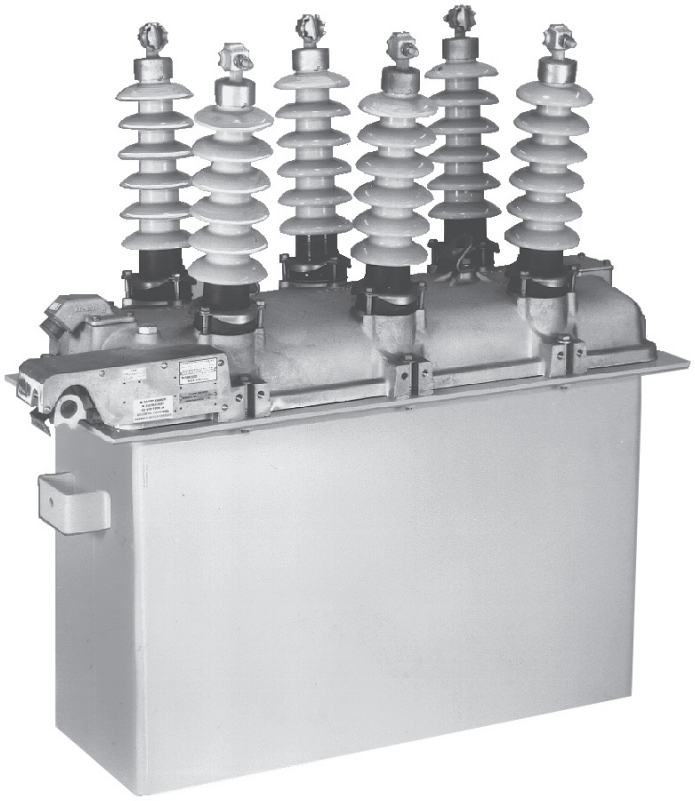
# Types VWE, VWVE27, VWVE38X, WE, WVE27, and WVE38X; three-phase electronically controlled; installation and operation instructions



Powering Business Worldwide

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## Contents


**SAFETY FOR LIFE** . . . . . **V**

**SAFETY INFORMATION** . . . . . **V**

Safety instructions . . . . . v

**PRODUCT INFORMATION** . . . . . **1**

Introduction . . . . . 1

Read this manual first . . . . . 1

Additional information . . . . . 1

Acceptance and initial inspection . . . . . 1

Handling and storage . . . . . 1

Description . . . . . 1

Recloser operation . . . . . 1

Oil interrupters and vacuum interrupters . . . . . 1

Tripping and closing . . . . . 1

Manual operating handle and contact position indicator . . . . . 2

Electronic control . . . . . 2

Installation manuals for controls . . . . . 2

**SPECIFICATIONS AND RATINGS** . . . . . **3**

Check recloser ratings prior to installation . . . . . 3

ANSI standards . . . . . 3

ISO standards . . . . . 3

**DIMENSIONS AND WEIGHTS** . . . . . **4**

**Lifting a recloser** . . . . . **6**

**INSTALLATION PROCEDURE** . . . . . **6**

**OPERATION** . . . . . **8**

Manual operation . . . . . 8

Initial operation . . . . . 8

Automatic operation . . . . . 8

Control lockout . . . . . 9

Cold-load pickup . . . . . 9

**TESTING** . . . . . **10**

Testing vacuum interrupters in VWE, VWVE27, and VWVE38X reclosers . . . . . 10

Safety requirements . . . . . 10

Untanking the recloser . . . . . 10

**ACCESSORIES** . . . . . **11**

Bushing-type multi-ratio current transformers . . . . . 11

Auxiliary switch . . . . . 12

To change any auxiliary switch cam position . . . . . 13

Low-voltage DC closing . . . . . 14

Low-voltage AC closing . . . . . 14

CT power source for battery charger . . . . . 15
Manual closing tools . . . . . 15

**MAINTENANCE INFORMATION . . . . . 16**
Maintenance requirements . . . . . 16
Maintenance manuals . . . . . 16
Frequency of maintenance . . . . . 16
Maximum recloser maintenance intervals . . . . . 16
Replacement parts . . . . . 16
Factory-authorized service centers . . . . . 16
Factory maintenance classes . . . . . 16
Instructional video programs . . . . . 16

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## 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.** G122.2

# Product information

## Introduction

*Service Information MN280060EN* provides installation instructions and operation information for Eaton's Cooper Power™ series three-phase, electronically controlled W-group 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 Procedure, Operation, Testing, Accessories, and Maintenance Information. Refer to the table of contents for page numbers.

## 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. This recloser is used in conjunction with an electronic recloser control. If used with a Form 3A Type ME control, refer to *Service Information S280-75-1*. If used with a Form 4C control, refer to *Service Information S280-77-1*. If used with an FXA or FXB control, refer to *Service Information S280-78-1*. If used with a Form 5 control, refer to *Service Information S280-79-10*. If used with a Form 5 LS/UDP control, refer to *Service Information S280-79-12*. If used with a Form 6 rack mount control, refer to *Service Information S280-70-1*. If used with a Form 6 yard mount control, refer to *Service Information S280-70-2*. If used with a Form 6 pole mount control, refer to *Service Information S280-70-3*.

## Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described nor to provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, contact your Eaton representative.

## Acceptance and initial inspection

Each recloser is completely assembled, tested, and inspected at the factory. It is carefully calibrated, adjusted, and filled to the correct level with insulating oil. It is in good condition when accepted by the carrier for shipment.

Upon receipt, inspect the recloser thoroughly for damage and loss of parts or oil incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Check for oil leakage and tighten all bolts that may have loosened during shipment, especially the tank mounting bolts. Tank mounting bolts should be tightened to 25–40 ft-lbs. torque.

## Handling and storage

Be careful during handling and storage 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 prior to installation, provide a clean, dry storage area.

## Description

The recloser with its electronic control senses distribution system overcurrents and interrupts the circuit to clear faults. It automatically recloses to restore service if a fault is temporary. Several attempts may be made to clear and re-energize the circuit, and, if the fault still exists, the recloser locks out.

## Recloser operation

The opening sequences of the recloser can be all fast, all delayed, or any combination of fast followed by delayed up to a total of four. Fast operations clear temporary faults before branch line fuses are weakened. Delayed operations allow time for downline protective devices to clear so that permanent faults can be confined to smaller sections of the system.

A complete electronic recloser package consists of the recloser which interrupts the circuit, an electronic control which senses overcurrents and actuates the recloser, and an interconnecting control cable.

## Oil interrupters and vacuum interrupters

Oil interrupters are used in WE, WVE27, and WVE38X reclosers. Vacuum interrupters are used in VWE, VWVE27, and VWVE38X reclosers. All are oil-insulated.

## Tripping and closing

Recloser tripping and closing operations are initiated by signals from the electronic control. When fault currents in excess of the programmed minimum-trip value are detected in one or more phases, a signal from the control actuates a solenoid in the operating mechanism of the recloser to trip the opening springs and open the interrupter contacts.

Closing energy and the force required to charge the opening springs is supplied by a closing solenoid energized by line voltage from the source side of the recloser. A number of high-voltage coils are available for the closing solenoid to cover the range of the rated nominal system voltage of the recloser. Also available are low-voltage coils to energize the closing solenoid from either an AC or DC 120- or 240-volt source. At the programmed reclosing time, the control energizes a rotary solenoid in the operating mechanism that closes the closing solenoid contactor to connect the closing coil to its power source.

## Manual operating handle and contact position indicator

A yellow manual trip-and-reset handle (Figure 1), located under the sleet hood, is linked to the trip mechanism. It can be used to manually trip the recloser and override the control to keep the recloser open. It cannot manually close the recloser, but must be in the closed position (up) before the rotary solenoid can be energized.

A contact-position indicator–a red flag labeled OPEN–also linked to the interrupter mechanism, but independent of the yellow handle, drops down from under the sleet hood when the interrupter contacts are open.

### ⚠ 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 procedures can result in contact with high voltage, which will cause death or severe personal injury.** G114.1

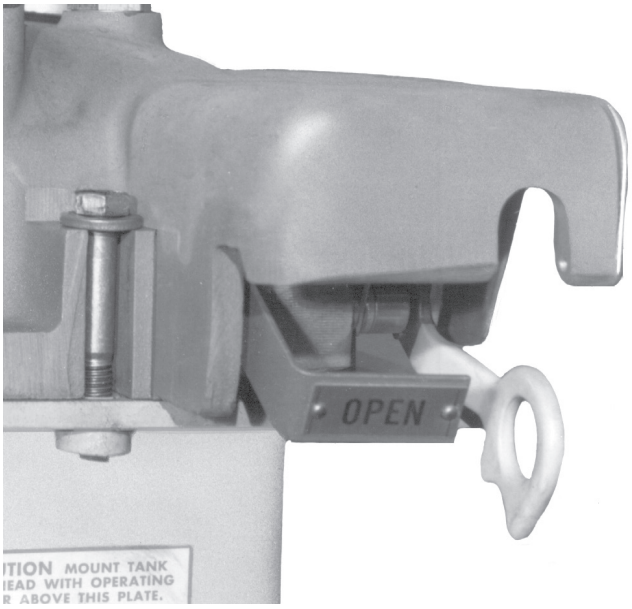



**Figure 1. Manual trip and reset handle and contact position indicator are located under the sleet hood.**

## Electronic control

Line current flow is sensed by current transformers mounted on the source-side bushings under the head of the recloser. When current in excess of the minimum trip value is detected, the control initiates the programmed sequence of operations and provides the trip and close signals to the recloser.

## Installation manuals for controls

Installation and programming instructions and procedures for checking the control are provided in separate instruction manuals furnished with the control.

- *S280-75-1, Type ME Electronic Control, Form 3A, Installation, Setting, and Testing Instructions*
- *S280-77-1, Form 4C Type ME Microprocessor-Based Recloser Control Installation, Operation, and Programming Instructions*
- *S280-77-4 Form 4C Microprocessor-Based Recloser Control Programming Guide*
- *S280-78-1, Type FXA and FXB Microprocessor-Based Recloser Control Installation, Operation, and Maintenance Instructions*
- *S280-78-2 Types FX, FXA, and FXB Microprocessorbased Recloser Controls Programmer's Software User's Manual*
- *S280-78-3 Type FXB Microprocessor-Based Electronic Recloser Control Front Panel Programming Instructions*
- *S280-79-10 Form 5, Form 5 UDP, Form 5 DC NOVA Microprocessor-Based Recloser Controls Installation and Operation Instructions*
- *S280-79-12 Form 5 LS/UDP and Form 5 LS/UDP DC NOVA Microprocessor-Based Recloser Controls Installation and Operation Instructions*
- *S280-79-2 Form 5 Microprocessor-Based Recloser Control Programming Guide*
- *S280-70-1 Form 6 Microprocessor-Based Rack Mount Recloser Control Installation and Operation Instructions*
- *S280-70-2 Form 6 Microprocessor-Based Yard Mount Recloser Control Installation and Operation Instructions*
- *S280-70-3 Form 6 Microprocessor-Based Pole Mount Recloser Control Installation and Operation Instructions*
- *S280-70-4 Form 6 Microprocessor-Based Recloser Control Programming Guide*
- *S280-70-21 Form 6 Microprocessor-Based Recloser Control Programming Guide*

## Specifications and ratings

### Check recloser ratings prior to installation

The recloser will effectively interrupt fault currents only when applied within its specified ratings. Check data plate ratings and compare with the system characteristics at the point of application, prior to installation. Tables 1, 2, and 3 list the specifications and ratings for W-group electronically controlled three-phase reclosers.

### ANSI® standards

W-group reclosers are designed and tested in accordance with the following ANSI® standards: C37.60, C37.85 and meets the guidelines of C37.61 Application, Operation, and Maintenance of Automatic Circuit Reclosers Guide.

### ISO standards

ISO 9001 certified quality management system

**Table 1. Electrical Ratings**

| Description | WE, VWE | WVE27 | VWVE27 | VWVE38X | WVE38X |
|---|---|---|---|---|---|
| Nominal system voltage (kV) | 14.4 | 24.9 | 24.9 | 34.5 | 34.5 |
| Maximum rated voltage (kV) | 15.5 | 27 | 27 | 38 | 38 |
| Rated impulse withstand voltage (BIL)(kV crest) | 110 | 150 | 125** | 150 | 170 |
| 60 Hz withstand voltage (kV rms)<br>Dry, one min.<br>Wet, ten sec. | <br>50<br>45 | <br>60<br>50 | <br>60<br>50 | <br>70<br>60 | <br>70<br>60 |
| Rated maximum continuous current (amps) | 560* | 560* | 560* | 560* | 560* |
| Bushing creepage distance (in) | 13 or 17† | 26½ | 26½ | 26½ | 26½ |

* Extendable to 800 amps with accessory.

** Extendable to 150 kV BIL with accessory.

† 17 inch extra-creepage bushing accessory

**Table 2. Interrupting Ratings**

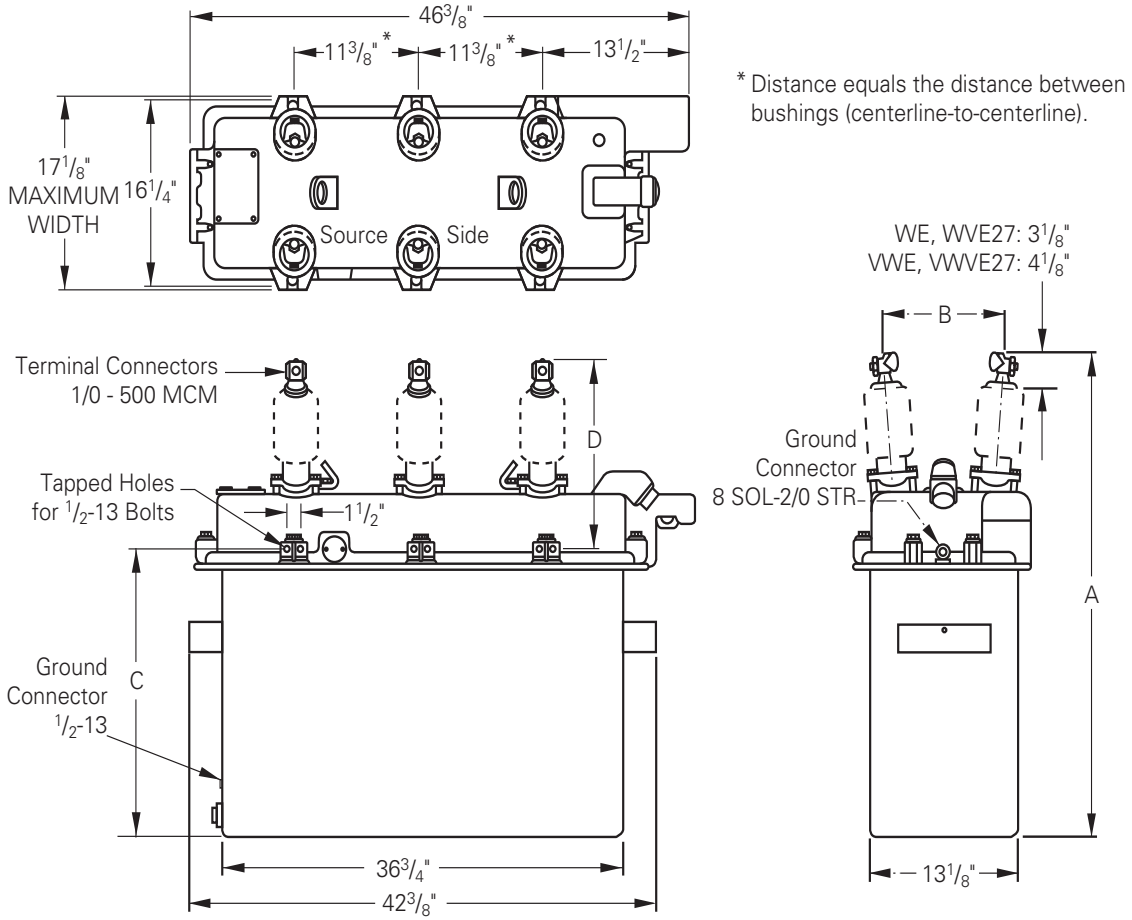
| Type | Maximum Continuous Current (amps) | Interrupting Ratings (rms symmetrical amps) | Voltage (kV) |
|---|---|---|---|
| WE | 560* | 12000 | 4.8 |
| WE | 560* | 10000 | 14.4 |
| VWE | 560* | 12000 | 14.4 |
| VWVE27 | 560* | 12000 | 24.9 |
| WVE27 | 560* | 8000 | 24.9 |
| WVE38X | 560* | 8000 | 34.5 |
| VWVE38X | 560* | 12000 | 34.5 |

* Continuous current rating can be extended to 800 amps with an accessory.

**Table 8. Duty Cycle**

| Type | % of Interrupting Rating | No. of Unit Operations | Maximum Circuit X/R Value |
|---|---|---|---|
| WE | 15-20<br>45-55<br>90-100 | 28<br>20<br>10<br>Total 58 | 3<br>7<br>14 |
| VWE | 15-20<br>45-55<br>90-100 | 88<br>112<br>32<br>Total 232 | 4<br>8<br>15 |
| WVE27<br>WVE38X | 15-20<br>45-55<br>90-100 | 28<br>20<br>10<br>Total 58 | 4<br>8<br>15 |
| VWVE38X | 15-20<br>45-55<br>90-100 | 88<br>112<br>32<br>Total 232 | 4<br>8<br>15 |

## Dimensions and weights




| Dimensions of Recloser Without BCT Accessory* | | | | | |
|---|---|---|---|---|---|
| **Type** | **Bushing Type** | **A (in.)** | **B (in.)** | **C (in.)** | **D (in.)** |
| WE<br>VWE | 13 in. standard creepage<br>or 17 in. extra creepage | 41 5⁄8<br>43 7⁄8 | 11 1⁄8<br>11 1⁄8 | 26 5⁄8<br>28 7⁄8 | 15<br>15 |
| WVE27<br>VWVE27 | 26 1⁄2 in. creepage<br>26 1⁄2 in. creepage | 47 3⁄4<br>50 | 11 3⁄4<br>11 3⁄4 | 26 5⁄8<br>28 7⁄8 | 21 1⁄8<br>21 1⁄8 |

* Dimensions configured to the nearest 1⁄8 in.

| Dimensions of Recloser With BCT Accessory* | | | | | |
|---|---|---|---|---|---|
| **Type** | **Bushing Type** | **A (in.)** | **B (in.)** | **C (in.)** | **D (in.)** |
| WE<br>VWE | 13 in. standard creepage<br>or 17 in. extra creepage | 46 3⁄8<br>48 5⁄8 | 11 7⁄8<br>11 7⁄8 | 26 5⁄8<br>28 7⁄8 | 19 3⁄4<br>19 3⁄4 |
| WVE27<br>VWVE27 | 26 1⁄2 in. creepage<br>26 1⁄2 in. creepage | 52 1⁄2<br>54 3⁄4 | 12 5⁄8<br>12 5⁄8 | 26 5⁄8<br>28 7⁄8 | 25 7⁄8<br>25 7⁄8 |

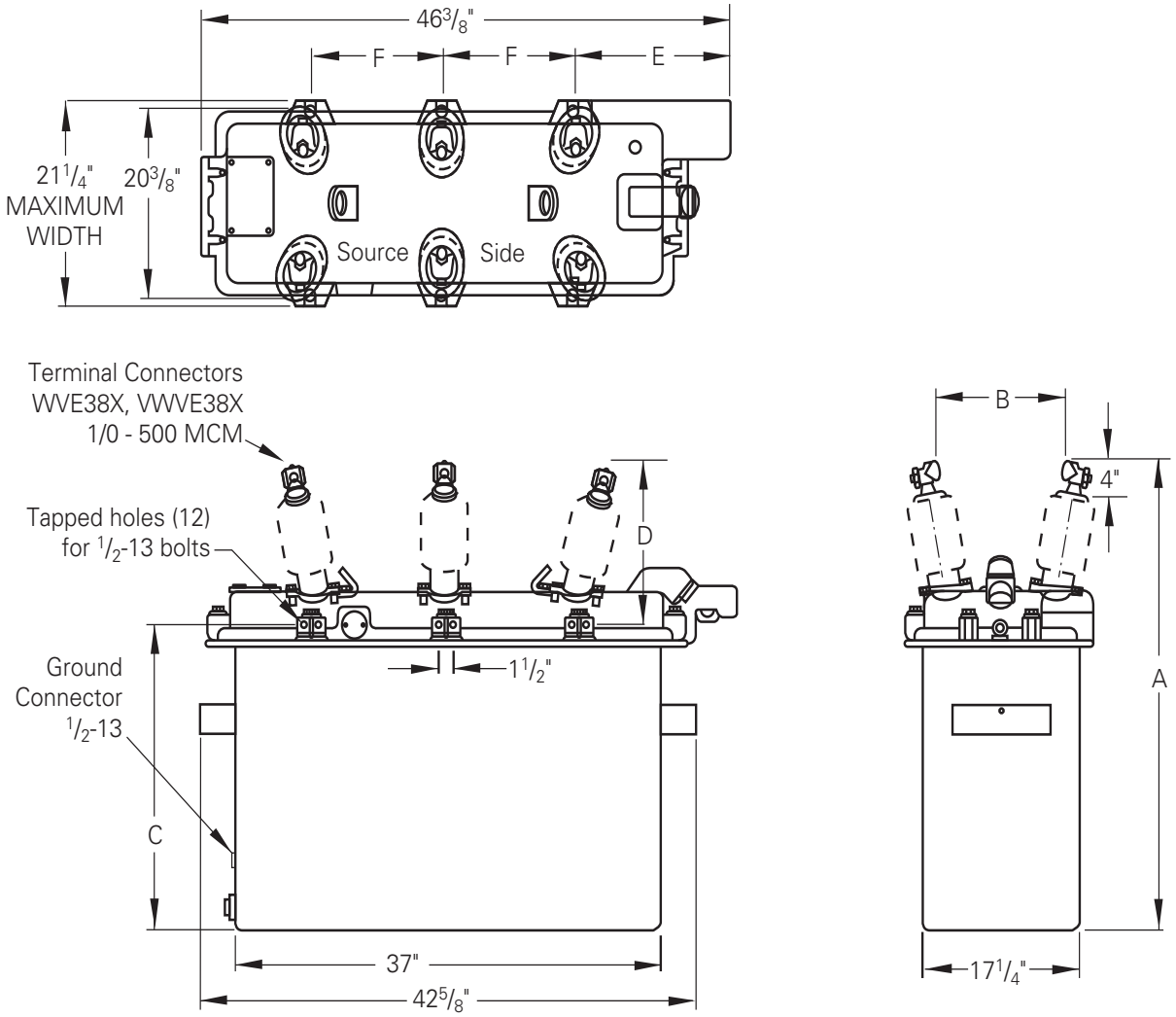
* Dimensions configured to the nearest 1⁄8 in.

**Figure 2. Dimensions of Types WE, VWE, WVE27, and VWVE27 reclosers with and without the bushing current transformer accessory.**

**Table 3. Weights and Oil Capacity**

| | **WE** | **VWE** | **WVE27** | **VWVE27** | **WVE38X** | **VWVE38X** |
|---|---|---|---|---|---|---|
| Weight with oil (lb)* | 790 | 790 | 840 | 830 | 990 | 990 |
| Oil capacity (gal) | 38 | 45 | 38 | 45 | 52 | 61 |

* Does not include the weight of the recloser control or accessory BCT's. Add 25 lbs. for each BCT.




| Dimensions of Recloser With and Without BCT Accessory* | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Type** | **Bushing Type** | **A (in.)** | **B (in.)** | **C (in.)** | **D (in.)** | **E (in.)** | **F ** (in.)** |
| WVE38X | 26 1/2 in. creepage | 47 1/8 | 15 | 26 5/8 | 20 1/2 | 10 | 15 1/8 |
| VWVE38X | 26 1/2 in. creepage | 49 3/8 | 15 | 28 7/8 | 20 1/2 | 10 | 15 1/8 |
| WVE38X | 26 1/2 in. w/ BCT | 51 3/4 | 15 7/8 | 26 5/8 | 25 1/8 | 9 1/2 | 15 5/8 |
| VWVE38X | 26 1/2 in. w/ BCT | 54 | 15 7/8 | 28 7/8 | 25 1/8 | 9 1/2 | 15 5/8 |

* Dimensions configured to the nearest 1/8 in.

** Dimension F is the distance between bushings (centerline-to-centerline).

**Figure 3. Dimensions of Types WVE38X and VWVE38X reclosers with and without the bushing current transformer accessory.**

## Installation procedure

This recloser is used in conjunction with an Eaton's Cooper Power series electronic recloser control. When installing the recloser, refer to the applicable recloser mounting frame instructions. Installation instructions are included with the mounting frame.

### ⚠ 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

### ⚠ CAUTION

**This equipment relies on dielectric fluid to provide electrical insulation between components. The dielectric strength of the fluid must be checked on a regular basis, as part of the routine maintenance inspection, to ensure that it is at or above minimum dielectric requirements. Use of this equipment with dielectric fluid that does not meet minimum requirements can result in internal flashovers that will damage the equipment and can cause personal injury.** G107.3

1. Check the oil level before putting the recloser into service. Using the dipstick provided on the recloser head, make sure the oil in the recloser tank is at the proper level (Figure 4). If the oil is below the minimum level, fill the recloser with oil to the proper level using the dipstick hole. Do not exceed the maximum oil level, as indicated by the dipstick.

**Note:** If the recloser is equipped with an oil-sight gauge, the oil level should be above the sight gauge window. If the oil line is visible in the window, add oil to raise the level to the upper line on the dipstick.

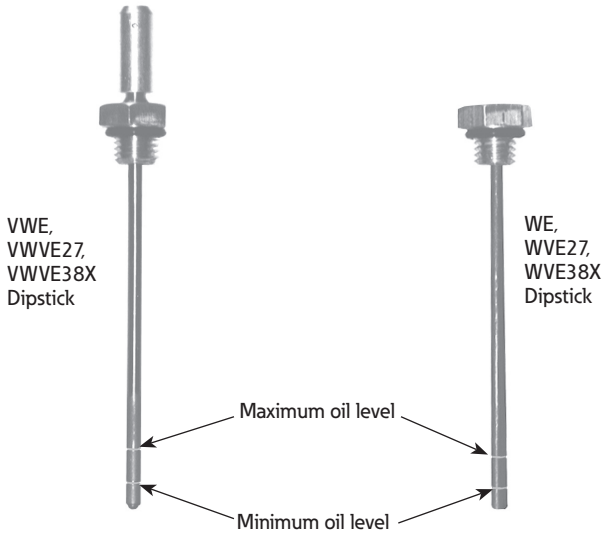



**Figure 4. W-Group oil dipsticks.**

### ⚠ WARNING

**Do not operate this equipment out of oil. Oil is the electrical insulating medium within this equipment; operation out of oil will result in internal flashovers that will damage the equipment and can cause death or severe personal injury.** G104.2

2. Test the oil dielectric strength. Perform a dielectric test on the oil in accordance with ASTM-approved testing procedures.
   A. On new equipment, the oil must have a minimum dielectric strength of 26 kV.
   B. If the dielectric strength of the oil is less than 26 kV, filter the oil to restore the dielectric strength to the acceptable minimum level.
3. Check the data plate ratings. Make sure the ratings on the recloser data plates are correct for the planned installation.
4. Mount the recloser.

   Eaton's Cooper Power series mounting frames should always be used; refer to the instructions accompanying that equipment.

### ⚠ WARNING

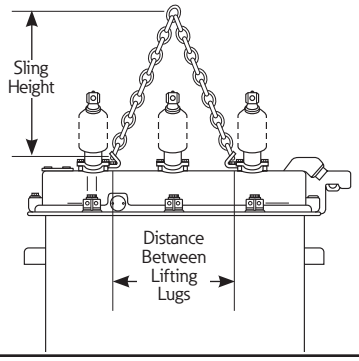
**Falling equipment. Use the lifting lugs provided and follow all locally approved safety practices when lifting and mounting the equipment. Lift the unit smoothly and do not allow the unit to shift. Improper lifting can result in severe personal injury, death, and/or equipment damage.** G106.3

### Lifting a recloser

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 recloser has two lifting lugs - both must be used when lifting. Maximum strength is attained with a vertical lift attached to the lugs. Use a spreader bar with a fixed attachment point for the hook at the load center.

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 lifting lugs.



5. Program and install the control. Refer to the control installation manual and install the control. Connect the control battery. Make sure that the control is properly programmed for the planned installation and that the control cable is connected between the recloser and control.

6. Ground the recloser. Make the ground connection to the recloser head and to the recloser control (Figure 5).

## ⚠ WARNING

**Hazardous voltage. Solidly ground all equipment. Failure to comply can result in death, severe personal injury, and equipment damage.** G223.2

## IMPORTANT

High-Voltage Closing Solenoid. To energize the closing solenoid, the source leads must be connected to terminals 1, 3, and 5 marked SOURCE on the head casting. Bushings connected to the closing solenoid are identified on the head casting.

7. Make high-voltage line connections (Figure 6).

**Note:** The six disconnect switches and three bypass switches are not required, but they do facilitate maintenance.

A. Connect high-voltage lines to recloser bushing terminals (Figure 6). The universal clamp-type terminals for main line connections accept 1/0- through 500-MCM cables.

B. Provide surge arrester protection. Surge arrester protection should be provided on at least one side.

- Substation-mounted reclosers. Connect the surge arresters on the load side.
- Line-mounted reclosers. Connect surge arresters on both the source-side and the load-side. If only one set of surge arrestersis used, the arresters should be connected to the source-side of the recloser.

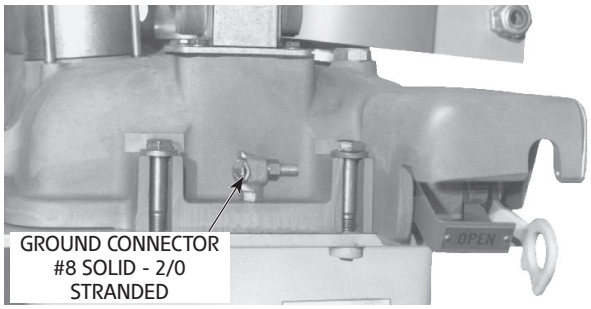



**Figure 5. Ground connector on recloser head.**

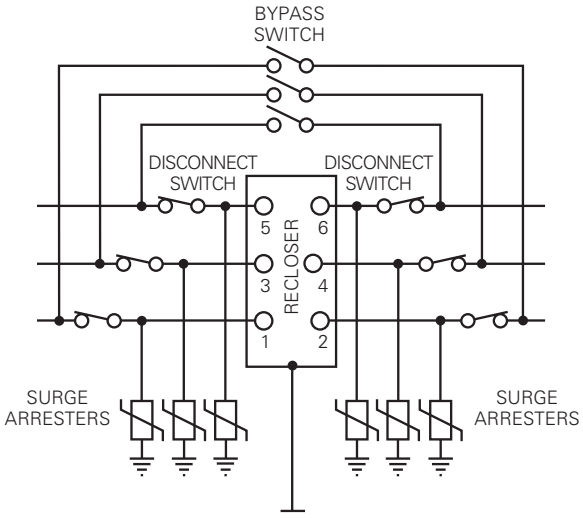



**Figure 6. Connection diagram shows complete surge protection and illustrates switches to facilitate maintenance.**

# Operation

## Manual operation

### Manual operation from the control panel

**To close recloser:**

1. Move manual control switch to the TRIP position.
2. Move yellow trip-reset handle on recloser up to its CLOSED position.
3. Make sure high-voltage source lines are energized, providing power to the closing solenoid if recloser has high-voltage closing solenoid.

**CAUTION**

**To prevent blowing the control fuse, on a Form 3A control that is not equipped with a fuse elimination accessory, the high-voltage source lines must be energized before operating the control's Manual Control Switch to the CLOSE position.** G225.0

**⚠ CAUTION**

**Equipment damage. Never operate the Manual Control Switch of any type of Eaton recloser control to the CLOSE position while the recloser is operating to lockout. The recloser will trip instantaneously and then start through a complete new sequence to lockout. If this should occur under high fault current conditions, the additional operations could cause damage to the recloser and result in possible personal injury.** T245.0

4. Move manual control switch to CLOSE. Recloser should close immediately.

**To open the recloser and lock out the control:**

Move the manual control switch, on control panel, to TRIP. The recloser will open and the control will lock out.

### Manual operation at the recloser

**To open the recloser:**

Pull down the yellow manual trip-reset handle located under the recloser sleet hood. Then operate the manual control switch to TRIP position.

**To close the recloser:**

Manual closing is normally accomplished from the control panel on the electronic control.

**Note:** The yellow trip-reset handle must be returned to the CLOSED position to permit recloser closing. If the control is in a closed condition when the yellow handle is moved up, the recloser will close.

The following closing procedure will ensure that the recloser and Form 3A control are synchronized, following an opening operation at the recloser (this procedure does not apply to a recloser connected to a Form 4C, FXA, FXB, Form 5, or Form 6 control, as the control automatically adjusts itself to the state of the recloser):

1. Move manual control switch, on operator control panel, to TRIP and release.
2. Return yellow handle on recloser to the up (CLOSED) position.
3. Move manual control switch, on operator control panel, to CLOSE and release. Recloser will close if source lines are energized at rated voltage.

**Note:** If recloser is equipped with the low-voltage closing accessory, proper voltage will have to be supplied to that circuit to accomplish closing.

### Initial operation

With the electronic control connected and energized and with the source lines energized, perform the following steps to place the recloser in service:

1. Operate the manual control switch, on the operator panel, to TRIP.
2. Set switches to NORMAL (unless altered operation is desired).
3. Move the yellow trip-reset handle, under the recloser sleet hood, to its CLOSED position.
4. Move the manual control switch, on operator control panel, to CLOSE.
5. Open the bypass switches or perform the equivalent operation with jumper switches if these are used instead of disconnect and bypass switches.

### Automatic operation

Once closed and in service, the electronic control will automatically cause trip and reclosing operations as programmed by the control. If the control sequences to lockout, the recloser will remain open (the red indicator blade under the sleet hood is in the down position) until the control is manually operated to close.

The control can be set for non-reclosing operation on the control panel: NORMAL RECLOSING to NON-RECLOSING. If a fault occurs, the control will operate to lockout after the first tripping operation.

Ground-trip operation can be blocked via the control panel: NORMAL to GROUND TRIP BLOCK.

## Control lockout

Indication of control lockout is provided on the control front panel when the recloser sequences to lockout or is manually or supervisory tripped to lockout.

**To place recloser back in service after the control has locked out:**

Move the manual control switch or depress the CLOSE pushbutton on the control panel to CLOSE. The recloser will close immediately, and, if a fault still exists, the control will perform the programmed number of operations to lockout.

## Cold-load pickup

When closing in after an extended outage, the cold-load inrush current or magnetizing inrush current may be great enough to trip the recloser. Provisions for cold-load pickup are built into the electronic control. Tripping on cold-load pickup generally can be prevented by the following procedure:

1. Set the ground-trip and recloser operating mode switches on the control according to local utility standard startup practices.
2. Move the manual control switch to CLOSE and hold. With the switch held on CLOSE, the recloser will close in and the control will operate on the programmed delayed phase-trip and ground-trip timing characteristics.

   Should a fault be present on the line during the coldload pickup procedure, the control will operate the recloser on the delayed timing characteristic once and lock out (if set in the NON-RECLOSING operating mode) or for a sequence of all delayed operations to lockout (if set in the NORMAL RECLOSING operating mode).
3. Release the manual control switch, letting it return to the center position.

## Testing

All reclosers are carefully tested and adjusted at the factory to operate according to published data. Wellequipped test facilities, a detailed testing procedure, and thoroughly trained personnel assure accurately calibrated equipment. Each recloser leaves the factory ready for installation.

Pre-installation testing is not necessary. However, should verification of recloser operation prior to installation be required, refer to the control installation instructions or to the applicable maintenance manual (listed in Table 8).

### Testing vacuum interrupters in VWE, VWVE27, and VWVE38X reclosers

To check the vacuum integrity of the interrupters in VWE, VWVE27, and VWVE38X reclosers, the following procedure can be used. Refer to the applicable maintenance manual (listed in Table 8) for additional information on this and other testing procedures.

### Safety requirements

To prevent accidental contact with high-voltage parts, the recloser and high-voltage transformer must be placed in a test cage and all proper grounding procedures must be observed.

**⚠ 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 in Service Information MN280062EN, Vacuum Interrupter Withstand Test Voltage Ratings Information for further information.**

G109.3

With the recloser open and the yellow trip-reset handle down, perform a hi-pot test for one minute across each open vacuum interrupter assembly at the following voltages:

Type VWE: 37.5 kV rms or 53 kV DC

Type VWVE27: 45kV rms or 63.5 kV DC

Type VWVE38X: 52.5 kV rms or 74.2 kV DC

The interrupter should withstand the test voltage and should not load down the source.

**CAUTION**

**Equipment damage. Recloser must be open (yellow operating handle, under sleet hood, down) before untanking. Tripping the mechanism out of oil will cause excessive mechanical shock to the operating mechanism, which will cause accelerated wear and/or damage to the mechanism.** T202.0

### Untanking the recloser

When untanking the recloser for inspection or repair, use care to keep from catching the corona shields on the inside lip of the tank. This is particularly likely on units that are heavily unbalanced, such as those equipped with accessory BCTs on one side.

## Accessories

Recloser accessories that require customer connections and/or customer furnished auxiliary power are described on the following pages.

Power requirements, connection instructions, and adjustments, where needed, are also included. A connection diagram for the recloser is shown in Figure 8.

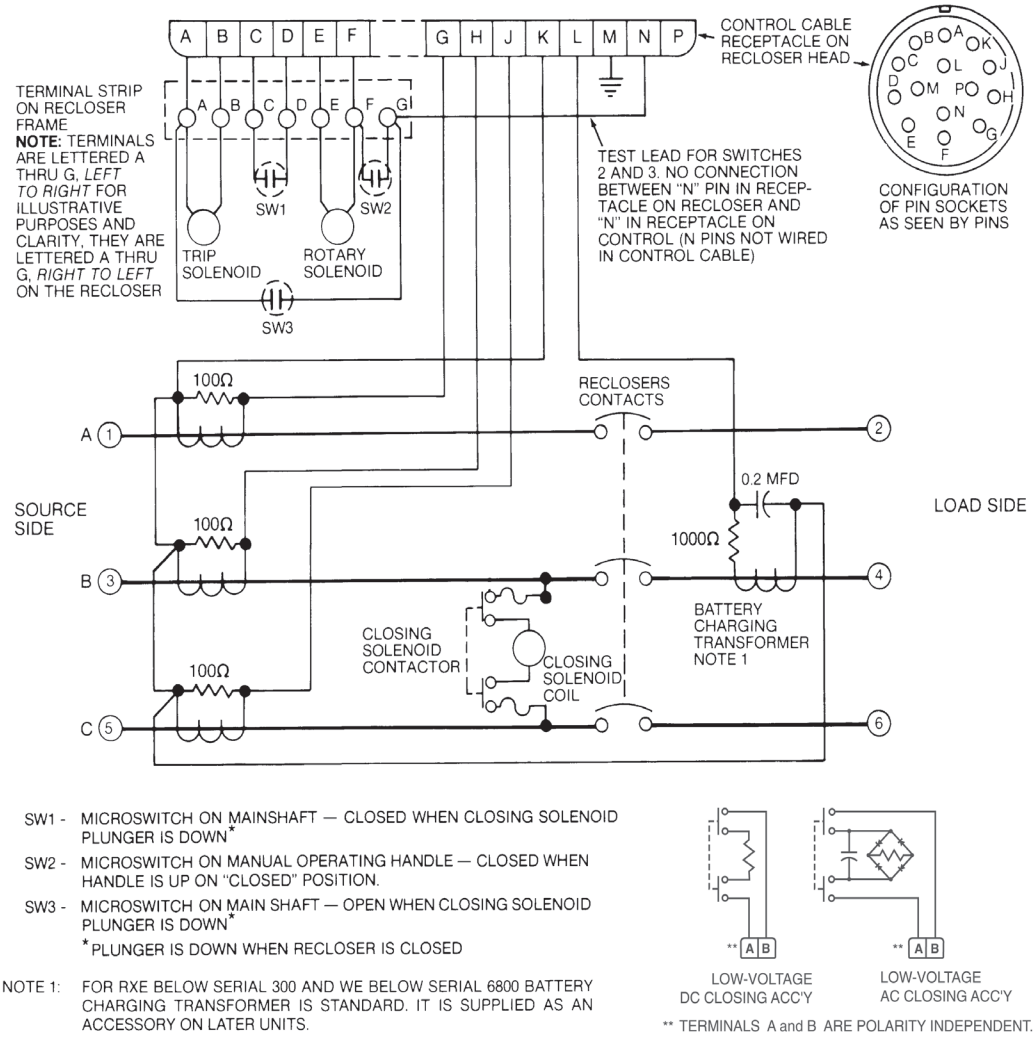



**Figure 7. Connection diagram for the recloser.**

### ⚠ 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

### Bushing-type multi-ratio current transformers

Either 600:5 or 1200:5 multi-ratio current transformers for operating relays or current meters can be installed on the load-side bushings (Figure 8) and/or the source-side bushings. These transformers have only one primary turn, which is the bushing rod. Taps on the secondary winding provide the different ratios. The available ratios and their corresponding terminal connections are shown in Table 5. The terminal arrangement for tapped secondary (Figure 9) is accessible when the cover plate on the transformer housing is removed.

| Table 4. Multi-Ratio Current Transformer Ratios and Terminal Connections | | | |
|---|---|---|---|
| **600:5 Multi-ratio BCT's** | | **1200:5 Multi-ratio BCT's** | |
| **Ratio** | **Terminals** | **Ratio** | **Terminals** |
| 600:5 | X1-X5 | 1200:5 | X1-X5 |
| 500:5 | X2-X5 | 1000:5 | X2-X5 |
| 450:5 | X3-X5 | 900:5 | X3-X5 |
| 400:5 | X1-X4 | 800:5 | X1-X4 |
| 300:5 | X2-X4 | 600:5 | X2-X4 |
| 250:5 | X3-X4 | 500:5 | X3-X4 |
| 200:5 | X4-X5 | 400:5 | X4-X5 |
| 150:5 | X1-X3 | 300:5 | X1-X3 |
| 100:5 | X1-X2 | 200:5 | X1-X2 |
| 50:5 | X2-X3 | 100:5 | X2-X3 |

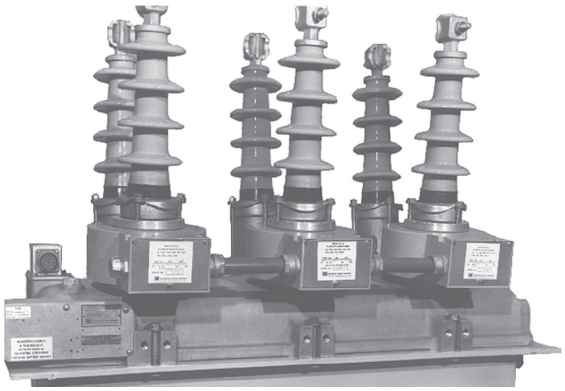


**Figure 8. Multi-ratio current transformers mounted on loadside bushings.**

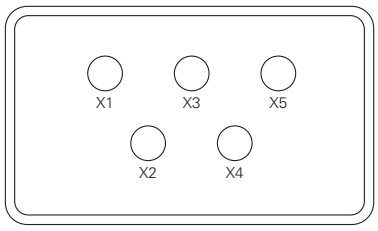



**Figure 9. Multi-ratio current transformers mounted on loadside bushings.**

## CAUTION

**Equipment damage. Do not use metallic (electrically conductive) conduit when connecting the current transformers that are enclosed in metal housings. Metallic conduit will form a shorted turn, linking the CT core, which will increase exciting current and adversely affect accuracy and it can also damage the transformer winding.** T227.1

## Auxiliary switch

Remote indication of recloser contact position can be accomplished with an auxiliary switch.

The three-stage switch (with switch cover removed) is shown in Figure 10. Each stage or section has two independent sets of contacts: a and/or b. When the recloser's main contacts are open, the a contacts are also open and the b contacts are closed. Table 6 shows the related recloser-switch contact positions.

| Table 5. Related Recloser/Switch Contact Position | | |
|---|---|---|
| **Recloser Contacts** | **Closed** | **Open** |
| Auxiliary a contacts are: | Closed | Open |
| Auxiliary b contacts are: | Open | Closed |

Switch contacts are insulated for 600 volts and have a continuous-current rating of 10 amps. The interrupting rating of the auxiliary switch contacts is shown in Table 7.

A 11/8-inch diameter wiring entrance hole is provided in the baseplate to accommodate standard 1-inch conduit cable bushing. Contacts can be changed for either a or b operation by repositioning the cams inside each switch section.

| Table 6. Auxiliary Switch Interrupting Ratings | | | | |
|---|---|---|---|---|
| **Volts** | **AC Inductive** | **AC Non-Inductive** | **DC Inductive** | **DC Non-Inductive** |
| 24 | – | – | 15.0 | 20.0 |
| 48 | – | – | 7.5 | 10.0 |
| 120 | 50 | 80 | – | – |
| 125 | – | – | 1.5 | 2.0 |
| 240 | 25 | 40 | – | – |
| 250 | – | – | 0.45 | 0.5 |

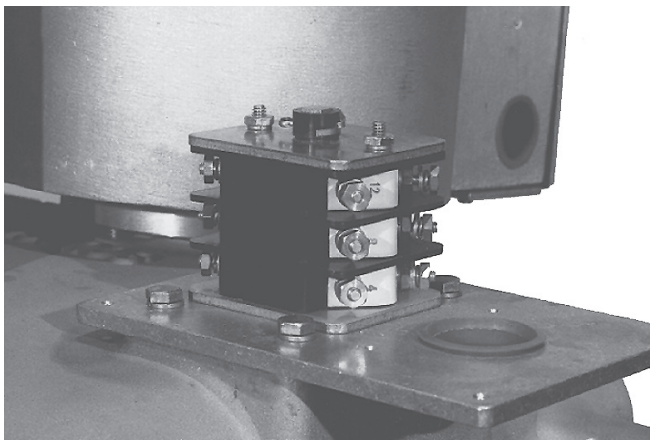


**Figure 10. Auxiliary switch.**

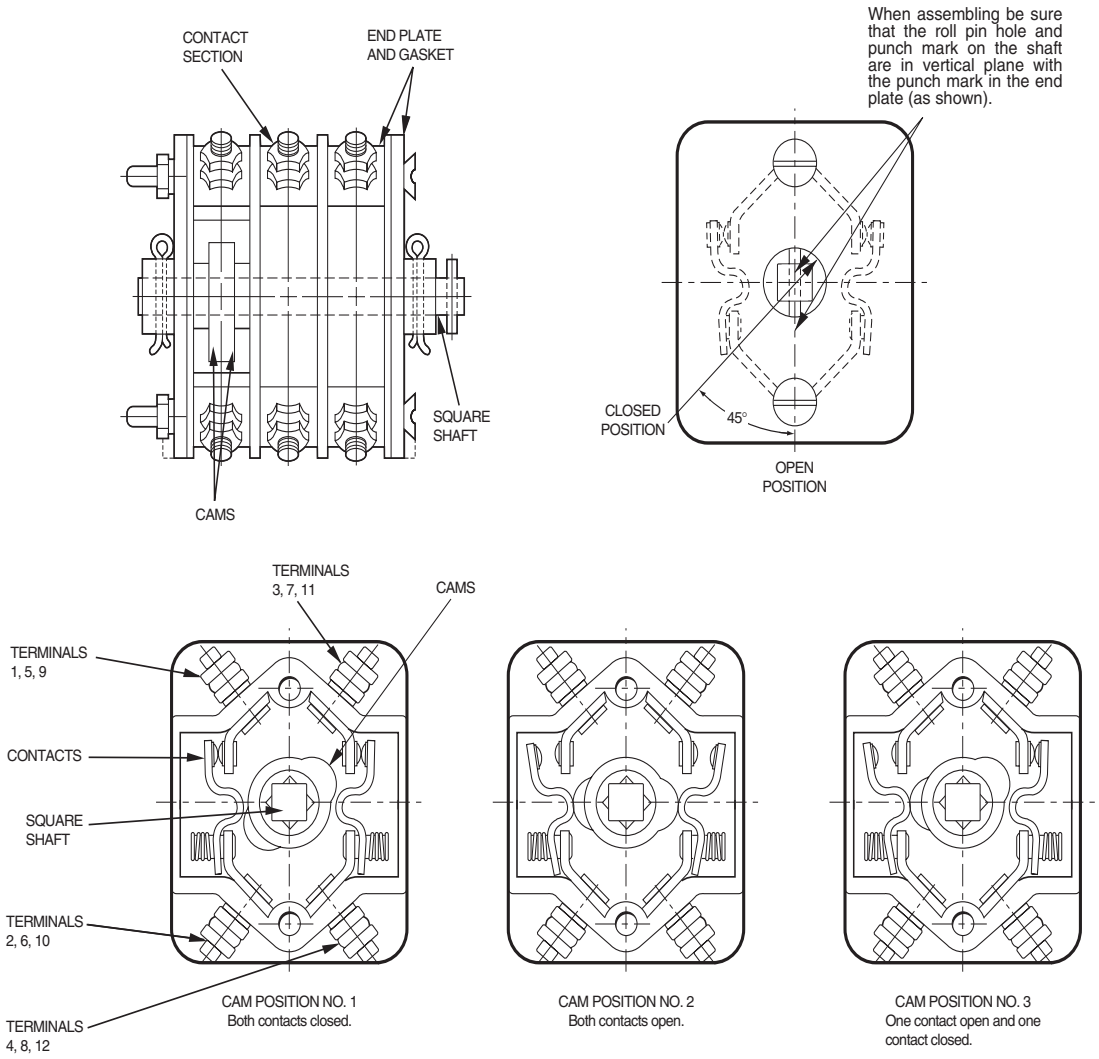



**Figure 11. Auxiliary switch cam positions.**

## To change any auxiliary switch cam position

1. Remove the auxiliary switch housing cover.
2. Remove the four screws and lockwashers securing the housing baseplate to the recloser head.
3. Lift off the entire switch assembly.
4. Remove the cotter pin and collar from the square shaft.
5. Remove the hexnuts and lockwashers from the two long machine screws holding the switch sections to the baseplate.
6. Starting with the bottom section, lift the cams off the square shaft.
7. Replace the cams in one of the positions shown in Figure 11.
8. Reposition and fasten the switch sections to the housing baseplate.
9. Replace the collar and cotter pin on the shaft.
10. Remount the assembled switch on the recloser head, making sure that the pin in the square shaft engage the notch in the switch-operating shaft in the head casting.
11. Verify correct operation of each contact on the switch by using a continuity meter.

## Low-voltage DC closing

With the substitution of a special DC closing solenoid, mechanism modifications, and associated wiring, the recloser can be closed by an externally supplied lowvoltage power source rather than from the primary highvoltage source. Low voltage is especially desirable in loop and load transfer schemes in which the recloser can be operated regardless of which side of the unit is energized. Current requirements for DC closing are 55 A at 125 Vdc and 30 A at 250 Vdc (momentary - five to six cycles in duration).

For reclosers equipped with low-voltage closing, a T-type double-receptacle assembly (Figure 11) is provided on the recloser head: one side is for connecting the electronic control; the other, for making low-voltage connections (polarity independent). No. 12 stranded conductors are recommended. The mating plug includes a weatherproof cable grip for 9/16-5/8-in. OD two-wire cable. Refer to Figure 14 for low-voltage DC closing connection requirements.

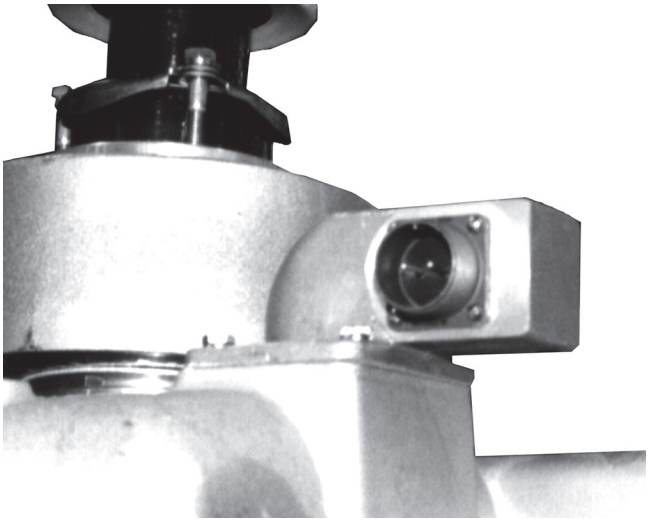


**Figure 11. Low-voltage connection fitting on top of recloser.**

## Low-voltage AC closing

The DC closing solenoid can be operated from a low-voltage AC source with the addition of a modified closing contactor equipped with a full-wave diode bridge (Figure 12).

Current requirements are 50 A at 120 Vac and 34 A at 240 Vac (momentary - five to six cycles in duration). A 5 kVA transformer with a 3% impedance should be adequate. Smaller transformers may successfully operate the closing coil provided their impedance is low enough to supply the required current at the required voltage for the required duration. Figure 13 illustrates the low-voltage AC closing connection requirements.

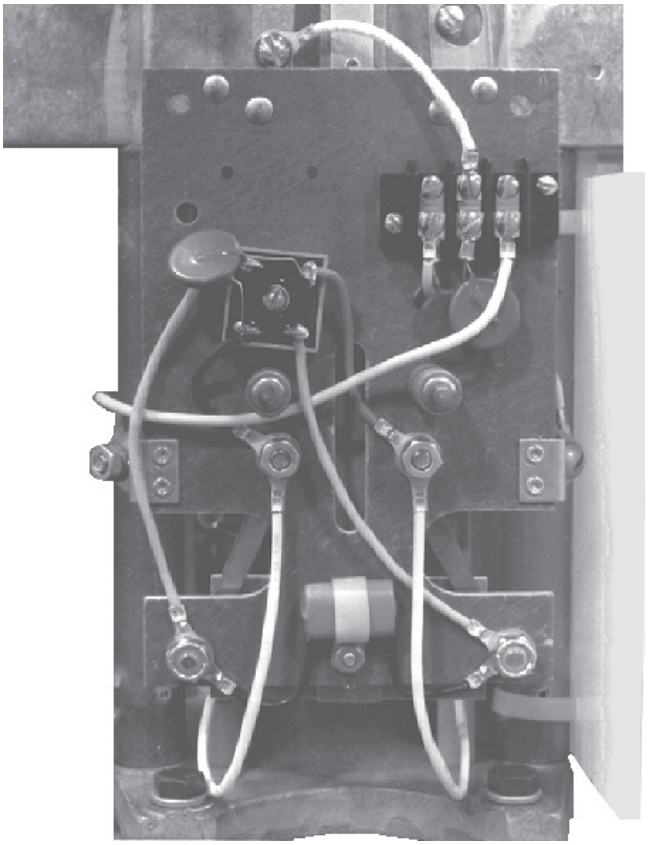
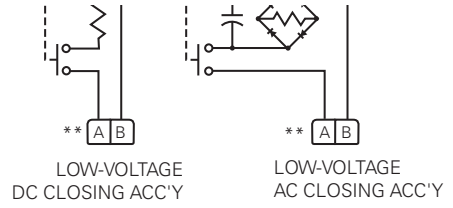


**Figure 12. Low-voltage AC closing contactor.**




** TERMINALS A and B ARE POLARITY INDEPENDENT.

**Figure 13. Low-voltage closing connection diagrams.**

## CT power source for battery charger

On reclosers controlled by Form 3A control only: if a 120 Vac source is not available to power the battery charger in the electronic control, the recloser may be equipped with a BCT accessory to supply battery charger power from the primary line. The accessory consists of a single BCT mounted under the recloser head on the loadside B phase. The accessory is wired to pins K and L of the Form 3A electronic control receptacle as shown in Figure 7.

To maintain a full battery charge, the line current through the recloser must exceed 40 amps for at least 12 hours per day.

## Manual closing tools

A T-handled closing tool, KA90R (Figure 14), is available for closing a de-energized recloser when high-voltage closing power is not available. If the recloser is mounted out of reach of the T-handled tool, the KA476R (Figure 15) manual closing tool can be used.

### ⚠ WARNING

**Explosion Hazard. Excessive Contact Arcing. Do not use the manual closing tool to close an oil-insulated energized recloser. Closing an energized oil-insulated recloser with a manual closing tool can cause excessive contact arcing, rapid build-up of gas within the equipment, and possible explosion that can cause death, severe personal injury and equipment damage.**

T203.2

**To close a de-energized recloser with the KA90R closing tool:**

1. Remove the closing tool port cover and gasket from the side of the recloser head casting.
2. Insert the KA90R T-handled closing tool into the port, and engage the pin on the closing shaft (Figure 14).
3. To close the recloser, place the yellow operating handle (under the sleet hood) in the up (CLOSED) position and turn the tool one-quarter turn clockwise.

### CAUTION

**Equipment damage. Do not turn the manual closing tool more than one-quarter turn clockwise. Forcing the tool beyond the mechanism stop may shear the pin on the closing shaft of the recloser.** T222.0

4. On reclosers controlled by Form 3A Controls only: operate manual control switch to CLOSE position, to synchronize control with recloser.
5. Replace the gasket and port cover before returning the recloser to service.

**To close a de-energized recloser with the KA476R closing tool:**

1. Place the yellow manual operating handle, located under the sleet hood, in the CLOSED (up) position.

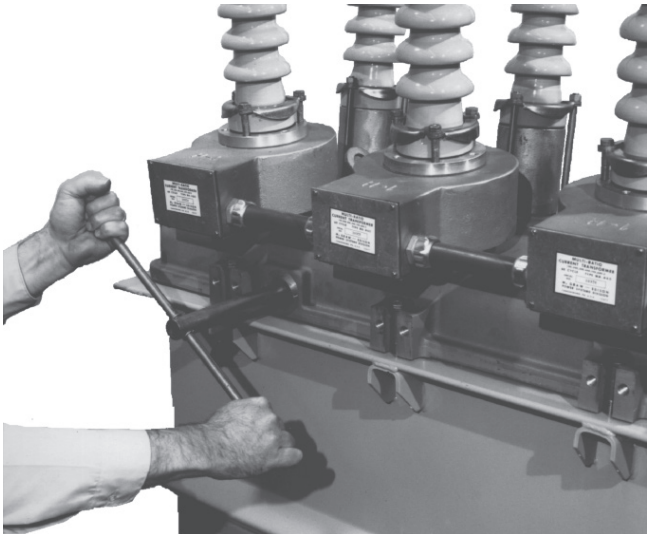


**Figure 14. Using a KA90R manual reclosing tool to operate the recloser.**

2. Engage the closing tool handle (Figure 16) in the operating socket and move the handle clockwise approximately 90 degrees to close the recloser.
3. After the recloser has been closed, remove the KA476R closing tool handle from the operator socket.
4. On reclosers controlled by Form 3A Controls only: operate manual control switch to the CLOSE position, to synchronize control with recloser.

**To trip the recloser:**

Pull down on the yellow manual operating handle.

### CAUTION

**Equipment Damage. Do not attempt to trip a recloser by operating the manual closing tool from CLOSED to OPEN. This will result in damage to the recloser operating mechanism.** T228.0

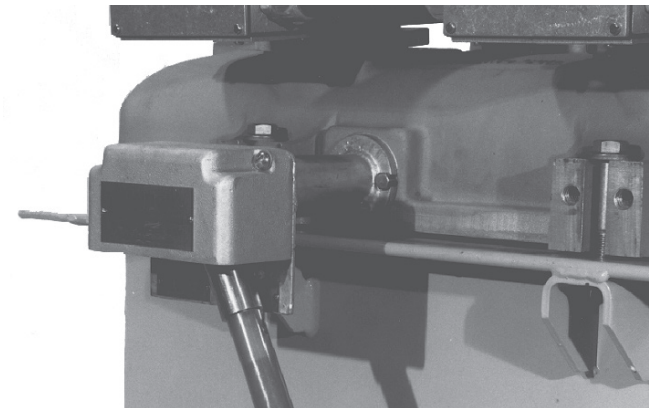


**Figure 15. KA476R manual closing tool.**

## Maintenance information

### Maintenance requirements

All Eaton reclosers and controls require routine inspection and maintenance to ensure proper operation. If the equipment is not adequately maintained, it may fail to operate properly.

**⚠ 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

**⚠ CAUTION**

**This equipment relies on dielectric fluid to provide electrical insulation between components. The dielectric strength of the fluid must be checked on a regular basis, as part of the routine maintenance inspection, to ensure that it is at or above minimum dielectric requirements. Use of this equipment with dielectric fluid that does not meet minimum requirements can result in internal flashovers that will damage the equipment and can cause personal injury.** G107.3

### Maintenance manuals

Maintenance instructions for three-phase electronically controlled reclosers are listed in Table 8. Reference Data TD280022EN provides information on oil specifications and tests.

### Frequency of maintenance

To assure proper and trouble-free operation, reclosers must be maintained when they have operated the equivalent of a rated duty cycle (see Table 3, Page 5).

**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.

**Table 7. Maintenance Manuals For Three-Phase Electronically Controlled Reclosers**

| Recloser Type | Service Information Bulletin Number |
|---|---|
| VWE, VWVE | MN280061EN |
| WE (S/N 6316 and above) | S280-40-7 |
| WVE (S/N 1000 and above) | S280-40-8 |

### Maximum recloser maintenance intervals

In the absence of specific operation experience, use the following guideline to establish maintenance intervals:

- Oil interrupting reclosers should be maintained at least every three years.
- Vacuum interrupting reclosers should be maintained at least every six years.

For additional information and specific maintenance requirements, including periodic maintenance inspection procedures, refer to the appropriate maintenance manual, shown in Table 8.

### Replacement parts

Replacement parts for Eaton reclosers are available through the factory Service Department. Only factory authorized parts are to be used. To order replacement parts, refer to the applicable maintenance manual and the current Replacement Parts price list for catalog numbers and pricing. Contact your Eaton representative for additional information and ordering procedures.

### Factory-authorized service centers

Factory-authorized service centers 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. These courses provide hands-on instruction and factory-recommended procedures for the routine maintenance, troubleshooting, repair, and testing of Eaton reclosers and controls. It is strongly recommended that all personnel who service and maintain Eaton switchgear attend the appropriate classes. For additional information, contact your Eaton representative.

### Instructional video programs

Two DVD maintenance training programs (*KSPV1A General Maintenance and Inspection Procedures for Eaton Reclosers* and *KSPV4A Mechanical Operation Service and Testing For Three-Phase Electronic Reclosers*) are available as supplemental training aids for maintenance and operations personnel. These video programs are to be used only as supplements to a comprehensive training program and in conjunction with existing service literature. For additional information, contact your Eaton representative.

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