COOPER Power Systems

Sectionalizers

Types TVS15 and TVS27 Time–Voltage Sectionalizer Installation and Operation Instructions

Service Information

S270-30-1

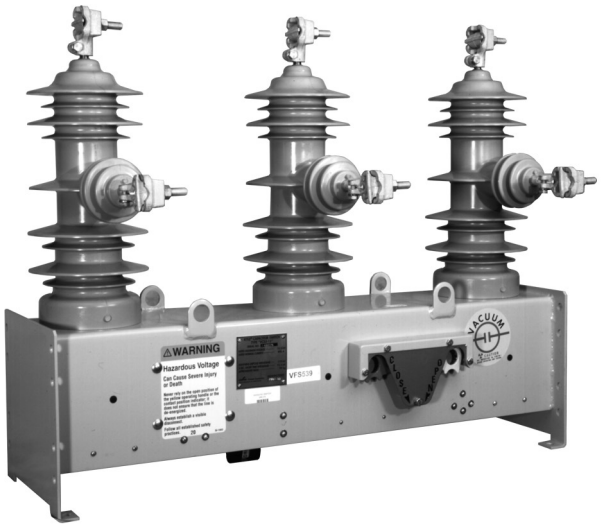

Figure 1.
Kyle® Type TVS Time-Voltage Sectionalizer.

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Contents

SAFETY FOR LIFE

Cooper Power Systems products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Cooper Power Systems employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment and support our “Safety For Life” mission.

SAFETY INFORMATION

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- *Is thoroughly familiar with these instructions.*
- *Is trained in industry-accepted high- and low-voltage safe operating practices and procedures.*
- *Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.*
- *Is trained in the care and use of protective equipment such as flash clothing, safety glasses, face shield, hard hat, rubber gloves, hotstick, etc.*

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety Instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER: Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high and low voltage lines and equipment. G103.3

WARNING: Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage. G101.0

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury, and equipment damage. G102.1

WARNING: Power distribution equipment must be selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install, or maintain this equipment can result in death, severe personal injury, and equipment damage. G122.2

PRODUCT INFORMATION

Introduction

Service Information S270-30-1 provides installation, operation, and maintenance instructions for the Kyle Type TVS Time-Voltage Sectionalizer with TVS Control. Before installing and operating this sectionalizer and control, carefully read and understand the contents of this manual.

Read This Manual First

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

Additional Information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, nor provide directions for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your Cooper Power Systems representative.

Acceptance and Initial Inspection

Each sectionalizer and control is completely assembled, tested, and inspected at the factory. They are in good condition when accepted by the carrier for shipment.

Upon receipt, inspect the shipping container for signs of damage. Unpack the sectionalizer and control, and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Handling and Storage

Be careful during handling and storage of the sectionalizer to minimize the possibility of damage. If the sectionalizer and control is to be stored for any length of time prior to installation, provide a clean, dry storage area.

Standards

The Kyle Type TVS Time–Voltage sectionalizers are designed and tested in accordance with

ANSI C37.63 - 1994

Quality Standards

The Quality System at the Cooper Power Systems, Kyle Distribution Switchgear plant is certified to the following standards:

ISO 9001, 1994

CAN/CSA ISO 9001, 1994

BS EN ISO 9001, 1994

ANSI/ASQC Q9001, 1994

Description

The Kyle Type TVS Sectionalizer is a self-contained, circuit-opening device used in conjunction with a substation or other source-side recloser to isolate system disturbances. Single or multiple TVS sectionalizers can be applied to a distribution line based on feeder size and system protection requirements. The TVS sectionalizer does not interrupt faults. Faults and overcurrents are detected and interrupted by an upline recloser. As the recloser sequences, the TVS sectionalizer detects loss and restoration of voltage and utilizes time-voltage logic to isolate the section of line impacted by the disturbance.

When the TVS sectionalizer is properly installed, and the distribution feeder is operating normally, manually raising the yellow operating handle and pushing the reset button on the TVS control resets and closes the sectionalizer.

If a sustained loss of voltage occurs, the sectionalizer times out and opens. When voltage is restored and sustained, the TVS times out and closes. If loss of voltage re-occurs before the sectionalizer resets, the TVS opens and locks out.

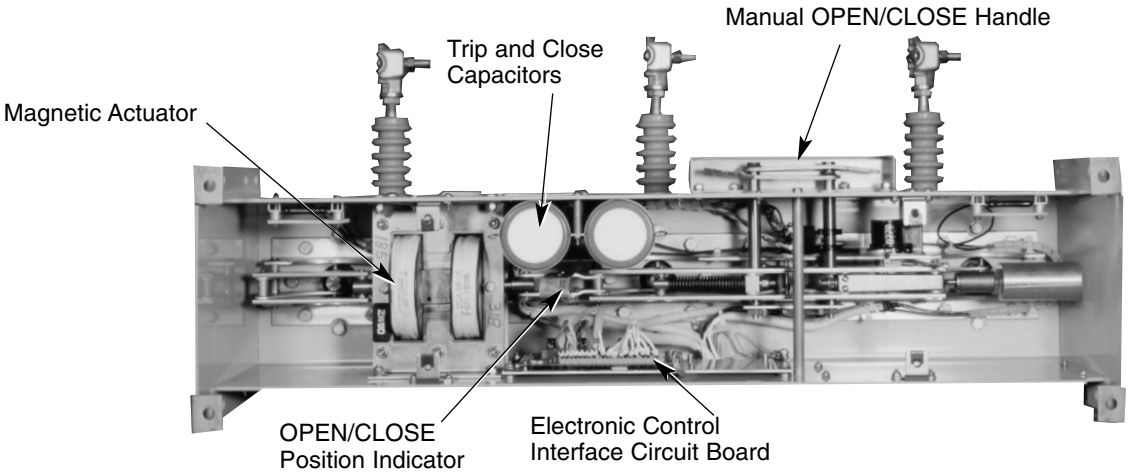

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Figure 2.
Type TVS Sectionalizer mechanism (view from bottom of sectionalizer with bottom cover removed).

The sectionalizer mechanism provides close and latch capability for electrical operation. The solid polymer insulation system does not rely on gaseous or liquid dielectric. The TVS Sectionalizer is highly resistant to ozone, oxygen, moisture, contamination, and ultraviolet light.

The sectionalizer has three, solid-polymer, vacuum interrupter modules and is suitable for operation through a temperature range of -40°C to +55°C. This results in an environmentally safe sectionalizer for general purpose, distribution automation, and distribution switching applications.

RATINGS AND SPECIFICATIONS

Check Ratings Prior To Installation

Tables 1, 2, and 3 list the ratings and specifications for the Type TVS Sectionalizer. The TVS Sectionalizer must be applied within its specified ratings. Check data plate ratings and compare with the system characteristics at the point of application prior to installation.

TABLE 1
Voltage Ratings (kV)

Description	TVS15	TVS27
Maximum Voltage	15.5 kV	27.0 kV
Rated Basic Impulse Voltage	110.0 kV	125.0 kV
Rated Basic Impulse Voltage (Open Contacts)	110.0 kV	145.0 kV
Radio Noise Limit (microvolts)	100 @ 9.4 kV	100 @ 16.4 kV
60 Hz Withstand Voltage		
Dry, one-minute	50.0 kV	60.0 kV
Wet , ten seconds	45.0 kV	50.0 kV

TABLE 2
Current Ratings (Amperes)

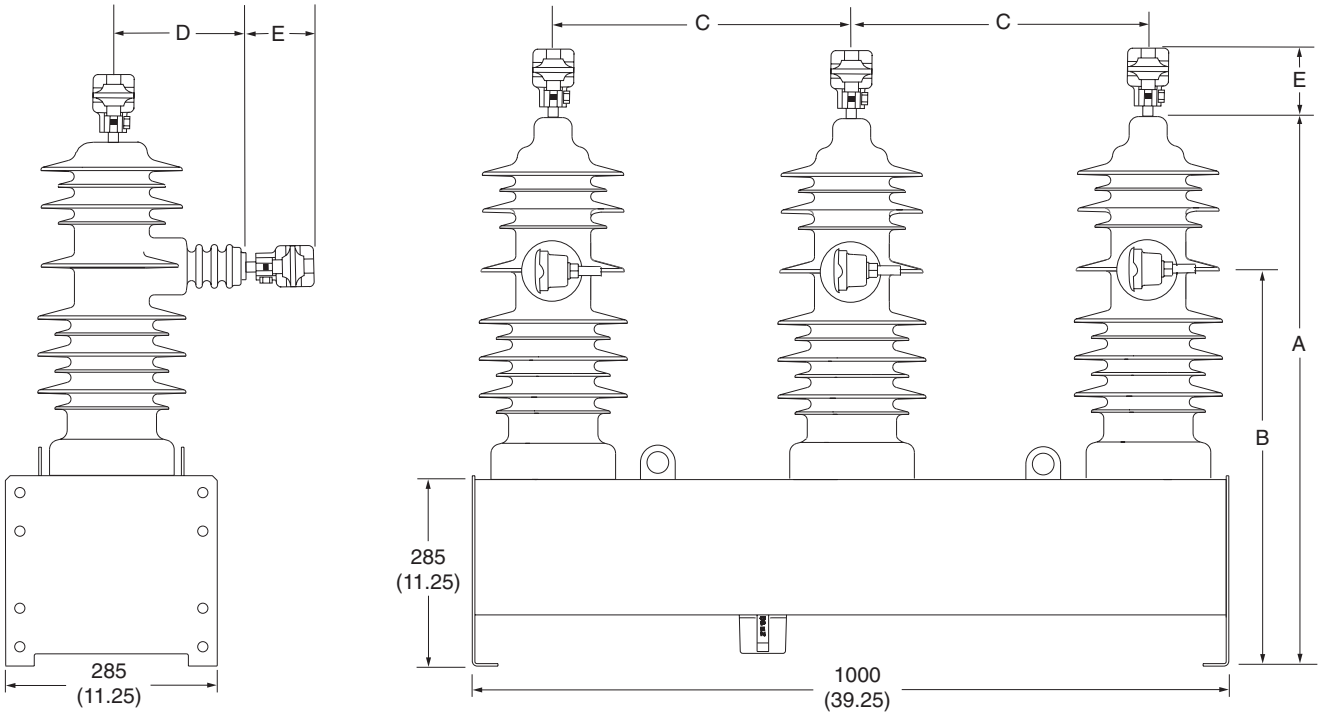
Description	TVS15	TVS27
Rated Continuous Current	630/800* A	630/800* A
Three-Hour Overload	950 A/none	950 A/none
Rated Loadbreak Capability	630/800* A	630/800* A
Short Circuit Current, 1 Second Symmetrical.	12.5 kA	12.5 kA
Making Current, Asymmetrical Peak	31.0 kA	31.0 kA
Making Current, Asymmetrical RMS	20.0 kA	20.0 kA

*Available optional ratings.

TABLE 3
Mechanical Ratings

Description	TVS15	TVS27
Mechanical Operations without Maintenance (opening/closing operations)	10,000	10,000

DIMENSIONS AND WEIGHTS



NOTE: All dimensions are mm (inches).
Dimensions shown are approximate.

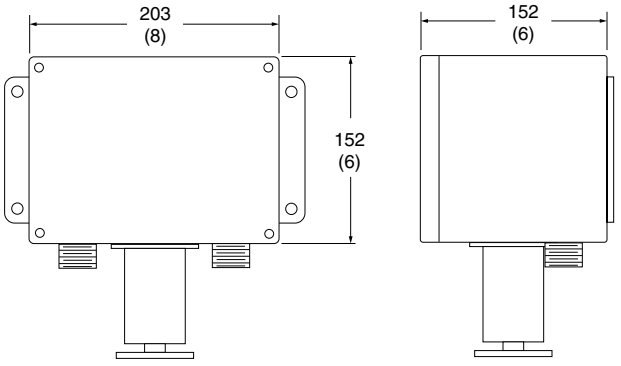
	A	B	C	D
TVS15	730 (28.75)	508 (20)	394 (15.5)	215 (8.5)
TVS27	787 (31.25)	572 (22.5)	394 (15.5)	215 (8.5)

Creepage Distances

Description	TVS15	TVS27
Terminal to terminal*	675 (26.5)	675 (26.5)
Terminal to ground/earth	670 (26.25)	834 (32.75)

*On the same phase.

Terminal Options	E
Eyebolt, 1/0 - 500 MCM Cable Range (630 amps maximum)	80 (3.25)
Eyebolt, 4/0 - 1000 MCM Cable Range (800 amps maximum)	86 (3.5)
Flat Pad, 2-hole (630 amps) or 4-hole (800 amps)	117 (4.5)
Stud Type, 1.125 - 12 threads (800 amps maximum)	82 (3.25)



TVS Control

Figure 3.
Type TVS Sectionalizer and TVS Control dimensions.

TABLE 4
Type TVS Sectionalizer Weights

Description	TVS15	TVS27
TVS Sectionalizer- kilograms (pounds)	73 (160)	75 (165)
TVS Sectionalizer with TVS Control - kilograms (pounds)	84 (185)	86 (190)

TIME-VOLTAGE SECTIONALIZER CONTROL

Control Description

The Time-Voltage Sectionalizer Control is designed to coordinate with an upline recloser to protect distribution lines and equipment from faults and overcurrent conditions that can occur on these systems. The control senses recloser operation by detecting the loss of voltage. The control does not rely on current sensing or TCC curves for coordination with upline and downline devices. An auxiliary power transformer provides the input for both voltage sensing and power to the control.

The operating voltage range is 110-120 Vac or 220-240 Vac (factory set). The TVS control operates properly with voltage variations of ±10%. The control operates on 50 or 60 Hz, with no change in operations or tolerances.

Operating parameters are set by four potentiometers on the front panel of the control. A lockout-reset pushbutton switch is provided at the bottom of the control. If adequate source voltage is present, pushing this switch causes the control to reset and issue a close signal to the sectionalizer. See Figures 4 and 5.

The four potentiometer controls that set the operating parameters are Voltage Loss Threshold, Open Time, Close Time, and Reset Time.

Voltage Loss Threshold

Voltage Loss Threshold establishes the voltage level at which the TVS Sectionalizer will open or close. The minimum operating voltage for closing the sectionalizer is 95 Vac for a 120 Vac system or 190 Vac for a 240 Vac system.

Open Time

Open Time is the length of time, beginning when input voltage drops and remains below the Voltage Loss Threshold setting, after which the TVS Sectionalizer opens.

Close Time

Close Time is the length of time, beginning when a sustained input voltage above the minimum operating voltage is present, after which the TVS Sectionalizer closes. If the input voltage is less than 105 Vac on a 120 Vac system or 210 Vac on a 240 Vac system, the sectionalizer may take longer to close.

Reset Time

Reset Time is the length of time after the TVS Sectionalizer closes that input voltage must be sustained above the minimum operating voltage setting to reset. A lockout will occur if the TVS Sectionalizer re-opens before this time elapses.

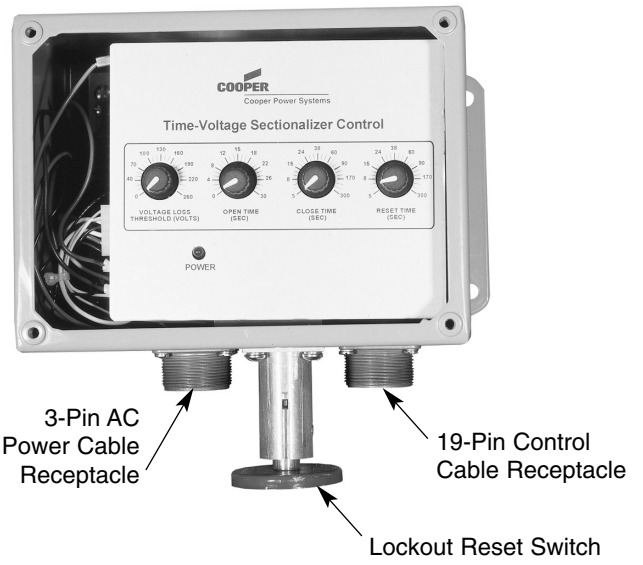


Figure 4.
Time-Voltage Sectionalizer Control (TVSC).
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Lockout Reset Switch

Push this button with a shotgun stick, when voltage is present, to reset the control and close the TVS Sectionalizer.

Control Operation

Under normal operating conditions, with voltage applied to the TVS control, the TVS Sectionalizer is closed.

When the upline recloser operates, voltage is lost to the control and the OPEN timer begins to operate. If voltage returns before the OPEN timer times out, the TVS sectionalizer remains closed.

If the OPEN timer times out before voltage returns, the TVS sectionalizer opens. The sectionalizer remains open until voltage returns.

Upon return of voltage, the CLOSE timer begins to operate. If voltage is lost again, the TVS sectionalizer remains open, and the CLOSE timer resets.

If voltage is sustained and the CLOSE timer times out, the TVS sectionalizer closes, and the RESET timer begins to operate. If the RESET timer times out, the TVS control resets to its initial state, and the sectionalizer remains closed.

If voltage is lost again before the RESET timer times out, the TVS sectionalizer opens and locks out.

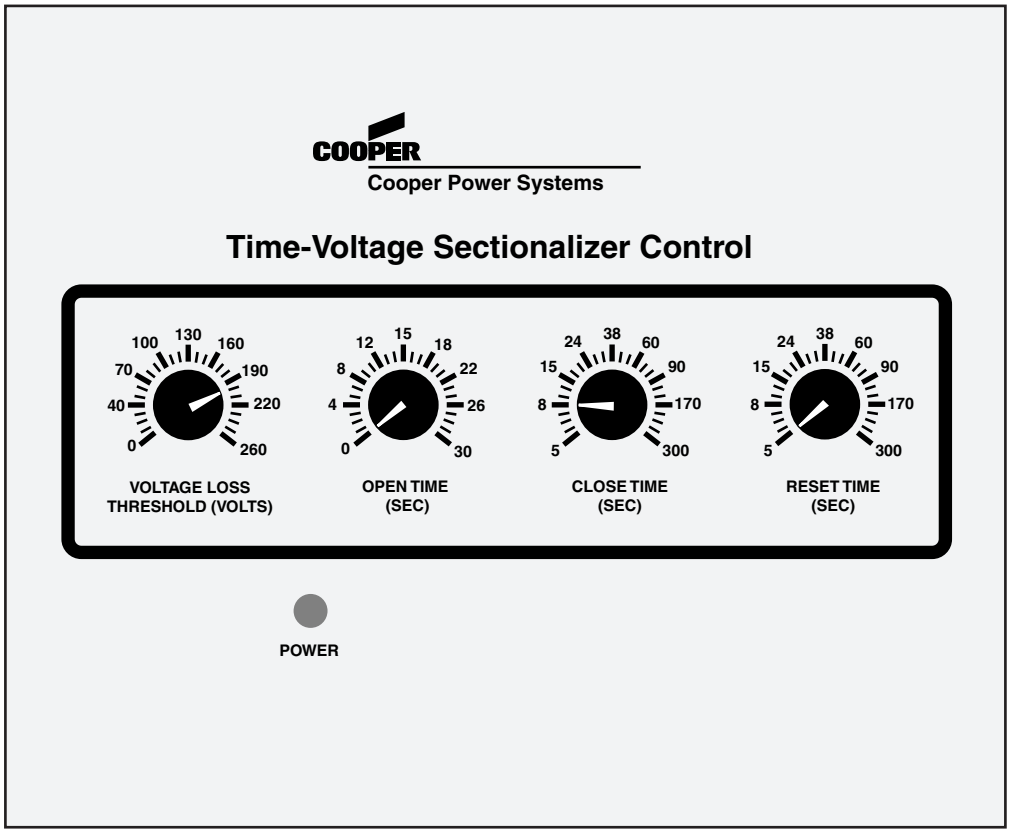


Figure 5.
TVS Control Front Panel.

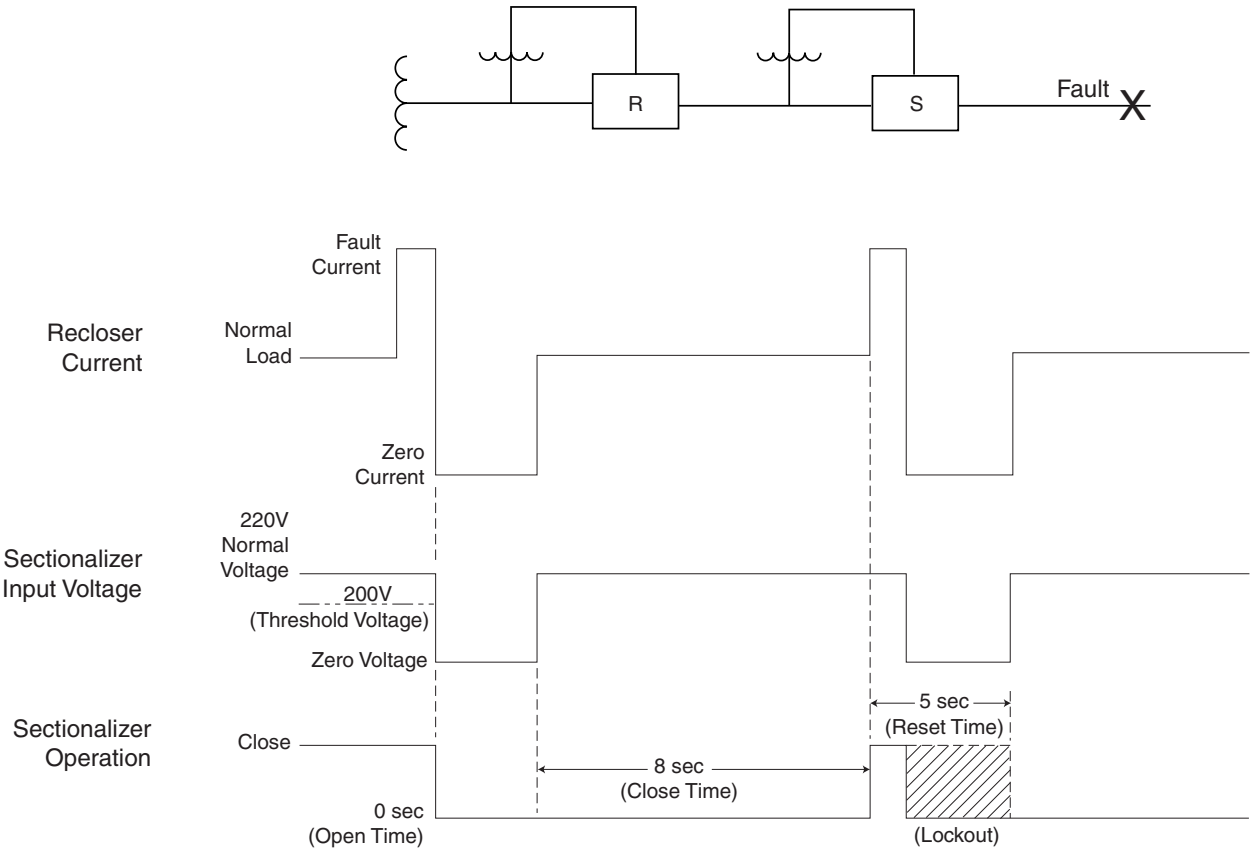


Figure 6.
Coordinated operation of a TVS Sectionalizer with an upline recloser.

TVS Control and Sectionalizer Operation With a Recloser

Figure 6 shows the coordinated operation of an upline recloser with a downline TVS sectionalizer. In the following example, the TVS operates to lockout to isolate the fault during the fast operations of the upline recloser and utilizes the settings illustrated in Figure 5.

When the recloser senses an overcurrent or a fault, it begins its sequence of operations. Figure 6 shows two recloser fast operations.

After sensing a fault, the recloser opens (0 seconds Open Time), interrupting the voltage and fault current. The TVS detects the loss of voltage and opens.

After a time delay, the recloser closes and voltage is restored. The TVS detects that voltage has been restored, but remains open for eight seconds (which is the CLOSE TIME setting shown in Figure 5).

After eight seconds, the sectionalizer times out and closes, re-establishing the fault. The recloser detects the fault and trips, causing a voltage loss to the TVS control. The sectionalizer detects the voltage loss and opens. The TVS also determines that the second loss of voltage occurred before the Reset time (5 seconds) elapsed. The TVS then sequences to lockout, isolating the fault.

After a time delay, the recloser closes, restoring service to the remainder of the distribution feeder.

TESTING OPERATION

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply may result in death, severe personal injury and equipment damage.
G102.1

Testing of the TVS Sectionalizer is done in conjunction with the TVS Control (TVSC). A test circuit switch wired to the power cable (Figure 7) is necessary for these tests.

Connect the TVS Control to the Sectionalizer

1. Connect one end of the 19-pin control cable to the 19-pin receptacle on the back of the sectionalizer.
2. Connect the other end of the 19-pin cable to the bottom of the TVS control. See Figures 4 and 12.
3. Connect ac voltage cable to the 3-pin receptacle on the bottom of the control. See Figures 4 and 7.
4. Adjust control settings as shown in Figure 5 for the following tests.
5. Connect a switch to the voltage cable as shown in the test circuit diagram in Figure 7, and connect cable to an ac outlet.

Test Manual Open of Contacts

1. Pull the yellow manual open handle down to open the sectionalizer contacts.
2. Confirm that the contacts have opened by:
   - **A.** The OPEN/CLOSE position indicator, or
   - **B.** By a continuity check between the sectionalizer terminals.

Test Manual Close of Contacts

1. Pull the red manual close handle down to close the sectionalizer contacts.
2. Confirm that the contacts have closed by:
   - **A.** The OPEN/CLOSE position indicator, or
   - **B.** By a continuity check between the sectionalizer terminals.

Test Electrical Close of Sectionalizer Contacts

See Figure 7.

1. Push the yellow manual operating handle up.
2. Apply power to the control (close the test circuit switch).
3. Push the Lockout Reset Switch.

   Note: Pushing the Lockout Reset switch with supply voltage present initiates a close and temporarily disables the reset timer for that close operation only. The Reset Timer will be active for any subsequent close operations initiated by the TVS control.
4. Confirm the sectionalizer contacts are closed.

Electrically Open the Sectionalizer Contacts

1. Remove ac power from the control (open the test circuit switch).
2. Confirm the sectionalizer contacts are open.

Test Sectionalizer Lockout

Use the TVS control settings shown in Figure 5.

1. Adjust Reset time to 5 seconds or longer.
2. Follow the steps listed in *Test Electrical Close of Sectionalizer Contacts* to initiate a close.
3. Open the test circuit switch; allow the TVS sectionalizer to time out and open.
4. Close the test circuit switch; allow the TVS to time out and close.
5. Open the test circuit switch after the TVS opens, but before the 5 second Reset time elapes; the TVS will open and lock out.
6. To confirm lockout, close the test circuit switch and maintain for 8 seconds. Confirm the TVS sectionalizer remains open.

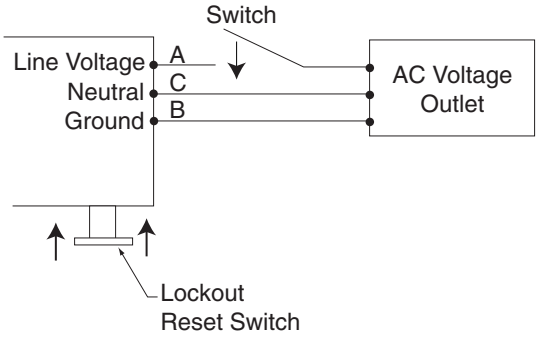


Figure 7.
Power Supply test circuit.

INSTALLATION PROCEDURE

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply may result in death, severe personal injury and equipment damage. G102.1

WARNING: Hazardous voltage. Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage. T223.2

When installing the sectionalizer, refer to the applicable sectionalizer mounting frame instructions. Installation instructions are included with the mounting frame.

1. **Check the data plate ratings.** Make sure the ratings and settings on the sectionalizer data plates are correct for the planned installation.

CAUTION: Follow all locally approved safety practices when lifting and mounting the equipment. Use the lifting lugs provided. Lift the unit smoothly and do not allow the unit to shift. Improper lifting can result in equipment damage. G106.2

CAUTION: Personal Injury. Bushings have sharp edges. Wear protective gloves when handling the unit. Failure to do so can result in cuts and abrasions. T258.0

2. **Install the sectionalizer.** Kyle mounting frames should always be used. See Figure 8 for lifting instructions.
3. **Ground the sectionalizer.** Make the ground connection to the ground connector. The ground connector is located on the back of the mechanism housing. The ground clamp accepts #10 to #2 stranded cables.
4. **Adjust settings and install the control.** Make the appropriate settings adjustment for the installation location and install the control.

   With the appropriate option provided, the TVS control is mounted to either the pole-mounting hanger or directly to the sectionalizer.

   Make sure the control cable is connected between the control and the sectionalizer. If a different control is used, be sure to follow all installation instructions included with the control.
5. **Ground the Control.** Make the ground connection from the control to the TVS sectionalizer.
6. **Make high-voltage line connections** (Figure 9).

   Note: The six disconnect switches and bypass switches are not required, but they do facilitate switching and isolation.

CAUTION: Equipment Damage. Do not adjust or rotate bushing terminals. The bushing terminals are factory-calibrated to meet the continuous current requirement of the switchgear. Adjusting or rotating the bushing terminals can damage the encapsulated interrupter resulting in equipment damage or personal injury. T270.0

   A. Connect high-voltage lines to sectionalizer bushing terminals.

   B. Provide surge arrester protection. Surge arrester protection should be provided on both sides.

   Refer to Figure 10 for terminal identification of the Type TVS Sectionalizer.
7. **Make the low-voltage power connections.** Connect the low-voltage side of the power transformer to the control as shown in Figure 11.
8. **Make the high-voltage power connections.** Connect the power transformer to the source side high-voltage lines.

Moving the Sectionalizer

The Type TVS Sectionalizer is shipped bolted to a pallet. When moving with a forklift/truck, the sectionalizer must remain bolted on the pallet to avoid damage to the OPEN/CLOSE contact position indicator.

Lifting the Sectionalizer

Follow all approved safety practices when making hitches and lifting the equipment. Lift the unit smoothly and do not allow the unit to shift.

This sectionalizer has four lifting lugs - all four lugs must be used when lifting.

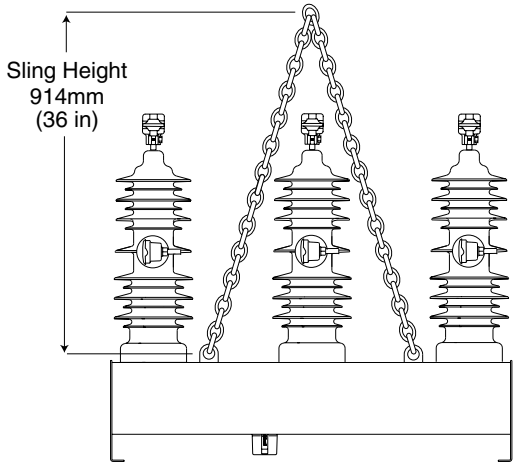


Figure 8.
Lifting instructions for the Type TVS Sectionalizer.

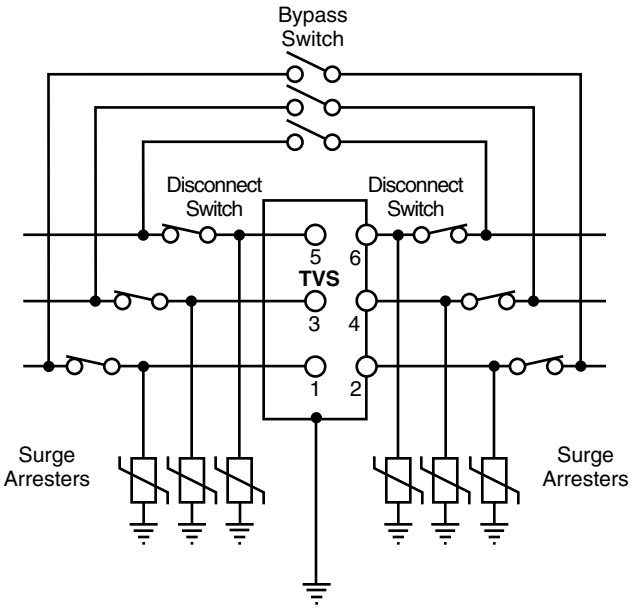


Figure 9.
Connection diagram shows complete surge protection and illustrates Bypass and Disconnect switches to facilitate maintenance.

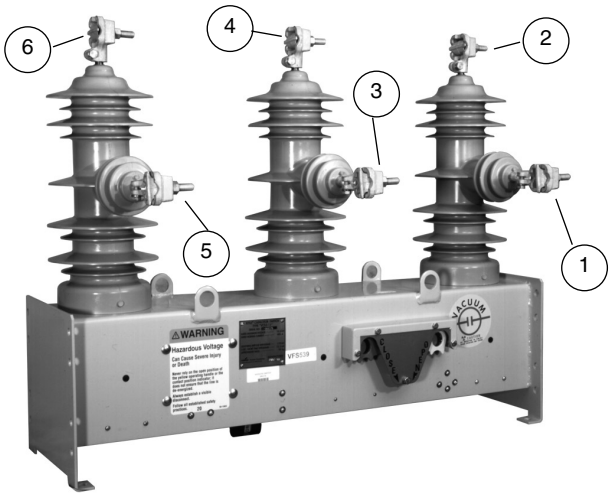


Figure 10.
Terminal identification of Type TVS Sectionalizer.

OPERATION

WARNING: This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply may result in death, severe personal injury and equipment damage. G102.1

WARNING: Hazardous voltage. Do not rely on the open position of the yellow manual OPEN handle or the contact position indicator; it does not ensure that the line has been de-energized. Always establish a visible disconnect. Failure to follow proper safety practices can result in contact with high voltage, which will cause death or severe personal injury. G114.1

TVS Sectionalizer Electrical Operation

With 48 Vdc applied to Pin T with Pin N as ground (Figure 11), the sectionalizer may be opened and closed electrically by making momentary contact between P-B or P-E, Trip or Close Circuitry. The TVS Sectionalizer Control has a 19-pin and 3-pin receptacle as shown in Figure 4.

TVS Control Electrical Operation

By alternately applying and removing power to the control pins 2 and 3 (Figure 10), the control can be sequenced through its operations as described in the *Testing Operation* section of this manual.

OPEN/CLOSE Position Indicator

The OPEN/CLOSE contact position indicator consists of a red CLOSED and a green OPEN indicator located on the bottom of the mechanism housing.

IMPORTANT: If the yellow manual open handle remains in the down position, the sectionalizer cannot be closed.

Hotstick Operation

WARNING: Hazardous voltage. Always use a hotstick when working with this equipment. Failure to do so could result in contact with high voltage, which will cause death or severe personal injury. G108.1

The sectionalizer may be opened manually by using a hotstick to pull down the yellow manual OPEN handle, located on the front of the sectionalizer (see Figure 1).

To close the sectionalizer manually, first, use a hotstick to push up the yellow manual OPEN handle, then pull down the red manual CLOSE handle (see Figure 1).

Note: Ac voltage must be supplied to the control to reset and close the sectionalizer.

To close the sectionalizer via control, first, push the yellow manual open handle up. Then, using the Lockout Reset Switch, close the sectionalizer.

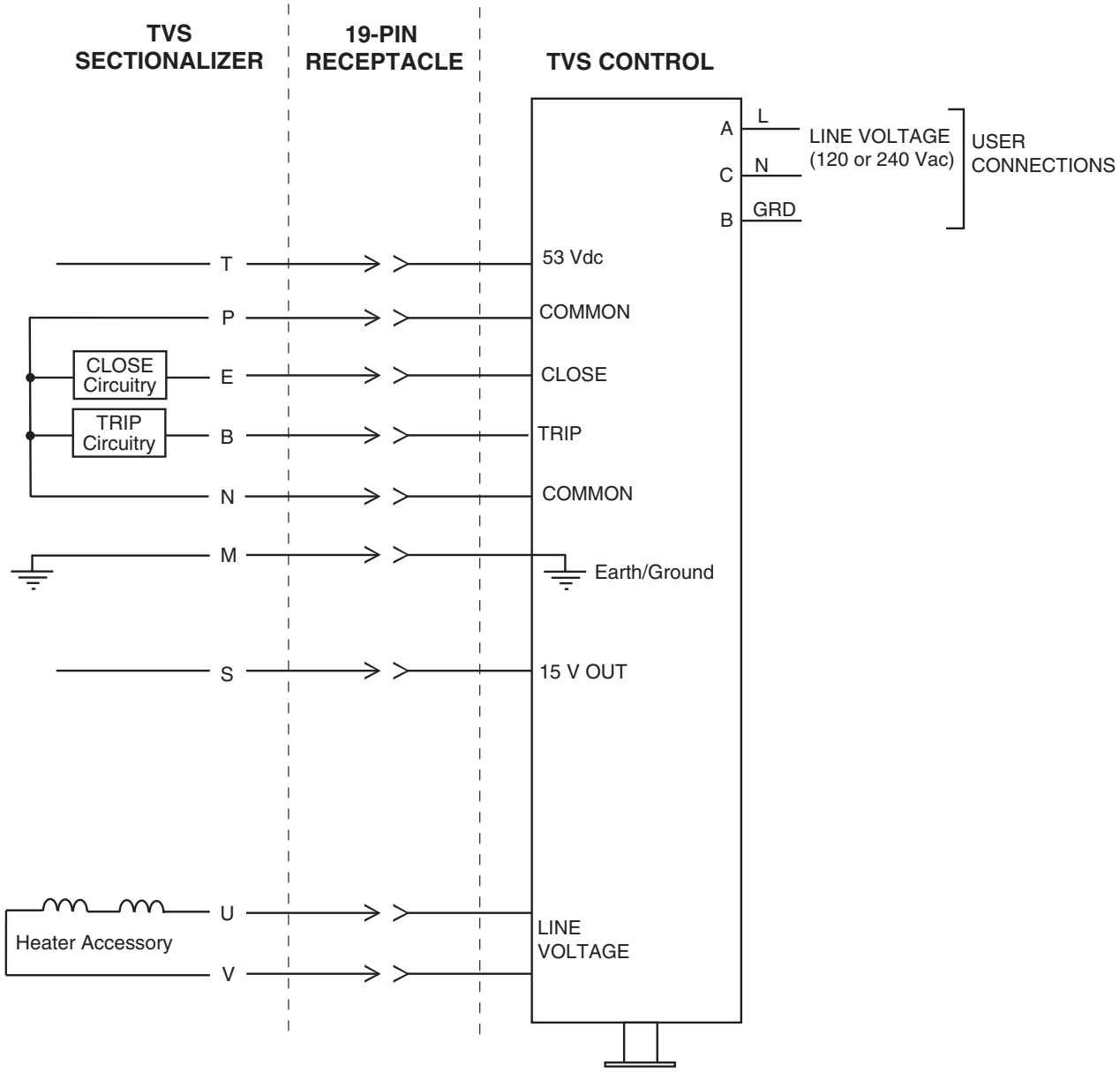


Figure 11.
TVS Sectionalizer 19-pin receptacle diagram.

ACCESSORIES

Heater

A heater accessory is available for the TVS Sectionalizer mechanism housing. Either 120 V or 240 Vac is required.

Terminals

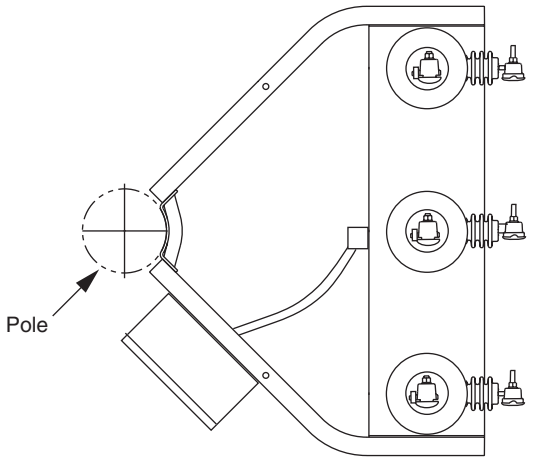
800 A eyebolt, 630 A 2-hole, 800 A 4-hole, and 800 A stud type terminals are available as an accessory.

Pole-Mounting Hanger

A simple pole-mounting hanger (Figure 12), that bolts directly to the sectionalizer frame, provides a strong, clean, and uncluttered pole-mounting installation.

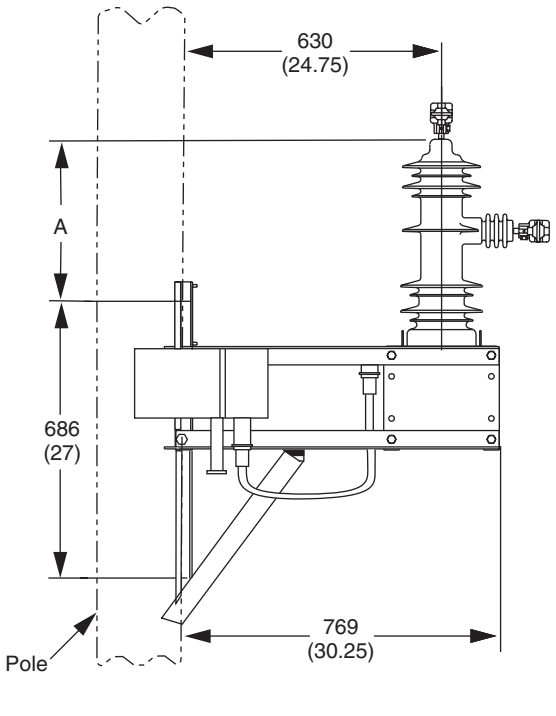
Arrester Mounting Frame

The arrester mounting bracket accessory (Figure 13) can be bolted to the sectionalizer frame and pole-mounted hanger for the addition of inboard and outboard arresters. The arresters are not included with the brackets.



Unit Type	A
TVS 15	378 (14.75)
TVS 27	439 (17.25)

NOTE: All dimensions are mm (inches).
Dimensions shown are approximate.



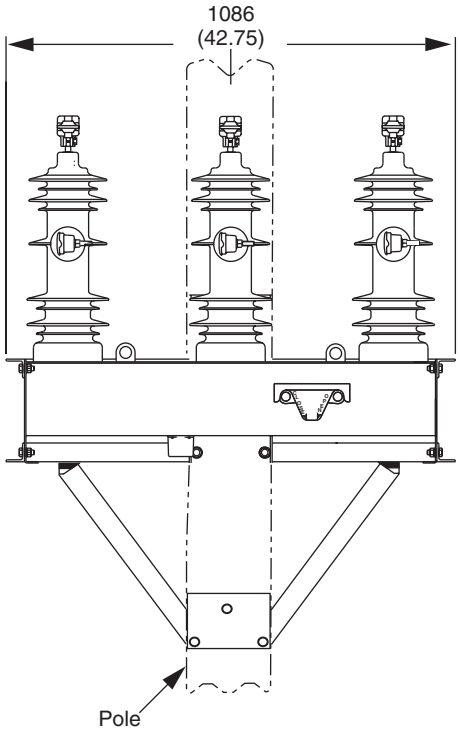
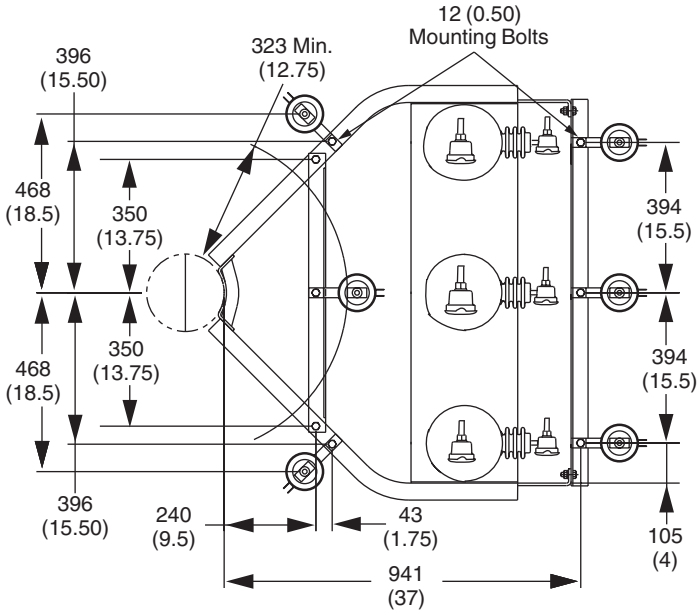
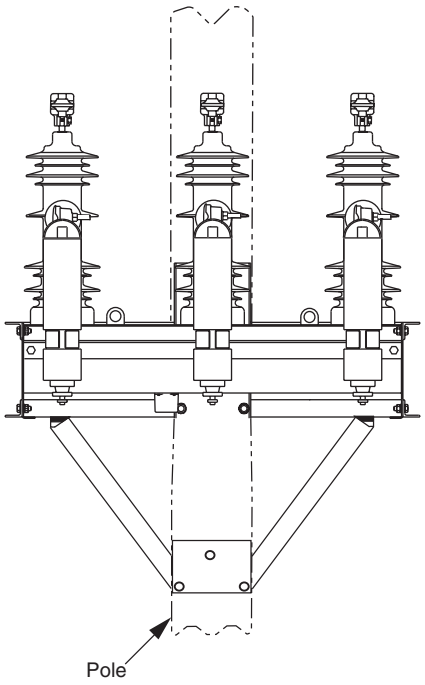
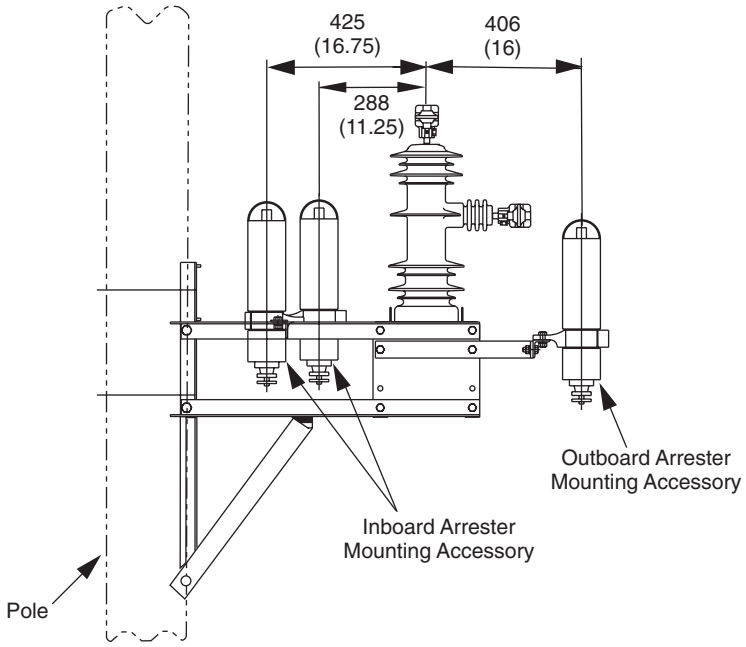


Figure 12.
Dimensions of Type TVS Sectionalizer with pole-mounting hanger accessory.







NOTE: All dimensions are mm (inches).
Dimensions shown are approximate.

Figure 13.
Dimensions of Type TVS Sectionalizer with pole-mounting hanger and arrester mounting bracket accessories.

SERVICE INFORMATION

Service Requirements

The Kyle Type TVS Sectionalizer has been designed with a minimum mechanical life of 10,000 operations. The TVS Sectionalizer requires routine inspection to check for physical damage and verify proper operation.

Frequency of Inspection

Because this sectionalizer is applied under widely varying operating and climatic conditions, service intervals are best determined by the user based on actual operating experience.

High-Potential Withstand Testing

WARNING: Hazardous voltage. The switchgear and high voltage transformer must be in a test cage or similar protective device to prevent accidental contact with the high voltage parts. Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage. T221.3

CAUTION: Radiation. At voltages up to the specified test voltages, the radiation emitted by the vacuum interrupter is negligible. However, above these voltages, radiation injurious to personnel can be emitted. See *Service Information S280-90-1, Vacuum Interrupter Withstand Test Voltage Ratings Information* for further information. G109.2

Use the following procedures to perform high-potential withstand tests at 75% of the rated low-frequency withstand voltage voltage for 60 seconds. See Table 5 for test voltages.

Test 1

1. Close the sectionalizer contacts.
2. Ground the sectionalizer.
3. Connect terminals 2, 4, and 6 (see Figure 10) together.
4. Apply proper test voltage (see Table 5) to terminals 2, 4, and 6.
5. The sectionalizer should withstand the test voltage for 60 seconds.

Test 2

1. Close the sectionalizer contacts.
2. Ground the sectionalizer.
3. Ground Phase A (terminal 2) and Phase C (terminal 6).
4. Apply proper test voltage to Phase B (terminal 3).
5. The sectionalizer should withstand the test voltage for 60 seconds.

Test 3

1. Open the sectionalizer contacts.
2. Ground the sectionalizer.
3. Connect and ground terminals 1, 3, and 5 (see Figure 10).
4. Connect terminals 2, 4 and 6.
5. Apply proper test voltage to terminals 2, 4, and 6.
6. The sectionalizer should withstand the test voltage for 60 seconds.
7. Reverse the connections: ground terminals 2, 4, and 6.
8. Apply test voltage to terminals 1, 3, and 5 for 60 seconds.
9. The sectionalizer should withstand the test voltage for 60 seconds.

Withstand Test Results

The high-potential withstand tests provide information on the dielectric condition of the sectionalizer and the vacuum integrity of the interrupters.

If the sectionalizer passes the closed-contacts tests (Tests 1 and 2), but fails the open-contacts test (Test 3), the cause is likely to be in the interrupter assembly. Retest each phase individually to determine the failed phase or phases.

If the sectionalizer fails the closed-contacts tests (Tests 1 or 2), the cause is likely to be a diminished electrical clearance or failed insulation. Retest each phase individually to determine the failed phase or phases.

TABLE 5
Type TVS Sectionalizer Vacuum Interrupter Withstand Test Voltage Ratings Information

Description	75% of Rated Low-Frequency Withstand Voltage (1 minute dry) (kV rms)
TVS15	37.5
TVS27	45.0

COOPER Power Systems

P.O. Box 1640
Waukesha, WI 53187
www.cooperpower.com