

## Specifications

### Conditions of Sale

**STANDARD:** The seller's standard conditions of sale set forth in Price Sheets 150 and 181 apply, except as modified by the "Special Warranty Provisions" on page 8 and "Warranty Qualifications" on page 9.

### SPECIAL TO THIS PRODUCT AND ASSOCIATED SERVICES:

**INCLUSIONS:** A complete Scada-Mate Switching System includes two major components: a Scada-Mate Switch and a control unit that provides an interface between the switch and the master-station computer or peer-to-peer communication with distributed intelligence.

### Scada-Mate Switches

Scada-Mate Switches are three-pole, group-operated, integer-style interrupter switches rated 600 amperes continuous and interrupting, offered in voltage ratings of 14.4 kV, 25 kV, and 34.5 kV. These switches are factory-assembled on a one-piece base and include an integral stored-energy operating mechanism. In addition to electrically operating the interrupters, the operating mechanism provides non-electrical mechanical opening and closing of the interrupters by means of a manual-operation pull-ring.

Circuit-making and circuit-breaking are accomplished within sealed interrupters in a controlled sulfur hexafluoride (SF<sub>6</sub>) environment. Scada-Mate Switches feature a five-time duty-cycle fault-closing rating of 20,000 amperes, RMS, asymmetrical, plus full live-switching performance under any and all ice conditions. Circuit-making and circuit-breaking are accomplished internally; there are no external moving parts. Visible air-gap isolation of switched-open circuits is provided by an integral, hookstick-operated three-pole disconnect. The disconnect is blocked until interrupters are opened manually via the pull-ring, or electrically via the local pushbutton or SCADA.

Scada-Mate Switches are specifically designed for automation of overhead distribution systems. They include integral sensors for three-phase monitoring of line current and single-phase monitoring of system voltage. All sensors are of molded Cypoxy™ Insulator construction and serve as support insulators for the switch live parts, thereby eliminating the cost, clutter, and complexity associated with separately mounted sensors. The voltage sensor also provides continuous battery-charging power for certain control units—eliminating the need to provide external low-voltage control power.

Scada-Mate Switches are available in upright, vertical, tiered-outboard, and pole-top mounting configurations, accommodating the most widely used overhead-distribution line configurations. Switches in the upright mounting configuration are also available with extra mounting-pole clearance.

Scada-Mate Switches include:

- A stored-energy operating mechanism mounted on the switch base for automated circuit-making and circuit-breaking within sealed interrupters
- A hookstick-operable three-pole disconnect for visible air-gap isolation of switched-open circuits
- A disconnect closed and latched indicator, which provides remote indication of the disconnect position
- Sensors for three-phase monitoring of line current and single-phase monitoring of system line voltage
- A 20 Volt-ampere power source for charging the batteries of certain control units
- Provisions for mounting six surge arresters (three on each side of switch)
- Provisions for dead-ending
- 35-foot (10.7-m) shielded liquid-tight control cable for low-voltage electrical connection of the switch to the control unit
- Lifting means for convenient rigging and hoisting of the switch during installation
- Except on vertical mounting configuration switches.



## Conditions of Sale—Continued

### Control Units

Scada-Mate Switches require a control unit to provide a complete switching system. Four control units are available, accommodating different automation approaches and strategies. Alternately, a switch control unit can be furnished, providing local pushbutton control of the Scada-Mate Switch.

### **Communication and Control Unit— Externally Powered**

This custom-engineered control includes the following:

- A customer-specified remote terminal unit
- A customer-specified communication device
- A switch control with OPEN/CLOSE pushbuttons, switch-position indicating lamps, a disconnect closed-and-latched indicating lamp, a LOCAL/REMOTE switch, and an **Operation** counter
- A high-output temperature-compensated constant-voltage battery charger with a unique battery management system, powered by a customer-supplied 120-Vac source (Integral load-disconnect circuitry prevents deep discharge of batteries on loss of ac source. Alarms are on loss of ac source, battery low voltage, or charger overvoltage. The **Battery Load Test** feature works in conjunction with suitably equipped remote terminal unit.)
- Rechargeable sealed-lead starved-electrolyte battery packs
- Any other electrical components required for the specific application
- An easy-to-install 316L stainless steel enclosure

### **Communication and Control Unit— Self-Powered**

This custom-engineered control includes the following:

- A customer-specified remote terminal unit
- A customer-specified communication device●
- Switch control with OPEN/CLOSE pushbuttons, switch-position indicating lamps, a disconnect closed-and-latched indicating lamp, a LOCAL/REMOTE switch, and an **Operation** counter
- A temperature-compensated constant-voltage battery charger powered by an S&C Voltage Sensor (Integral load-disconnect circuitry prevents deep discharge of batteries on loss of ac source. Alarms are on loss of ac source, battery low voltage, or charger overvoltage. The **Battery Load Test** feature works in conjunction with a suitably equipped remote terminal unit.)■
- Rechargeable sealed-lead starved-electrolyte battery packs
- Any other electrical components required for the specific application
- An easy-to-install 316L stainless steel enclosure

● The self-powered communication and control unit is not recommended for use with a 5-Watt transceiver. The limited power output of the battery charger will put the batteries in a cyclic loading condition, which may reduce battery life by up to 50%. The externally powered communication and control unit is recommended if a 5-Watt transceiver is the desired communication device.

■ Frequent deep-discharge load testing of the batteries may put the batteries into a cyclic loading condition, which may reduce battery life by up to 50%. Contact your nearest S&C Sales Office for details.

### Model 6801 Automatic Switch Control

This fully integrated package includes the following:

- Sophisticated RTU functionality, including remote reporting of switch status points and switch operations, as well as current, voltage, wattage, and vars via a variety of protocols (The package also includes automatic sectionalizing on overcurrent, loss of voltage, or phase unbalance; overcurrent fault detection; selectable shots-to-lockout; and extensive data-logging (used this way for 6802 control) capability.)
- A customer-specified communication device
- A faceplate with a liquid-crystal display for viewing real-time data, settings, and fault events (Also included are touch switches, operation and diagnostic indicating lamps, and a USB local communication port.)
- A high-output temperature-compensated constant-voltage battery charger with a unique battery management system, powered by three S&C Voltage Sensors or a customer-supplied 120-Vac source (The integral load-disconnect circuitry prevents deep discharge of batteries on loss of ac source. Alarms are on loss of ac source, battery low voltage, or charger overvoltage. Includes an intelligent, microprocessor-controlled **Battery Test** feature.)
- Rechargeable sealed-lead starved-electrolyte battery packs
- Any other electrical components required for the specific application
- A compact easy-to-install aluminum enclosure

The 6801 control supports the IntelliTeam® SG Automatic Restoration System, which uses peer-to-peer communication and distributed intelligence to make operating decisions. No central processing or SCADA is required, though they are fully supported.

### Switch Control Unit

This device provides local pushbutton control only. It includes the following:

- Switch control with OPEN/CLOSE pushbuttons, switch-position indicating lamps, a disconnect closed-and-latched indicating lamp, a LOCAL/REMOTE switch, and an **Operation** counter
- A temperature-compensated constant-voltage battery charger powered by an S&C Voltage Sensor or a customer-supplied 120-Vac source (Integral load-disconnect circuitry prevents deep discharge of batteries

on loss of ac source. Alarms are on loss of ac source, battery low voltage, or charger overvoltage. A **Battery Load Test** feature works in conjunction with a suitably equipped customer-supplied RTU, which must be installed in a customer-supplied enclosure.)

- Rechargeable sealed-lead starved-electrolyte battery packs
- A terminal strip for connection of an external control power input (if required), remote **Open/Close** command inputs, current and voltage sensor outputs, and remote switch-position indication output.
- A surge protector for external control power input
- An easy-to-install 316L stainless steel enclosure

### Automatic Source-Transfer Applications

In automatic source-transfer applications, a source-transfer control unit is required to provide a complete switching system. Two control units are available as discussed below. Excluding any intentional time delay to coordinate with upstream protective devices and/or transition dwell time, transfer is achieved in 70 cycles maximum with either control unit.

### Micro-AT® Source-Transfer Control

The Micro-AT Source-Transfer Control uses voltage sensing and control power provided by a dedicated single-phase, customer-furnished line-to-ground connected voltage transformer for each source. Each transformer must be rated 500 VA minimum and have a 240/120-Volt, 60-Hertz secondary. No batteries are required.

This control is a fully integrated package that includes the following features:

- A MANUAL/AUTOMATIC operation selector switch
- A two-line, 48-character backlit liquid-crystal display
- An automatic-transfer READY indicating lamp, SOURCE VOLTAGE indicating lamps, and an OVER-CURRENT LOCKOUT indicating lamp with a reset key
- A keypad for entry of the control's operating characteristics and voltage, current, and time-related operating parameters
- Test keys for simulating overcurrent and loss of voltage on the sources

- Frequent deep-discharge load testing of the batteries may put the batteries into a cyclic loading condition, which may reduce battery life by up to 50%. Contact your nearest S&C Sales Office for details.

- Input isolation transformers and a signal-voltage input isolation assembly to isolate the source-transfer control from potential ground loops—as may occur because of differences in voltage between the grounding points of the voltage transformers and the control
- A control-voltage-seeking relay that transfers between the two sources, as required, to ensure adequate control voltage (One source must be energized for the control to operate.)
- Terminal strips for external connections (All necessary internal connections are prewired.)
- Fuse holders for secondary fuses of user-furnished voltage transformers
- A compact, easy-to-install 304L stainless steel enclosure

A separate junction box is provided for making connections to the second Scada-Mate Switch.

The Micro-AT Source-Transfer Control may optionally be furnished with the following:

- An **Overcurrent Lockout** feature (This prevents an automatic-transfer operation that would close a switch into a fault, thereby avoiding further utility-system disturbance. Includes facilities for external reset.)
- A **Remote Indication** feature (This permits remote monitoring of the presence or absence of source voltages, **Manual** or **Automatic** operating mode, the status of the READY indicator, an EVENT indicator, and, if furnished, an overcurrent lockout.)
- A test panel (This permits the use of an external, adjustable three-phase source to verify, through independent measurement, the response of the control to **Loss of Source**, **Phase Unbalance**, and **Overcurrent Lockout** conditions.)
- A supervisory control to permit operation from a remote location
- A communications card (This permits local uploading of “events” and settings from the Micro-AT control to a user-furnished personal computer, as well as downloading of the user’s standard operating parameters.)
- A customer-specified remote terminal unit and communication device for SCADA applications that can be furnished on a custom basis

The Micro-AT Source-Transfer Control automatically records system status every time a control operation occurs. Events can be viewed on the display or be uploaded to a personal computer if the optional communications card is furnished. The events are time-stamped and coded for easy interpretation; 130 events are stored in memory.

### **Model 6802 Automatic Switch Control**

This control uses current/voltage sensing and control power provided by three S&C Current/Voltage Sensors per source, mounted on the jaw side of each switch. A single 6802 control can manage two switches. It is a fully automated integrated package that includes the following:

- Sophisticated RTU functionality, including remote reporting of switch status points and switch operations via a variety of protocols, including DNP 3.0, as well as data-logging capability
- A faceplate with a liquid-crystal display for viewing real-time data, settings, and fault events (Also included are touch switches, operation and diagnostic indicating lamps, and a USB local communication port.)
- A high-output temperature-compensated constant-voltage battery charger with a unique battery management system, powered by three S&C Current/Voltage Sensors (Integral load-disconnect circuitry prevents deep discharge of batteries on loss of ac source. Alarms are on loss of ac source, battery low voltage, or charger overvoltage. Includes an intelligent, microprocessor-controlled **Battery Test** feature.)
- Rechargeable sealed-lead starved-electrolyte battery packs.●
- A compact easy-to-install aluminum enclosure

The Model 6802 Automatic Switch Control may optionally be furnished with the following:

- The IntelliTeam® SG Automatic Restoration System
- A customer-specified communication device

The Model 6802 control automatically records system status every time a control operation occurs. Events can be viewed on the display or uploaded to a personal computer; 64 events are stored in memory.

- The condition of the batteries may affect the ability to transfer or communicate.

## Sensors

All sensors are of molded Cyproxy Insulator construction and serve as support insulators for the switch live parts, thereby eliminating the cost, clutter, and complexity associated with separately mounted sensors. Sensing options include three-phase voltage sensing on the jaw side of the switch, and three-phase voltage sensing on both sides of the switch. Refer to Table 4 on page 15.

## Equipment/Services Packages

Complete equipment/services packages are available for three- through 12-member Scada-Mate Switch teams, as listed in Table 13 on page 19. Each team member includes a Model 6801 Automatic Switch Control with IntelliTeam SG Automatic Restoration System and a SpeedNet™ Radio. One SpeedNet Repeater Radio is also included with the team. Each package includes the following services:

- A communication site survey
- IntelliTeam SG system factory acceptance testing
- IntelliTeam SG system training
- IntelliTeam SG system commissioning

## Services-Only Packages

Services-only packages are also available for Scada-Mate Switches, as listed in Table 14 on page 20. Offerings include:

- Communication site surveys
- IntelliTeam SG system device settings determination
- IntelliTeam SG system factory acceptance testing
- IntelliTeam SG system training
- IntelliTeam SG system commissioning
- IntelliTeam SG system SCADA integration
- IntelliTeam SG system monitoring
- Scada-Mate Switching System maintenance
- Scada-Mate Switching System project and construction management

## Communication Site Surveys

A communication site survey is required for new IntelliTeam SG system applications and is critical to ensure acceptable signal strength between the switches in the team and the head-end SCADA radio, if applicable. A site survey includes:

- An engineering review of selected team member sites that considers distance, topological constraints, and other factors that can affect signal strength
- An on-site survey of team member sites to confirm feasibility—and, if necessary, determination of alternative sites that will provide better signal strength.
- A detailed report defining the GPS coordinates of all team and repeater radios
- Establishment of baseline communication statistics for monitoring communication system performance
- Training on installation and configuration of SpeedNet Radios

The user will need to supply a line truck and the engineer/technician responsible for the project.

The site survey ensures optimal communication when the system is commissioned. However, building construction, relocation of lines, vegetation growth, and other factors can degrade communication over time. A subsequent “tune-up” site survey may be desirable.

## IntelliTeam SG Device Settings Determination

Appropriate device settings are essential to the successful implementation of the IntelliTeam SG system. These settings must be documented prior to factory acceptance testing and commissioning of the IntelliTeam SG system.

## IntelliTeam SG Factory Acceptance Testing

Factory acceptance testing ensures all information required for a successful IntelliTeam SG system implementation is gathered and understood prior to commissioning, and is strongly recommended if there are any unusual system characteristics or loading limitations. It provides significant insight on how the IntelliTeam SG system will work on the user’s system—with the user’s specific system-protection settings, available fault currents, connected loads, etc. To perform this testing, the user must furnish the following:

- Substation breaker data, including overcurrent pickup levels and relay timer settings

- Any substation capacity limitations, conductor loading limitations, or system operating rule limitations
- A written description of the desired system functionality
- A single-line diagram of the circuits on which the IntelliTeam SG system will be applied
- Completed IntelliTeam SG system settings sheets (Determination of device settings is the customer's responsibility, or can be provided by S&C.)

Factory acceptance testing is performed at S&C's IntelliLab facility in Chicago. S&C will provide a detailed test plan. After testing has been completed, the user will receive a CD-ROM containing the results of each simulation, which they can use for training.

### ***IntelliTeam SG System Training***

IntelliTeam SG system training is conducted on-site and ensures that user's personnel fully understand IntelliTeam SG system functioning. Both operations and engineering sessions are provided.

Operations training is intended for persons who will encounter the equipment in the field, create switching orders, or dispatch system functions. A typical agenda includes:

- The IntelliTeam SG system—what it is, how it works, and examples
- Operation of Scada-Mate Switches and 6801 Automatic Switch Controls in an IntelliTeam SG system
- Real-world examples of IntelliTeam SG system operation using IntelliTeam® Designer in **Instant Replay** mode

Engineering training is intended for engineers and technicians who will configure the controls and radios. A typical agenda includes:

- A detailed look at how the IntelliTeam SG system works
- Explanation of all control settings
- Software screens useful for troubleshooting
- Configuration of the radios
- Creation of a DNP lookup table

### ***IntelliTeam SG Commissioning***

IntelliTeam SG system commissioning ensures the Scada-Mate Switches in the team have been set up correctly and are ready to be put into service. These services include:

- Assistance with configuring the 6801 Automatic Switch Controls and radios (Determination of device settings is the customer's responsibility, or can be provided by S&C.)
- Verification of acceptable peer-to-peer communication
- Verification of acceptable communication with the SCADA system
- Checking each Scada-Mate Switch and 6801 Automatic Switch Control for conformance with installation recommendations
- Verification that each team is capable of achieving **Ready** status (Upon user request, the teams will be disabled after verification.)

### ***IntelliTeam SG System SCADA Integration***

If an IntelliTeam SG system is to communicate with a SCADA system, integration services may be desirable. These services include:

- Working with the SCADA supplier
- Designing and installing the communication infrastructure linking the IntelliTeam SG system with the user's LAN
- Developing the protocol conversion necessary to change DNP into the native language of the SCADA master
- Developing optimal SCADA settings and polling sequence

### ***IntelliTeam SG System Monitoring***

Ongoing remote system monitoring ensures the IntelliTeam SG system operation meets agreed-upon service levels. Requires a SpeedGate™ Radio Interface System with a wireless telephone modem. If wireless telephone service is not available, a telephone modem and user-supplied telephone line must be installed at the SpeedGate Radio Interface System.

System monitoring allows S&C's engineers to assist with any required troubleshooting, update configurations, and provide weekly "health reports" on the status of the system. Such reports can include:

- Team **Ready** status
- IntelliTeam SG system operational status
- Battery system status
- Active trouble conditions or alarms

The scope and format of the reports can be customized to meet specific user needs.

### **Scada-Mate Switching System Maintenance**

Scada-Mate Switching System maintenance includes periodic field inspection and testing of the switch and control unit on a three-year interval. Services provided for each team member include:

- Visual inspection of the switch, control unit, control cable, antenna, grounding, arresters, and wiring connections
- Verification of control unit processor operation
- Downloading of a full report from the control unit, review of the data, and execution of any corrective actions necessary
- Replacement of the battery
- Operation of the switch (if it can be bypassed or operated decoupled): locally, manually, and from SCADA
- Inspection of the repeater radio and replacement of its battery
- Monitoring of communication statistics and comparison against the initial baseline (Identification of recommended communication enhancements.)

All system maintenance is coordinated with the user's designee. To facilitate the inspection process and ensure consistent and accurate reporting, S&C will work with the designee to develop an inspection checklist and train inspection crews on its importance and use.

### **Scada-Mate Switching System Project and Construction Management**

S&C's highly trained, experienced staff will assist the user's automation team in the areas of project and construction management, working closely with them to ensure on-time completion of the project. Services may include working with the user's contractor or crew to:

- Ensure proper installation of the Scada-Mate Switches and control units
- Supply the automation system as a complete turnkey or engineer/procurement project

**EXCLUSIONS:** Scada-Mate Switches do not include terminal-pad connectors. Various connectors are available as listed in Table 2 on page 13. Equipment/services packages and services-only packages do not include field installation or construction labor.

For non-IntelliTeam SG system applications, S&C may be able to furnish and install in the communication and control unit or 6801 Automatic Switch Control a customer-specified communication device other than an S&C SpeedNet™ Radio, as indicated in Table 5 on page 16. S&C will need to evaluate the physical and electrical requirements of the communication device and its performance characteristics and conduct qualification testing to verify its suitability for the desired application. Refer to the nearest S&C Sales Office for scheduling information. S&C cannot furnish or install any communication device for which the supplier requires S&C to offer Tier I (i.e., "help desk") support.

Control units do not include the antenna. The antenna, antenna support, and coaxial feedline are to be provided by others. Propagation study, frequency selection, and FCC license application are also to be provided by others.

**APPLICATION NOTES: System voltage restrictions applicable to the self-powered communication and control unit for 6801 and 6802 Automatic Switch Controls and the switch control unit when powered by an S&C Voltage Sensor(s):**

For adequate power to be available for the voltage sensors, Scada-Mate Switches must be applied on effectively grounded systems at line-to-line voltages in the ranges shown in Table 1. For applications at lower system voltages, contact your nearest S&C Sales Office.

**Table 1. Scada-Mate Switch Ground-to-Ground Voltage Ranges**

kV, Nom., at 60 Hz●	Range, kV, at 60 Hz●	Range, kV, at 50 Hz●
14.4	11.43 through 17.0	10 through 15
25	20.44 through 29	20 through 24
34.5	28.3 through 38	N/A

● Switches must be applied on effectively grounded systems at line-to-line voltages in the range specified by the minimum and maximum voltages shown. Contact your nearest S&C Sales Office for applications on other than effectively grounded systems.

**Downed-conductor switching.** Scada-Mate Switches are capable of interrupting low-magnitude fault currents of the type generally associated with downed overhead conductors. As reported in the literature●, the magnitude of a downed-conductor fault is essentially determined by the conductivity of the return path, which depends, to a large degree, on local conditions such as soil type, soil moisture, and the contact surface (asphalt, concrete, etc.). There is little correlation between the available fault current at the point of the fault and the actual fault current produced by the downed conductor, provided the downed conductor *does not* come in contact with a metallic return path such as an adjacent phase conductor or the circuit neutral. Downed-conductor faults are highly resistive in nature and are typically less than 100 amperes in magnitude.

Downed and *broken* conductors on a main feeder can usually be identified by a significant reduction in the normal load current in the affected phase at the nearest Scada-Mate Switch on the source side of the downed conductor and the loss of current and voltage in the affected phase (if three-phase voltage sensing is provided) at the next load-side Scada-Mate Switch. Downed but *not broken* conductors on a main feeder can usually be identified by erratic behavior of the load current in the affected phase at the nearest Scada-Mate Switch on the source side of the downed conductor and no loss of current and voltage (if three-phase voltage sensing is provided) at the next load-side Scada-Mate Switch. Scada-Mate Switches are capable of switching either of these types of faults.

**Application of surge arresters.** Surge arresters are recommended to protect the switches from surges beyond their ratings. Scada-Mate Switches have provisions for mounting six surge arresters (three on each side of the switch).

**Resistively grounded systems.** Voltage sensors must have a ground reference to work properly and the phase-to-ground voltage on all phases should be fairly well balanced (i.e., within 5% of each other). If the grounding resistance is relatively low—on the order of 300 to 500 ohms—this should not be a problem since the impedance of the sensor is quite high. But, it is important that the system have a mechanism for sensing and removing ground faults fairly quickly. For example, if a wire comes down on the Scada-Mate Switch base, the sensors will be exposed to line-to-line voltage until the phase is opened. While this might be okay for a short time, it could cause damage in the course of a day or so.

● The following publications are recommended:

1. *Downed Power Lines: Why They Can't Always be Detected.* A publication of the IEEE Power Engineering Society, The Institute of Electrical and Electronics Engineers, Inc., New York, February 22, 1989.
2. IEEE Tutorial Course, "Detection of Downed Conductors on Utility Distribution Systems." Course Text No. 90EH0310-3-PWR. The Institute of Electrical and Electronics Engineers, Inc., New York, 1989.
3. Lee, P. E., Robert E., "High Impedance Fault Detection." Presented to Edison Electric Institute, Transmission and Distribution Committee, Kansas City, October 19, 1989.

It is also important the Scada-Mate Switch base be very well grounded to provide a good ground reference for the sensors—otherwise erroneous readings could result. And, of course, short-circuits to an ungrounded or poorly grounded base might not clear very well, especially on a resistance-grounded system.

**SPECIAL WARRANTY PROVISIONS:** The standard warranty contained in the seller's standard conditions of sale, as set forth in Price Sheets 150 and 181, applies to Scada-Mate Switching Systems.

For equipment/services packages, the seller warrants, for a period of one year after commissioning, that the Scada-Mate Switching Systems will provide automatic fault isolation and system reconfiguration per agreed-upon service levels. The remedy shall be additional system analysis and reconfiguration of IntelliTeam SG system until the desired result is achieved.



**WARRANTY QUALIFICATIONS:** The standard warranty contained in the seller's standard conditions of sale, as set forth in Price Sheets 150 and 181, does not apply to major components not of S&C manufacture, such as customer-specified remote terminal units and communication devices, including hardware, software, resolution of protocol-related matters, and notification of upgrades or fixes for those devices.

The seller's standard warranty does not apply to any components not of S&C manufacture that are supplied and installed by the purchaser, nor to the ability of the seller's equipment to work with such components.

Warranty of equipment/services packages is contingent upon receipt of adequate information on the user's distribution system, sufficiently detailed to prepare a technical analysis. The seller is not liable if an act of nature or parties beyond S&C's control negatively impact performance of equipment/services packages; for example, new construction that impedes radio communication, or changes to the distribution system that impact protection systems, available fault currents, or system loading characteristics.

## How to Order a Scada-Mate® Switching System

Complete the following steps to put together a complete catalog number for a Scada-Mate Switching System order.

**Note:** For automatic source-transfer applications, two switches are required for the installation. Repeat Steps 1 through 5 for each switch.

**STEP 1. Model Number and Base Catalog Number.** Select from Table 3 on page 14.

Catalog Number:

**STEP 2. Sensor option suffix.** Select suffix from Table 4 on page 15. Add this suffix to the switch catalog number.

Suffix:

**STEP 3. Control cable suffix.** Select suffix from Table 4 on page 15. Add this suffix to the switch catalog number.

Suffix:

**STEP 4. Optional features suffix(es).** Select suffix(es) for the switch from Table 4 on page 15. Add the suffix(es) to the switch catalog number.

Suffix:

**STEP 5. Connector Suffix.** Select suffix for the switch from Table 2 on page 13. Order six connectors per switch.

Catalog Number:

### Switch Control Product Required

**STEP 6. Remote Supervisory Control Application:** Select a control unit from Table 5 on page 16.  
**Automatic Source-Transfer Applications:** Select a control unit from Table 6 on page 16. For communication and control units, contact your nearest S&C Sales Office.

### Switch Control Product Required

**STEP 7.** Obtain the catalog number(s) of the desired accessories from Table 10 on page 18.

Catalog Number:

Model Number:

Product Style Number:

Product Voltage Number:

14.4 kV	25 kV	34.5 kV
<input type="text"/>	<input type="text"/>	<input type="text"/>

Sensor Option Suffix:

I3	E3	E33	V3
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Control Cable Suffix:

G25	G35	G45	G75	G100
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Options


Connector Suffix:

4740R1	4741R2	4581
<input type="text"/>	<input type="text"/>	<input type="text"/>

For communication and control units, contact your nearest S&C Sales Office.

For optional control unit features, contact your nearest S&C Sales Office.

**STEP 8.** If a Micro-AT Source-Transfer Control is specified, an interconnecting cable is required between the control and the junction box. Obtain the catalog number of the desired interconnecting cable from Table 9 on page 17.

Catalog Number:

**How to Order a Scada-Mate Switching System for Automatic Source-Transfer Applications**

Complete the following steps to put together a Scada-Mate Switch order for automatic source-transfer applications:

**STEP 1.** Obtain the catalog number of the switch from Table 6 on page 16. Order two switches per installation.

Catalog Number:

**STEP 2. If a Model 6802 Automatic Switch Control is specified:** Three-phase voltage sensing is required on the jaw side of each switch as a minimum. Add suffix “-E3” or “-E33” (for 60-Hertz systems) or “-V3” or “-V33” (for 50-Hertz systems) to the switch catalog number per the table Table 4 on page 15.

Catalog Number:

**STEP 3.** Obtain the suffix of the desired control cable for the switch from Table 4 on page 15. Add this suffix to the switch catalog number.

Catalog Number:

**STEP 4.** Obtain the suffix(es) of other desired optional features for the switch from Table 4 on page 15. Add suffix(es) to the switch catalog number.

Catalog Number:

**STEP 5.** Obtain the catalog number(s) of the connectors for the switch from Table 2. Order six connectors per switch.

Catalog Number:

**STEP 6.** Obtain the catalog number(s) of desired accessories for the switch from Table 10 on page 18.

Catalog Number:

**STEP 7.** Obtain the catalog number of the desired source-transfer control unit from Table 6 on page 16.

Catalog Number:

**STEP 8.** Obtain the suffix(es) of desired optional features for the source-transfer control unit from the Table 7 page 17. Add suffix(es) to the source-transfer control unit catalog number.

Catalog Number:

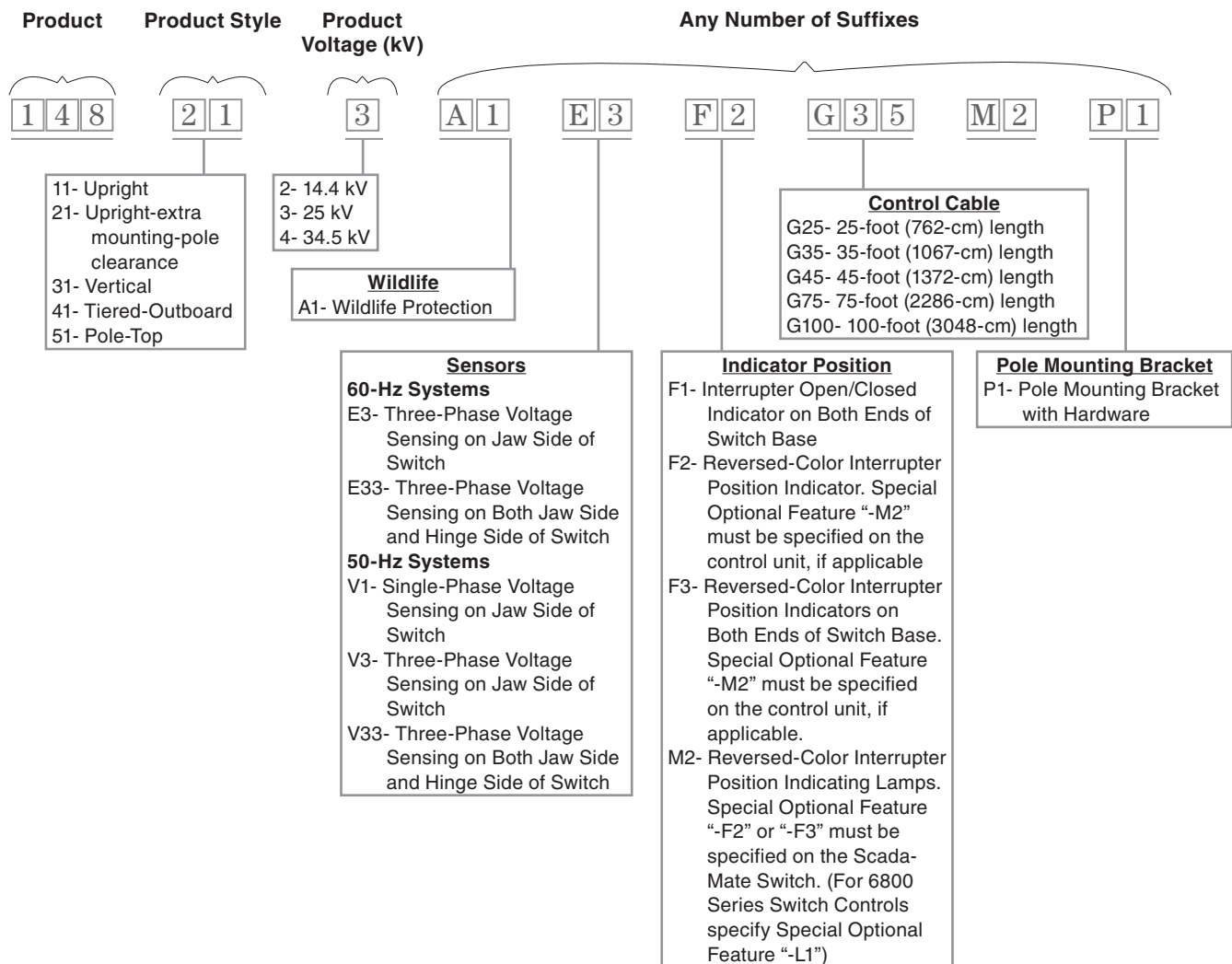
**STEP 9. If a Micro-AT Source-Transfer Control is specified:** An interconnecting cable is required between the control and the junction box. Obtain the catalog number of the desired interconnecting cable from Table 9 on page 17.

Catalog Number:

**Example:** The catalog number for a 27-kV upright ScadaMate switch with three-phase voltage sensing on jaw side of switch, interrupter OPEN/CLOSED indicator on both ends of the switch base, wildlife guards, and 45-foot (13.7-m) control cable is:


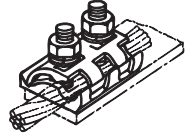
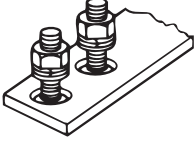
1 4 8 1 1 3 R 2 - A 1 E 3 F 1 G 4 5

## Anatomy of a Scada-Mate® Switching System Catalog Number



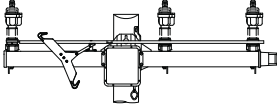
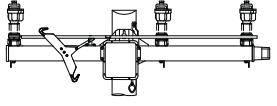
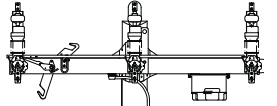
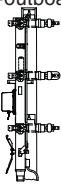
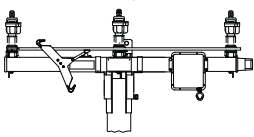
The catalog number created above represents a 25-kV upright-extra mounting-pole clearance ScadaMate. It comes with wildlife protection and 60 Hz current and voltage sensors on the jaw side of the switch. To connect to the control unit a 35-foot (10.7-m) cable option is chosen and for a pole connection.

**Table 2. Connectors**

Illustration	Description	Accommodating Conductor	Catalog Number
	Bronze body, tin plated, single 1/2-13 x 2 1/2 galvanized steel bolt	No. 2 solid (33.6 mm <sup>2</sup> ) through 500 kc mil (335 mm <sup>2</sup> ) stranded copper or aluminum	4740R1●
	Aluminum-alloy body, tin plated, two 1/2-13 x 2 3/4 galvanized steel bolts	No. 2 solid (33.6 mm <sup>2</sup> ) through 500 kc mil (335 mm <sup>2</sup> ) stranded copper or aluminum	4741R2●
	Provision only for compression connectors. Includes two 1/2-13 x 2 galvanized steel bolts		4581●

● Connector suitable for hot-line tool handling.

**Table 3. Scada-Mate Switches**

Mounting Configuration	Rating <sup>①</sup>					Five-Time Duty-Cycle Fault Closing, Amperes, RMS, Asymmetrical <sup>⑥</sup>	Catalog Number <sup>⑦</sup>	Page Reference for Dimensional Information
	kV <sup>②</sup>			Amperes, RMS				
	Nom.	Max	BIL	Cont. <sup>③</sup> and Interr. <sup>④</sup>	Mom., Asym. <sup>⑤</sup>			
 <p>Upright<sup>⑧⑨</sup></p>	14.4 25 34.5	17.0 29 38	110 150 200	600 600 600	25 000 25 000 25 000	20 000 20 000 20 000	148112R2 148113R2 148114R2	21
 <p>Upright<sup>⑧⑨</sup> (extra mounting-pole clearance)</p>	14.4 25	17.0 29	110 150	600 600	25 000 25 000	20 000 20 000	148212R2 148213R2	21
 <p>Vertical<sup>⑨⑩</sup></p>	14.4 25	17.0 29	110 150	600 600	25 000 25 000	20 000 20 000	148312R2-H 148313R2-H	23
 <p>Tiered-outboard<sup>⑧⑨</sup></p>	14.4 25 34.5	17.0 29 38	110 150 200	600 600 600	25 000 25 000 25 000	20 000 20 000 20 000	148412R2 148413R2 148414R2	25
 <p>Pole-top<sup>⑧⑨</sup></p>	14.4 25 34.5	17.0 29 38	110 150 200	600 600 600	25 000 25 000 25 000	20 000 20 000 20 000	148512R2 148513R2 148514R2	27

① Ratings listed apply to switches with voltage sensor(s) for use on 60-Hz systems. Switches furnished with voltage sensor(s) for use on 50-Hz systems—see Table 4 on page 15—have ratings as listed below:

60-Hz Rating, kV, Nom.	50-Hz Ratings			
	kV			Amperes, RMS, Cont. and Interr.
	Min.	Max	BIL	
14.4	10	15	110	630
25	20	24	150	630

② Switches furnished with a self-powered communication and control unit, a 6801 or 6802 Automatic Switch Control, or switch control unit, when powered by S&C Voltage Sensor(s), are restricted to applications at certain system voltages. Refer to the “Application Notes” section on page 7.

③ Scada-Mate Switches can carry up to 900 amperes indefinitely in ambient temperatures to 40°C (104°F) with a minimum wind velocity of two feet per second. Maximum allowable conductor temperature is 90°C (194°F). Switches can endure 1000 operations of loop-current switching at 900 amperes.

④ For line or cable dropping, the following maximum conductor miles apply: line dropping to 50 miles (80.5 km) of line; cable dropping to 12 miles (19.3 km) of 1/0 cable or 5 miles (8.1 km) of 1000 kc mil cable, or equivalent.

FOOTNOTES ►

Footnotes—Continued

- ⑤ The 1-second rating is 16,000 amperes RMS, symmetrical.
- ⑥ The duty-cycle fault-closing rating defines the ability to close the switch the specified number of times against a three-phase fault with asymmetrical current in at least one phase equal to the listed value, with the switch remaining operable and able to carry and interrupt rated continuous current.
- ⑦ Catalog numbers shown include a switch with a stored-energy operating mechanism, three-phase current sensing, single-phase voltage sensing, and a 35-foot (1067-cm) shielded control cable. A control unit must be specified separately. Refer to Table 5 on page 16.
- ⑧ Maximum dead-end loading: 2000 pounds (907 kg) per conductor

where pull-off forces are applied to only one side of the switch; 8000 pounds (3629 kg) per conductor where equal pull-off forces are applied to both sides of the switch.

- ⑨ The loading from the jumpers shall not exceed 90 lbs. in-line and 30 lbs. perpendicular to the terminal pad per IEEE Standard ANSI C37.32-1996 Section 8.8.2.2.
- ⑩ Operating mechanism furnished on vertical mounting configuration switches does not permit non-electrical mechanical closing of interrupters.

Table 4. Optional Features

Item			Suffix to be Added to Catalog Number	
For switches	Wildlife Protection		-A1●	
	Shielded Control Cable in Liquid-Tight Flexible Metal-Wiring Conduit			
	25-foot (762-cm) length		-G25	
	35-foot (1067-cm) length		-G35	
	45-foot (1372-cm) length		-G45	
	75-foot (2286-cm) length		-G75	
	100-foot (3048-cm) length		-G100	
	High-speed operating mechanism①②		-H	
	Voltage sensors for use on 60-Hz systems③	Three-phase voltage sensing on jaw side of switch④	14.4 kV	-E3
			25 kV	-E3
			34.5 kV	-E3
		Three-phase voltage sensing on both jaw side and hinge side of switch④	14.4 kV	-E33
			25 kV	-E33
			34.5 kV	-E33
Voltage sensor(s) for use on 50-Hz systems	Single-phase voltage sensing on jaw side of switch④	15 kV	-V1	
		24 kV	-V1	
	Three-phase voltage sensing on jaw side of switch④	15 kV	-V3	
		24 kV	-V3	
	Three-phase voltage sensing on both jaw side and hinge side of switch④	15 kV	-V33	
		24 kV	-V33	
Interrupter OPEN/CLOSED indicator on both ends of switch base⑤		-F1		
Extension-link assemblies (set of six) for switches in all mounting configurations except vertical⑥		-L		
For switch-control unit	Burdens for 69-Vac voltage sensing output⑦		-B1	

- ① Provides 6-cycle (100-millisecond) operating time; does not permit non-electrical mechanical closing of the interrupters. Operating mechanism normally furnished provides 30-cycle (500-millisecond) operating time.
- ② Standard for vertical mounting configuration. Standard on upright, tiered-outboard, and pole-top mounted switches shipped before May 2000.
- ③ All Scada-Mate Switches include single-phase voltage sensing on jaw side of switch, for use on 60-Hz systems, as standard.
- ④ Three-phase voltage sensing is required for switches furnished with a 6801 Automatic Switch Control if control power is to be furnished by the sensors.

- ⑤ Applicable only to switches in the upright, upright with extra mounting-pole clearance, vertical, and pole-top configurations. As standard, these switches include an interrupter OPEN/CLOSED indicator on the right end of the base, as viewed from the mechanism side of the switch.
- ⑥ Extension-link assemblies are 16 inches (406 mm) in length for 14.4-kV and 25-kV switches, and 24 inches (610 mm) in length for 34.5-kV switches.
- ⑦ All control units include burdens for 5-Vac voltage sensing output as standard.
- For use only when the connectors listed in Table 2 on page 13 are specified. Contact your nearest S&C Sales Office for use with other connectors.

**Table 5. Control Units—For Remote Supervisory Control Applications**

Item	Catalog Number	Net Wt., Lbs. (kg)
Communication and control unit—externally powered. Powered by customer-supplied 120-Vac source. Includes customer-specified remote terminal and communication device; switch control with <b>Open/Close</b> pushbuttons, switch-position indicating lamps, disconnect closed-and latched indicating lamp, a LOCAL/REMOTE switch, an operational counter; high-output battery charger; and battery packs	●	130 (59)
Communication and control unit—self powered. Powered by S&C Voltage Sensor. Includes customer-specified remote terminal unit and communication device; switch control with <b>Open/Close</b> pushbuttons, switch-position indicating lamps, disconnect closed-and-latched indicating lamp, a LOCAL/REMOTE switch, an operation counter; battery charger; and battery packs <sup>①②</sup>	●	134 (61)
Model 6801 Automatic Switch Control. Powered by S&C Voltage Sensors or customer-supplied 120-Vac source. Provides sophisticated RTU functionality. Includes customer-specified communication device; faceplate with liquid-crystal display, touch switches, operation and diagnostic indicating lamps, and USB local communication port; high-output battery charger; and battery packs. Upgradeable to IntelliTeam SG Automatic Restoration System	●	58 (26)
Switch control unit. Powered by S&C Voltage Sensor or customer-supplied 120-Vac source. Includes switch control with <b>Open/Close</b> pushbuttons, switch-position indicating lamps, disconnect closed-and-latched indicating lamp, a LOCAL/REMOTE switch, and operation counter; battery charger; battery packs; terminal strip for external inputs, sensor outputs and remote switch position indication; and surge protector <sup>③</sup>	54411R1	95 (43)

① Battery charger is factory-calibrated to accommodate the loads in the communication and control unit at the time of shipment. If loads are subsequently added, the charging output of the battery should be recalibrated to optimize battery life. Refer to Table 10 on page 18 for recalibration instructions.

② The self-powered communication and control unit is not recommended for use with a 5-watt transceiver. The limited power output of the battery charger puts the batteries into a cyclic loading condition,

which may reduce battery life by up to 50%. The externally powered communication and control unit is recommended if a 5-Watt transceiver is the desired communication device.

③ The battery charger and battery packs furnished are intended to provide power for the switch only and not for customer-supplied communication and control equipment.

● Contact your nearest S&C Sales Office.

**Table 6. Control Units—For Automatic Source-Transfer Applications**

Item	Catalog Number
Model 6802 Automatic Switch Control. Powered by S&C Voltage Sensors. Provides sophisticated RTU functionality. Includes faceplate with liquid-crystal display, touch switches, operation and diagnostic indicating lamps, and USB local communication port; high-output battery charger; and battery packs. Upgradeable to full IntelliTeam SG functionality	●

● Contact your nearest S&C Sales Office for availability.



**Table 7. Optional Features—For Source-Transfer Control Units**

Item	Applicable to Control Unit	Suffix to be Added to Control Unit Catalog Number
Overcurrent lockout. Prevents automatic-transfer operation that would close a switch into a fault. Includes facilities for external reset	Micro-AT Source-Transfer Control	-Y21
Remote indication. Includes provisions for remote monitoring of presence or absence of source voltages, manual or automatic operating mode, status of the READY indicator, EVENT indicator, and (if furnished) overcurrent lockout		-Y4
Test panel. Permits the use of an external, adjustable three-phase source to verify, through independent measurement, the response of the control to <b>Loss-Of-Source</b> , <b>Phase-Unbalance</b> , and <b>Overcurrent-Lockout</b> conditions		-Y5
Supervisory control. Includes facilities for switch operation from a remote location		-Y6
Communications card. Permits local uploading of “events” and settings from the Micro-AT Control to a user-furnished personal computer, as well as downloading of the user’s standard operating parameter <sup>①</sup>		-Y8
Pole mounting bracket with hardware		-P1
RTU and communication device for SCADA application		●
IntelliTeam SG Automatic Restoration System	Model 6802 Automatic Switch Control	●
WinMon Graphical User Interface		
User-specified communication device		

<sup>①</sup> Requires Micro-AT control communication cable, catalog number TA-2320 or TA-2321. See Table 10 on page 18.

● Contact your nearest S&C Sales Office for availability.

**Table 8. Special Optional Features**

Item		Suffix to be Added to Catalog Number
For switches	Reversed-color interrupter position indicator. <sup>①</sup> special optional feature “-M2” must be specified on the control unit, if applicable	-F2
	Reversed-color interrupter position indicators on both ends of switch base. <sup>①②</sup> Special optional feature “-M2” must be specified on the control unit, if applicable	-F3
For control unit catalog number 54411R1	Reversed-color interrupter position indicating lamps. <sup>①</sup> Special optional feature “-F2” or “-F3” must be specified on the Scada-Mate Switch. (For 6800 Series switch controls, specify special optional feature “-L1”)	-M2

<sup>①</sup> Reversed-color interrupter position indicators and position-indicating lamps (green for “closed,” “red” for “open”) are available only in instances where the user is a Canadian utility requiring this color scheme. These special optional features are not available to any other customers.

<sup>②</sup> Not available on switches in the tiered-outboard mounting configuration. These switches are equipped with one indicator, on the bottom of the switch.

**Table 9. Interconnecting Cables—For Micro-AT Source-Transfer Controls**

Item	Catalog Number
50-foot (1524-cm) length	SDA-2775-50
100-foot (3048-cm) length	SDA-2775-100
150-foot (4572-cm) length	SDA-2775-150
200-foot (6096-cm) length	SDA-2775-200
250-foot (7620-cm) length	SDA-2775-250
300-foot (9144-cm) length	SDA-2775-300

**Table 10. Accessories**

Item		Catalog Number
Shielded control cable connector cover. Protects connector at the control-unit end of cable if control unit is disconnected. Includes sensor shorting blocks		SDA-2456
Detailed hardware manual for switch control unit. Includes schematic diagrams, circuit-board layouts, parts lists, bench-check procedures, and operating descriptions for the switch control and battery charger		RD-3585
Battery charger recalibration procedure. Includes detailed instructions for calibrating charging voltage to optimize battery life		RD-3808
Micro-AT Communication Cable. For connecting optional communications card to user-furnished personal computer. Includes Matlink communication software	For personal computers having 25-pin serial communication port	TA-2320
	For personal computers having 9-pin serial communication port	TA-2321

**Table 11. Static-Dissipative Surface**

Item	Catalog Number
3M 8501 Portable Static-Dissipative Field Service Kit. Includes a static-dissipative work mat and a ground cord assembly with wrist strap, for connecting the mat—along with the person changing out the component—to the same ground point	9931-218

**Table 12. Spare or Replacement Control Cables**

Item →			Control Cable With Liquid-Tight Flexible Metal Conduit Catalog Number
Number of Connector Pins		Length, Feet (cm)	
At Switch End of Cable	At Control End of Cable		
24	24	25 (762)	SDA-2338-25
		35 (1067)	SDA-2338-35
		45 (1372)	SDA-2338-45
		75 (2286)	SDA-2779-75
		100 (3048)●	SDA-2779-100

● If catalog number suffix “-E33” or “-V33” is specified, the maximum control cable length is 45 feet (1372 cm). If greater control cable length is required, refer to your nearest S&C Sales Office for availability.

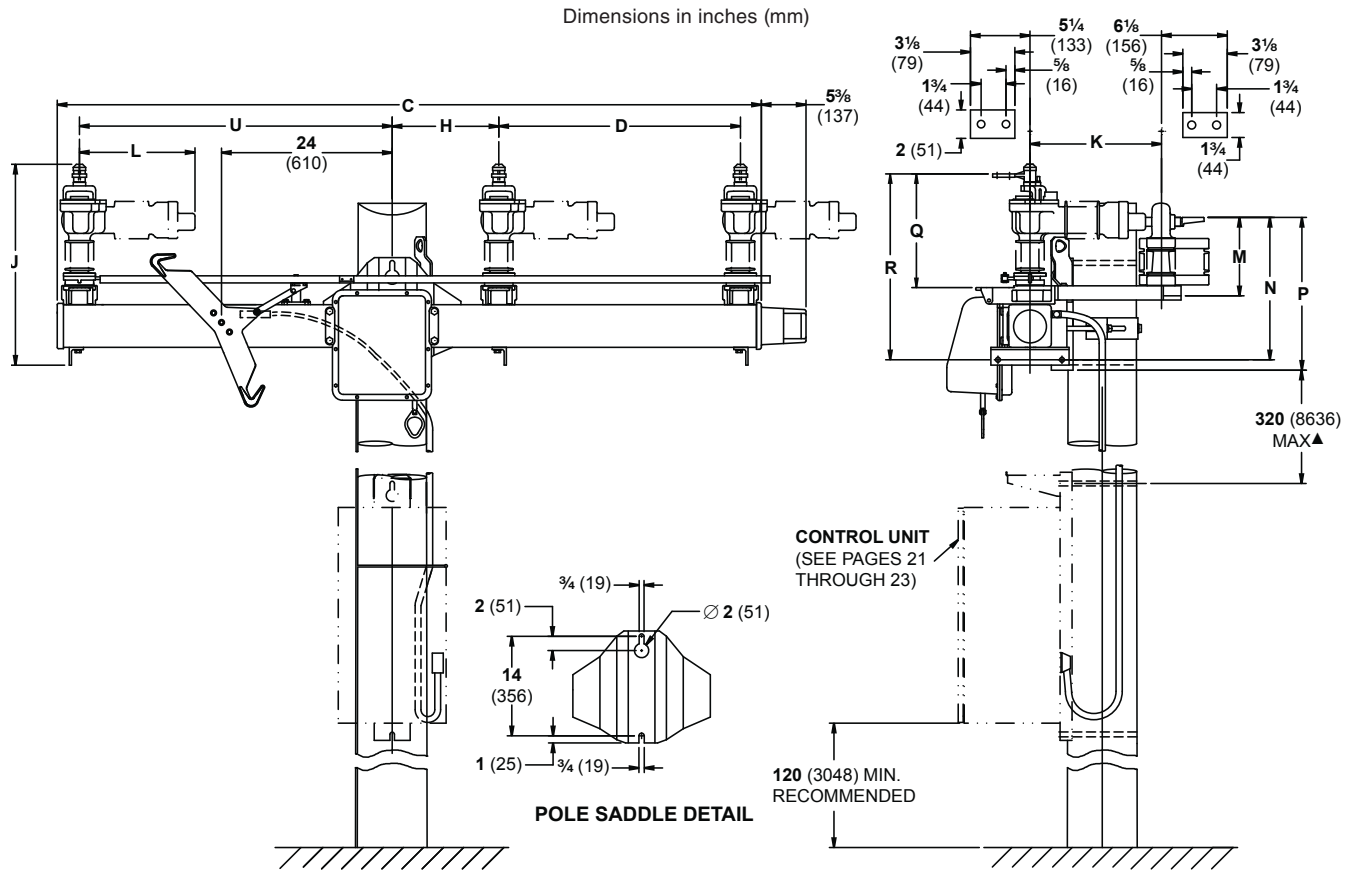
**Table 13. Scada-Mate Switching System/Services Packages**

Item		
<p><b>14.4-kV Scada-Mate Switching System/Services Packages</b></p> <p>Includes upright mounting configuration Scada-Mate Switches catalog number 148112R2-G35E3 or pole-top mounting configuration scada-mate switches catalog number 148512R2-G35E3, with 35-foot (1067-cm) shielded liquid-tight control cable and three-phase 60-Hz voltage sensing on jaw side of switch.</p> <p>Each switch includes 6801 Automatic Switch Control catalog number 6801-F01H9JB1K1P0R80R98S3W2XRxxXS3 or 6801-F01H9JB1K1P0R201R98S3W2XRxxXS3 and remote antenna kit catalog number 903-002132-03. One SpeedNet Extension Arm-Mounted Repeater Radio is also included.</p> <p>Services furnished include communication site survey, IntelliTeam SG system factory acceptance testing, IntelliTeam SG system training, and IntelliTeam SG system commissioning</p>	Three-Member Team	
	Four-Member Team	
	Five-Member Team	
	Six-Member Team	
	Seven-Member Team	
	Eight-Member Team	
	Nine-Member Team	
	Ten-Member Team	
	Eleven-Member Team	
	Twelve-Member Team	
	<p><b>25-kV Scada-Mate Switching System/Services Packages</b></p> <p>Includes upright mounting configuration Scada-Mate Switches catalog number 148113R2-G35E3 or pole-top mounting configuration Scada-Mate Switches catalog number 148513R2-G35E3, with 35-foot (1067-cm) shielded liquid-tight control cable and three-phase 60-Hz voltage sensing on jaw side of switch.</p> <p>Each switch includes 6801 Automatic Switch Control catalog number 6801-F01H9JB1K1P0R80R98S3W2XRxxXS3 or 6801-F01H9JB1K1P0R201R98S3W2XRxxXS3 and remote antenna kit catalog number 903-002132-03. One SpeedNet Extension Arm-Mounted Repeater Radio is also included.</p> <p>Services furnished include communication site survey, IntelliTeam SG system factory acceptance testing, IntelliTeam SG system training, and IntelliTeam SG system commissioning</p>	Three-Member Team
		Four-Member Team
Five-Member Team		
Six-Member Team		
Seven-Member Team		
Eight-Member Team		
Nine-Member Team		
Ten-Member Team		
Eleven-Member Team		
Twelve-Member Team		
<p><b>34.5-kV Scada-Mate Switching System/Services Packages</b></p> <p>Includes upright mounting configuration Scada-Mate Switches catalog number 148114R2-G35E3 or pole-top mounting configuration Scada-Mate Switches catalog number 148514R2-G35E3, with 35-foot (1067-cm) shielded liquid-tight control cable and three-phase 60-Hz voltage sensing on jaw side of switch.</p> <p>Each switch includes 6801 Automatic Switch control catalog number 6801-F01H9JB1K1P0R80R98S3W2XRxxXS3 or 6801-F01H9JB1K1P0R201R98S3W2XRxxXS3 and remote antenna kit catalog number 903-002132-03. One SpeedNet Extension Arm-Mounted Repeater Radio is also included.</p> <p>Services furnished include communication site survey, IntelliTeam SG system factory acceptance testing, IntelliTeam SG system training, and IntelliTeam SG system commissioning</p>		Three-Member Team
		Four-Member Team
	Five-Member Team	
	Six-Member Team	
	Seven-Member Team	
	Eight-Member Team	
	Nine-Member Team	
	Ten-Member Team	
	Eleven-Member Team	
	Twelve-Member Team	

**Table 14. Scada-Mate Switching System Services Packages**

Item	Catalog Number
Communication site survey. Field testing to confirm that user-proposed Scada-Mate Switch locations will provide acceptable communication between team members and head-end SCADA radio, if applicable. User should make available their engineer/technician responsible for the project	AS100
IntelliTeam SG system device settings determination. Determination of these settings is essential to the successful implementation of IntelliTeam SG system, and must be documented prior to factory acceptance testing and commissioning	AS109
IntelliTeam SG factory acceptance testing. Factory testing ensures that all information required for successful IntelliTeam SG system implementation is gathered and understood prior to commissioning. Provides insight on how IntelliTeam SG system will work on the user's system. User must travel to Chicago to witness the testing	AS104
IntelliTeam SG system training. On-site training on functioning of IntelliTeam SG system. Includes operations and engineering training sessions	AS101
IntelliTeam SG system commissioning. Ensures that Scada-Mate Switches have been set up correctly and IntelliTeam SG system is ready to be put into service	AS102
IntelliTeam SG system SCADA integration. Includes review of user's SCADA system, development of DNP points lists, coordination with the user's SCADA supplier, and review of SCADA database	AS103
IntelliTeam SG system monitoring. Ongoing remote monitoring ensures that IntelliTeam SG system operation meets agreed-upon service levels. Minimum monitoring period is six months	AS105
Scada-Mate Switching System maintenance. Includes inspection, testing, and battery replacement on a three-year interval	AS106
Scada-Mate Switching System project management. Includes Scada-Mate Switch installation, construction oversight, and engineering/procurement projects	AS107

Scada-Mate Switch—Upright Mounting Configuration



- Applicable to switches supplied with 35-foot (1067-cm) control cable.

# Scada-Mate® Switching System

Mounting Configuration	Rating						Catalog Number <sup>⑥</sup>	Dimensions in Inches (mm)											Net Wt., Switch Assem., Lbs. (kg)	
	kV <sup>①</sup>			Amperes, RMS		Five-Time Duty-Cycle Fault-Closing, Amps RMS Asym. <sup>⑤</sup>		C	D	H	J	K	L	M	N	P	Q	R		U
	Nom.	Max	BIL	Cont. <sup>②</sup> and Interr. <sup>③</sup>	Mom. Asym. <sup>④</sup>															
Upright <sup>⑦⑧</sup>	14.4	17.0	110	600	25 000	20 000	148112R2	99 (2515)	34 (864)	15 (381)	29 (737)	18 <sup>5</sup> / <sub>8</sub> (473)	15 <sup>3</sup> / <sub>8</sub> (391)	11 <sup>1</sup> / <sub>4</sub> (286)	20 <sup>1</sup> / <sub>8</sub> (511)	21 <sup>1</sup> / <sub>2</sub> (546)	16 <sup>1</sup> / <sub>8</sub> (410)	26 <sup>1</sup> / <sub>4</sub> (667)	44 (1118)	415 (188)
	25	29	150	600	25 000	20 000	148113R2	99 (2515)	34 (864)	15 (381)	33 <sup>3</sup> / <sub>4</sub> (857)	19 <sup>3</sup> / <sub>8</sub> (492)	16 <sup>1</sup> / <sub>8</sub> (410)	15 <sup>3</sup> / <sub>4</sub> (400)	24 <sup>5</sup> / <sub>8</sub> (625)	26 (660)	21 (533)	31 <sup>1</sup> / <sub>8</sub> (791)	44 (1118)	465 (211)
	34.5	38	200	600	25 000	20 000	148114R2	124 (3150)	45 (1143)	24 (610)	38 <sup>7</sup> / <sub>8</sub> (987)	26 <sup>1</sup> / <sub>8</sub> (664)	22 <sup>7</sup> / <sub>8</sub> (581)	19 <sup>3</sup> / <sub>4</sub> (502)	30 <sup>1</sup> / <sub>4</sub> (768)	31 <sup>5</sup> / <sub>8</sub> (803)	24 <sup>1</sup> / <sub>4</sub> (616)	36 <sup>1</sup> / <sub>8</sub> (918)	49 (1245)	590 (268)
Upright Extra Mounting-Pole Clearance <sup>⑦⑧</sup>	14.4	17.0	110	600	25 000	20 000	148212R2	105 (2667)	34 (864)	24 (610)	29 (737)	18 <sup>5</sup> / <sub>8</sub> (473)	15 <sup>3</sup> / <sub>8</sub> (391)	11 <sup>1</sup> / <sub>4</sub> (286)	20 <sup>1</sup> / <sub>8</sub> (511)	21 <sup>1</sup> / <sub>2</sub> (546)	16 <sup>1</sup> / <sub>8</sub> (410)	26 <sup>1</sup> / <sub>4</sub> (667)	41 (1041)	465 (211)
	25	29	150	600	25 000	20 000	148213R2	105 (2667)	34 (864)	24 (610)	33 <sup>3</sup> / <sub>4</sub> (857)	19 <sup>3</sup> / <sub>8</sub> (492)	16 <sup>1</sup> / <sub>8</sub> (410)	15 <sup>3</sup> / <sub>4</sub> (400)	24 <sup>5</sup> / <sub>8</sub> (625)	26 (660)	21 (533)	31 <sup>1</sup> / <sub>8</sub> (791)	41 (1041)	515 (234)

① Switches furnished with a self-powered communication and control Unit, a 6801 or 6802 Automatic Switch Control, or a switch control unit when powered by S&C Voltage Sensor(s), are restricted to applications at certain system voltages. Refer to the "Application Notes" section on page 7.

② Scada-Mate Switches can carry up to 900 amperes indefinitely in ambient temperatures to 40°C (104°F) with a minimum wind velocity of two feet per second. Maximum allowable conductor temperature is 90°C (194°F). Switches can endure 1000 operations of loop-current switching at 900 amperes.

③ For line or cable drooping, the following maximum conductor miles apply: line drooping to 50 miles (80.5 km) of line; cable drooping to 12 miles (19.3 km) of 1/0 cable or 5 miles (8.1 km) of 1000 kc mil cable, or equivalent.

④ The 1-second rating is 16,000 amperes RMS, symmetrical.

⑤ The duty-cycle fault-closing rating defines the ability to close the switch the specified number of times against a three-phase fault with asymmetrical current in at least one phase equal to the listed value, with the switch remaining operable and able to carry and interrupt rated continuous current.

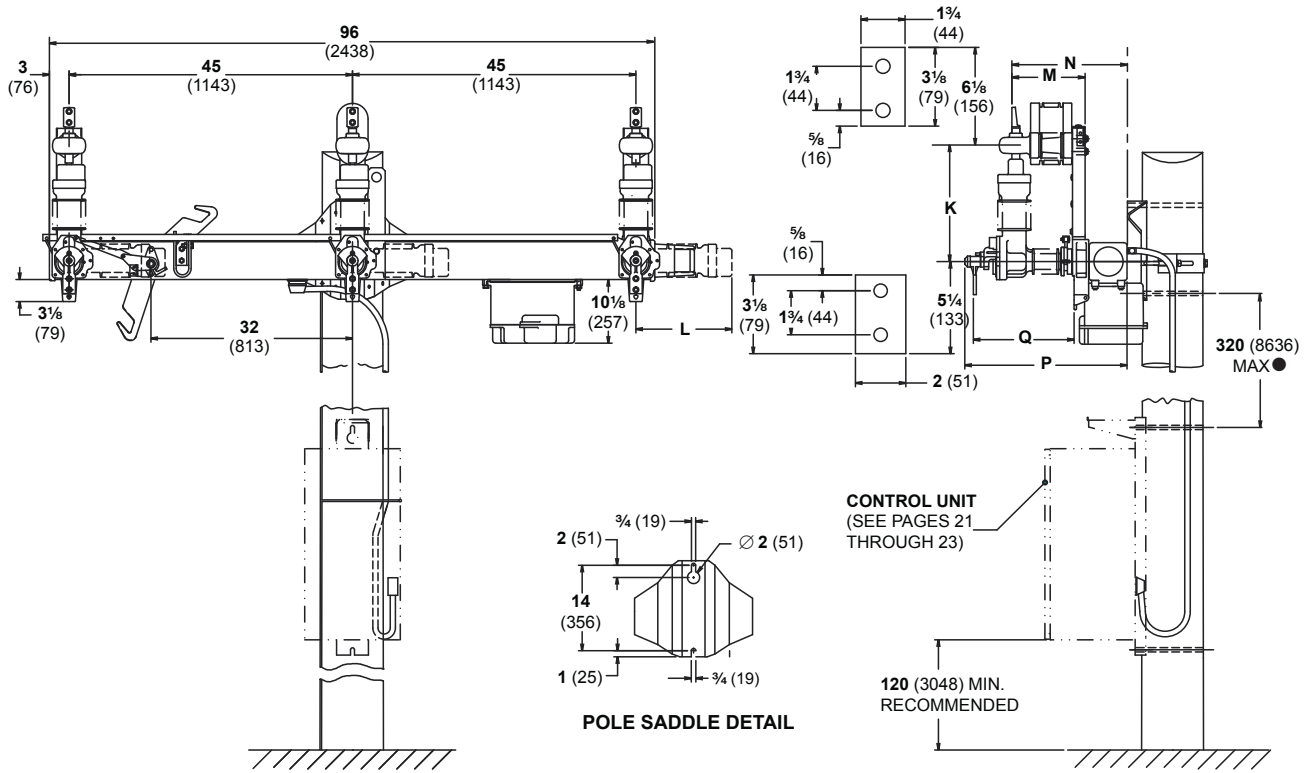
⑥ Catalog numbers shown include switch with stored-energy operating mechanism, three-phase current sensing, single-phase voltage sensing, and a 35-foot (1067-cm) shielded control cable. A control unit must be specified separately. Refer to Tables 5 and 6 on page 16.

⑦ Maximum dead-end loading: 2000 pounds (907 kg) per conductor where pull-off forces are applied to only one side of the switch; 8000 lbs. (3629 kg) per conductor where equal pull-off forces are applied to both sides of the switch.

⑧ The loading from the jumpers shall not exceed 90 lbs. in-line and 30 lbs. perpendicular to the terminal pad per IEEE Standard ANSI C37.32-1996 Section 8.8.2.2.

Scada-Mate Switch—Vertical Mounting Configuration

Dimensions in inches (mm)



- Applicable to switches supplied with optional 35-foot (1067-cm) control cable.

# Scada-Mate® Switching System

Mounting Configuration	Rating						Catalog Number <sup>⑥</sup>	Dimensions in Inches (mm)						Net Wt., Switch Assem., Lbs. (kg)
	kV <sup>①</sup>			Amperes, RMS		Five-Time Duty-Cycle Fault-Closing, Amps RMS Asym. <sup>⑤</sup>		K	L	M	N	P	Q	
	Nom.	Max	BIL	Cont. <sup>②</sup> and Interr. <sup>③</sup>	Mom, Asym. <sup>④</sup>									
Vertical ⑦⑧	14.4	17.0	110	600	25 000	20 000	148312R2-H	18 <sup>5</sup> / <sub>8</sub> (473)	15 <sup>5</sup> / <sub>8</sub> (391)	11 <sup>1</sup> / <sub>4</sub> (286)	18 <sup>5</sup> / <sub>8</sub> (467)	25 <sup>7</sup> / <sub>8</sub> (657)	16 <sup>5</sup> / <sub>8</sub> (410)	435 (197)
	25	29	150	600	25 000	20 000	148313R2-H	19 <sup>3</sup> / <sub>8</sub> (492)	16 <sup>1</sup> / <sub>8</sub> (410)	15 <sup>3</sup> / <sub>4</sub> (400)	22 <sup>7</sup> / <sub>8</sub> (581)	30 <sup>3</sup> / <sub>4</sub> (781)	21 (533)	485 (220)

① Switches furnished with a self-powered communication and control unit, a 6801 or 6802 Automatic Switch Control, or a switch control unit when powered by S&C Voltage Sensor(s), are restricted to applications at certain system voltages. Refer to the "Application Notes" section on page 7.

② Scada-Mate Switches can carry up to 900 amperes indefinitely in ambient temperatures to 40°C (104°F) with a minimum wind velocity of two feet per second. Maximum allowable conductor temperature is 90°C (194°F). Switches can endure 1000 operations of loop-current switching at 900 amperes.

③ For line or cable dropping, the following maximum conductor miles apply: line dropping to 50 miles (80.5 km) of line; cable dropping to 12 miles (19.3 km) of 1/0 cable or 5 miles (8.1 km) of 1000 kc mil cable, or equivalent.

④ The 1-second rating is 16,000 amperes RMS, symmetrical.

⑤ The duty-cycle fault-closing rating defines the ability to close the switch the specified number of times against a three-phase fault with asymmetrical current in at least one phase equal to the listed value, with the switch remaining operable and able to carry and interrupt rated continuous current.

⑥ Catalog numbers shown include switch with stored-energy operating mechanism, three-phase current sensing, single-phase voltage sensing, and a 35-foot (1067-cm) shielded control cable. A control unit must be specified separately. Refer to Tables 5 and 6 on page 16.

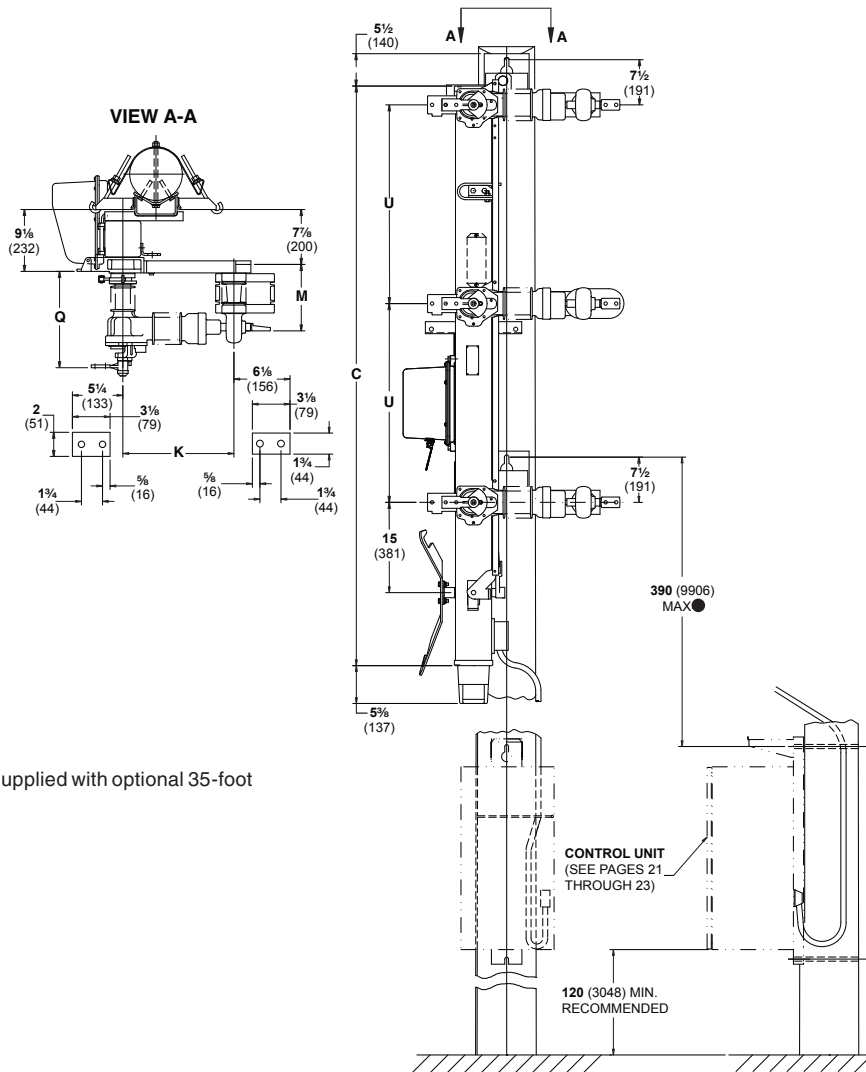
⑦ Maximum dead-end loading: 2000 pounds (907 kg) per conductor where pull-off forces are applied to only one side of the switch; 8000 lbs. (3629 kg) per conductor where equal pull-off forces are applied to both sides of the switch.

⑧ The loading from the jumpers shall not exceed 90 lbs. in-line and 30 lbs. perpendicular to the terminal pad per IEEE Standard ANSI C37.32-1996 Section 8.8.2.2.



Scada-Mate Switch—Tiered-Outboard Mounting Configuration

Dimensions in inches (mm)



- Applicable to switches supplied with optional 35-foot (1067-cm) control cable.

# Scada-Mate® Switching System

Mounting Configuration	Rating						Catalog Number <sup>⑥</sup>	Dimensions in Inches (mm)						Net Wt., Switch Assem., Lbs. (kg)
	kV <sup>①</sup>			Amperes, RMS		Five-Time Duty-Cycle Fault-Closing, Amps RMS Asym. <sup>⑤</sup>		C	K	L	M	Q	U	
	Nom.	Max	BIL	Cont. <sup>②</sup> and Interr. <sup>③</sup>	Mom, Asym. <sup>④</sup>									
Tiered-Outboard <sup>⑦⑧</sup>	14.4	17.0	110	600	25 000	20 000	148412R2	96 (2438)	18 <sup>5</sup> / <sub>8</sub> (473)	15 <sup>3</sup> / <sub>8</sub> (391)	11 <sup>1</sup> / <sub>4</sub> (286)	16 <sup>1</sup> / <sub>8</sub> (410)	33 (838)	470 (213)
	25	29	150	600	25 000	20 000	148413R2	120 (3048)	19 <sup>3</sup> / <sub>8</sub> (492)	16 <sup>1</sup> / <sub>8</sub> (410)	15 <sup>3</sup> / <sub>4</sub> (400)	21 (533)	45 (1143)	520 (236)
	34.5	38	200	600	25 000	20 000	148414R2	120 (3048)	26 <sup>1</sup> / <sub>8</sub> (664)	22 <sup>7</sup> / <sub>8</sub> (581)	19 <sup>3</sup> / <sub>4</sub> (502)	24 <sup>1</sup> / <sub>4</sub> (616)	45 (1143)	596 (270)

① Switches furnished with a self-powered communication and control unit, a 6801 or 6802 Automatic Switch Control, or a switch control unit when powered by S&C Voltage Sensor(s), are restricted to applications at certain system voltages. Refer to the "Application Notes" section on page 7.

② Scada-Mate Switches can carry up to 900 amperes indefinitely in ambient temperatures to 40°C (104°F) with a minimum wind velocity of two feet per second. Maximum allowable conductor temperature is 90°C (194°F). Switches can endure 1000 operations of loop-current switching at 900 amperes.

③ For line or cable dropping, the following maximum conductor miles apply: line dropping to 50 miles (80.5 km) of line; cable dropping to 12 miles (19.3 km) of 1/0 cable or 5 miles (8.1 km) of 1000 kc mil cable, or equivalent.

④ The 1-second rating is 16,000 amperes RMS, symmetrical.

⑤ The duty-cycle fault-closing rating defines the ability to close the switch the specified number of times against a three-phase fault with asymmetrical current in at least one phase equal to the listed value, with the switch remaining operable and able to carry and interrupt rated continuous current.

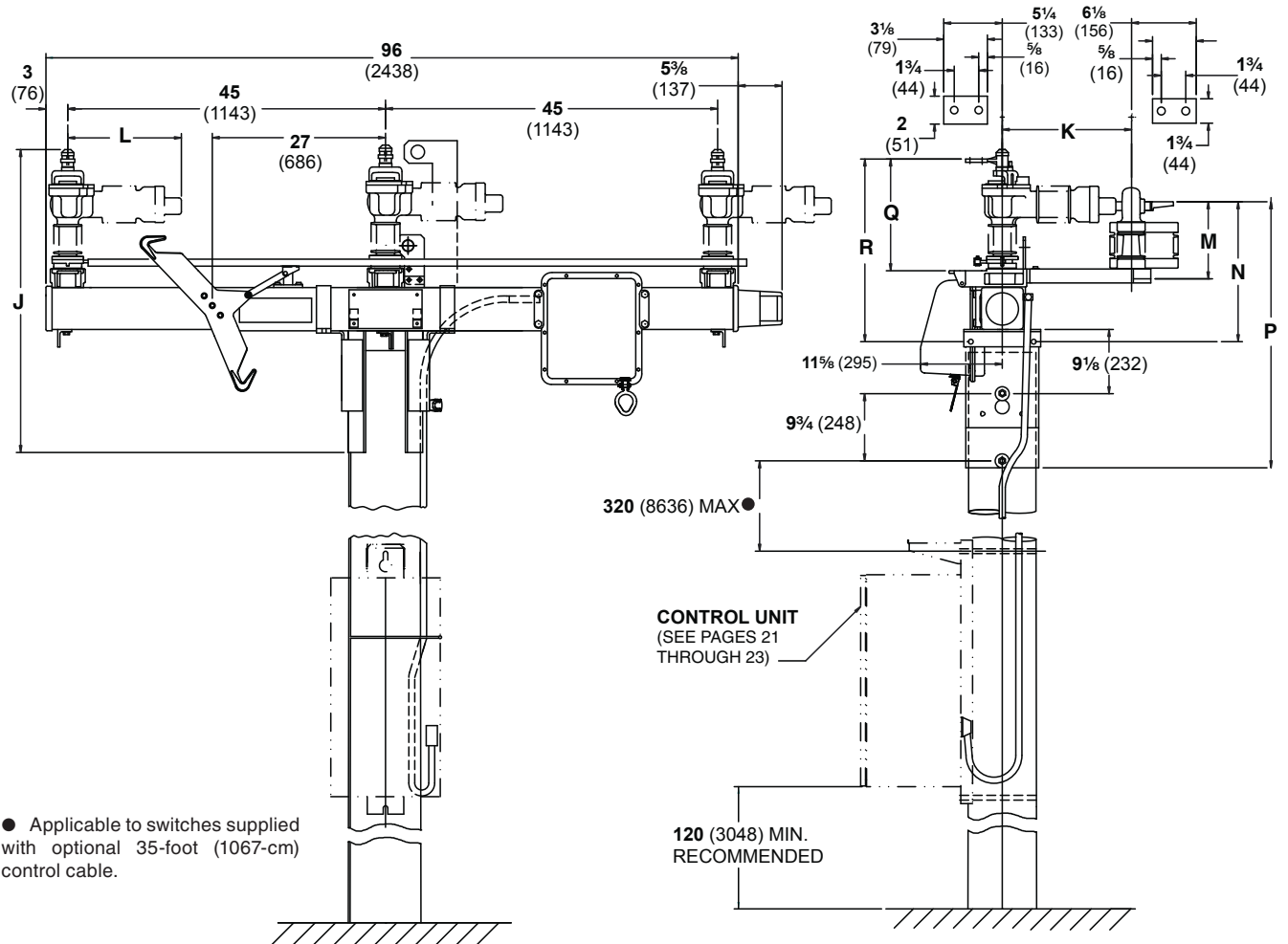
⑥ Catalog numbers shown include switch with stored-energy operating mechanism, three-phase current sensing, single-phase voltage sensing, and a 35-foot (1067-cm) shielded control cable. A control unit must be specified separately. Refer to Tables 5 and 6 on page 16.

⑦ Maximum dead-end loading: 2000 pounds (907 kg) per conductor where pull-off forces are applied to only one side of the switch; 8000 lbs. (3629 kg) per conductor where equal pull-off forces are applied to both sides of the switch.

⑧ The loading from the jumpers shall not exceed 90 lbs. in-line and 30 lbs. perpendicular to the terminal pad per IEEE Standard ANSI C37.32-1996 Section 8.8.2.2.

Scada-Mate Switch—Pole-Top Mounting Configuration

Dimensions in inches (mm)



● Applicable to switches supplied with optional 35-foot (1067-cm) control cable.

# Scada-Mate® Switching System

Mounting Configuration	Rating						Catalog Number <sup>⑥</sup>	Dimensions in Inches (mm)								Net Wt., Switch Assem., Lbs. (kg)
	kV <sup>①</sup>			Amperes, RMS		Five-Time Duty-Cycle Fault-Closing, Amps RMS Asym. <sup>⑤</sup>		J	K	L	M	N	P	Q	R	
	Nom.	Max	BIL	Cont. <sup>②</sup> and Interr. <sup>③</sup>	Mom, Asym. <sup>④</sup>											
Pole-Top <sup>⑦⑧</sup>	14.4	17.0	110	600	25 000	20 000	148512R2	45 <sup>3</sup> / <sub>4</sub> (1162)	18 <sup>5</sup> / <sub>8</sub> (473)	15 <sup>3</sup> / <sub>8</sub> (391)	11 <sup>1</sup> / <sub>4</sub> (286)	20 <sup>1</sup> / <sub>8</sub> (511)	38 <sup>1</sup> / <sub>4</sub> (972)	16 <sup>1</sup> / <sub>8</sub> (410)	26 <sup>1</sup> / <sub>4</sub> (667)	415 (188)
	25	29	150	600	25 000	20 000	148513R2	50 <sup>1</sup> / <sub>2</sub> (1283)	19 <sup>3</sup> / <sub>8</sub> (492)	16 <sup>1</sup> / <sub>8</sub> (410)	15 <sup>3</sup> / <sub>4</sub> (400)	24 <sup>5</sup> / <sub>8</sub> (625)	42 <sup>3</sup> / <sub>4</sub> (1086)	21 (533)	31 <sup>1</sup> / <sub>8</sub> (791)	465 (211)
	34.5	38	200	600	25 000	20 000	148514R2	55 <sup>5</sup> / <sub>8</sub> (1413)	26 <sup>1</sup> / <sub>8</sub> (664)	22 <sup>7</sup> / <sub>8</sub> (581)	19 <sup>3</sup> / <sub>4</sub> (502)	30 <sup>1</sup> / <sub>4</sub> (768)	48 <sup>3</sup> / <sub>8</sub> (1229)	24 <sup>1</sup> / <sub>4</sub> (616)	36 <sup>1</sup> / <sub>8</sub> (918)	540 (245)

① Switches furnished with a self-powered communication and control unit, a 6801 or 6802 Automatic Switch Control, or a switch control unit when powered by S&C Voltage Sensor(s), are restricted to applications at certain system voltages. Refer to the "Application Notes" section on page 7.

② Scada-Mate Switches can carry up to 900 amperes indefinitely in ambient temperatures to 40°C (104°F) with a minimum wind velocity of two feet per second. Maximum allowable conductor temperature is 90°C (194°F). Switches can endure 1000 operations of loop-current switching at 900 amperes.

③ For line or cable drooping, the following maximum conductor miles apply: line drooping to 50 miles (80.5 km) of line; cable drooping to 12 miles (19.3 km) of 1/0 cable or 5 miles (8.05 km) of 1000 kc mil cable, or equivalent.

④ The 1-second rating is 16,000 amperes RMS, symmetrical.

⑤ The duty-cycle fault-closing rating defines the ability to close the switch the specified number of times against a three-phase fault with asymmetrical current in at least one phase equal to the listed value, with the switch remaining operable and able to carry and interrupt rated continuous current.

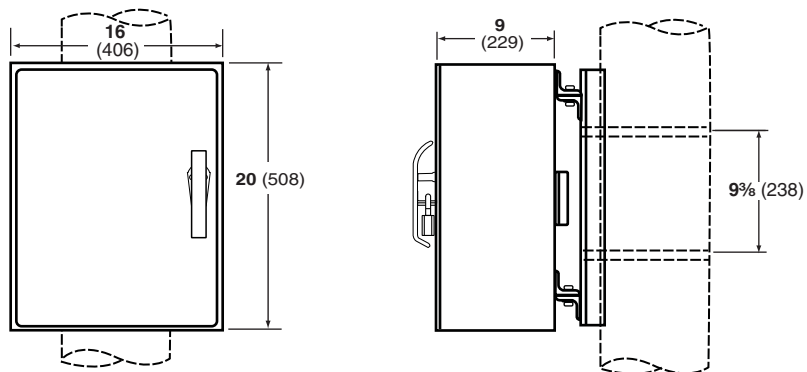
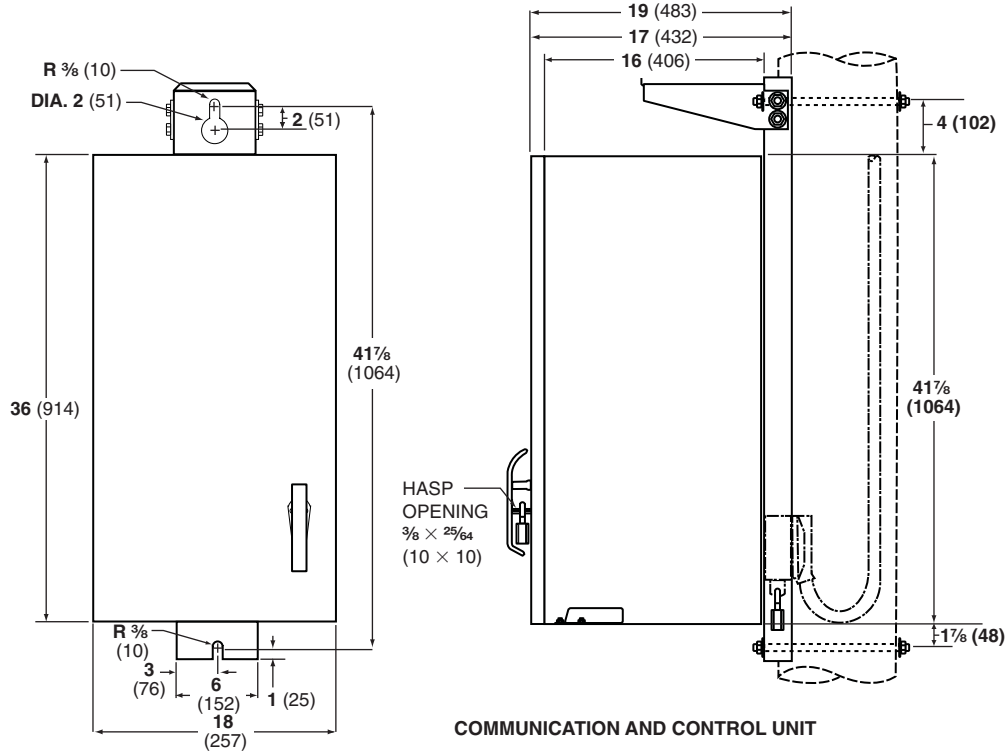
⑥ Catalog numbers shown include switch with stored-energy operating mechanism, three-phase current sensing, single-phase voltage sensing, and a 35-foot (1067-cm) shielded control cable. A control unit must be specified separately. Refer to Tables 5 and 6 on page 16.

⑦ Maximum dead-end loading: 2000 pounds (907 kg) per conductor where pull-off forces are applied to only one side of the switch; 8000 lbs. (3629 kg) per conductor where equal pull-off forces are applied to both sides of the switch.

⑧ The loading from the jumpers shall not exceed 90 lbs. in-line and 30 lbs. perpendicular to the terminal pad per IEEE Standard ANSI C37.32-1996 Section 8.8.2.2.

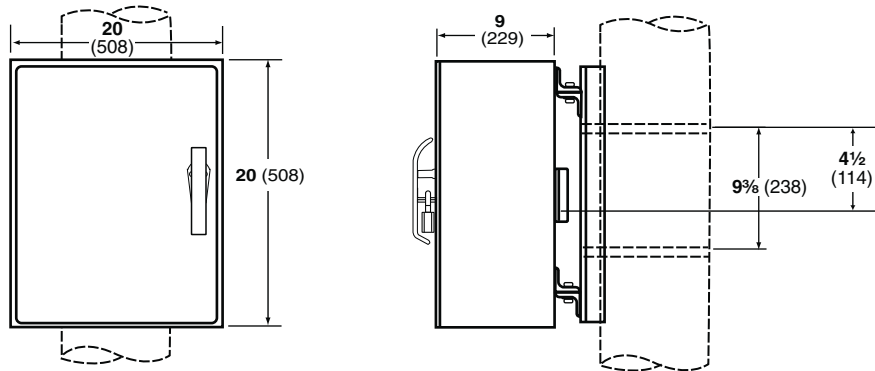
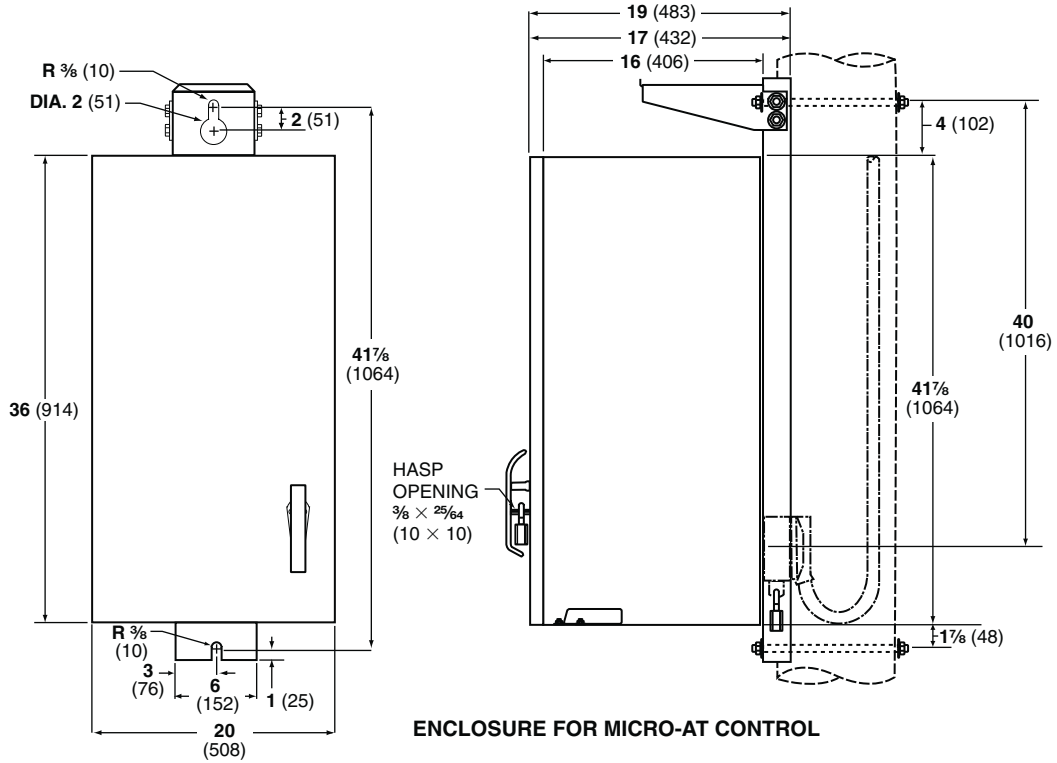
Control Units for Remote Supervisory Control Applications

Dimensions in inches (mm)

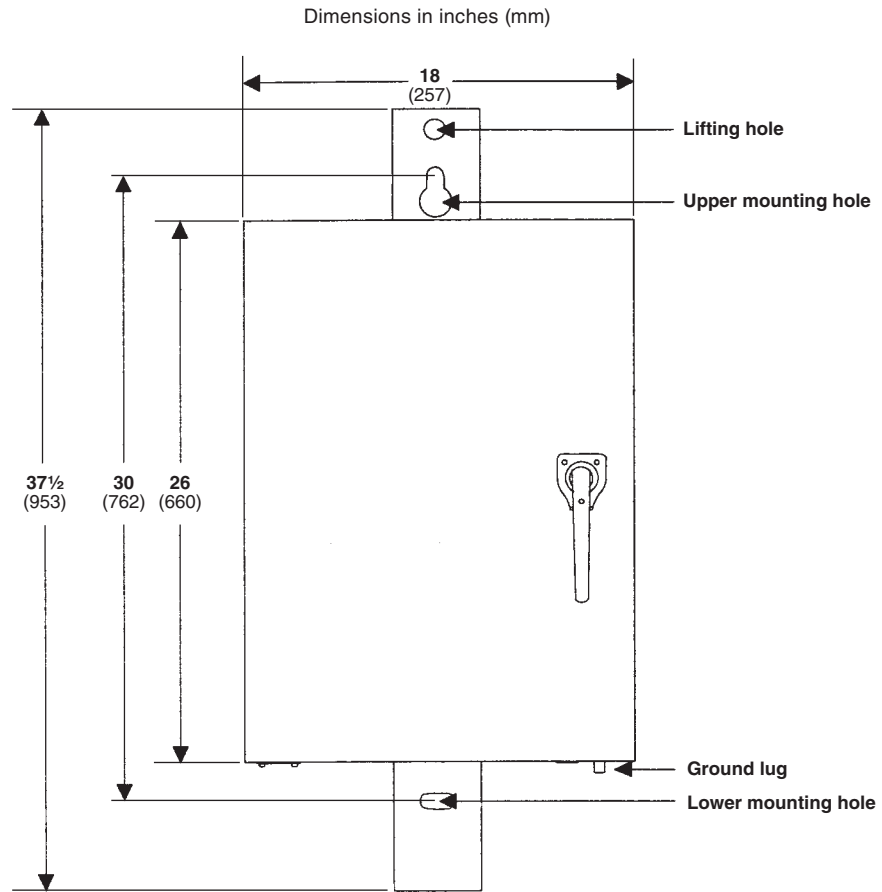


Control Units for Automatic Source-Transfer Applications

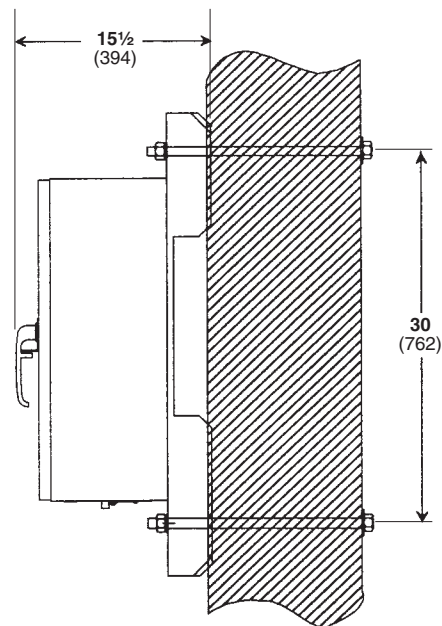
Dimensions in inches (mm)



Model 6801 and Model 6802 Automatic Switch Controls



FRONT VIEW OF ENCLOSURE



SIDE VIEW OF ENCLOSURE ON POLE