

Four-Position Sectionalizing Loadbreak Switches

Electrical Apparatus

800-64

GENERAL

The Cooper Power Systems four-position sectionalizing loadbreak switch is designed for use in transformer (mineral) oil, R-Temp® or Envirotemp® FR3™ fluid filled pad-mounted transformers or distribution switchgear. The switches meet the full requirements of the latest revision of both IEEE® and IEC standards.

Sectionalizing switches can be used on single- and three-phase grounded wye or delta systems. They are used in underground residential applications with loop feed, and in three-phase commercial industrial installations where the ability to use an alternative source of power is necessary. They can also be used to switch on and off a primary cable tap on a transformer.

The under-oil switch can be installed near the transformer core/coil assembly, thus minimizing cable capacitance. With cable capacitance minimized and all three phases switched simultaneously, the likelihood of ferroresonance is greatly reduced. All switches are hotstick operable and available in several different blade configurations (Refer to Table 5).

Cooper Power Systems sectionalizing switches rotate 360° in either direction for alternate source selection. An externally installed limiting plate prevents rotation to positions other than the one desired. A spring-loaded activating mechanism ensures quick loadbreak action and positive contact engagement through all positions.

The Make-Before-Break (MBB) switches provide uninterrupted power during switching.

MAKE-BEFORE-BREAK FEATURES

- Improves system reliability by eliminating momentary interruptions during switching operations typically associated with Break-Before-Make (BBM) sectionalizing switches.
- Replaces 2 or 3 two position loadbreak switches depending on application (Choose V-blade or T-blade type).
- Simplifies operational procedures.

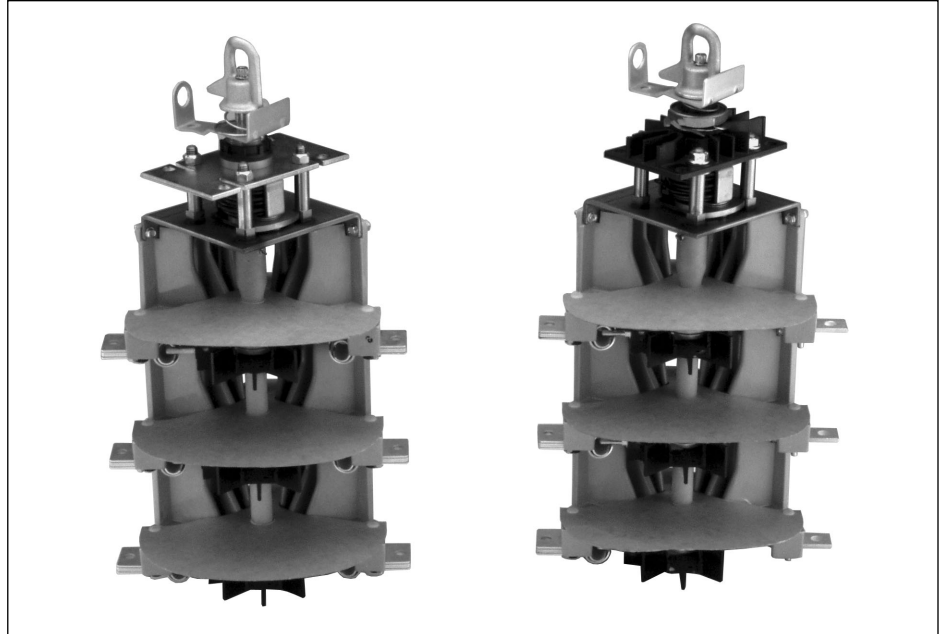


Figure 1. Sectionalizing Switches. Three-phase Bolt-In (left) and three-phase Quick-Mount (right).

- Make-Before-Break design available in both V- and T-blade switch types.

ATTRIBUTES

- Available for both 12 kA and 16 kA applications.
- Ratings from 200 A to 630 A and from 15 kV to 38 kV.
- Tested in mineral oil, R-Temp and Envirotemp FR3 fluids.
- All electrical switching tests performed at third-party certified test laboratories
- 5000 mechanical operations (meets IEC class M2 switch).
- All silver plated copper current path.
- Similar “footprint” as previous 10 kA switches (See Tables 3 and 4).
- The Quick-Mount System option offers easier and faster installation.
- Special vertical mounted switches available for cover mounted applications.

PRODUCTION TESTS

Tests are conducted in accordance with Cooper Power Systems requirements:

- Physical Inspection
- Mechanical operations
- Operating torque
- Contact pressure
- Switch contact resistance

INSTALLATION

The switch is either horizontally or vertically mounted, depending on the application and the selected switch type. The vertically mounted switch is typically used in transformers/switchgear installed below grade, where the switch would be mounted in the cover of that particular equipment. All exposed parts of the vertically mounted switch are made from stainless steel or other non-corrosive materials. Both types of switches, including the mechanism, must be completely immersed under the insulating fluid.

NOTE: For all mounting systems, refer to S800-64-2 for more detailed installation instructions.

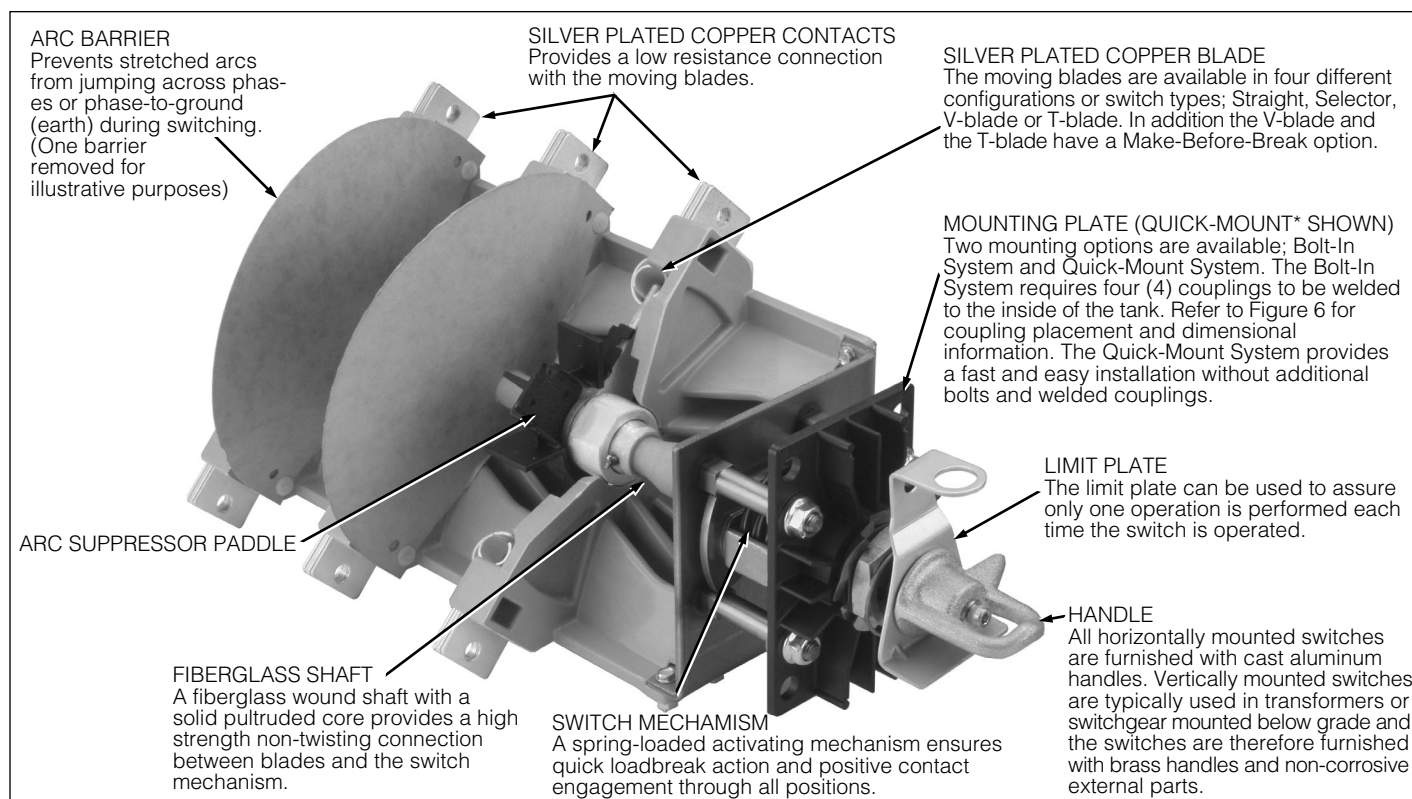


Figure 2.
Switch features and description.

* DuPont Zytel® HTN (High Temperature Nylon)

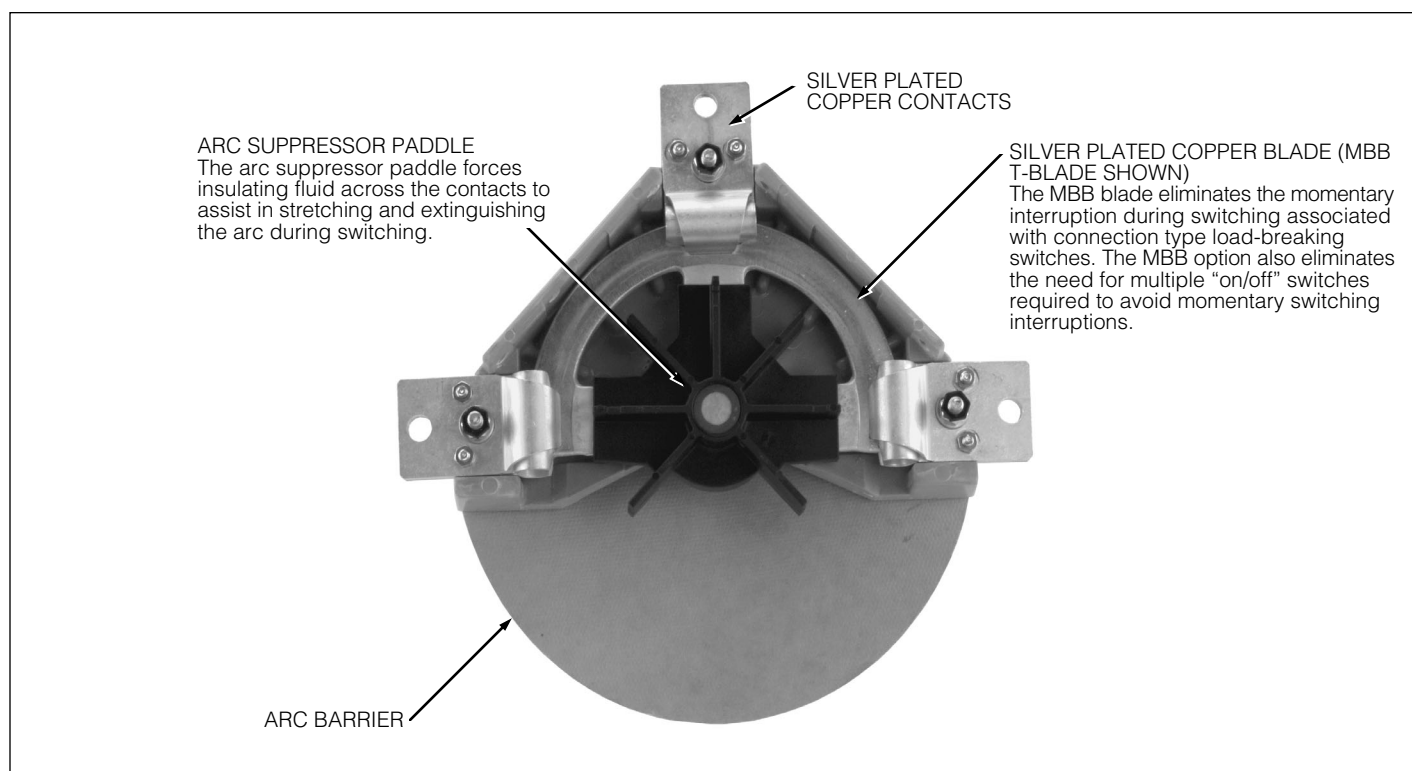


Figure 3.
Make-Before-Break switch features and description (See Table 5 for application details).

ELECTRICAL RATINGS

TABLE 1
Ratings and Characteristics per IEEE C37.71 – 2001™

| | Units | 12.5 kA Rated Switches To IEEE C37.71 - 2001™ | | |
|---|-------|--|-------|-------|
| Rated Voltage | | | | |
| Maximum rating phase-to-phase | kV | 15.5 | 27.8 | 38 |
| Maximum rating phase-to-ground | kV | 9 | 17.2 | 21.9 |
| Power Frequency | Hz | 60 | 60 | 60 |
| Current rating (Continuous) | A | 630 | 300 | 200 |
| Loadbreak Capability @ 0.75 | | | | |
| Power Factor | A | 630 | 300 | 200 |
| First peak min. | kV | 4 | 7.6 | 13 |
| Time-to-peak max. | µs | 180 | 290 | 424 |
| Magnetizing | A | 22 | 10.5 | 7 |
| Cable Charging | A | 10 | 25 | 40 |
| Fault Withstand Current (Momentary) | | | | |
| 10 cycle symmetric rms | kA | 12.5 | 12.5 | 12.5 |
| 10 cycle asymmetric rms | kA | 18.6 | 18.6 | 18.6 |
| 10 cycle peak | kA | 32.5 | 32.5 | 32.5 |
| Fault Withstand (Short-time) | | | | |
| 1s rms | kA | 12.5 | 12.5 | 12.5 |
| 2s rms | kA | 12.5 | 12.5 | 12.5 |
| Fault Close and Latch | | | | |
| 10 cycle symmetric rms | kA | 12.5 | 12.5 | 12.5 |
| 10 cycle asymmetric rms | kA | 18.6 | 18.6 | 18.6 |
| 10 cycle peak | kA | 32.5 | 32.5 | 32.5 |
| Impulse Withstand Voltage (1.2/50µs) | | | | |
| To ground and between phases | kV | 95 | 125 | 150 |
| Across open contacts | kV | 95 | 125 | 150 |
| Power Frequency (1 minute) | | | | |
| To ground and between phases | kV | 35 | 60 | 70 |
| Across open contacts | kV | 35 | 60 | 70 |
| DC Withstand (15 minutes) | | | | |
| To ground and between phases | kV | 53 | 78 | 103 |
| Across open contacts | kV | 53 | 78 | 103 |
| Corona (Extinction) | kV | 26 | 26 | 26 |
| Temperature Maximum at 630 A | °C | 75 | 75 | 75 |
| Temp. Rise Above Ambient Air at 630 A (Max.) | °K | 35 | 35 | 35 |
| Mechanical Life (Minimum Operations): | | 5,000 | 5,000 | 5,000 |

TABLE 2
Ratings and Characteristics per IEC 60265-1 – 1998

| | Units | 16 kA Rated Switches To IEC 60265-1 - 1998 | | |
|---|-------|---|-------|-------|
| Switch Rating | kV | 15 | 24 | 36 |
| Rated Voltage | | | | |
| Maximum rating phase-to-phase | kV | 15.5 | 24.9 | 38 |
| Maximum rating phase-to-earth | kV | 9 | 14.4 | 21.9 |
| Power Frequency | Hz | 50/60 | 50/60 | 50/60 |
| No-Load Transformer Breaking Current | A | 6.3 | 4 | 2 |
| Current Rating (Continuous) | A | 630 | 400 | 200 |
| Mainly Active Load Breaking Current | A | 630 | 400 | 200 |
| First peak min. | kV | 25.7 | 41 | 65.1 |
| Time-to-peak max. | µs | 72 | 88 | 108 |
| Closed Loop Breaking Current | A | 630 | 400 | 200 |
| Line Charging Current | A | 1 | 1.5 | 2 |
| Cable Charging Current | A | 10 | 17 | 25 |
| Earth Fault Switching Current | A | 1 | 10 | 8 |
| Cable and Line Charging Under Earth Fault | A | 17.5 | 17 | 26 |
| Short-time Withstand Current | | | | |
| 1s rms | kA | 18 | 18 | 18 |
| 2s rms | kA | 16 | 16 | 16 |
| 3s rms | kA | 13 | 13 | 13 |
| Short-circuit Making Current | | | | |
| 12 cycle symmetric rms (min.) | kA | 16 | 16 | 16 |
| 12 cycle asymmetric rms (min.) | kA | 24.8 | 24.8 | 24.8 |
| 12 cycle max. peak (min.) | kA | 41.6 | 41.6 | 41.6 |
| Impulse Withstand Voltage (1.2/50µs) | | | | |
| To earth and between phases | kV | 170 | 170 | 170 |
| Across open contacts (isolating distance) | kV | 195 | 195 | 195 |
| Power Frequency (1 Minute) | | | | |
| To earth and between phases | kV | 70 | 70 | 70 |
| Across open contacts (isolating distance) | kV | 80 | 80 | 80 |
| Corona (Extinction) | kV | 26 | 26 | 26 |
| Temperature Maximum at 630 A | °C | 90 | 90 | 90 |
| Temp. Rise Above Ambient Air at 630 A (Max.) | °K | 50 | 50 | 50 |
| Mechanical Life (Minimum Operations): | | 5,000 | 5,000 | 5,000 |

DIMENSIONAL INFORMATION

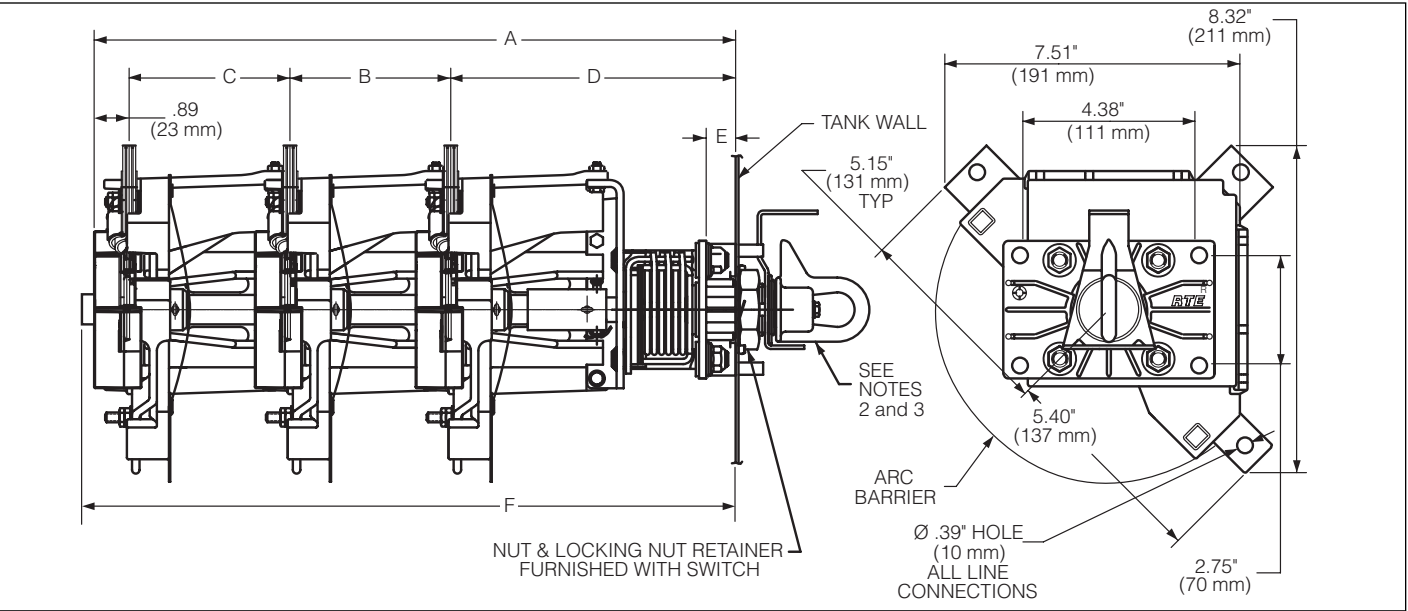


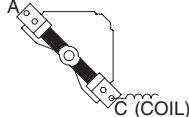
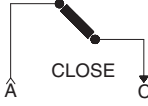
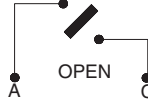
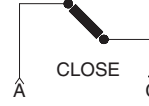
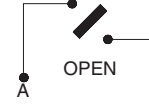
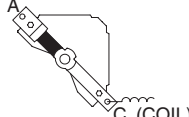
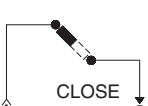
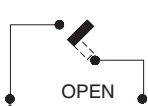
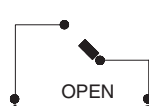
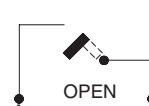
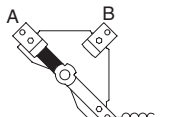
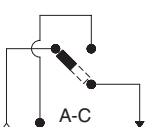
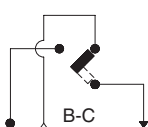
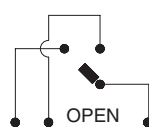
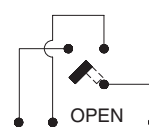
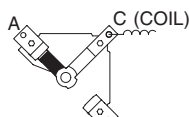
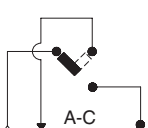
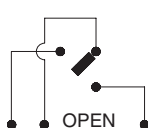
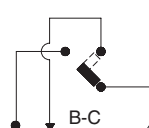
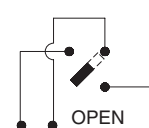
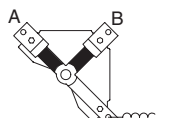
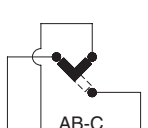
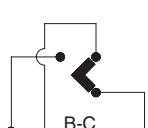
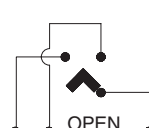
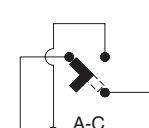
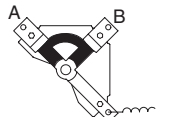
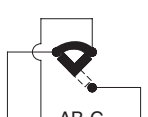
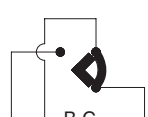
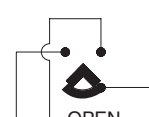

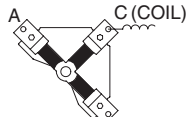
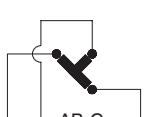
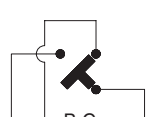
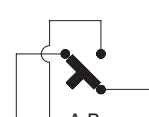
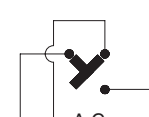





Figure 4. Line illustration with dimensions of sectionalizing switch with “Quick-Mount System.”

- Notes:
- 1. Dimensions given in Figure 4 and Table 3 are for reference only.
 - 2. Handle can be used on 14 gauge .075 inch (1.9 mm) to .25 inch (6.4 mm) thick frontplate. 14 gauge shown.
 - 3. Optional padlock handle is available. (See Table 7, Figure 7.)

TABLE 3 Dimensional Information for Figure 4 (Inches/mm)

| No. of Decks/ Phases | kV Rating & Blade Type | A | B | C | D | E | F |
|-------------------------|--|------------------|-----------------|-----------------|------------------|----------------|------------------|
| | | Horizontal Mount | | | Horizontal Mount | | |
| 1 | All | 8.14" 207 mm | – | – | 7.25" 184 mm | 0.75" 19 mm | 8.54" 217 mm |
| 2 | All | 12.23" 311 mm | 4.09" 104 mm | – | 7.25" 184 mm | 0.75" 19 mm | 12.54" 319 mm |
| 3 | 12 kA T Blade 12 & 16 kA Selector, Straight, & V Blade | 16.3" 414 mm | 4.09" 104 mm | 4.09" 104 mm | 7.25" 184 mm | 0.75" 19 mm | 16.54" 420 mm |
| 3 | 16 kA T Blade Only | 16.7" 424 mm | 4.09" 104 mm | 4.09" 104 mm | 7.65" 194 mm | 0.75" 19 mm | 16.94" 430 mm |

TABLE 5
Wiring Schematics

| SWITCH TYPE | TYPICAL DECAL STENCIL LAYOUT | VIEW OF CONTACTS FROM FRONT (HANDLE) END OF SWITCH | POSITION 1 FRONT SCHEMATIC AS SHIPPED AND AS SHOWN AT LEFT | POSITION 2 SCHEMATIC SWITCH HANDLE ROTATED 90° CLOCKWISE FROM POSITION 1 | POSITION 3 SCHEMATIC SWITCH HANDLE ROTATED 90° CLOCKWISE FROM POSITION 2 | POSITION 4 SCHEMATIC SWITCH HANDLE ROTATED 90° CLOCKWISE FROM POSITION 3 |
|--|--|---|---|--|---|---|
| STRAIGHT BLADE | CLOSE OPEN OPEN CLOSE |  |  |  |  |  |
| SELECTOR BLADE ON-OFF | CLOSE OPEN OPEN OPEN |  |  |  |  |  |
| SELECTOR BLADE 1 BLADE SIDE | LINE A TO C OPEN LINE B TO C OPEN |  |  |  |  |  |
| SELECTOR BLADE 1 BLADE CENTER | LINE A TO C OPEN OPEN LINE B TO C |  |  |  |  |  |
| V-BLADE BREAK BEFORE MAKE | LINES A & B TO C LINE A ONLY TO C LINE B ONLY TO C OPEN (ALL) |  |  |  |  |  |
| V-BLADE MAKE BEFORE BREAK | LINES A & B TO C LINE A ONLY TO C LINE B ONLY TO C OPEN (ALL) |  |  |  |  |  |
| T-BLADE BREAK BEFORE MAKE | LINES A & B TO C LINE A ONLY TO C LINE B ONLY TO C LINES A TO B C OPEN |  |  |  |  |  |
| T-BLADE MAKE BEFORE BREAK | LINES A & B TO C LINE A ONLY TO C LINE B ONLY TO C LINES A TO B C OPEN |  |  |  |  |  |
| NOTE: 1. SWITCH CENTER IS PIVOT POINT. BLACK SEGMENTS OF BLADE ROTATE. WHITE OUTLINED SEGMENTS ARE STATIONARY. 2. OTHER POSITION SEQUENCES AVAILABLE – CONSULT FACTORY FOR DETAILS. | | | | | | |

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