	Constant-Voltage Temperature Compensated
Operating Temperature Range	-40°C to +70°C (-40°F to +158°F)
Input Voltage	90-140 or 180-280 Vac 50/60 Hz
Number of Battery Charging Outputs	1
Float Charge Voltage	27.3 Volts at +25°C (77°F)
Low-Voltage Load Disconnect	+22 Volts sustained for 30 seconds
Low-Voltage Alarm-Contact Opening	Less than 24 Volts
Charger Overvoltage Alarm-Contact Opening	Charger output above +30.75 Vdc
Loss of AC Source Alarm	85 Vac
Maximum Time to Recharge Battery Packs Upon Return of AC Source	.5 hours
Dc Output Fuse	.10 A, 32 V
Ac Input Fuse	GDC-2A

## Cyclon Battery Packs in Metal Outer Case

Manufacturer	Hawker Energy Products
Type	Rechargeable, sealed-lead, starved-electrolyte
Part Number	0809-0100 (S&C # 9931-073)
Number of Packs Required	4
Nominal Voltage (each battery pack)	12 Vdc at +25°C (77°F)
Rated Capacity (10-Hour Rate)	5 ampere-hour at +25°C (77°F)
Operating Temperature Range	-65°C to +80°C (-85°F to +176°F)
Life Expectancy★	2-6 years
Maximum Recommended Interval Between Charge	6 months
Deep Discharge Limit (12-Volt pack)	10.2 Volts
Deep Discharge Limit (24-Volt pack)	21.6 Volts
Maximum Storage Temperature	+80°C (+176°F)

### Operating Time▲ (when disconnected from ac source)

For 1-Watt Radio at -40°C	.14 hours
For 1-Watt Radio at +25°C	26 hours
For 5-Watt Radio at -40°C	.8 hours
For 5-Watt Radio at +25°C	.18 hours

★ Dependent on storage conditions, charger settings, temperature, and type of load.

▲ The values shown represent the approximate length of time that S&C Scada-Mate Switching Systems will function before the low-voltage load-disconnect circuit in the battery charger operates to prevent deep discharge of the battery packs. These time values are based on continuous operation of the RTU drawing 3 watts and occasional recharging of the switch-operating mechanism.

## Calibrating the Voltage- and Current-Sensor Outputs

Switch-control units using external ac control power can accommodate 5 Vac or 69 Vac voltage-sensing outputs. Switch-control units using self-contained ac control power can accommodate only a 5 Vac voltage sensing output.

Locate the yellow card included in the “Installation and Operation Information Kit” shipped with the switch. This card contains the precise magnitude ratios and phase-angle shifts of each current sensor and voltage sensor included on the switch.

### For RTUs having 5-Vac voltage-sensing inputs:

Sensor data written on this card can be used directly to calibrate the voltage-sensing and current-sensing inputs to the RTU. Refer to the manufacturer’s literature for calibration instructions.

### For RTUs having 69-Vac voltage-sensing inputs:

Voltage sensor magnitude ratio(s) written on this card do not apply. Each voltage sensor magnitude ratio must be adjusted to take into account the sensor’s nominal 69-Vac output in these applications and the adjusted magnitude ratio used to calibrate the corresponding voltage-sensing input to the RTU.

To determine the adjusted voltage-sensor magnitude ratio(s), measure and record the voltage-sensor output voltage(s) on the terminal strip of the switch control or burden board. The procedure is as follows:

- STEP 1.** Attach voltmeter probes to the terminals connected to the voltage sensors. Refer to Table 3 on page 31 for switch control and output terminals.
- STEP 2.** Place the voltage-sensor output selector switch on the switch control or burden assembly in the **5 Vac** position. Measure and record the voltage, V1.
- STEP 3.** Place the voltage-sensor output selector switch on the switch control or burden assembly in the **69 Vac** position. Measure and record the voltage, V2.

- STEP 4.** Calculate and record the following:

Adjusted voltage-sensor magnitude ratio =

$$\left(\frac{V1}{V2}\right) \times (\text{voltage-sensor magnitude ratio})$$

where voltage-sensor magnitude ratio is the value written on the yellow card. ▲

- STEP 5.** Repeat Steps 1 through 4 for each voltage sensor provided.

For Type CCU-SP (catalog number 54215), the output terminals are located on the S&C Switch Control.

For Type CCU-XP (catalog number 54216), the output terminals are located on the bottom half of the S&C Voltage Sensor Burden Assembly.

# Calibration

**Table 3. Voltage Sensor Wiring**

Voltage Sensor▲	Output Terminals on Switch Control	Output Terminals on Burden Assembly
Jaw-Side Pole 1	23 and 26	VS01 and N1
Jaw-Side Pole 2	24 and 26	VS02 and N1
Jaw-Side Pole 3	25 and 26	VS03 and N1
Hinge-Side Pole 1	27 and 30	VS04 and N2
Hinge-Side Pole 2	28 and 30	VS05 and N2
Hinge-Side Pole 3	29 and 30	VS06 and N2

▲ Switch poles are identified as follows: When facing the mechanism side of the switch, Pole 1 is on the left, Pole 2 is in the center, and Pole 3 is on the right. For the tiered-outboard configuration, Pole 1 is on the top, Pole 2 is in the center, and Pole 3 is on the bottom.

Current-sensor magnitude ratios written on this card can be used directly to calibrate the current-sensing inputs to the RTU.

Refer to the manufacturer's instructions for calibrating the voltage-sensing and current-sensing inputs to the RTU. Voltage-sensor and current-sensor phase-angle shifts are not generally required for calibrating transducer-equipped RTUs. Measure the voltage-sensor output selector switch is in the **69 Vac** position after calibrating the RTU.

For future reference, keep the yellow card in the water-resistant envelope and place it in the instruction manual holder inside the control unit enclosure.

S&C Data Sheet 768-93 (furnished) provides additional information on the sensors included with S&C Automated Switches. Refer to this publication for details regarding specifications and accuracies of the outputs.

## Alternate Location of Data

If the yellow card is not available, the magnitude-ratio and phase-angle shift measurements of the voltage-sensor portion of each S&C Current/Voltage Sensor are also stamped on the left side of the sensor's terminal pad. These measurements are expressed in the form "V XXXX/XX.X," where the value to the left of the "/" is the magnitude ratio and the value to the right is the phase-angle shift.

The magnitude-ratio and phase-angle shift measurements of each S&C Current Sensor and the current-sensor portion of each S&C Current/Voltage Sensor are also stamped on the right side of the sensor's terminal pad. These measurements are expressed in the form "I XXX.X/X.X," where the value to the left of the "/" is the magnitude ratio and the value to the right is the phase-angle shift.

## Additional Calibration Factors for Self-Powered Units

Because the battery charger influences the voltage-sensor ratios, users may wish to further refine the accuracy of the sensor(s) to ensure voltage output accuracy.

As a consequence, the magnitude-ratio and phase-angle shift measurements may also be used by the RTU to calculate system analog values. The corrected sensor ratios may be used by the RTU to adjust the sensor outputs to account for the tolerance variations in the components.

The magnitude-ratio and phase-angle shift measurements of the battery charger are written on a label affixed to the battery-charger cover.

Voltage-sensor ratio corrections—battery charger phase  
magnitude ratio =  $Y_b X_v / K_v$

Where  $K_v = 1386$  (for 14.4-kV switches), or

2440 (for 25-kV switches), or

3389 (for 34.5-kV switches)

$X_v$  = magnitude ratio of voltage-sensor  
portion of current/voltage sensor

$Y_b$  = magnitude ratio of battery charger