INSTRUCTIONS

For Installation and Operation

This publication provides instructions for installation and operation of the switch control used with S&C Scada-Mate Switches. For instructions on installation and operation of Scada-Mate Switches, refer to S&C Instruction Sheet 768-500 furnished with the switch.

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Supersedes Instruction Sheet 768-580 dated 12-23-91

INTRODUCTION

A CAUTION

The equipment covered by this publication must be selected for a specific application and it must be installed, operated, and maintained by qualified persons who are thoroughly trained and who understand any hazards that may be involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

An S&C Scada-Mate Switching System consists of an integer style load-interrupting S&C Scada-Mate Switch and a control unit. This publication provides instructions for the switch control, shown in Figures 1 and 2,

for installation in a user-supplied control-unit enclosure. The switch control includes open/close pushbuttons, local/remote switch, and operation counter, as well as a terminal strip for connection of user-supplied 120-volt ac control power and 24-volt dc tripping power (12 amperes for 50 milliseconds), current sensor outputs (5 amperes ac), voltage sensor output (user-selectable 5 volts ac or 69 volts ac), open/close command inputs, and switch-position indication output.

Instructions for installation and operation of the Scada-Mate Switch are provided in S&C Instruction Sheet 768-500, shipped with the switch.

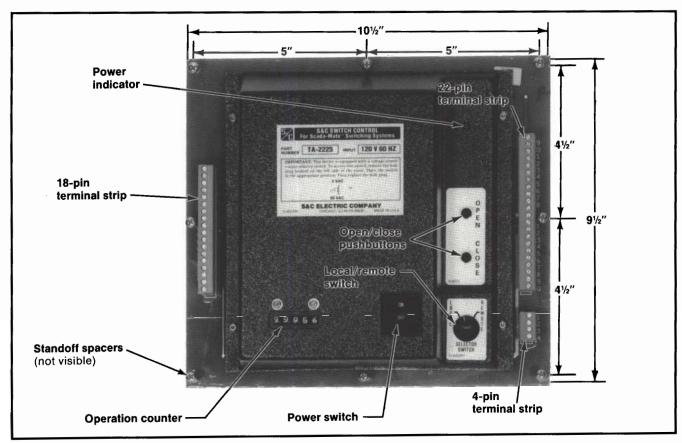


Figure 1. Switch control.

CHECKING THE SHIPMENT

A catalog drawing and wiring diagrams for the switch control will be found in a water-resistant envelope shipped with the switch control. Study these diagrams carefully and check the parts to verify that all parts are at hand. The shipment will include the following items:

- A switch control and eight standoff spacers (less hardware) ready for inclusion in a user-supplied communication and control unit.
- A panel-mount style connector for attachment to shielded control cable from the switch. The connector includes the connector base, insert portion, gasket, and security belt for installation on the usersupplied communication and control unit.

If the Scada-Mate Switch was shipped with the switch control, a catalog drawing and wiring diagrams for the switch will be found in a water-resistant envelope shipped with the switch. Study these diagrams carefully and check the parts to verify that all parts are at hand. The shipment will include the following items:

- A three-pole group-operated integer style Scada-Mate Switch, complete with interphase drive, storedenergy operating mechanism, and sensors all factoryassembled on a single base.
- A shielded control cable with multi-pin connectors for low-voltage electrical connection of the switch to the user-supplied communication and control unit.
- 3. Miscellaneous mounting hardware (less throughbolts and associated hardware) for securing the Scada-Mate Switch to the utility pole.
- 4. Optional features that are shipped unassembled to the Scada-Mate Switch, such as wildlife protection components.

Also included in the water-resistant envelope is a yellow card containing magnitude ratios for S&C Current Sensors and S&C Current/Voltage Sensors. These values must be used to calibrate the voltage and current sensor inputs to the RTU that will be installed in conjunction with the switch in order to offset the unit-to-unit variations in the sensors.

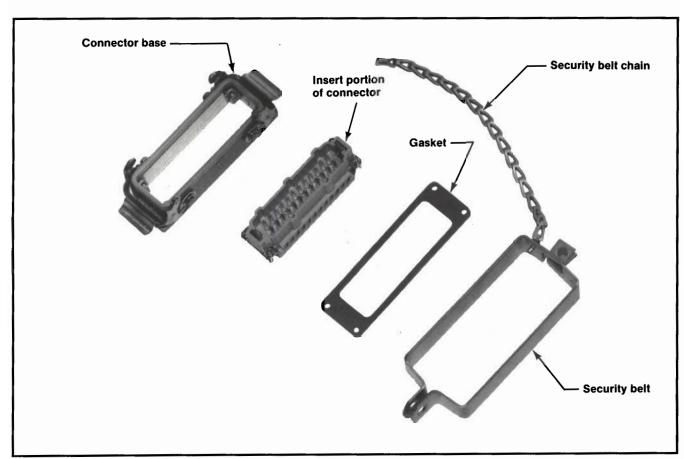


Figure 2. Panel-mount style connector for attachment of shielded control cable.

INSTALLING THE SWITCH CONTROL IN THE COMMUNICATION AND CONTROL UNIT

Step 1

Prepare an entrance for the panel-mount style connector at a suitable location on the rear of the user-supplied communication and control unit enclosure. See Figure 3 for mounting details.

Step 2

Attach the connector base—with its gasket—to the outside of the enclosure, using 8—32 hardware (not furnished). The security belt chain should be attached to the connector base using one of the mounting screws. Do not install the insert portion of the connector at this time.

Step 3

Make sure that the power switch on the switch control is in "OFF." Mount the switch control circuit board inside the enclosure. The eight standoff spacers are tapped to accept 6—32 screws (not furnished). See Figure 1.

Step 4

Referring to the wiring diagram furnished, prepare a wiring harness to connect the terminals in the insert portion of the panel-mount style connector to the 18-pin terminal strip on the switch control. Make up the connections as follows:

- (a) For signal and control lines, use 16-gauge wire of suitable length. Strip approximately % inch of insulation from both ends of each wire. Insert each wire in its appropriate terminal in the insert portion of the panel-mount style connector, then securely tighten the terminal screw.
- (b) For connections to ground, use 12-gauge wire of suitable length. Strip approximately % inch of insulation from both ends of each wire. Insert each wire in its appropriate terminal in the insert portion of the panel-mount style connector, then

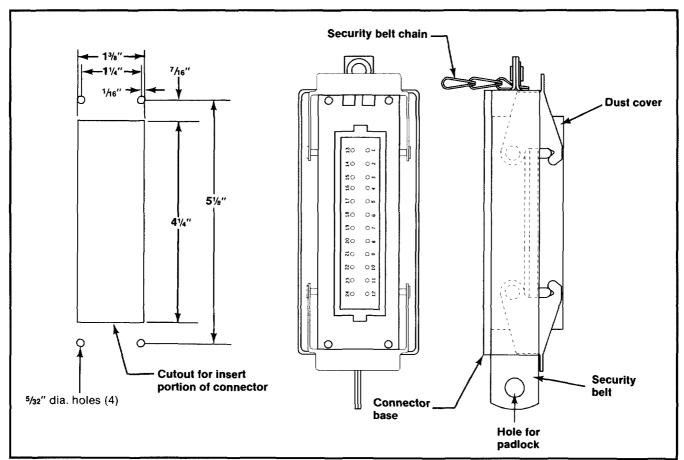


Figure 3. Mounting details of panel-mount style connector.

INSTALLING THE SWITCH CONTROL IN THE COMMUNICATION AND CONTROL UNIT — Continued

securely tighten the terminal screw. Note that the connector body ground terminal—indicated as "G" on the wiring diagram—is located at one end of the insert portion.

- (c) Push the free ends of the wires through the connector base and into the enclosure. Then attach the insert portion of the panel-mount style connector to the connector base and securely tighten the four captive 10—32 screws. Make sure that Terminal 1 is positioned at the top.
- (d) Attach the dust cover to the connector, to protect it until the control cable from the switch is connected.
- (e) Insert each signal or control line wire in its appropriate terminal in the 18-pin terminal strip on the switch control, then securely tighten the terminal screw.

Step 5

Referring to the wiring diagram furnished, make up the connections from the 18-pin terminal strip on the switch control to the enclosure ground and from the 22-pin terminal strip on the switch control to the enclosure ground. Also make up the connections from the insert portion of the panel-mount style connector to ground. Use 12-gauge wire of suitable length for each connection. All grounds should be made at a common point in the enclosure.

Step 6

Referring to the wiring diagram furnished, make up the connections from the 22-pin terminal strip to the user-supplied remote terminal unit (and transducers, if applicable) including the current sensor outputs, voltage sensor outputs, open/close command inputs, switch-position indication output (one aa contact and one bb contact), and local-remote status indication output. The "wetting" voltage input to the 22-pin terminal strip (used in the circuits which provide switch-position and local-remote status indication) must be obtained from the same wetting-voltage source used for the remote terminal unit. Use 16-gauge wire for all connections.

INSTALLING THE COMMUNICATION AND CONTROL UNIT

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

Step 1

Mount the communication and control unit on the utility pole. The communication and control unit should be mounted at least 10 feet above ground level to minimize exposure to vandals.

Step 2

Referring to the wiring diagram, make up the connections from the user-supplied 120-volt ac control power to the 4-pin terminal strip on the switch control. Also make up the connection from the user-supplied 24-volt dc tripping power source to the 22-pin terminal strip on the switch control. Use 16-gauge wire for all connections.

Step 3

Ground the enclosure by solidly connecting one number 6 AWG wire (or wires of equivalent cross-sectional area) to the enclosure ground point. Connect the other end of the wire to the switch ground wire(s).

A IMPORTANT

The capability of the switch control to withstand voltage surges is confirmed by two design tests: The ANSI/IEEE Surge Withstand Capability Test (ANSI/IEEE Standard C37.90.1-1989); plus a much more severe (5-kv, 3.75-joule) capacitive-discharge test specially developed by S&C to duplicate or exceed voltage surges measured on distribution circuits. Adequate shielding should be provided for control-circuit wiring to reduce the level of surges caused by induced voltages. If frequent surges in excess of factory-tested levels are anticipated, additional surge protection should be provided in accordance with established industry practices.

CONNECTING THE CONTROL CABLE

Step 1

A shielded control cable is included with the Scada-Mate Switch for connection of the switch to the communication and control unit. Remove the control cable from its shipping carton. Note that the control cable is provided with a multi-pin connector plug for attachment to the switch base and a multi-pin connector receptacle for attachment to the control unit. Locate the receptacle on the back of the switch base, remove the dust cover, and attach the plug from the control cable. Secure the connection with the connector clips. Refer to S&C Instruction Sheet 768-500. Retain the dust cover for future use.

Step 2

Remove the dust cover from the connector on the rear of the communication and control unit enclosure, and attach the receptacle from the control cable. Secure the connection with the connector clips. Retain the dust cover for future use.

Step 3

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

Step 4

A stainless-steel security belt is included with the switch-control panel-mount style connector for padlocking the connector at the control unit. Place the security belt around the connector between the connector clips and the enclosure, and insert a padlock (not furnished) through the holes provided.

PLACING THE SWITCH CONTROL INTO OPERATION

A CAUTION

Before energizing the Scada-Mate Switch, make sure that the switch base is grounded in accordance with the instruction sheet furnished with the switch, and that the control unit enclosure is grounded in accordance with Step 3 on page 5 of this instruction sheet. Failure to do so can result in electrical shock from induced voltages between the switch base and ground and/or the control unit enclosure and ground.

Energize the Scada-Mate Switch in accordance with standard operating practices. Place the power switch on the switch control in the "ON" position. Check the LED indicator on the switch control to verify that control power is present. When the control unit is first powered-up, the motor inside the stored-energy mechanism on the Scada-Mate Switch may begin charging the spring if it was not fully charged. The stored-energy mechanism can store energy for up to six switch operations, and the motor will take approximately fifteen seconds to charge each operation.

Complete the appropriate connections between the user-supplied communication and control unit and the master-station computer. For information on calibrating the voltage and current sensor outputs, refer to Appendix B.

OPERATION

Local Electrical Operation

Place the local/remote switch on the switch control in the "LOCAL" position. See Figure 1. Then press the "OPEN" or "CLOSE" pushbutton as appropriate. The interrupter open/closed indicator on the end of the Scada-Mate Switch base indicates interrupter contact position: The target with an "O" indicates that the interrupters are open; the target with a "C" indicates that the interrupters are closed. The indicator does not denote the status of the disconnect. Refer to S&C Instruction Sheet 768-500.

Remote Electrical Operation

Place the local/remote switch on the switch control in the "REMOTE" position. See Figure 1. The Scada-Mate Switch can now only be operated by remote supervisory control. The interrupter open/closed indicator on the end of the Scada-Mate Switch base indicates interrupter contact position: The target with an "O" indicates that the interrupters are open; the target with a "C" indicates that the interrupters are closed. The indicator does not denote the status of the disconnect. Refer to S&C Instruction Sheet 768-500.

Disconnect Operation

An integral hookstick-operated three-pole disconnect is built into every Scada-Mate Switch to provide visible air-gap isolation of switched-open circuits. First, place the local/remote switch on the switch control in the "LOCAL" position. See Figure 1. Open the interrupter contacts by pressing the "OPEN" pushbutton. Then open the disconnect by pulling down on the disconnect operating lever with a suitable hookstick. Refer to S&C Instruction Sheet 768-500. Incidentally, the interrupters are sequenced to mechanically trip before the disconnect opens, thus precluding misoperation if the disconnect is opened without first electrically tripping the interrupters.

Provisions for tagging the three-pole disconnect are provided when the disconnect is in the open position. Refer to S&C Instruction Sheet 768-500.

To close the disconnect, pull down on the disconnect operating lever (on the other side) with the hookstick. Closing the disconnect does not close the interrupter contacts. The switch must be closed electrically in order to close the interrupter contacts.

A DANGER

The interrupters and terminal pads of the 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.

APPENDIX A

Catalog Number Description

ltem	Catalog Number
Switch Control—for incorporation into user-supplied communication and control unit. Includes switch control with open/close pushbuttons, local/remote switch, and operation counter. Also includes terminal strips for connection of external ac control power and dc tripping power inputs, current sensor outputs (5 amperes ac), voltage sensor output (user-selectable 5 volts ac or 69 volts ac), open/close command inputs, and switch-position indication output. A panel-mount style connector for attachment of the shielded control cable is also included	

• Requires user-supplied 120-volt 60-hertz ac control power and 24-volt dc tripping power (12 amperes for 50 ms)

APPENDIX B

Calibrating the Voltage and Current Sensor Outputs

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.

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/XXX.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.

For RTUs having 5-volt ac voltage sensing inputs:

Voltage sensor and current sensor magnitude ratios written on this card can be used directly to calibrate the voltage sensing and current sensing inputs to the RTII

Refer to the manufacturer's instructions for further information on calibrating the voltage sensing and current sensing inputs to the RTU. Voltage sensor and current sensor phase-angle shifts are generally not required for calibrating transducer-equipped RTUs. Be sure that the voltage-sensor output selector switch (located underneath a hole plug on the left side of the switch control cover) is in the "5 VAC" position after calibrating the RTU.

For RTUs having 69-volt ac 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-volt ac 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), the voltage sensor output voltage(s) on the terminal strip of the switch control need to be measured. The procedure is as follows:

- 1. Attach voltmeter probes to Terminals 24 and 26, to which pole 2 voltage sensor is connected.
- 2. Place the voltage-sensor output selector switch on the switch control (located underneath a hole plug on the left side of the switch control cover) in the "5 VAC" position. Measure and record the voltage, $V_{\rm L}$.
- 3. Place the voltage-sensor output selector switch on the switch control in the "69 VAC" position. Measure and record the voltage, V_2 .
- 4. Calculate and record the following:

Adjusted Pole 2 Voltage Sensor Magnitude =

$$\left(rac{V_1}{V_2}
ight) imes$$
 (Pole 2 Voltage Sensor Magnitude Ratio)

where Pole 2 Voltage Sensor Magnitude Ratio is the value written in the table on the yellow card.▲

5. If the switch is equipped with three-phase voltage sensing (Catalog Number Suffix "-E3"): Attach voltmeter probes to Terminals 23 and 26, to which pole 1 voltage sensor is connected, and repeat Steps 2 through 4 for this voltage sensor. Then attach voltmeter probes to Terminals 25 and 26, to which pole 3 voltage sensor is connected, and repeat Steps 2 through 4 for this voltage sensor. ▲

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

Refer to the manufacturer's instructions for further information on calibrating the voltage sensing and current sensing inputs to the RTU. Voltage sensor and current sensor phase-angle shifts are generally not required for calibrating transducer-equipped RTUs. Be sure that the voltage-sensor output selector switch is in the "69 VAC" position after calibrating the RTU.

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

 $[\]blacktriangle$ 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 mounting configuration, Pole 1 is on the top, Pole 2 is in the center, and Pole 3 is on the bottom