

1.0 GENERAL

- 1.01 The automated distribution switching system shall conform to the following specification.
- 1.02 The loadbreak switch shall be an outdoor, three-pole device incorporating single-gap SF₆ gas-filled group-operated interrupters driven by a single, stored-energy operating mechanism located on the switch assembly base.
- 1.03 The loadbreak switch shall be configured (*select appropriate description*).
- (a) upright
 - (b) upright (extra mounting-pole clearance)
 - (c) tiered-outboard
 - (d) pole-top
 - (e) vertical
- 1.04 The switch manufacturer shall have a minimum of 10 years' experience in the production of distribution automation switches and have at least 5000 units installed and in operation.
- 1.05 The switch manufacturer shall supply all internal wiring for the switching system. The switch manufacturer shall supply detailed as-built wiring diagrams, interconnection drawings, and remote terminal unit point data drawings (as required).
- 1.06 Testing
- The following design tests shall have been performed on the switch, and certified test reports shall be provided upon request:
- | | |
|--------------------------|-----------------------------|
| Interrupting: | IEEE 1247 |
| Dielectric: | ANSI C37.34 |
| Radio Influence Voltage: | ANSI C37.34 and ANSI C37.32 |
| Temperature Rise: | IEEE 1247 |
| Short-Time: | ANSI C37.34 and IEC 265-1 |
| Fault Closing: | IEEE 1247 and IEC 265-1 |
| Mechanical Endurance: | IEEE 1247 |
- 1.07 Each interrupter shall be tested to -40°C to ensure a leak rate of less than 10 to the power of -6 cubic centimeters per second before shipment from the factory.
- 1.08 The switch shall perform as intended at temperatures from -40°C to +40°C and it shall maintain full dielectric strength and interrupting capability at a gas pressure of 0 PSI.



2.0 LOADBREAK SWITCH

- 2.01 The switch shall utilize an integrated switch operator having no exposed moving parts between the switch and any other device.
- 2.02 The interrupters and the stored-energy operating mechanism shall be maintenance-free.
- 2.03 The switch shall have an integral visible-break disconnect device operable by means of a hookstick.
- 2.04 A color-coded indicator shall be provided on the end of the switch base which clearly indicates the open/close status of the switch from ground level.
- or Optionally*
- 2.04 *A color-coded indicator shall be provided on both ends of the switch base for enhanced visibility of the open/close status of the switch from ground level.*
- 2.05 The switch shall have integral dead-ending brackets capable of supporting 2000-pound tension—1500-pound tension for extra mounting-pole clearance configurations—per conductor in instances where conductors are attached to only one side of the switch, or 8000-pound tension per conductor in instances where conductors are applied to both sides of the switch.
- 2.06 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.
- 2.07 The switch shall include provisions for mounting six surge arresters (three on each side of the switch).
- 2.08 The switch shall have a single-point lifting means to facilitate installation. *(Dual-point lifting means for pole-top configuration.)*
- 2.09 The switch shall have been tested and rated for at least 3000 mechanical close-open operations.
- 2.10 The switch shall have been tested and rated for at least 500 close-open, loop-current switching operations at 900 amperes.
- 2.11 The switch shall be able to continuously carry and interrupt up to 900 amperes at ambient temperatures up to 40°C with a minimum wind velocity of two feet per second.
- 2.12 The switch shall not utilize any pressure gauges, to minimize entry points into the interrupter as well as opportunities for leakage. Each interrupter shall be tested in the manner indicated in Section 1.06—Testing.
- 2.13 The switch shall have remote disconnect-close-latch indication by means of communication through the RTU or IED, if this function is supported.

2.14 60-Hz Ratings

Load-Current Interrupting: 900 Amperes

Momentary: 25,000 Amperes, Asymmetrical

Duty-Cycle Fault Closing: 20,000 Amperes, RMS Asymmetrical, Five-Time

SELECTION OF VOLTAGE RATINGS

<i>kV</i>		
<i>Nominal</i>	<i>Maximum</i>	<i>BIL</i>
<i>14.4</i>	<i>17.0</i>	<i>110</i>
<i>25</i>	<i>29</i>	<i>150</i>
<i>34.5</i>	<i>38</i>	<i>200</i>

2.15 50-Hz Ratings

Load-Current Interrupting: 900 Amperes

Momentary Rating: 25,000 Amperes, Asymmetrical

Duty-Cycle Fault Closing: 20,000 Amperes, RMS Asymmetrical, Five-Time

SELECTION OF VOLTAGE RATINGS

<i>kV</i>		
<i>Minimum</i>	<i>Maximum</i>	<i>BIL</i>
<i>10</i>	<i>15</i>	<i>110</i>
<i>20</i>	<i>24</i>	<i>150</i>

3.0 OPERATING MECHANISM—

For Upright, Upright with Extra-Mounting-Pole Clearance, Tiered-Outboard, and Pole-Top Mounting Configuration Switches

- 3.01 The integral stored-energy operating mechanism shall be capable of electrically opening and closing the switch, or manually opening and closing the switch by means of a standard or extendible hookstick. No vertical operating shaft shall be required.
 - 3.02 The visible air-gap isolation disconnect shall be mechanically interlocked with the operating mechanism so that the disconnect will be blocked from opening until the interrupters are opened.
 - 3.03 The operating mechanism shall be mechanically and electrically interlocked with the visible air-gap isolation disconnect in such a way as to prevent both manual and electrical operation of the interrupters when the disconnect is not fully closed.
 - 3.04 The operating mechanism shall include:
 - (a) Low-resistance contacts for indication of open/close position.
 - (b) Maintenance-free wiping contacts to prevent operational difficulties arising from corrosion or frost.
 - (c) Self-lubricating, maintenance-free bearings.
 - 3.05 The operating mechanism shall be capable of operating electrically at a minimum operating voltage of 16 Vdc.
 - 3.06 The operating mechanism shall require one pull of less than 50 pounds force to operate manually when the mechanism is fully charged.
 - 3.07 Stored energy in the operating mechanism shall not be released upon large impact load to the switch or pole.
 - 3.08 The operating mechanism shall be tested in the manner described in Section 1.06—Testing.
- or

3.0 OPERATING MECHANISM—

For Vertical Mounting Configuration Switches

- 3.01 The integral stored-energy operating mechanism shall be capable of performing five change-of-state operations after control power has been lost. The switch shall always be capable of opening.
- 3.02 The operating mechanism shall be mechanically interlocked with the manual opening device so that the circuit will always be interrupted prior to visible-gap opening of the switch.
- 3.03 The operating mechanism shall include:
 - (a) Low-resistance contacts for indication of open/close position.
 - (b) Maintenance-free wiping contacts to prevent operational difficulties arising from corrosion or frost.
 - (c) Self-lubricating, maintenance-free bearings.
- 3.04 The operating mechanism shall be tested in the manner described in Section 1.06—Testing.

4.0 SELF-POWERED COMMUNICATION AND CONTROL UNIT

- 4.01 The manufacturer shall provide a custom-engineered communication and control unit including a/an _____ remote terminal unit (RTU) and a/an _____ communication device.
- 4.02 Control power shall be provided by a voltage sensor on the jaw side of the switch.
- or
- 4.02 Control power shall be provided by three voltage sensors located on one or both sides of the switch. A transfer scheme shall be furnished to ensure continuous control power as long as one side of the switch is energized.
- 4.03 A temperature-compensated constant voltage battery charger and rechargeable, sealed-lead, starved-electrolyte battery packs shall be provided in the communication and control unit.
- 4.04 Controls for local electrical opening and closing of the switch and for selecting local or remote operation shall be provided in the communication and control unit.
- 4.05 Switch-position indicating lamps and a disconnect-close-latch indicating lamp shall be provided in the communication and control unit.
- 4.06 An operation counter shall be provided in the communication and control unit.
- 4.07 The communication and control unit and all standard components shall be rated for an ambient temperature range of -40°C to +70°C.
- 4.08 The communication and control unit enclosure shall be of 316L stainless-steel with gasketed front, designed to the NEMA 4X standard. Appropriate venting shall be provided to prevent gas and moisture buildup. Vents shall be louvered, screened, and filtered to prevent entry of insects and to minimize entry of dust and wind-driven rain into the enclosure.
- 4.09 Connection of the communication and control unit to the switch shall be by control cable in liquidtight flexible metal conduit.

or

4.0 EXTERNALLY POWERED COMMUNICATION AND CONTROL UNIT

- 4.01 The manufacturer shall provide a custom-engineered communication and control unit including a/an _____ remote terminal unit (RTU) and a/an _____ communication device.
- 4.02 Control power shall be provided by an external 120-Vac power source.
- 4.03 A high-output, temperature-compensated constant-voltage battery charger with unique battery management system, and rechargeable, sealed-lead, starved-electrolyte batteries shall be provided in the communication and control unit.
- 4.04 Controls for local electrical opening and closing of the switch and for selecting local or remote operation shall be provided in the communication and control unit.
- 4.05 Switch-position indicating lamps and a visual-break indicating lamp shall be provided in the communication and control unit.
- 4.06 An operation counter shall be provided in the communication and control unit.
- 4.07 The communication and control unit and all standard components shall be rated for an ambient temperature range of -40°C to +70°C.
- 4.08 The communication and control unit enclosure shall be of 316L stainless-steel with gasketed front, designed to the NEMA 4X standard. Appropriate venting shall be provided to prevent gas and moisture buildup. Vents shall be louvered, screened, and filtered to prevent entry of insects and to minimize entry of dust and wind-driven rain into the enclosure.
- 4.09 Connection of the communication and control unit to the switch shall be by control cable in liquidtight flexible metal conduit.

or

4.0 S&C 5801 AUTOMATIC SWITCH CONTROL

- 4.01 The manufacturer shall provide a fully integrated, automatic switch control providing sophisticated remote terminal unit (RTU) functionality and a/an_____ communication device. The control shall be upgradeable to the IntelliTEAM II® Automatic Restoration System, which uses peer-to-peer communication and distributed intelligence to make operating decisions. No central processing or SCADA shall be required (though fully supported).
- 4.02 Control power shall be provided by an external 120-Vac power source.
- or
- 4.02 Control power shall be provided by three voltage sensors located on one or both sides of the switch. A transfer scheme shall be furnished to ensure continuous control power as long as one side of the switch is energized.
- 4.03 A high-output, temperature-compensated, constant-voltage battery charger with unique battery management system, and rechargeable, sealed-lead, starved-electrolyte batteries shall be provided in the automatic switch control.
- 4.04 Controls for local electrical opening and closing of the switch and for selecting local or remote operation shall be provided in the automatic switch control.
- 4.05 Operation and diagnostic indicating lamps shall be provided in the automatic switch control.
- 4.06 Local communication access shall be provided via a DB9 connector.
- 4.07 The automatic switch control and all standard components shall be rated for an ambient temperature range of -40°C to +70°C.
- 4.08 The automatic switch control enclosure shall be of non-corrosive aluminum. Appropriate venting shall be provided to prevent gas and moisture buildup. Vents shall be louvered, screened, and filtered to prevent entry of insects and to minimize entry of dust and wind-driven rain into the enclosure.
- 4.09 Connection of the automatic switch control to the switch shall be by control cable in liquidtight flexible metal conduit.

or

4.0 S&C 5802 AUTOMATIC SWITCH CONTROL

- 4.01 The manufacturer shall provide a fully integrated, automatic switch control, for remote supervisory or source-transfer application, providing sophisticated remote terminal unit (RTU) functionality and a/an _____ communication device. The control shall be upgradeable to the IntelliTEAM II® Automatic Restoration System, which uses peer-to-peer communication and distributed intelligence to make operating decisions. No central processing or SCADA shall be required (though fully supported).
- 4.02 Control power shall be provided by three voltage sensors located on one or both sides of the switch. A transfer scheme shall be furnished to ensure continuous control power as long as one side of the switch or—in source-transfer applications—the other switch, is energized.
- 4.03 A high-output, temperature-compensated, constant-voltage battery charger with unique battery management system, and rechargeable, sealed-lead, starved-electrolyte batteries shall be provided in the automatic switch control.
- 4.04 Controls for local electrical opening and closing of the switch and for selecting local or remote operation shall be provided in the automatic switch control.
- 4.05 Operation and diagnostic indicating lamps shall be provided in the automatic switch control.
- 4.06 Local communication access shall be provided via a DB9 connector.
- 4.07 The automatic switch control and all standard components shall be rated for an ambient temperature range of -40°C to +70°C.
- 4.08 The automatic switch control enclosure shall be of non-corrosive aluminum. Appropriate venting shall be provided to prevent gas and moisture buildup. Vents shall be louvered, screened, and filtered to prevent entry of insects and to minimize entry of dust and wind-driven rain into the enclosure.
- 4.09 Connection of the automatic switch control to the switch shall be by control cable in liquidtight flexible metal conduit.

or

4.0 MICRO-AT® SOURCE-TRANSFER CONTROL

- 4.01 The manufacturer shall provide a fully integrated, automatic source-transfer control. The control shall include a control-voltage-seeking relay to ensure adequate control voltage. One source must be energized for the control to operate.
- 4.02 Control power shall be provided by a dedicated, customer-furnished, single-phase, line-to-ground connected voltage transformer for each source. Each transformer must be rated 500 volt-amperes minimum and have a 240/120-volt, 60-hertz secondary. Fuseholders shall be provided for the secondary fuses of the user-furnished voltage transformers.
- 4.03 Input isolation transformers and a signal-voltage input isolation assembly shall be provided 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.
- 4.04 A switch for selecting manual or automatic operation shall be provided in the source-transfer control.
- 4.05 A two-line 48-character backlit liquid-crystal display shall be provided in the source-transfer control.
- 4.06 The source-transfer control and all standard components shall be rated for an ambient temperature range of -40°C to +70°C.
- 4.07 The source-transfer control enclosure shall be of 316L Stainless Steel with gasketed front, designed to the NEMA 4X standard. Appropriate venting shall be provided to prevent gas and moisture buildup. Vents shall be louvered, screened, and filtered to prevent entry of insects and to minimize entry of dust and wind-driven rain into the enclosure.
- 4.08 Connection of the source-transfer control to the switch shall be by control cable in liquidtight flexible metal conduit.

5.0 SENSORS

- 5.01 Voltage and current sensing shall be provided by sensors integrally mounted to the switch.
- 5.02 The switch shall include, as standard, sensors for three-phase monitoring of line current and single-phase monitoring of system line voltage on the jaw side of the switch.
- or Optionally*
- 5.02 *The switch shall include sensors for three-phase monitoring of line current and line voltage on the jaw side of the switch.*
- or Optionally*
- 5.02 *The switch shall include sensors for three-phase monitoring of line current and line voltage on both the jaw side and hinge side of the switch.*
- 5.03 Voltage sensors shall have isolated secondaries to protect the inputs of the RTU or IED from potentially damaging voltage surges.
- 5.04 Voltage sensing shall be accurate to within $\pm 3\%$ across the tested temperature range of -40°C to $+40^{\circ}\text{C}$.
- 5.05 Current sensing shall be accurate to within $\pm 3\%$ across the tested temperature range of -40°C to $+40^{\circ}\text{C}$.

6.0 OPTIONAL FEATURES FOR MICRO-AT® SOURCE-TRANSFER CONTROL

The following optional features shall be furnished (*specify as required*):

- 6.01 An overcurrent lockout feature shall be provided. This feature prevents automatic-transfer operations that would close a switch into a fault. Facilities for external reset are included.
- 6.02 A remote indication feature shall be provided. This feature includes provisions for remotely monitoring the presence or absence of source voltages, manual or automatic operating mode, status of the “ready” indicator, “event” indicator, and (if furnished) overcurrent lockout.
- 6.03 A test panel feature shall be provided. This feature permits the use of an external, adjustable three-phase source to verify, through independent measurement, response of the control to loss-of-source, phase-unbalance, and overcurrent-lockout conditions.
- 6.04 A supervisory control feature shall be provided. This feature includes facilities for switch operation from a remote location.
- 6.05 A communications card feature shall be provided. This feature 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.
- 6.06 A pole-mounting bracket with hardware shall be provided.
- 6.07 A/an _____ remote terminal unit (RTU) and a/an communication device for SCADA application shall be provided.

7.0 OPTIONAL FEATURES FOR S&C 5800 SERIES AUTOMATIC SWITCH CONTROLS

The following optional features shall be furnished (*specify as required*):

- 7.01 The full version of IntelliTEAM II® Automatic Restoration System software shall be provided.
- 7.02 A PASS Pager Alert and Supervisory System shall be provided.
- 7.03 The WinMon® Graphical User Interface software shall be provided.
- 7.04 A/an _____ communication device shall be provided.

8.0 SPECIAL OPTIONAL FEATURES

The following optional features shall be furnished exclusively for use where the end user is a Canadian utility whose convention requires such features (*specify as required*):

- 8.01 Reversed colors for interrupter open/closed indicator (green for closed, red for open) shall be provided.
- 8.02 Reversed colors for interrupter open/closed indicators on both ends of the switch base (green for closed, red for open) shall be provided.
- 8.03 Reversed colors for interrupter open/closed indicating lamps (green for closed, red for open) shall be provided.

9.0 OPTIONAL ACCESSORIES

- 9.01 *Wildlife protection shall be provided.*
- 9.02 *High-speed operating mechanism shall be provided (standard for vertical mounting configuration). Does not permit non-electrical mechanical closing of the interrupters.*

