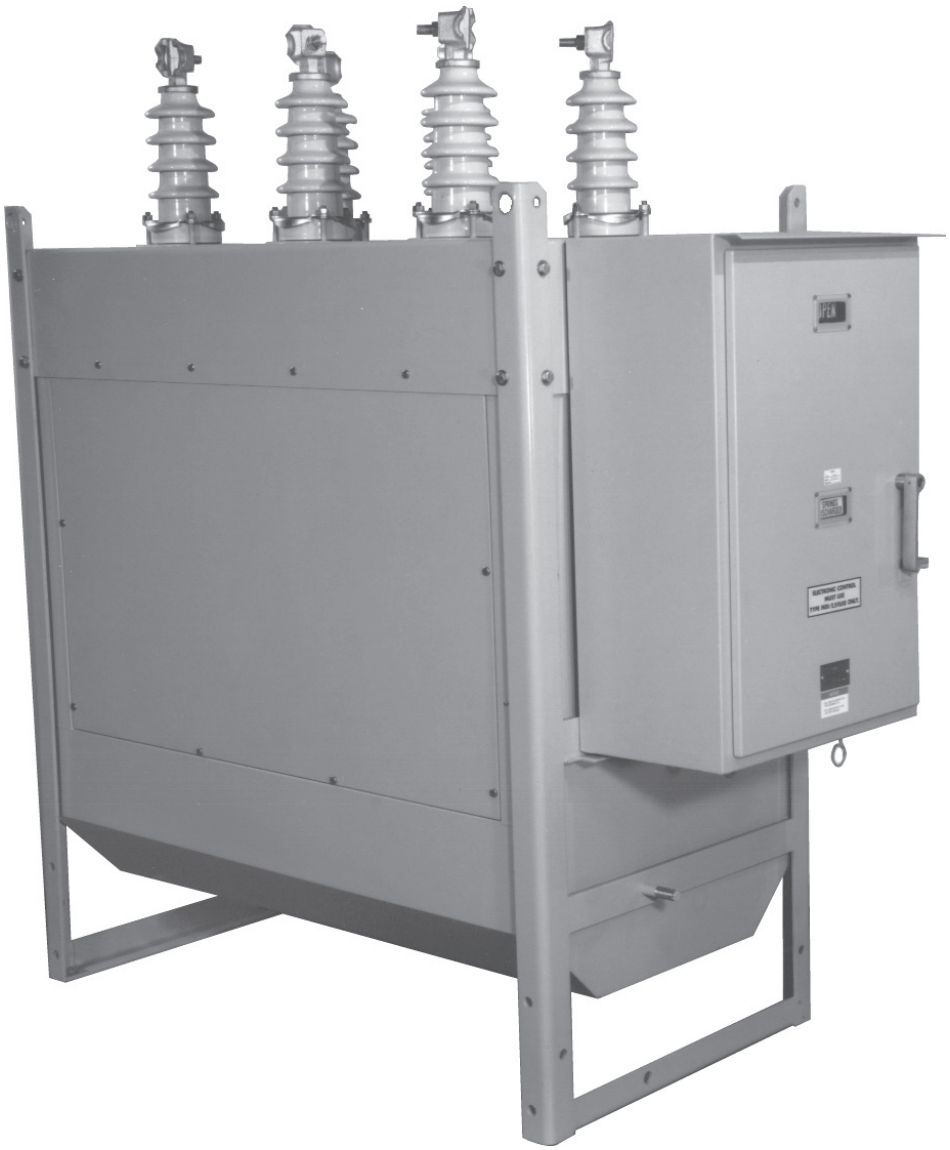
Type VSA12, VSA12B, VSA16, VSA20, and VSA20A operation and installation instructions



Powering Business Worldwide

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Contents

Safety for life

Eaton meets or exceeds all applicable industry standards relating to product safety in its Cooper Power™ series products. 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 Eaton 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 arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, 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 and transmission equipment must be properly 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 power distribution and transmission equipment can result in death, severe personal injury, and equipment damage. G122.3

Product information

Introduction

Service Information MN280063EN provides installation instructions, operating information, and testing procedures for Eaton's Cooper Power™ series three-phase motor-operated reclosers.

The information contained in this manual is organized into the following major categories: Safety Information, Product Information, Specifications and Ratings, Dimensions and Weights, Installation, Accessories, Operation, and Service Information.

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. For additional information, contact your Eaton representative.

Acceptance and initial inspection

This product is completely assembled, tested, and inspected at the factory. It is carefully calibrated, adjusted, and in good condition when accepted by the carrier for shipment.

Upon receipt, inspect the carton for signs of damage. Unpack the 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 this equipment to minimize the possibility of damage. In particular, protect the bushings and control equipment.

If the unit is to be stored for any length of time before installation, provide a clean, dry storage area. If the recloser is to be stored in a humid atmosphere, make provisions to keep the cabinet heaters energized.

ANSI® standards

The VSA recloser is designed and tested in accordance with ANSI® standards: C37.60 and C37.85.

Quality standards

ISO 9001 certified quality management system

Description

A complete assembly consists of the recloser control unit, the vacuum interrupter assemblies, and the operating mechanism housing.

Recloser tripping employs stored spring energy. When the trip solenoid is actuated by the 24 Vdc trip signal, the stored spring energy is released to open the recloser. The 24 Vdc trip signal is originated at the recloser control. The 240 Vdc supply is not required to trip the recloser. An external 240 Vac source is required to operate the drive motor. A 120 Vac input power supply accessory is also available.

Type VSA reclosers are electronically controlled by Eaton's Cooper Power series recloser controls.

Specifications and ratings

A recloser will effectively interrupt fault currents only when applied within its specified ratings. Check data plate ratings and compare with the system characteristics at point of application prior to installation.

Table 1. Voltage Ratings

Description	Ratings
Maximum Design Voltage, kV.	15.5
Nominal Operating Voltage, kV	2.4-14.4
Basic Insulation Level (BIL), kV	110
60 Hz Withstand Voltage, kV	
Dry, one minute	50
Wet, ten seconds .	45
Max RIV at 1.0 MHz/9.41 kV, µV.	100

Table 2. Bushing Specifications

Description	Distance
Bushing creepage distance, mm (in)	
VSA12, VSA12B, VSA16, VSA20	305 (12)
VSA20A	432 (17)
Arcing Distance, phase to ground, mm (in)	
VSA12, VSA12B, VSA16, VSA20	191 (7.5)
VSA20A	197 (7.75)
Arcing Distance, phase to phase, mm (in)	
VSA12, VSA12B, VSA16, VSA20	248 (9.75)
VSA20A	279 (11)

Table 3. Current Ratings

Description	Rating
Continuous Current Rating, A	
VSA12B	600
VSA12, VSA16, VSA20	800
VSA20A	1,200
Symmetric Interrupting Current, A	
VSA12, VSA12B	12,000
VSA16	16,000
VSA20, VSA20A	20,000
Cable Charging Current, A	2
Magnetizing Current, A	
VSA12, VSA12B, VSA16, VSA20	28
VSA20A	42
Three-Second Current, Symmetric, A	
VSA12, VSA12B	12,000
VSA16	16,000
VSA20, VSA20A	20,000
Momentary Current, Asymmetric, A	
VSA12, VSA12B	20,000
VSA16	25,600
VSA20, VSA20A	32,000
Capacitive Switching,	
General Purpose, Isolated Bank, A	250

Table 4. Duty Cycle

Percent of Maximum Circuit Interrupting Rating	Maximum X/R Ration	Number of Unit Operations
15-20	4	88
45-55	8	112
90-100	16	32
		Total 232

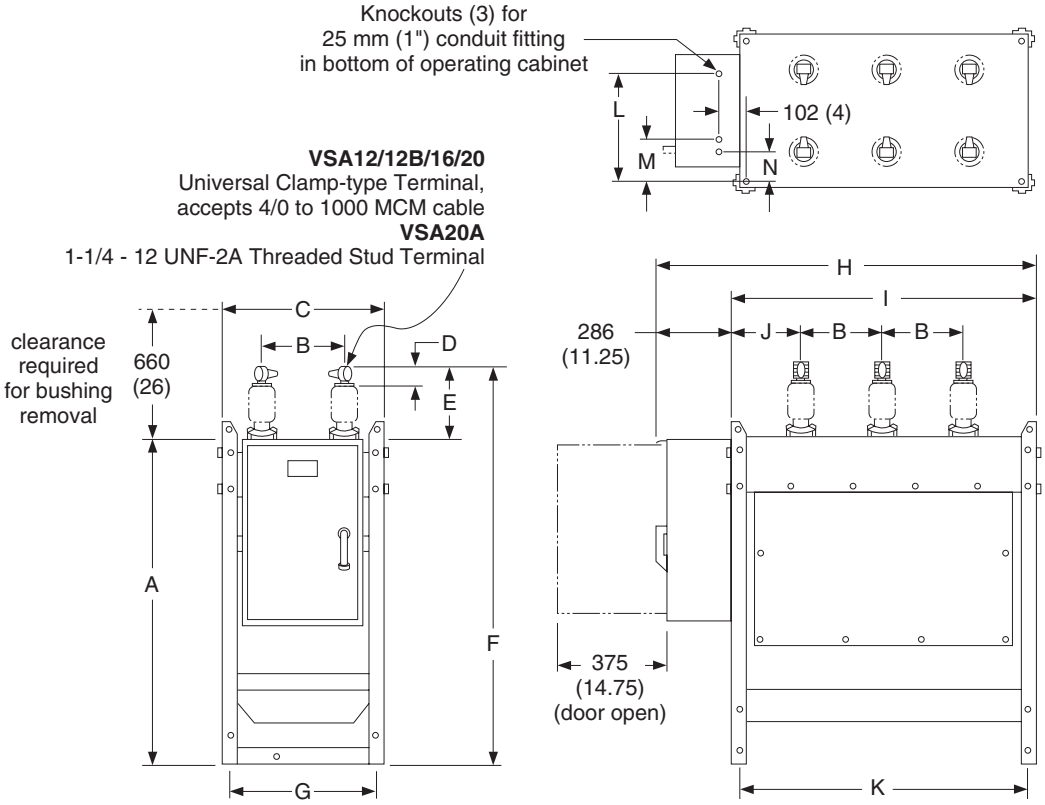
Table 5. Electrical Specifications

Description		
Trip Solenoid		
Operating voltage, Vdc	24	
Peak current, A	12.2	
Actuation time, cycles	1.25	
Close Solenoid		
Operating voltage, Vdc	24	
Peak current, A	15.5	
Actuation time, cycles	1.5	
Spring Charging Motor	Standard	Accessory
Operating voltage, Vac	240	120
Voltage range, Vac	160-257	90-127
Maximum current, RMS, A	14	18
Steady state current, A	4.1	9
Motor running time, cycles	40	40
Sensing Current Transformers		
VSA12, VSA16	1000:1	
VSA20VSA20A	2000:1	
Maximum Arcing Time, cycles	1.0	
Interrupting Time, cycles	2.5	

Table 6. Mechanical Specifications

Description	
Operating Temperture, °C	
Minimum	-30
Maximum	
VSA12, VSA12B, VSA16, VSA20 .	+50
VSA20A	+40
Closing Mechanism	Spring Operated
Opening Mechanism	Spring Operated
Contact Gap, mm (in)	11 (7/16)
Close Contact Travel Time, cycles	5
Open Contact Travel Time, cycles.	5
Allowable Contact Erosion, mm (in)	3 (.125)
Opening Time, 24 Vdc solenoid, Signal to contact part, m sec.	25
Closing Time, 24 Vdc solenoid, Signal to contact make, m sec.	32
Mechanical Life	
Open-Close, no load, operations	2,500

Dimensions and weights



	Dimensions per model	
Item	**VSA 12/12B/16 /20**	**VSA20A**
A	1219 (48)	1270 (50)
B	305 (12)	356 (14)
C	622 (24.5)	826 (32.5)
D	76 (3.25)	77 (3.5)
E	330 (13)	330 (13)
F	1549 (61)	1600 (63)
G	572 (22.5)	775 (30.5)
H	1416 (55.75)	1594 (62.75)
I	1130 (44.5)	1308 (51.5)
J	260 (10.25)	298 (11.75)
K	1080 (42.5)	1257 (49.5)
L	413 (16.25)	514 (20.25)
M	159 (6.25)	260 (10.25)
N	108 (4.25)	210 (8.25)

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

Model	kg (lbs)
VSA 12/12B/16/20	238 (525)
VSA20A	336 (740)

Figure 1. Outline dimensions and weights.

Installation

⚠ 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

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

Installation procedure

All reclosers are carefully tested and adjusted at the factory. Well-equipped test facilities, detailed testing procedures, and thoroughly trained personnel assure accurately calibrated equipment. Each recloser leaves the factory ready for installation.

1. Check the data plate ratings. Make sure the ratings of each recloser data plate are correct for the planned installation.
2. Perform high-potential withstand tests. Prior to installing the VSA recloser, with the recloser in the OPEN position, perform high-potential withstand tests across each open interrupter assembly. Refer to the High- Potential Withstand Testing section of this manual.

⚠ CAUTION

Falling equipment. Use the lifting lugs provided and follow all locally approved safety practices when lifting and mounting the equipment. Lift the unit smoothly and do not allow the unit to shift. Improper lifting can result in severe personal injury, death, and/or equipment damage. G106.3

3. Mount the recloser. Use the lifting lugs located on the frame and follow approved procedures. See Figure 2.

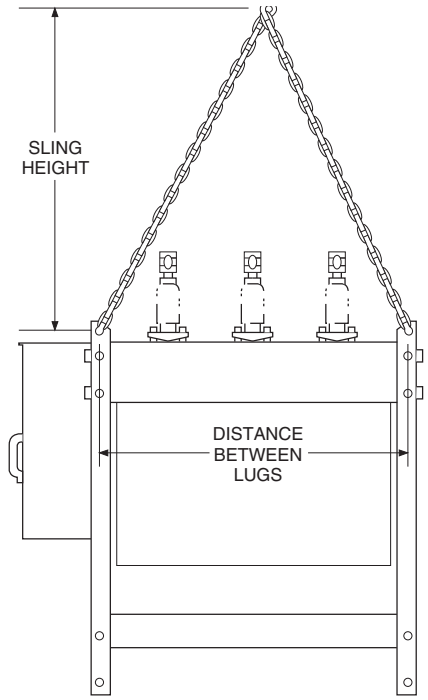


Figure 2. Lifting the recloser.

IMPORTANT

This recloser has four lifting lugs; all must be used when lifting. Maximum strength is attained with a vertical lift. Use of a spreader bar, with a fixed attachment point for the hook at the load center, is recommended when lifting. If a sling is used for lifting the recloser, it must have a fixed attachment point at the load center. Rig the recloser so that the sling height is equal to or greater than the distance between lugs.

⚠ WARNING

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

4. Ground the recloser. Make ground connections to the recloser ground connector. For substation installations, the ground connector is moved to the bottom of one of the extension legs, as shown in Figure 10. It will accommodate 2/0 to 250 MCM stranded conductors. Make ground connections in accordance with approved utility standards.

The VSA recloser is used with a control. Refer to the appropriate service information manual for complete recommended grounding instructions for the control.

IMPORTANT

Form 3 and Form 3A electronic controls must be equipped with the KA1175ME fuse accessory. This accessory supplies a MDQ-2.5 closing coil control fuse, which is required for operation of the closing solenoid.

The instantaneous reclose delay plug must not be used in Form 3 and Form 3A controls. For fast reclosing, use the KA1177ME1 reclose delay plug, which provides a fixed 0.5 second delay.

VSA12, VSA12B, and VSA16 reclosers use 1000:1 ratio current sensing transformers (CTs), VSA20 and VSA20A reclosers use 2000:1 ratio CTs. Form 3 and Form 3A controls, used with 1000:1 CTs, require **YELLOW** labeled trip resistors; **BLUE** labeled trip resistors are required with 2000:1 CTs. Refer to S280-75-1 for additional information.

All microprocessor controls must be programmed for the appropriate CT ratio.

5. Install the control. Connect the control cable between the control and the recloser. Make sure the control is grounded and properly programmed for the planned installation.
6. Make the high-voltage line connections. See Figure 3.

Note: Disconnect switches and bypass switches are recommended to facilitate switching and isolation.

   A. Surge protection on both sides of the recloser is recommended. However, if protection is provided on only one side, it should be located on the source side for line installation and on the load side for substation installation.

   B. Connect high-voltage lines to recloser bushing terminals. VSA12, VSA12B, VSA16, and VSA20 bushing terminals are universal clamp-type and will accommodate conductors ranging in size from 4/0 to 1000 MCM inclusive. VSA20A bushings are equipped with 1 1/4 - 12 UNF-2A threaded studs.

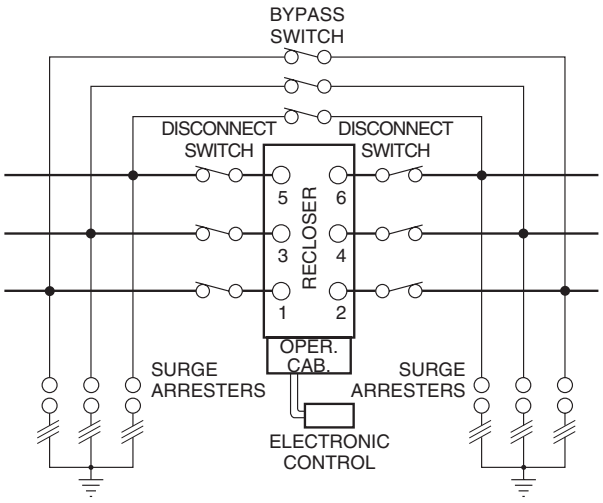


Figure 3. Typical recloser connections, with switches to facilitate maintenance and with complete surge protection.

7. Block ground sensing via the control panel.
8. Close source and load disconnect switches.
9. Closer reclosers via control signal.
10. Open bypass switches.
11. Enable ground sensing, if applicable.

Heaters

Cabinet heaters are provided in both the operating mechanism cabinet and at the bottom of the interrupter enclosure cabinet. Power is supplied to both sets of heaters from the 240 Vac source and are connected through a DPST toggle switch and 2 A fuses, see Figure 5. The two mechanism cabinet heating resistors are rated 500 Ω, 50 W; the two interrupter enclosure heating resistors are rated 1000 Ω, 100 W.

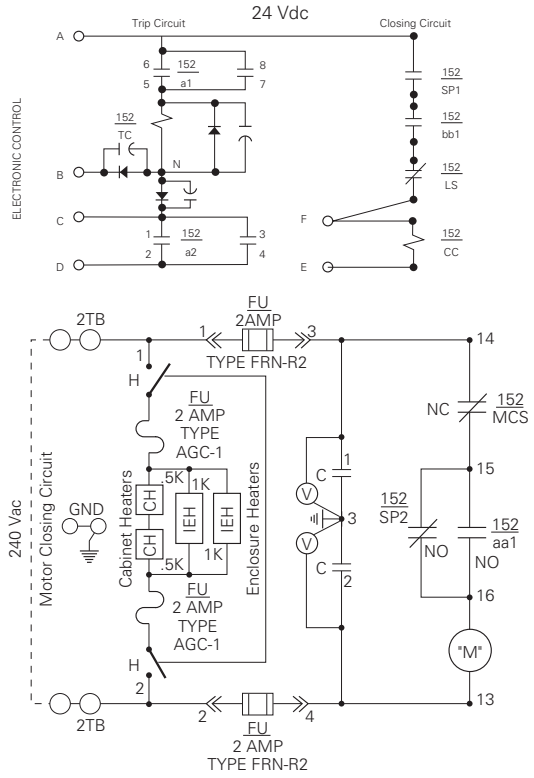
240 vac power connections

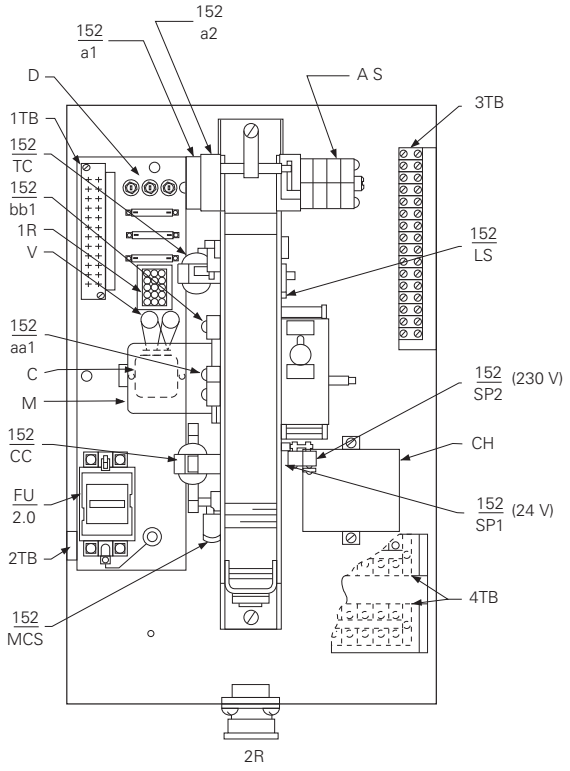
A 240 Vac power source is required to operate the recloser. A 120 Vac input power supply accessory is also available. The source is brought into the operator mechanism cabinet and connected to the terminal block mounted on the left side wall of the cabinet. The terminal block is permanently wired to the circuit-fused disconnect and the heater control panel. Two 2 A fuses are included on the heater control panel.

A schematic diagram of the recloser circuit and the physical arrangement of the operator mechanism, with parts identified, is shown in Figure 4. Figure 5 is an interconnection diagram.

Remove recloser from service

1. Block ground tripping via the control panel.
2. Close all three bypass switches.
3. With a hotstick, pull down the yellow MANUAL TRIP PULLRING under the cabinet.
4. The control will sense that the recloser is open.
5. Open the source and load disconnect switches.
6. Follow standard utility procedures regarding removal of recloser from service.





AS	Auxiliary Switch	152	Spring Position Switch (24 Vdc) SP1	152 / CC	Close Coil (Solenoid)
D	Diodes 1N3209	152 / SP2	Spring Position Switch (240 Vac) Close Motor Circuit	152 / MCS	Manual Close Switch
C	Surge Capacitor	M	Motor	152 / LS	Contact for Manual Limit Switch - Trip and Reset
FU / 20	Fuse Box 1R Socket	152 / aa1	Cam-Operated Switch Open Motor Circuit	V	Varistor
2R	Recloser Receptacle	152 / bb1	b Contact to Close Closing Circuit	CH	Mechanism Cabinet Heater
152 / a1	a Contact to Open Trip Coil	152 / TC	Trip Coil (Solenoid)	IEH	Interrupter Enclosure Heater

Figure 4. Schematic diagram of recloser circuits and approximate location of circuit components.

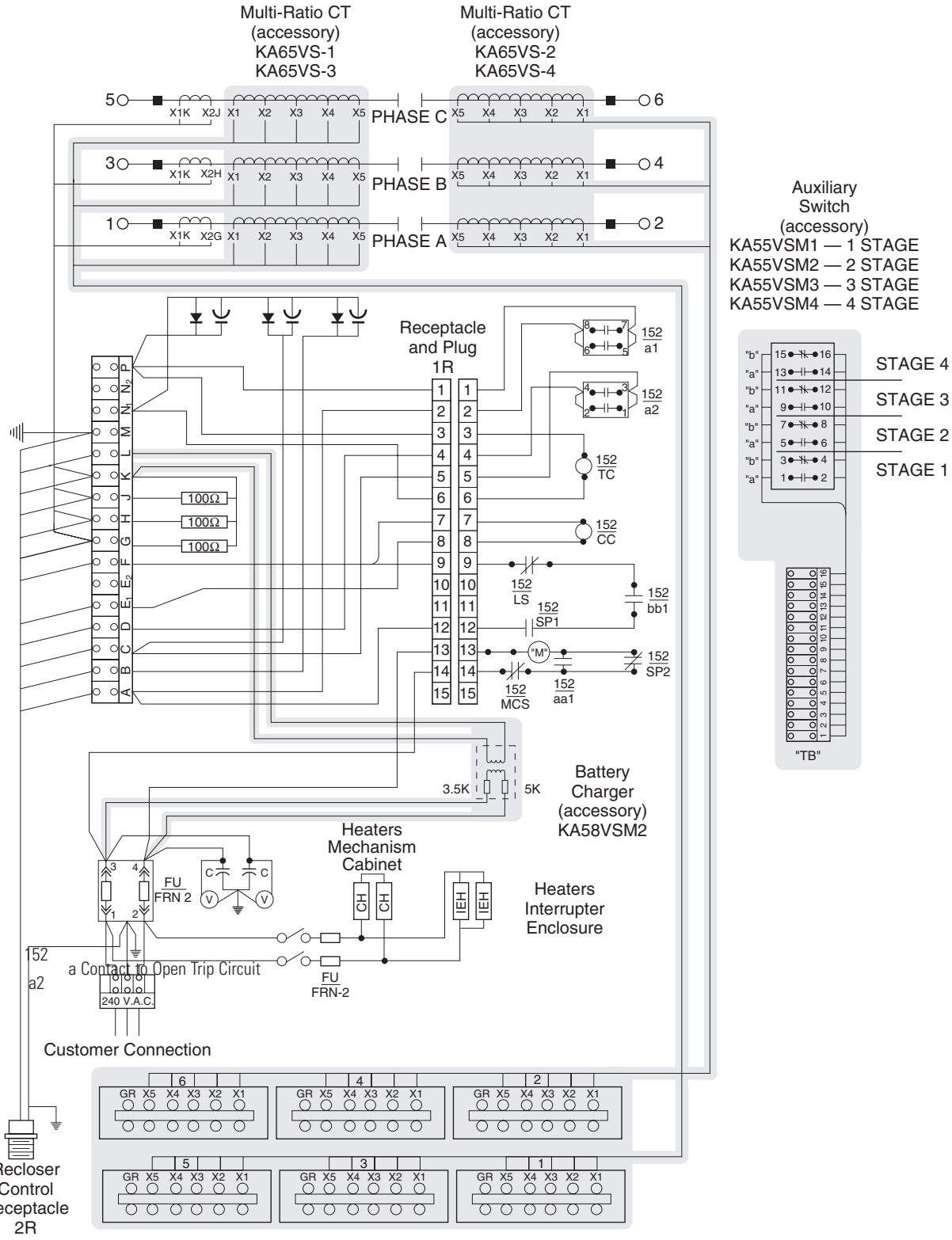


Figure 5. Recloser interconnection diagram.

Accessories

Auxiliary switch

A one-, two-, three-, or four-stage auxiliary switch can be provided as an accessory. Each stage has two independent contacts that permit any desired combination of "a" (follow state of recloser contacts) and "b" (opposite state of recloser contacts) positions. The switch is wired to a separate terminal block as shown in Figure 5.

The switch contacts are insulated for 600 V and have a continuous current rating of 10 A. Their interrupting ratings are shown in Table 7.

Table 7. Auxiliary Switch Interrupting Ratings

Volts	Inductive AC (amps)	Non-Inductive AC (amps)	Inductive DC (amps)	Non-Inductive DC (amps)
24	–	–	15.0	20.0
48	–	–	7.5	10.0
120	60	80	–	–
125	–	–	1.5	2.0
240	30	60	–	–
250	–	–	0.45	0.5

Current transformers

⚠ WARNING

Hazardous voltage. The equipment is shipped with the shorting thumbscrews in the CT terminal blocks. These thumbscrews must not be removed until external connections are made to the terminal blocks. Energizing the equipment with the shorting screws removed, and no load connected, will cause high voltage to be generated in the CT secondaries. Contact with high voltage can cause severe personal injury or death and equipment damage. T208.2

Multi-ratio bushing current transformers can also be supplied in either 600:5 or 1200:5 A ratios. Each multi-tapped CT secondary is wired to a separate six-point terminal block in the operator mechanism cabinet (Figure 5). The available current ratios and terminal block terminations are shown in Table 8.

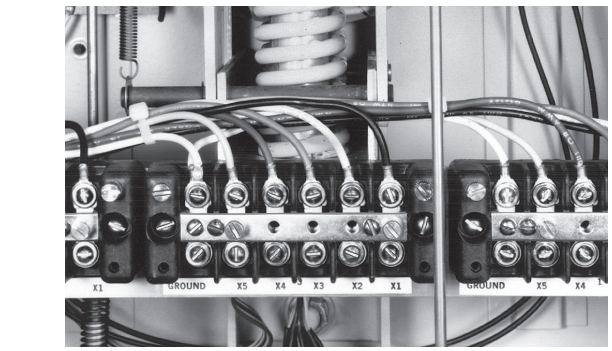


Figure 6. Position of shorting thumbscrews.

Figure 7 shows one of the three terminal blocks for the multi-ratio bushing CTs in the as-shipped condition. The secondary of each CT is shorted and grounded by the thumbscrew which shorts terminals X1 and X5 to the grounding bar. After external connections are made, the thumbscrew at X1 is removed and stored in the corner of the terminal block. The other thumbscrew remains in the grounding bar to make the common ground connection for one side of the CT secondary winding. The location of the screw in the bar is dependent upon the CT ratio desired and is always the higher of the two terminal numbers. Typical customer wiring to the three terminal blocks is shown in Figure 7.

Table 8. Multi-Ratio Current Transformer Ratios and Terminal Connections

600:5 Ratio BCT	1200:5 Ratio BCT	Terminal Connection
600:5	1200:5	X1-X5
500:5	100:5	X2-X5
450:5	900:5	X3-X5
400:5	800:5	X1-X4
300:5	600:5	X2-X4
250:5	500:5	X3-X4
200:5	400:5	X4-X5
150:5	300:5	X1-X3
100:5	200:5	X1-X2
50:5	100:5	X2-X3

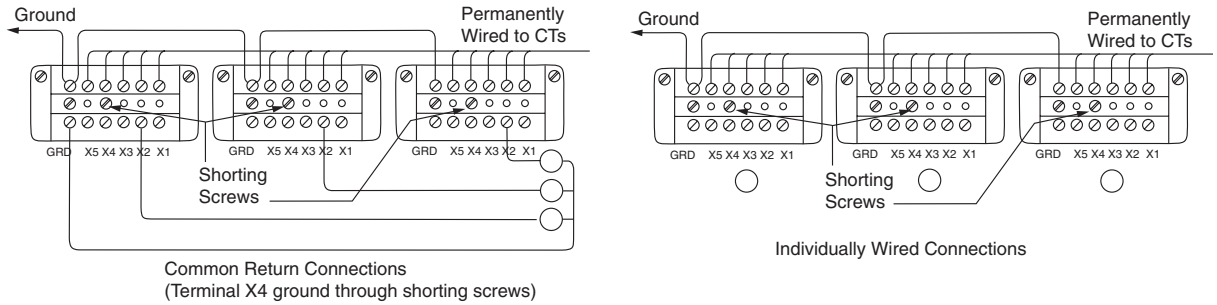


Figure 7. Position-shorting thumbscrews in terminal block and customer wiring.

Form 6 rack mount substation battery power interface accessory

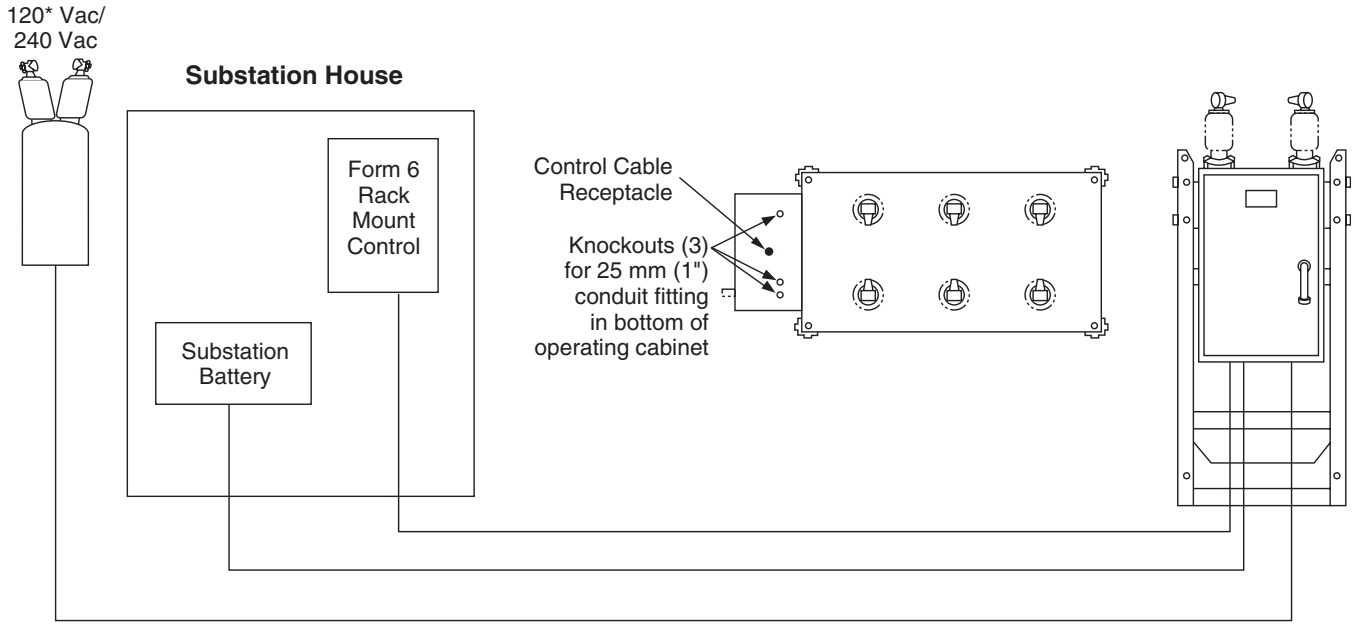
The substation battery power interface accessory is designed for the Form 6 Rack Mount Control only. For other control applications, contact your Eaton representative.

The factory-installed accessory, located in the mechanism cabinet, is powered by a 24, 48, or 125 Vdc substation battery, as specified at time of order. It allows the recloser to be located up to 150 m (500 ft) from the control (see Table 9). The Form 6 Rack Mount Control cable is wired to the accessory, which transforms the control signal to trip and close the recloser. Refer to Figures 8 and 9.

Table 9. Cable Lengths for Substation Battery Power Interface Accessory

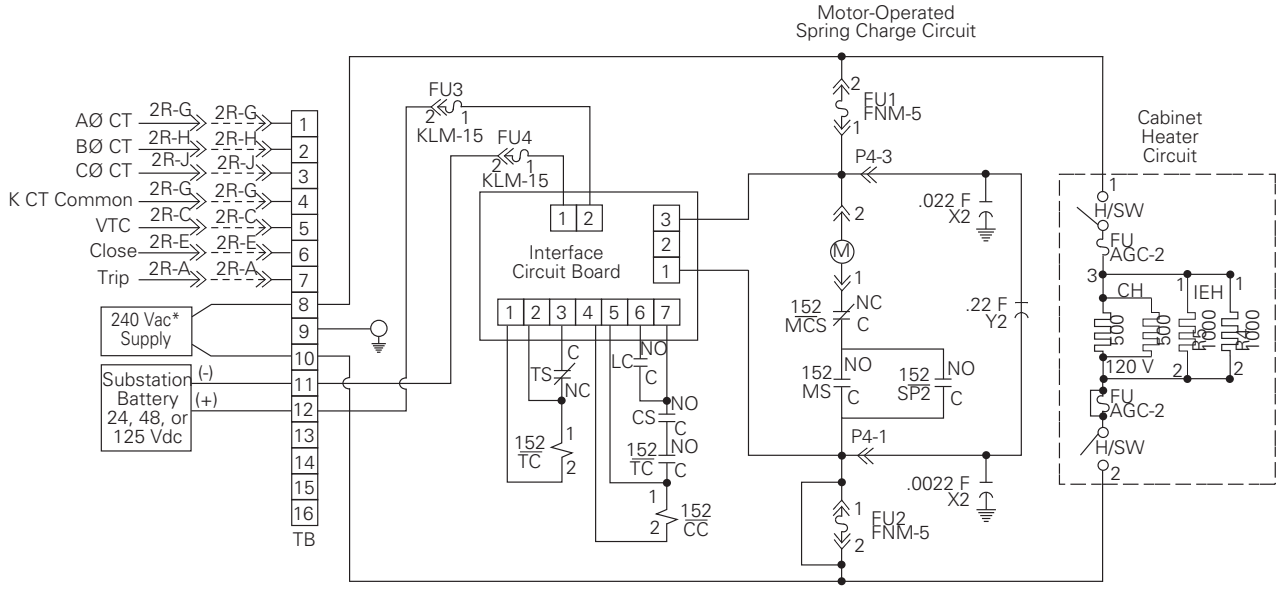
	Substation Battery Voltage					
	24 Vdc		48 Vdc		125 Vdc	
Wire Gauge	Meters	Feet	Meters	Feet	Meters	Feet
18 AWG	12	40	24	80	48	120
16 AWG	18	60	36	120	54	180
14 AWG	30	100	60	200	90	300
12 AWG*	50	175	100	350	150	500

* 12 gauge cable to be used with junction box accessory KME6-1859 or KME6-1811.



* 120 Vac available with KA60VSM2 120 Vac Motor Operator Accessory

Figure 8. Substation Battery Power Interface Accessory wiring.



* 120 Vac available with KA60VSM2 120 Vac Motor Operator Accessory

C	Capacitor
F	Fuse
2R>>	Receptacle for supplied control cable between operating mechanism cabinet and remotemounted electronic control cabinet.
R	Resistor
CH	Cabinet Heater
H/SW	Heater Disconnect Switch
TS	Closed when Main Contacts are Open
CS	Open when Main Contacts are Open
152/a	Auxiliary Switch Contact Open when Main Contacts Open
IEH	Interrupter Enclosure Heater
152/b	Auxiliary Switch Contact Closed when Main Contacts Open
152/SP2	Closing Spring Position Switch (ac control) Closed when Closing Springs Discharged
152/LC	Limit Switch Contact for Manual Trip and Reset
152/TC	Trip Coil (Solenoid)
152/CC	Close Coil (Solenoid)
152/MCS	Manual Close Switch (ac control)
152/H	Manual Trip and Reset Switch (when not in reset position, will prevent a close)

Figure 9. Substation Battery Power Interface Accessory circuit diagram.

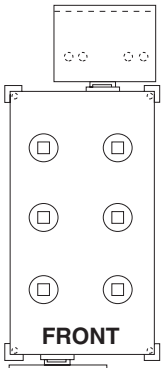
Substation mounting

The substation mounting frame consists of angle-iron extension legs and braces that adjust to meet specific installation requirements. Refer to Figure 10.

	Dimensions per model	
Item	**VSA 12/12B/16 /20**	**VSA20A**
A	572 (22.5)	775 (30.5)
B	2108 (83)	2159 (85)
C	946 (37.25)	997 (39.25)
D	508 (20)	559 (22)
E	933 (36.75)	984 (38.75)
F	1080 (42.5)	1257 (49.5)

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

Model	**kg (lbs)**
VSA 12/12B/16/20	306 (675)
VSA20A	404 (890)



Standard Control Cabinet Mounting Brackets:
FRONT
KA55VS2
KA55VS4 (double-size control cabinet)
BACK
KA55VS3
KA55VS5 (double-size control cabinet)

Alternate Control Mounting (for clarity, operator on front of recloser is not shown)

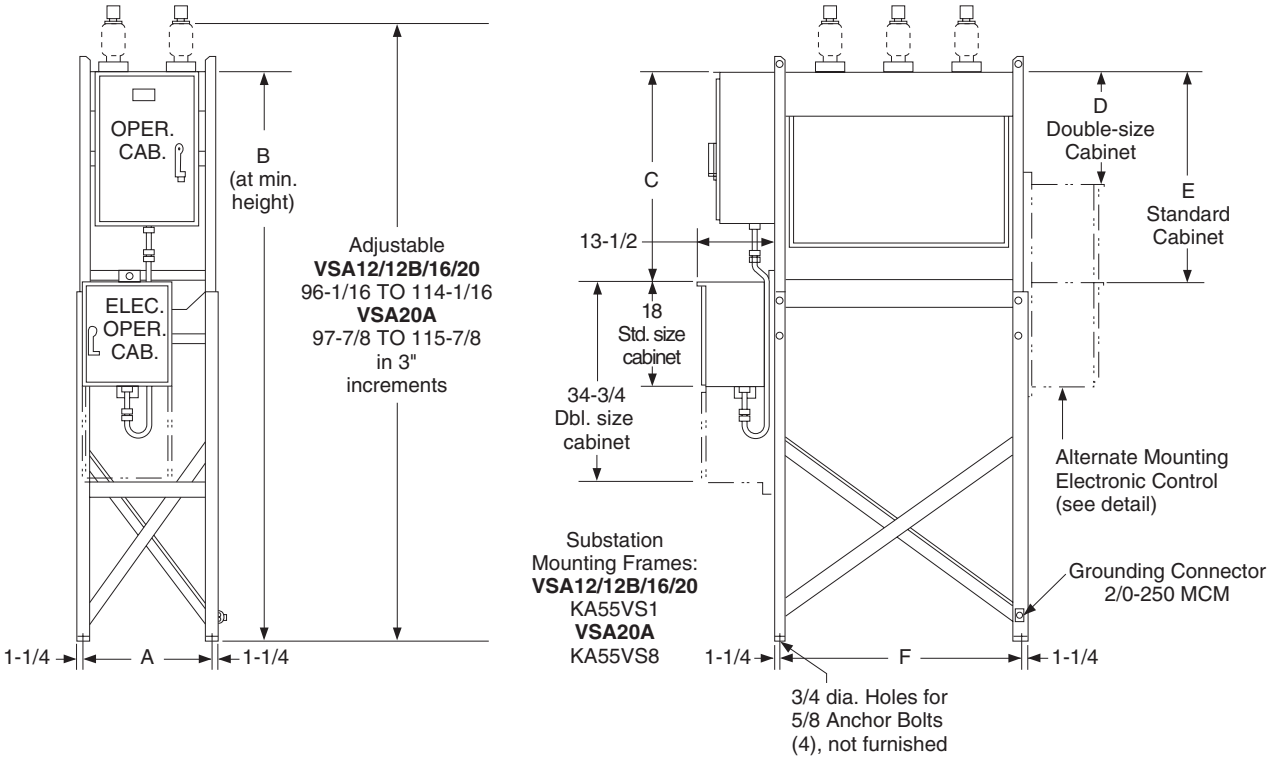
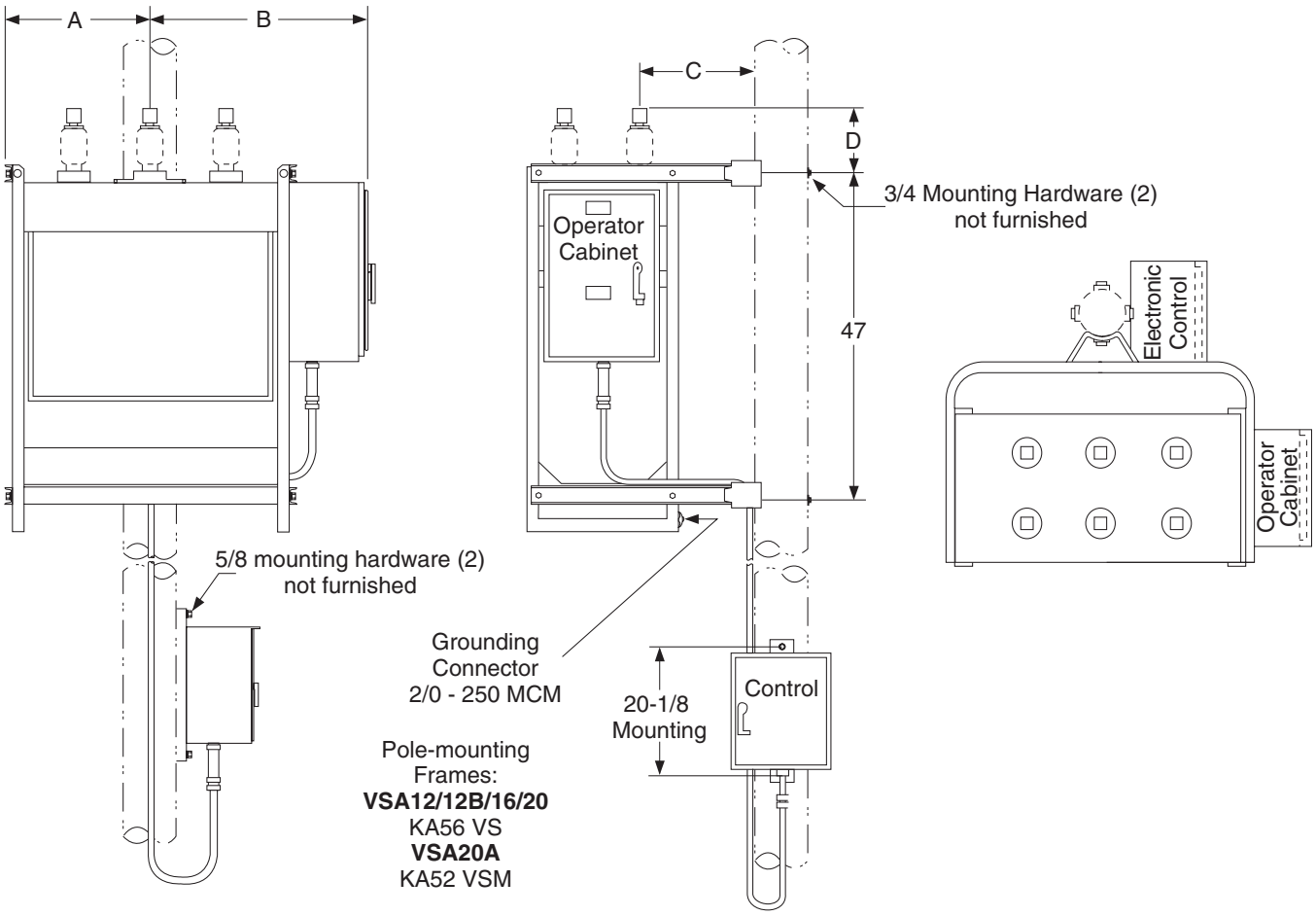


Figure 10. Outline dimensions and weights with substation mounting frame accessory (recloser and mounting frame only).

Pole mounting

The pole-mounting equipment consists of two C-shaped brackets that attach the recloser to the pole. Refer to Figure 11.



	Dimensions per model	
Item	**VSA 12/12B/16 /20**	**VSA20A**
A	616 (24.25)	705 (27.75)
B	819 (32.25)	908 (35.75)
C	406 (16)	483 (19)
D	292 (11.5)	318 (12.5)

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

Model	kg (lbs)
VSA 12/12B/16/20	272 (600)
VSA20A	381 (840)

Figure 11. Outline dimensions and weights with single-pole mounting hanger accessory (recloser and mounting frame only).

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 can result in death, severe personal injury, and equipment damage. G102.1

⚠ 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

⚠ WARNING

Hazardous voltage. Do not rely on the open position of the yellow operating 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

VSA three-phase reclosers feature vacuum interruption and air insulation. Current interruption takes place in the vacuum interrupter assemblies that are suspended from the recloser cover by insulating supports. See Figures 12 and 13. The moving contacts, which are located in each interrupter assembly and driven by the recloser operating mechanism, close or open the circuit. Arc interruption takes place within one cycle while utilizing a stroke of approximately one-half inch.

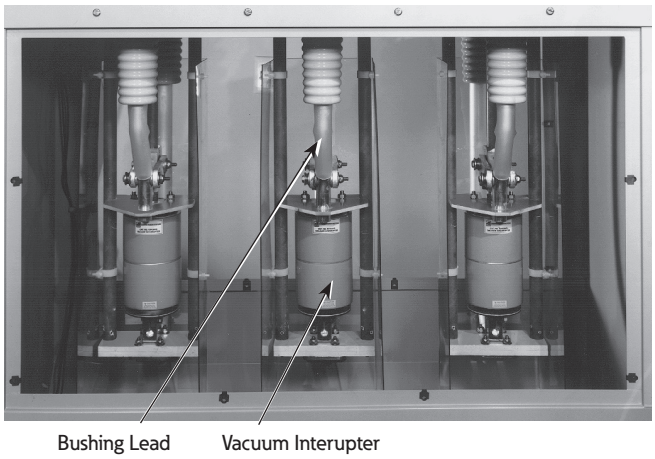


Figure 12. Type VSA20 vacuum recloser with inspection cover removed.

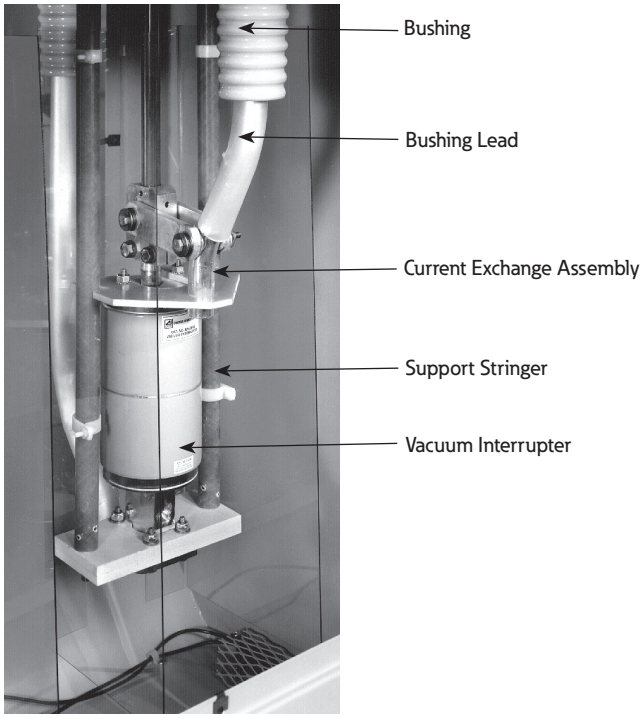


Figure 13. VSA20 vacuum interrupter assembly.

Recloser tripping and closing are initiated by signals from the recloser control unit. When current in excess of the programmed minimum trip level is detected on any phase or phases, the recloser control initiates a trip signal which energizes a solenoid in the operating mechanism of the recloser. When actuated, this solenoid trips the opening springs which opens the interrupter contacts.

Closing springs provide the force required to close the vacuum interrupters as well as the force required to charge the opening springs. A 240 Vac motor charges the closing springs through a multi-stage gear drive. When 240 Vac is present, the motor is automatically operated to keep the closing springs in a charged state.

To close the recloser, the control initiates a signal which energizes a solenoid in the recloser operating mechanism. Once actuated, the solenoid releases the closing springs, closing the vacuum interrupters. At the same time, the opening springs are charged and, when 240 Vac is present, the closing springs are charged. An external 240 Vac source is required to operate the drive motor.

Recloser tripping employs stored spring energy. The 240 Vdc supply is not required to trip the recloser. When the trip solenoid is actuated by the 24 Vdc trip signal, the stored spring energy is released to open the recloser. The 24 Vdc trip signal is originated at the recloser control.

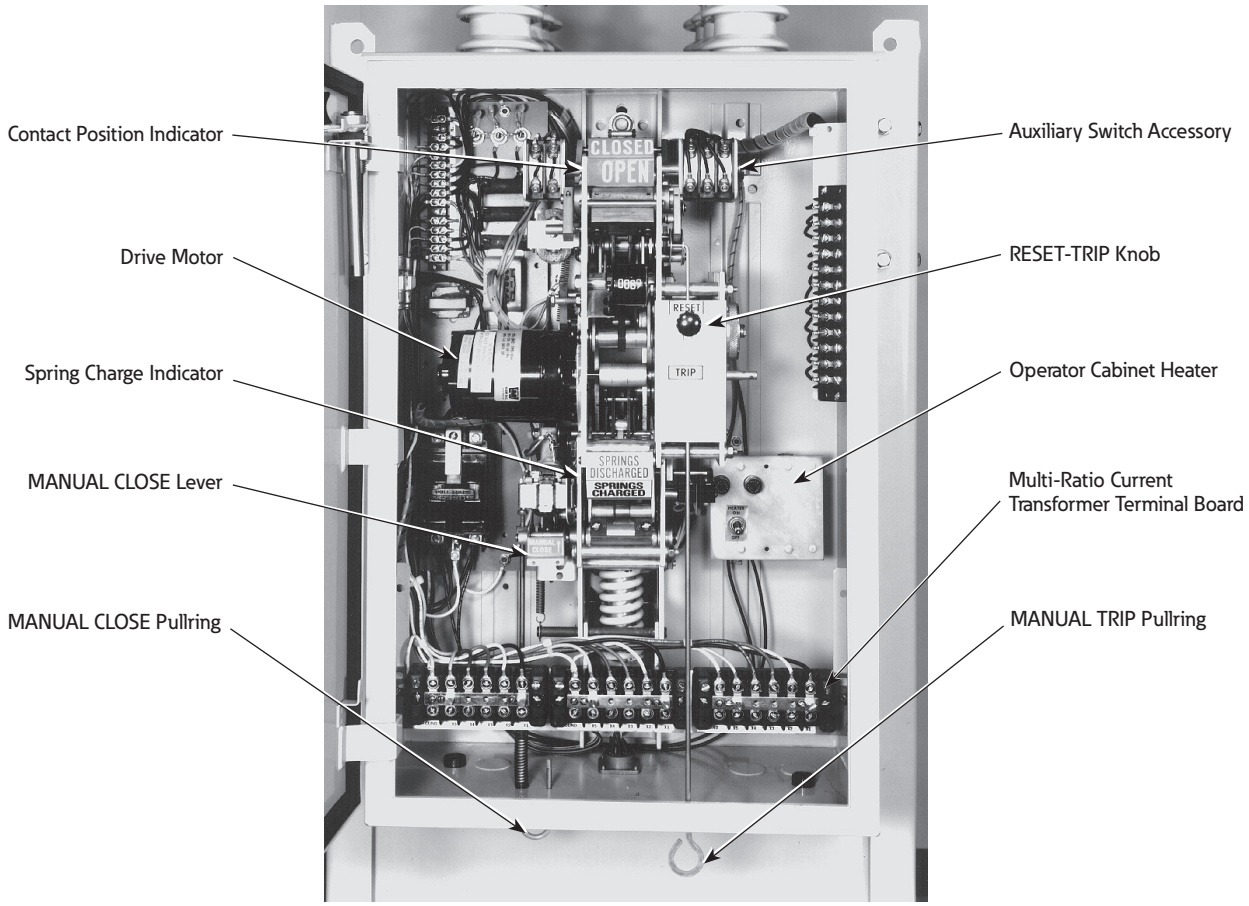


Figure 14. VSA recloser operating mechanism.

Manual tripping

A closed recloser can be tripped manually, from inside the operator cabinet by moving the RESET-TRIP knob to TRIP or from outside the cabinet by pulling down the yellow MANUAL TRIP PULLRING under the cabinet. When the recloser is manually tripped, the closing circuit is opened to prevent reclosing. Refer to Figure 14.

Manual closing

Closing springs must be charged prior to manual closing operation (see the Testing Operation section of this manual). There are two ways to manually close the recloser. Refer to Figure 14.

1. From inside the operator cabinet, move the RESETTRIP knob to RESET and push up on the MANUAL CLOSE LEVER.
2. From outside the operator cabinet, push up the yellow MANUAL TRIP PULLRING, then pull down on the MANUAL CLOSE PULLRING.

Service information

⚠ CAUTION

This equipment requires routine inspection and maintenance to ensure proper operation. If it is not maintained, it can fail to operate properly. Improper operation can cause equipment damage and possible personal injury. G105.1

Maintenance

Manuals

Maintenance instructions for the VSA12, VSA12B, VSA16, and VSA20 reclosers can be found in *Service Information S280-45-5 Type VSA12, VSA16, and VSA20/800 Maintenance Instructions*.

Frequency of maintenance

To assure proper and trouble-free operation, reclosers must be maintained when they have operated the equivalent of a related duty cycle or before, see Table 4 in the Ratings and Specifications section of this manual.

Note: ANSI® C37.61, *Guide for the Application, Operation, and Maintenance of Automatic Circuit Reclosers*, gives a procedure for converting the rated standard duty cycle into an equivalent duty cycle based on the actual operating duty of the recloser.

If the recloser has not completed an equivalent duty cycle within ten years, an inspection must be made and any needed maintenance performed. Refer to *Service Information S280-45-5 Type VSA12, VSA16, and VSA20/800 Maintenance Instructions* for inspection and maintenance procedures.

For additional information and specific maintenance requirements, including periodic maintenance inspection procedures, refer to the maintenance manual.

Testing operation

This recloser is used with microprocessor-based recloser controls. Refer to the control operation manual.

⚠ 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

1. Check the data plate ratings. Make sure the ratings on the recloser data plate are correct for the planned testing.
2. Test electrical open and close operation. Close and open the recloser contacts using the microprocessor control. Confirm that the contacts have closed and opened by:
   A. The OPEN/CLOSE contact position indicator, or
   B. By a continuity check between the recloser terminals.
3. Test manual open, see Figures 14 and 15. Confirm that the contacts have opened by:
   A. The OPEN/CLOSE contact position indicator, or
   B. By a continuity check between the recloser terminals
   C. A simple non-electric test of recloser operation will assure that the operator mechanism and the recloser linkage are functioning properly. The following procedure may be used prior to high voltage connection:
      i. If the recloser is connected to a 120 or 240 Vac power supply, pull out the fused disconnect switch to prevent the spring charging motor from running.
      ii. Make sure the electronic control is in the CONTROL LOCKOUT state.

iii. Check that the recloser is open. The contact position indicator in the operator cabinet should read OPEN. The RESET-TRIP knob should be in the RESET position and the spring chargestate indicator should read SPRINGS DISCHARGED.

a. If the recloser is closed, trip the recloser following the Manual Tripping instructions in this section. This will release a latch in the tripping mechanism, and energy stored in the opening springs will drive the operating mechanism to open the recloser contacts. The contact position indicator will read OPEN. Return the RESET-TRIP knob to RESET.

b. If the spring charge state indicator shows SPRINGS CHARGED, close the recloser following the Manual Closing instructions in this section. This will close the recloser contacts and charge the opening springs. The contact position indicator will read CLOSED. Repeat procedure in Step 3A above.

iv. Insert the manual closing crank (stored on the inside of the operator cabinet door) through the hole in the right-hand side of the operator cabinet (sealed with a bolt-nut-seal) and onto the drive shaft (see Figure 15).

v. Crank the motor in a counterclockwise direction until the springs charge: approximately 150 revolutions of the motor shaft are required. The spring indicator will rotate to the SPRINGS CHARGED position.

vi. Push up the manual closing lever to manually close the recloser. This will close the contacts and charge the opening springs. The contact position indicator will read CLOSED and the spring charge-state indicator will show SPRINGS DISCHARGED.

vii. Move the RESET-TRIP knob to TRIP. The recloser contacts will trip open and the contact position indicator will read OPEN.

viii. Replace the fused disconnect if it was removed.

4. To close the recloser contacts with the control:

   A. Apply specified motor voltage (see page 10)

   B. First, push the yellow manual open handle up.

   C. Close the recloser using the microprocessor-based control.

5. To trip the recloser contact using the control:

   A. Trip and lockout the recloser using the microprocessor-based control.

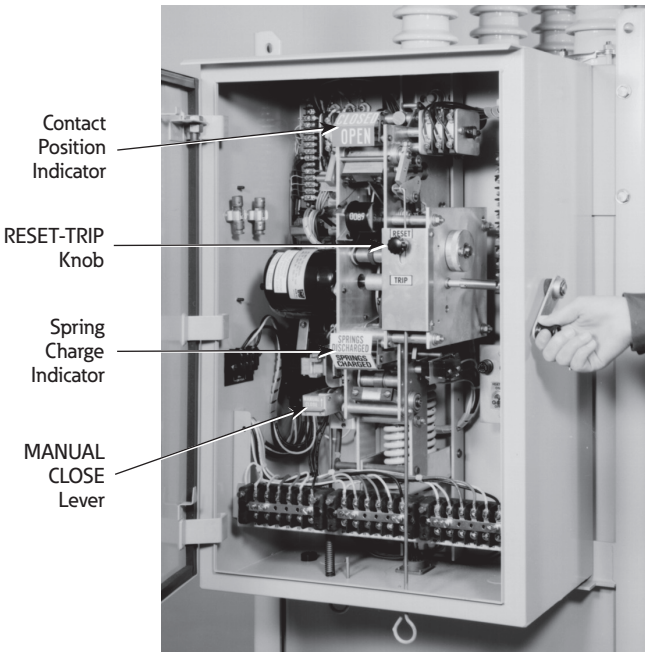


Figure 15. Manual closing.

High-potential withstand testing

⚠ WARNING

Hazardous voltage. The switchgear (apparatus and control) and high-voltage transformer must be in a test cage or similar protected area 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. T221.5

⚠ 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

The high-potential withstand test provides information on the dielectric condition of the recloser and the vacuum integrity of the interrupters. Use the following procedures to perform high-potential withstand tests at 37.5 kV rms 60 Hz or at 50 kV, for 60 seconds. See Figure 16 for test connection diagrams.

Test 1

1. Close the recloser contacts.
2. Ground the recloser.
3. Connect terminals 2, 4, and 6 together.
4. Apply proper test voltage to terminals 2, 4, and 6.
5. The recloser should withstand the test voltage for 60 seconds.

Test 2

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

Test 3

1. Open the recloser contacts.
2. Ground the recloser.
3. Connect and ground terminals 1, 3, and 5.
4. Connect terminals 2, 4, and 6.
5. Apply proper test voltage to terminals 2, 4, and 6.

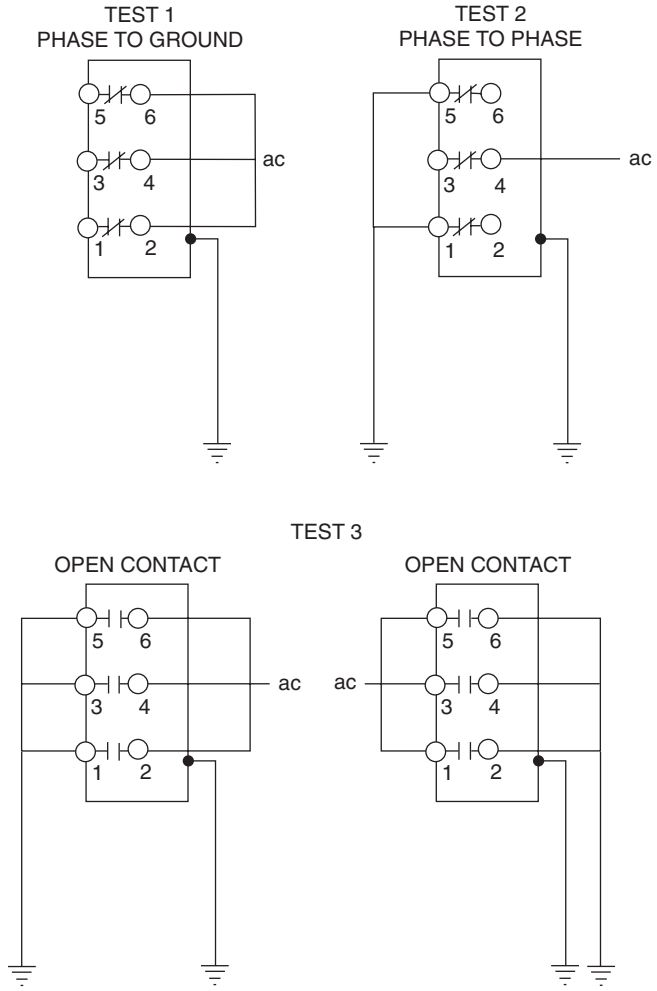


Figure 16. Connection diagrams for high-potential withstand testing.

6. The recloser 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 recloser should withstand the test voltage for 60 seconds.

Withstand test results

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

If the recloser 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 recloser does not pass Tests 1, 2, or 3, contact an authorized service center or your Eaton representative.

Replacement parts

Replacement parts for Eaton reclosers are available through the factory Service Department. To order replacement parts, refer to the maintenance manual and *S260-01 through S280-01 Distribution Switchgear Parts Guide* for catalog numbers. Contact your Eaton representative for additional information and ordering procedures.

Factory-authorized service centers

Factory-authorized repair shops are located throughout the continental United States to provide maintenance, repair, and testing services for Eaton reclosers. For further information, contact your Eaton representative.

Factory maintenance classes

The factory Service Department offers recloser maintenance training classes. These classes, taught by experienced service technicians, are held at the factory's inhouse training facility.

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