600 A 35 kV class PUSH-OP™ deadbreak connector installation instructions

Cooper
Power Systems
by EATON

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Contents

Safety for life

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

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

Safety information

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

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as 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

⚠ WARNING

Hazardous Voltage. All associated apparatus must be de-energized during any hands-on installation or maintenance. Failure to comply could result in death and severe personal injury.

⚠ WARNING

Optional Capacitive Test Point Operating Instructions: Use only voltage indicating instruments specifically designed for test points. Use of conventional voltage sensing devices may provide false "No Voltage" indications.

The test point must be dry and free of contaminants when checking for voltage. After indication is taken: clean, dry, and lubricate the test point cap with silicone grease and assemble to the test point.

The capacitive test point is not sufficiently accurate, nor is it intended for, actual voltage measurements or phasing operations.

A reading of no voltage from the test point should not be the only indication of a de-energized circuit obtained before touching the connector. Other procedures can include direct conductor voltage testing or grounding using a live-line tool.

Failure to comply could result in death and severe personal injury.

Product information

Introduction

Eaton's Cooper Power Systems 600 A, 35 kV Class PUSH-OP™ deadbreak connectors are used to terminate high-voltage underground cable on deadfront apparatus such as transformers, switches, and switchgear. They are fully shielded, submersible, and meet the requirements of IEEE Std 386™ standard – "Separable Insulated Connector Systems". 600 A deadbreak connectors are fully interchangeable with all other manufacturers that also certify compliance with IEEE Std 386™ standard. The PUSH-OP deadbreak connector is rated for 900 A when used with all 900 A current carrying components.

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.

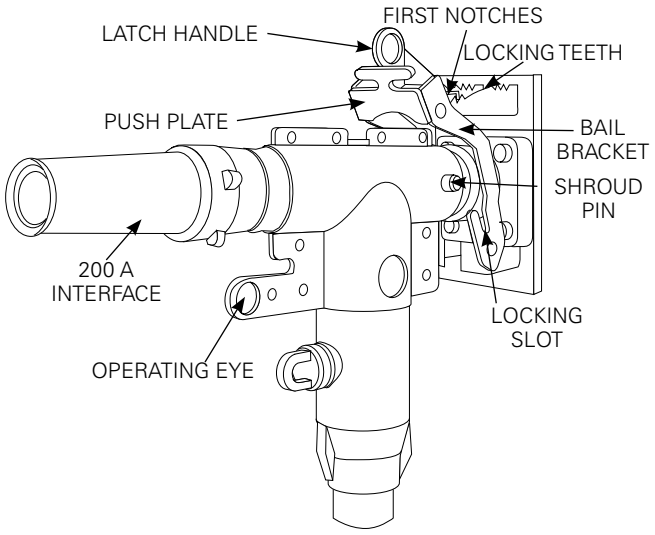


Figure 1. Line illustration of typical 35 kV PUSH-OP Connector Assembly.

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 representative.

Acceptance and initial inspection

Each PUSH-OP deadbreak connector is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the PUSH-OP deadbreak connector 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 PUSH-OP deadbreak connector to minimize the possibility of damage. If the PUSH-OP deadbreak connector is to be stored for any length of time prior to installation, provide a clean, dry storage area.

Standards

ISO 9001 Certified Quality Management System

Installation procedure

Equipment required

- PUSH-OP Terminator Assembly Kit including:
  - PUSH-OP Body
  - Cable Adapter
  - Coppertop Compression Connector
  - Loadbreak Reducing Tap Plug (LRTP)
  - Protective Cap (when furnished)
  - Silicone Lubricant
  - Tin Plated Copper Contact Probe
  - Instruction Sheet
- Tools
  - 5/16" Torque Tool (Catalog Number TQHD635)
  - 5/16" T-Wrench (Catalog Number TWRENCH)

Prepare the cable

Step 1. Train cable.

- Position cable vertically so that it is centered between apparatus bushing and parking pocket, parallel to, and 7" (178 mm) from apparatus frontplate.
- Provide adequate cable slack for cable movement between standoff bushing and apparatus bushing.
- Support cable as needed to maintain position.
- Cut cable 1 3/4" (45 mm) from centerline of bushing. (Refer to Figure 2.)

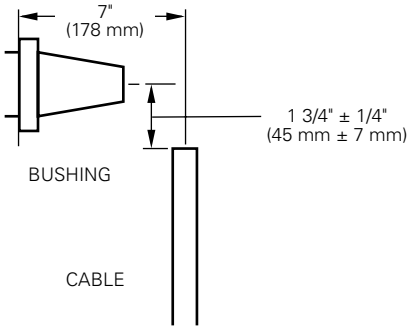


Figure 2. Line illustration for cable training.

Step 2. Remove concentric neutral wires or jacket.

Note: Care should be taken to not cut or score the neutral conductors when cutting the cable jacket.

- Measure 13" (330 mm) from end of cable. (Refer to Figure 3.)
  - If jacketed neutral cable, remove jacket to 13" dimension.
  - If unjacketed neutral cable, bind neutral wires using (3) wraps of tape at 14 3/4" dimension.
- Pull back concentric neutral wires. Allow enough extra concentric neutral wires to connect to ground after installation and allow movement to insulated standoff bushing.

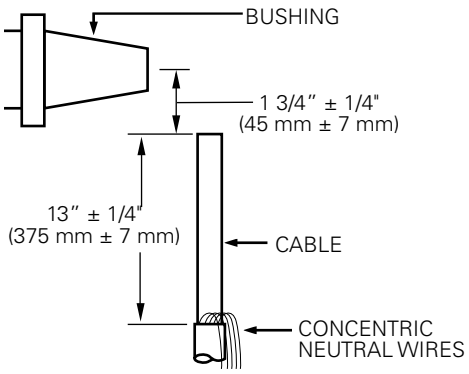


Figure 3. Line illustration of removing concentric neutral wires.

Step 3. Remove insulation shield.

- Remove insulation shield 10-1/2" (267 mm) from end of cable. (Refer to Figure 4.)

Note: Do not cut or nick insulation.

Step 4. Put tape marker in place.

- Measure 1" (25 mm) from end of insulation shield. (Refer to Figure 4.)
- Wrap two (2) turns of tape to serve as marker for cable adapter location.

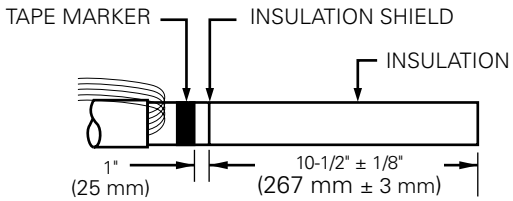


Figure 4. Line illustration of cable stripback.

Step 5. Remove conductor insulation.

Note: Do not pencil cable.

- Remove insulation exposing bare conductor to length of 4-3/8" (111 mm). (Refer to Figure 5.)

Note: Do not unwind conductor strands.

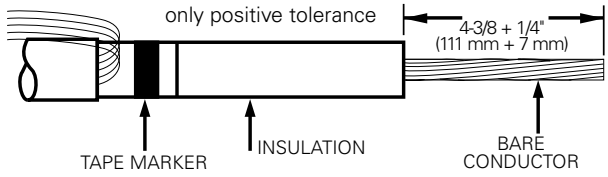


Figure 5. Line illustration of bare conductor length.

Step 6. Bevel insulation.

Note: This step is for ease of installation only and has no effect on electrical characteristics.

- Remove sharp edge of insulation by beveling at 45° angle for approximately 1/4" (6 mm). (See Figure 6.)

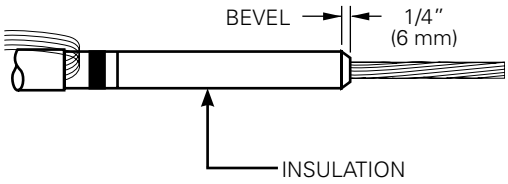


Figure 6. Line illustration of insulation bevel.

Step 7. Clean insulation.

Note: Apply solvent with a rag not directly to cable insulation.

- Clean insulation thoroughly with solvent dampened rag, wiping from conductor end toward insulation shield. (Refer to Figure 7.)
- Ensure that all traces of conductive residue are removed.

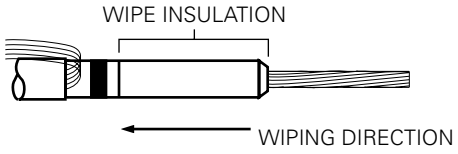


Figure 7. Line illustration of insulation cleaning.

Step 8. Lubricate and install cable adapter.

- Lubricate exposed cable insulation.
- Lubricate inside of cable adapter.
- Slide small end of cable adapter over cable using twisting motion until small end is flush with tape marker. (Refer to Figure 8.)
- After sliding the cable adapter into position make sure that no bulge is present (see Figure 9).

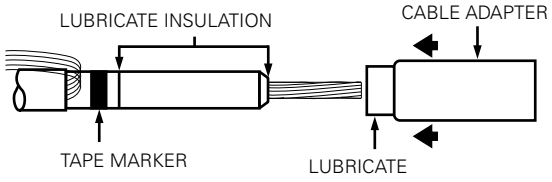
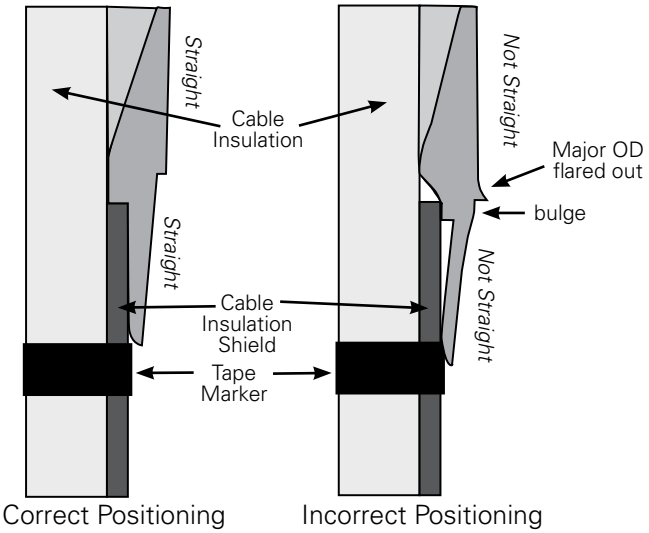


Figure 8. Line illustration of insulation cable adapter.

⚠ WARNING

Equipment Damage/Personal Injury. Improperly positioned cable adapter may result in equipment damage or personal injury.



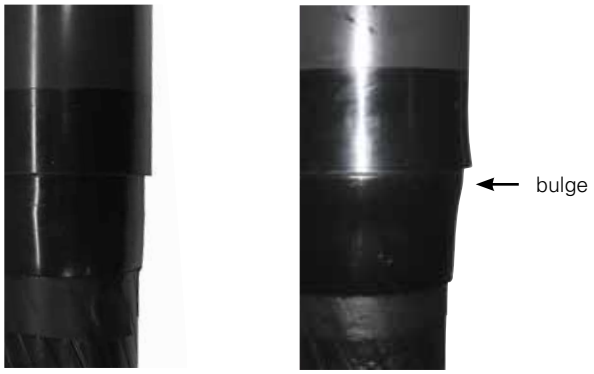


Figure 9. Cross sectional view of cable adapter positioning.

Step 9. Install compression connector.

Note: Refer to chart supplied with the crimp connector for tool and die to be used.

- Wire brush conductor, only if it is aluminum.
- Remove protective cap from compression connector.
- Insert conductor completely into compression connector and rotate connector to distribute inhibitor.

Note: Connector must be fully seated on cable conductor.

- Align flats of compression connector and apparatus bushing for minimum conductor strain.
- Make first crimp 1/2" (13 mm) below shoulder of compression connector. (Refer to Figure 10.)
- Rotate each successive crimp 90º on compression connector and allow 1/8" (3 mm) between crimps.
- Wipe excess inhibitor from connector and adapter surfaces.

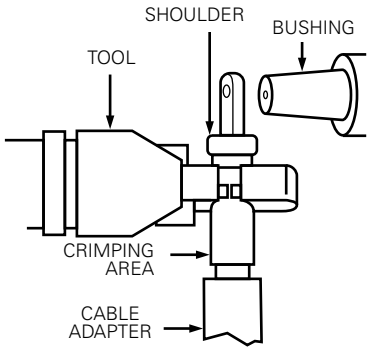


Figure 10. Line illustration of crimping area.

Step 10. Check dimensions.

- Check length from end of compression connector to top of cable adapter.
- Length should be between 6-3/4" and 7-3/4" (171-197 mm). (Refer to Figure 11.)

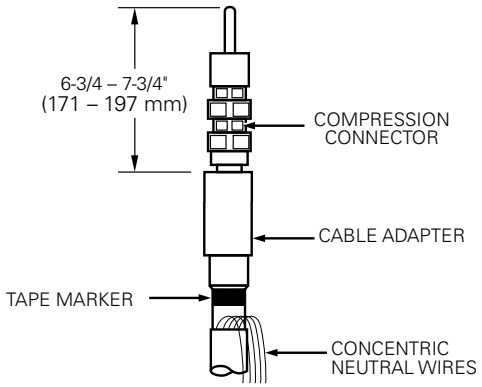


Figure 11. Line illustration for dimensional check.

Install T-Body and reducing tap plug

Step 11. Install PDT635 PUSH-OP body.

- Clean and then lubricate outside of cable adapter.
- Clean and lubricate inside of PUSH-OP.
  - Align PUSH-OP body so that operating eye is oriented away from apparatus bushing.
  - Slide PUSH-OP body onto cable until compression connector eye is centered between 600 A interfaces. (Refer to Figure 12.)
- Remove tape marker from cable.

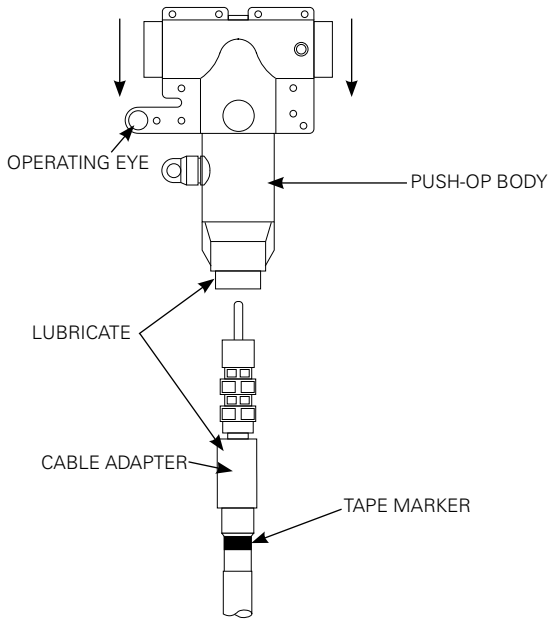


Figure 12. Line illustration of PUSH-OP Body installation.

Step 12. Install LRTP into T-Body.

- Clean and then lubricate the mating 600 A interface of the LRTP and T-body with the lubricant supplied.
- Remove and recycle the shipping cap from the 200 A LRTP interface and the thread protector from the alignment segment.
- Insert T-Wrench into throat of LRTP and thru rotating nut and engage alignment segment. (T-Wrench should not rotate without entire LRTP rotating.)
- Insert the 600 A alignment segment end of the LRTP into the side of T-body opposite the apparatus bushing. (Refer to Figure 13.)
- Carefully thread the alignment segment into the threads of compression connector by turning the T-Wrench clockwise until a positive stop is felt.
- Continue applying clockwise force to the T-Wrench until the pin connecting the alignment segment to the LRTP shears allowing the T-Wrench and alignment segment to rotate freely.
- Remove alignment segment by applying pressure to the T-Wrench to separate the alignment segment from the LRTP. Recycle the alignment segment.
- See Figure 14 for illustration of completed LRTP installation.

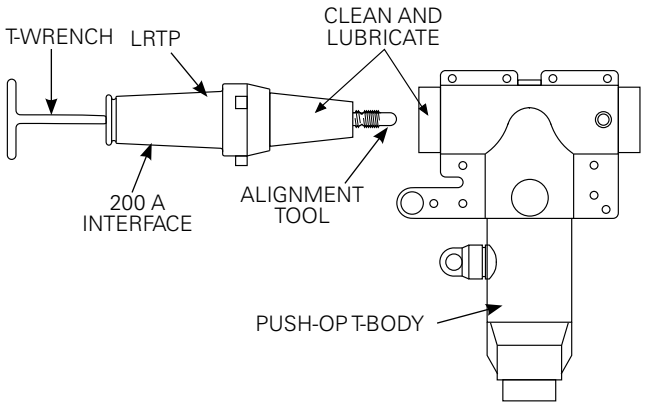


Figure 13. LRTP installation into T-body.

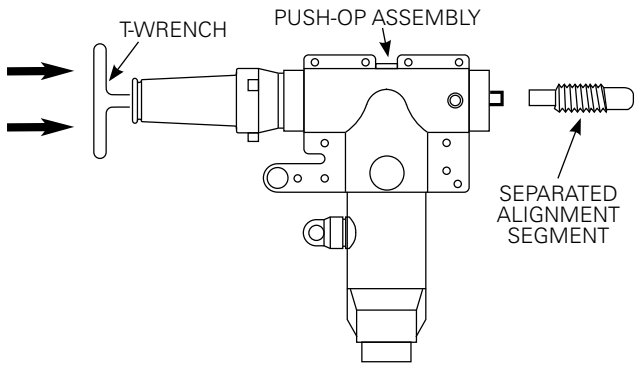


Figure 14. Line illustration of T-Wrench installation.

Step 13. Install probe.

- Place tin plated copper PUSH-OP probe with stud on 5/16" hex T-Wrench.
- Insert 5/16" hex T-Wrench into the end of the probe and align the exposed extended length threads of stud-T with the internal floating nut of the LRTP.

Note: Do not cross thread probe on floating nut.

- Insert torque tool into the throat of the LRTP to engage the floating nut.
- Holding probe in place with 5/16" hex T-Wrench, tighten probe until torque tool begins to ratchet (20 to 25 ft. lbs.). (Refer to Figure 15.)
- Remove Tools

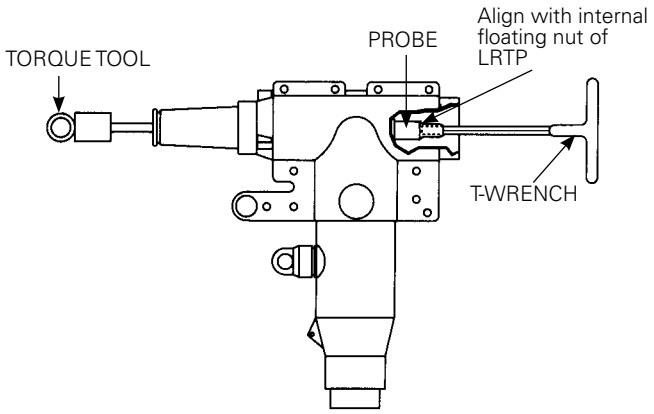


Figure 15. Line illustration of T-Wrench installation.

Install PUSH-OP terminator on apparatus bushing

Step 14. Install PUSH-OP terminator on apparatus bushing

- Clean and lubricate mating interface of PUSH-OP terminator and mating apparatus bushing.
- Grasp terminator operating eye with clampstick and pull eye completely into clampstick.
- Move terminator to apparatus bushing, engaging shroud locating pins in bail bracket locking slots (refer to Figure 16), and push until latch plate engages first notches. (Refer to Figure 17.)
- Release operating eye from clampstick.
- Push forward on push plate firmly with clampstick until a bump is felt and latch plate fully engages locking teeth. (Refer to Figure 18a.)

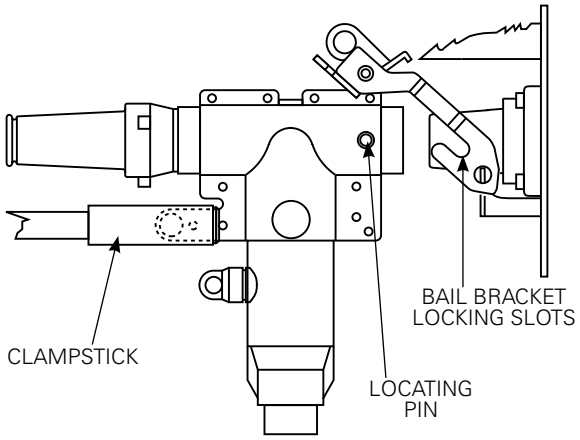


Figure 16. Line illustration of moving terminator to bushing.

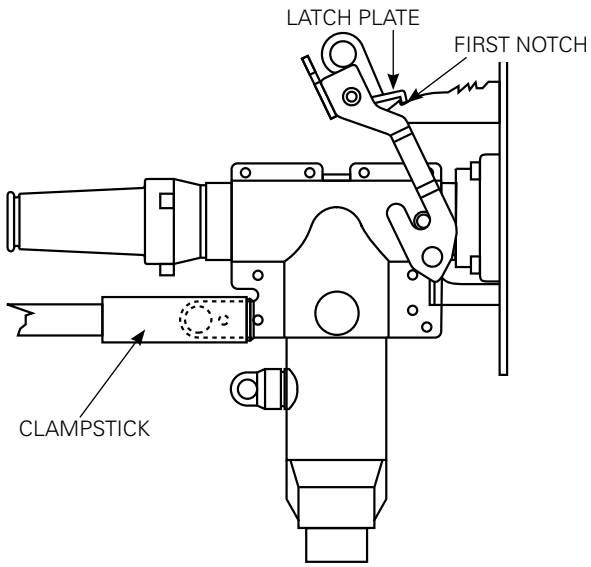


Figure 17. Line illustration of beginning engagement of latch plate.

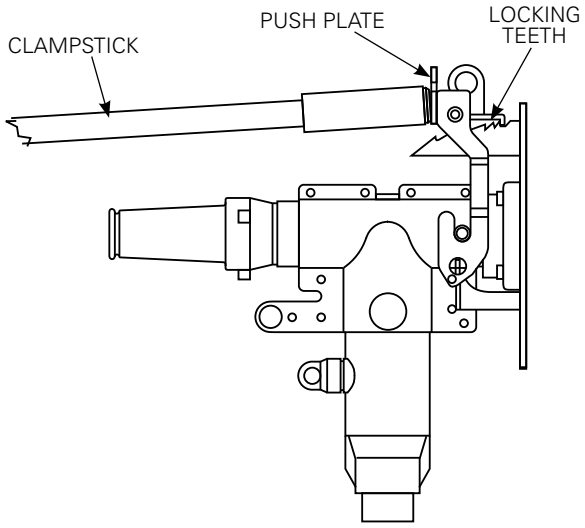


Figure 18a. Line illustration of full engagement of push plate.

- Pull on push plate with clampstick to ensure latch plate is engaged. (Refer to Figure 18b.)

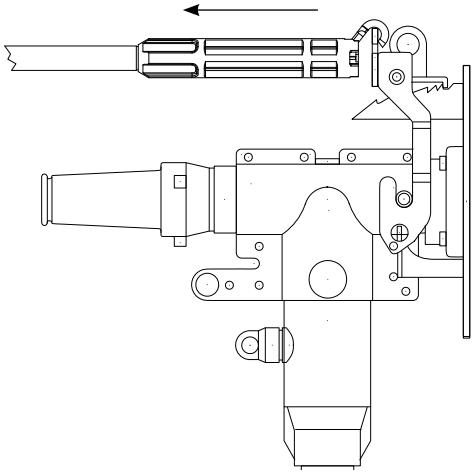


Figure 18b. Check latch engagement.

- If present, thread optional locking pin with clampstick to secure connection. (Refer to Figure 18c.)

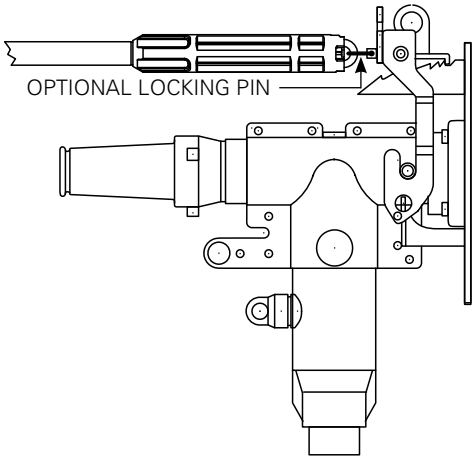


Figure 18c. Thread optional locking pin.

⚠ WARNING

Do not push on push plate while threading locking pin as this can cause the latch plate to become disengaged from the locking teeth. This condition can cause the PUSH-OP deadbreak connector to come off of the bushing during mating device removal, resulting in a line-to-ground fault causing serious injury or death.

(Refer to Figure 18d for incorrect positioning.)

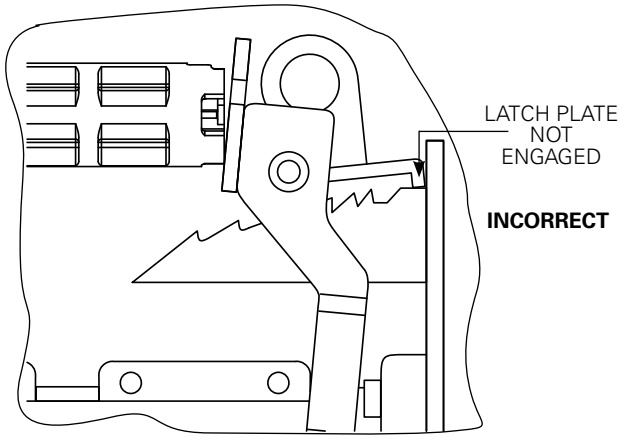


Figure 18d. Incorrect latch plate positioning.

- If optional locking pin is used, pull on latch plate's operating eye with clampstick to verify latch plate is still engaged in locking teeth after locking pin is tightened. (Refer to Figure 18e.)

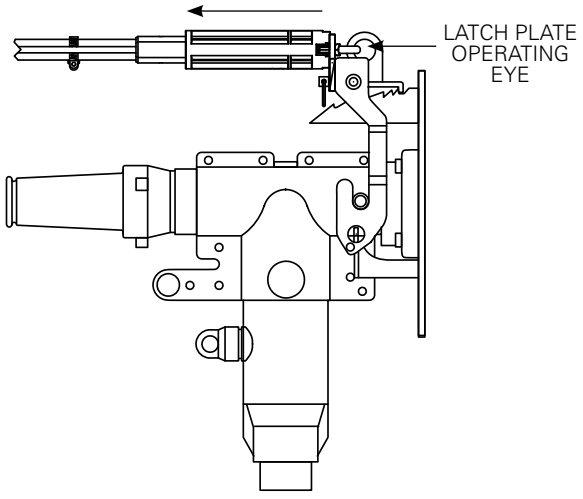


Figure 18e. Verify latch plate engagement.

Step 15. Cap the 200 A interface

- Clean and lubricate 200 A LRTP interface and mating apparatus (i.e., 200 A protective cap, grounding elbow, M.O.V.E. arrester).
- To cap interface, follow installation instructions supplied with apparatus used. (Refer to Figure 19.)

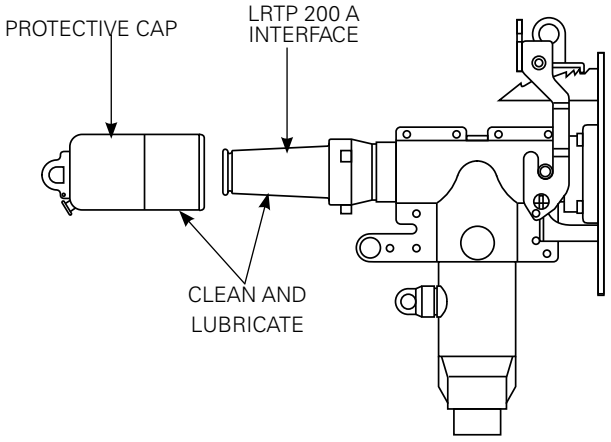


Figure 19. Line illustration of protective cap installation.

Step 16. Ground system

- Connect drain wire on insulated protective cap to system ground.
- Connect drain wire to LRTP grounding tab and shroud grounding tab.
- Connect drain wire to PUSH-OP body grounding tab and shroud grounding tab.
- Connect one strand of cable concentric neutral to shroud grounding tab. Connect remainder of concentric neutral wires to system ground. (Refer to Figure 20.)

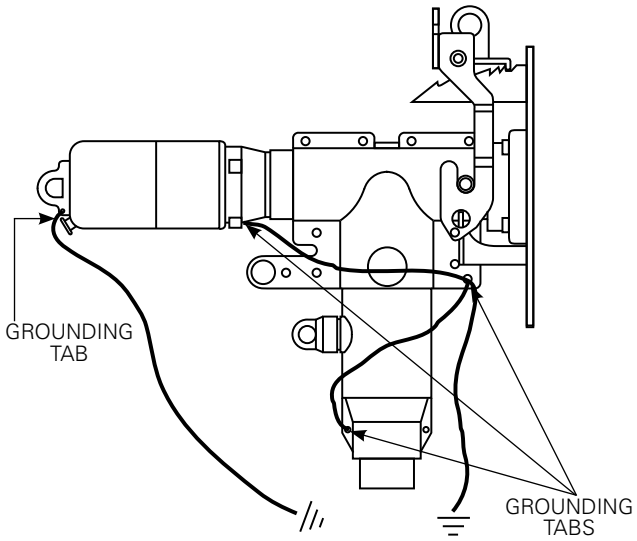


Figure 20. Line illustration of grounding.

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