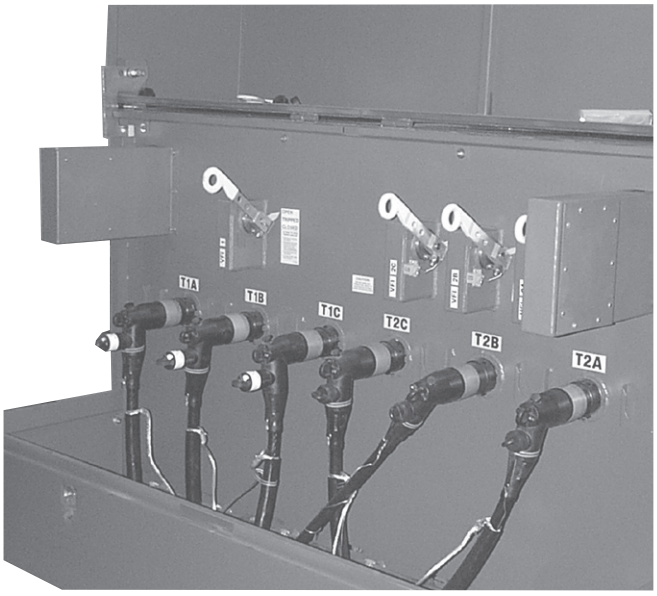
Type VFI Tri-Phase ground control retrofit instructions and internal CT polarity test procedures



Powering Business Worldwide

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Contents

Safety for life

Eaton's Cooper Power series 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 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 MN285017EN provides Installation, and Testing procedures for Eaton's Cooper Power series Type TPG Control. The kit literature is divided into two sections, the first section describes the installation procedure for the TPG Control, while the second section describes testing procedures to verify CT Polarity. Carefully read and understand the contents of this manual before installing this kit.

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 to 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, contact your Eaton representative.

Acceptance and initial inspection

Each Kit is completely inspected at the factory. It is in good condition when accepted by the carrier for shipment.

Upon receipt, inspect the carton for signs of damage. Unpack the kit 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 kit to minimize the possibility of damage. If the kit is to be stored for any length of time prior to installation, provide a clean, dry storage area. If storage is in a humid atmosphere, make provisions to keep the kit dry.

Standards

Underground distribution switchgear products are designed and tested in accordance with IEEE Std C37.60™-2003, IEEE Std C37.74™-2003, IEEE Std C.57.12.28™-2005, and IEEE Std 386™-2006 standards.

Quality standards

ISO 9001 Certified Quality Management System

Description

This kit allows the customer to retrofit existing Tri-Phase VFI units to Tri-Phase Ground status.

The kit is available in two forms, VFI units with top-hinge doors, and VFI units with side-hinge doors. Top-hinge kits will contain an enclosed "bolt-on" Tri-Phase box and wireharness, while the side-hinge units receive an "enclosure type" box with door, and cable. Each kit contains the necessary mounting hardware.

Refer to *Service Information MN285008EN Kyle Tri-Phase, TPG, TPG w/SCADA Electronic Control Installation and Operation Instructions, MN285006EN Oil-Insulated Operation and Maintenance Instructions, or MN285004EN SF_6-Insulated Operation and Maintenance Instructions for further information.*

Installation procedure

For VFI units with top-hinged doors

⚠ 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

Hazardous voltage. Do not rely on the open position of the yellow operating handle; 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. G116.0

⚠ CAUTION

Equipment damage. Always wear a grounding wrist strap to control static electricity before handling circuit boards. Failure to use this strap may result in circuit board damage. T253.1

1. Remove all potential from unit, and remove unit from service.
2. Remove the six nuts from the VFI Control box (See Figure 2) and carefully remove the box, exposing the cable.
3. Disconnect cable from front-plate receptacle.
4. Store old control box according to storage procedures listed in the front of this manual.

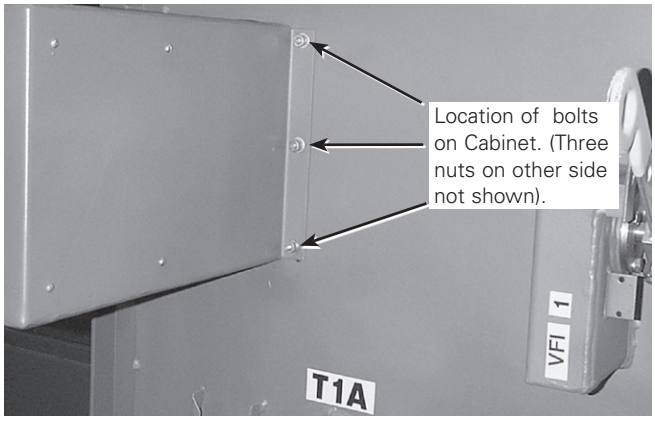

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Figure 1. Location of nuts on top hinge cabinet

5. Connect new TPG control cable to front plate receptacle and mount new control box.
6. Install six washers and six retaining nuts and tighten.
7. Refer to *Service Information MN285008EN Kyle Tri-Phase, TPG, TPG w/SCADA Electronic Control Installation and Operation Instructions, MN285006EN Oil-Insulated Operation and Maintenance Instructions, or MN285004EN SF_6-Insulated Operation and Maintenance Instructions for further information.*

Note: If unit is supplied with SCADA accessory, connect the supplied battery assembly to the appropriate terminals. For further information, refer to Service Publication MN285008EN.

For VFI units with side-hinged doors

⚠ 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

Hazardous voltage. Do not rely on the open position of the yellow operating handle; 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. G116.0

⚠ CAUTION

Equipment damage. Always wear a grounding wrist strap to control static electricity before handling circuit boards. Failure to use this strap may result in circuit board damage. T253.1

1. Remove all potential from unit, and remove unit from service.
2. Disconnect cable from front-plate receptacle.
3. Remove four mounting screws from front panel and remove circuit-board from control box (See Figure 3).
4. Remove four retaining screws and remove old control box from door. Store according to storage procedures listed in the front of this manual.

Note: Stainless Steel control boxes have mounting screws located on tabs outside of the box, and will NOT need to have the control-panel removed prior to removal of the control panel box.

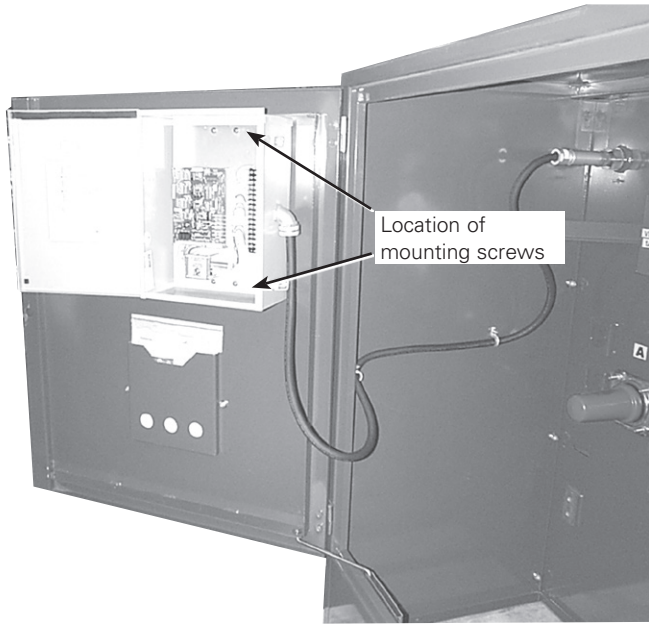

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Figure 2. Mounting of control box on side hinge units

5. Install new control box (non-stainless units) and then install new printed circuit board and mounting plate assembly into control cabinet.

Note: On stainless units, install four mounting screws to tabs on outside of box.

6. Connect the new TPG control cable connector to the front plate receptacle, and the control.
7. Refer to *Service Information MN285008EN Tri-Phase, TPG, TPG w/SCADA Electronic Control Installation and Operation Instructions, MN285006EN Oil-Insulated Operation and Maintenance Instructions, or MN285004EN SF_6-Insulated Operation and Maintenance Instructions for further information.*

Note: If unit is supplied with SCADA accessory, connect the supplied battery assembly to the appropriate terminals. For further information, refer to Service Publication MN285008EN.

Testing for proper internal CT polarity

⚠ 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

Test procedures for units retrofitted w/TPG control

Items required for testing

1. 2/0 Cable for use as jumpers.
2. 600:5 Current Transformer.
3. Current source (Variac).
4. Multimeter (ammeter).

⚠ WARNING

Hazardous voltage. Do not rely on the open position of the yellow operating handle; 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. G116.0

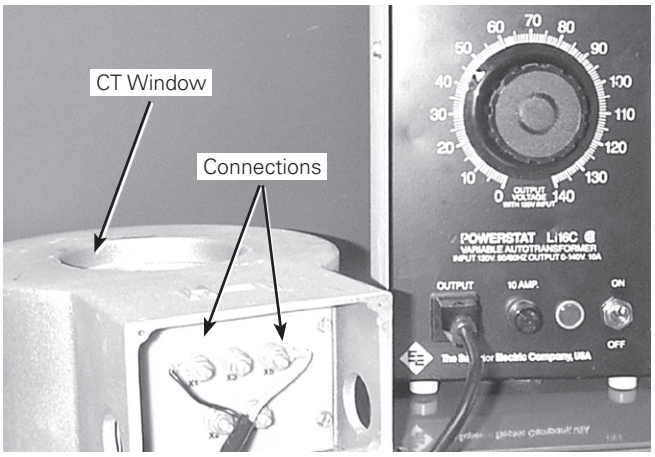

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Figure 3. Variac and CT showing connection of power source

Preparing unit for test

1. Remove potential from unit and remove unit from service.
2. Open source and load side switches.
3. Remove source and load side cables and insert them into their respective parking stands.
4. Connect a set of 2/0 jumpers from Load A-Phase bushing to Source B-Phase bushing and from Load B phase bushing to Source C-Phase bushing (See Figure 5).
5. Connect a 120Vac Voltage source (Variac) to the 5 Amp (secondary) side of a 600:5 Current Transformer (See Figure 4).
6. Connect a 2/0 jumper to AØ Source through the CT and to CØ Load side.

Note: Loop the current supply jumper through the CT 3 times to produce sufficient voltage for testing purposes (See Figure 6).

7. Place a clamp-on ammeter on the same jumper as the CT.

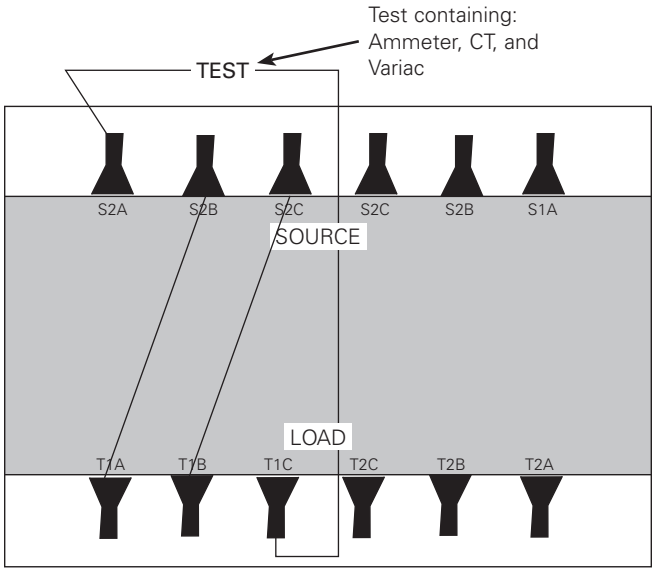

Figure 4. Typical padmount unit in three-phase test

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Figure 5. CT with current supply jumper looped through to increase output current supply

Verifying phase minimum trip

1. Place all dip-switches in the ON position as shown in Figure 7 (this will set minimum trip to 1290 Amps).
2. Turn Ground Trip Block to ON (blocking ground).
3. Set AØ Minimum Trip to 80 Amps (refer to label on new control panel door for dip switch settings).
4. Adjust current source to 65 Amperes, as shown in Figures 4 and 6.
5. Allow 30 seconds for unit to time out.

Note: Unit should not trip.

6. Increase current output to 95 Amperes.

Note: Unit should trip within 30 seconds

7. Return AØ to the 1290 Ampere setting.
8. Repeat steps 1-5 for BØ and CØ testing.

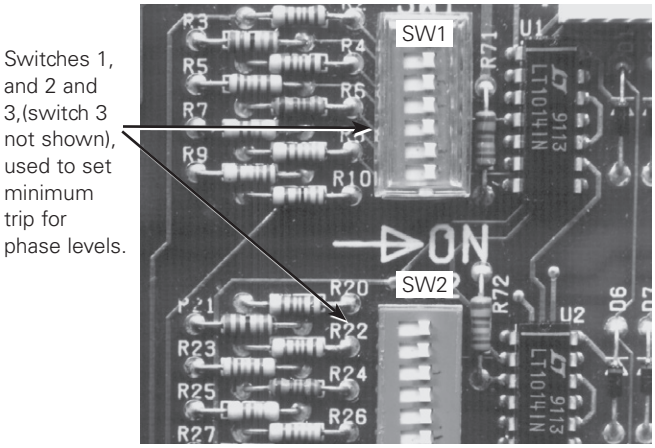

Figure 6. Switch 1, 2 and (3 not shown) for setting minimum trip

Verifying CT polarity

Proceed with the following test procedure to verify CT polarity.

1. Turn Ground Trip Block to OFF(enabling ground).
2. Set Ground Minimum Trip to 100 Amperes and set Phase to 1290 Amperes.

Note: Refer to NEW door decal for dipswitch settings.

3. Adjust current source to 28 Amperes for 30 seconds (unit should NOT trip).
4. Increase current to 40 Amperes.

Note: Unit should trip within 30 seconds. If all three phases trip, CT polarity is correct, and this test procedure is complete.

Note: If unit does not trip, one or more CT's may have reversed polarity. Proceed to the Identifying a Reversed CT test section.

Identifying a reversed CT

To identify reversed CT polarity, set Phase to 640A, Ground to 10A, and set Ground Trip Block to OFF. Apply a current of 100 Amperes.

Test 1

1. Place 2/0 jumper between A and B Phase of Load side of unit. (See Figure 8)
2. Install current source between A and B Phase on the source side (See Figures 4, 6 and 8).

Note: At this point, unit should not trip.

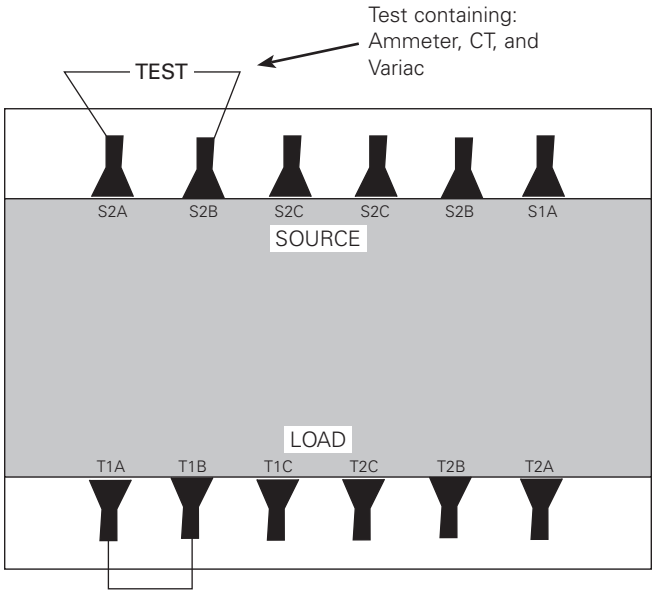

Figure 7. Typical padmount unit in AØ to BØ test

Test 2

1. Place 2/0 jumper between A and C Phase of Load side of unit. (See Figure 8)
2. Install current source between A and C Phase on the Source side (See Figures 4, 6, and 9).

Note: At this point, unit should not trip.

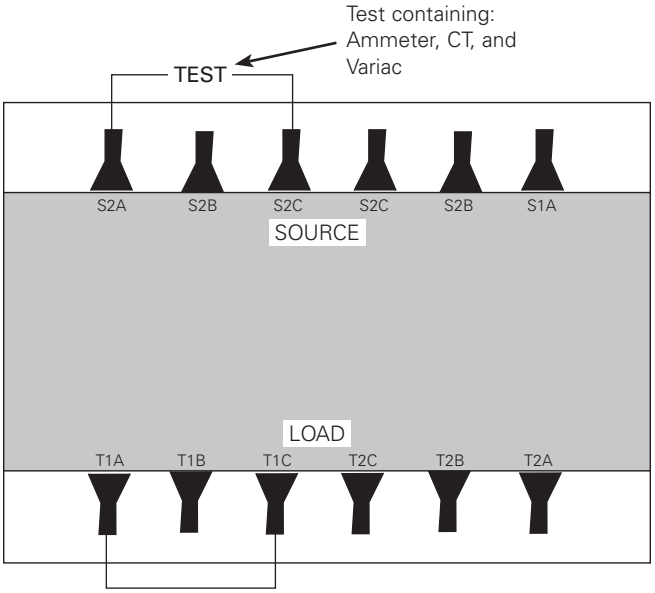

Figure 8. Typical padmount unit in AØ to CØ test

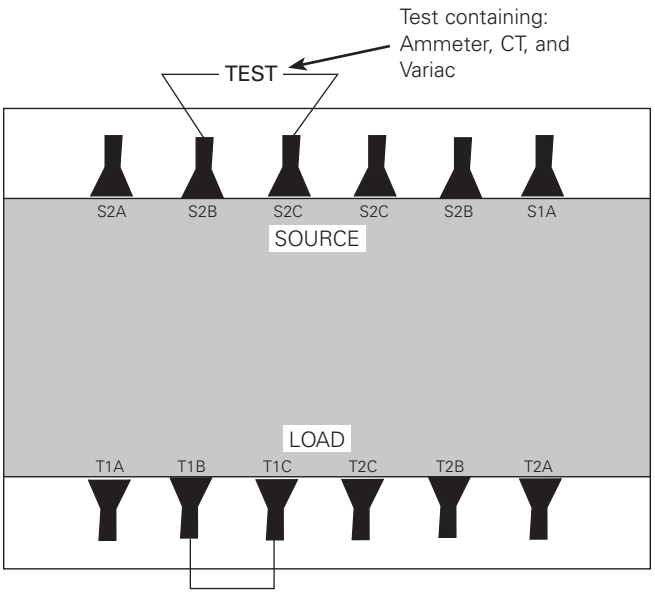

Figure 9. Typical padmount unit in BØ to CØ test

Test 3

1. Place 2/0 jumper between B and C Phase of Load side of unit (See Figure 10).
2. Install current source between B and C Phase on the source side (See Figures 4,6, and 10).

Note: At this point, unit should not trip.

Test results

If tests one and two fail, reverse white-red and white-orange wires in white pin connector cable routed to control circuit board P1 (See Figure 11).

Note: To release wires from connector place the blade of a small screwdriver in area designated in Figure 11. Make sure wire ends snap into place when placing wires back into pin connector.

If tests one and three fail, reverse black and white-brown wires in white receptacle of connector cable routed to control circuit board P1.

If tests two and three fail, reverse grey and white wires in white receptacle of connector cable routed to control circuit board P1.

After correcting wire connections in white receptacle, perform tests 1, 2 and 3 again to verify proper function.

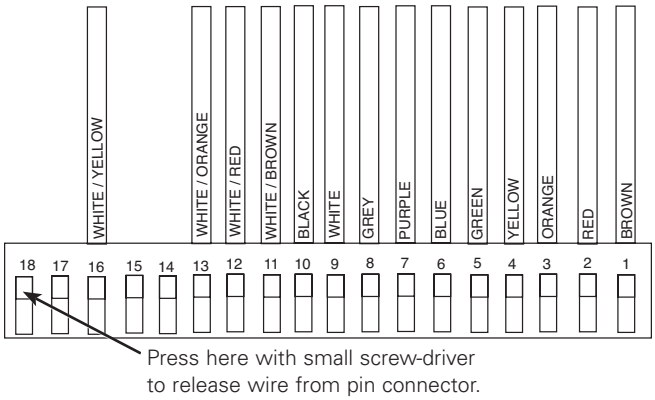

Figure 10. Pin connector for control circuit board shown with wires in factory locations

Maintenance 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

Factory-authorized service centers

Factory-authorized service centers are located throughout the continental United States to provide maintenance, repair and testing services for Eaton's Cooper Power series controls and reclosers. For further information, contact your Eaton representative.

Repair shops

Factory authorized repair shops are located throughout the continental United States to provide maintenance, repair, and testing services for Eaton's Cooper Power series

padmount switchgear and reclosers. For further information, contact your Eaton representative.

Instructional video cassette programs

A DVD program entitled *KSPV10 VFI Vacuum Fault Interrupter General Description and Operation* is available as a supplemental training aid for operating and service personnel.

This video program, developed for use in factory training school, is used in conjunction with existing service literature. For additional information, contact your Eaton representative.

Testing and returning unit to service

For testing and returning unit to service, refer to *MN285006EN Type VFI, Oil-Insulated Vacuum Fault Interrupter; Installation, Operation and Maintenance Instructions or MN285004EN Type VFI, SF_6 Insulated, Vacuum Fault Interrupter; Installation Operation and Maintenance Instructions.*

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