

600 A 15, 25, and 28 kV class Cleer loadbreak connector system installation instructions



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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.

G122.3

Product information

Introduction

Eaton's Cooper Power series Cleer™ loadbreak connector system is a 600 A loadbreak device available in ratings for operation on 15, 25, and 28 kV class systems. It is used to provide a visible break and visible ground on 600 A network and distribution systems without having to remove 600 A terminations and move heavy cable. The Cleer loadbreak connector system is fully shielded, submersible and meets the applicable requirements of IEEE Std 386™-2006 standard – “Separable Insulated Connector Systems”.

Many configurations are possible with this connector system. Under normal operating conditions, the current path is through one of the 600 A loadbreak/deadbreak 2-position junctions (DLJ6_ _), through the 600 A loadbreak “C” (LCN) connector and through the second 600 A loadbreak/deadbreak junction.

When isolating underground cable, with the system energized or de-energized, with or without rated load current, with the use of a clampstick, the LCN connector can be removed. A 600 A loadbreak protective cap (LPC6_ _) can then be installed on the two exposed loadbreak interfaces. All bushings of the connector system are then insulated and deadfront. When a 600 A termination with a 200 A reducing tap plug is used on the IEEE Std 386™-2006 standard 600 A 15/25 kV deadbreak interfaces of the junction, a direct conductor test can be performed. A Cleer grounding elbow can then be installed on the 600 A loadbreak interfaces providing a visible ground. It is then safe to perform work on the underground cable.

Read this manual first

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

Additional information

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

Acceptance and initial inspection

Each connector is completely inspected and tested at the factory. It is in good condition when accepted by the carrier for shipment. Upon receipt of a connector, inspect the connector thoroughly for damage and loss of parts incurred during shipment. If damage or loss is discovered, file a claim with the carrier immediately.

Handling and storage

If the connector is to be stored for an appreciable time before installation, provide a clean, dry storage area. Locate the connector so as to minimize the possibility of physical damage.

Quality standards

ISO 9001 Certified Quality Management System

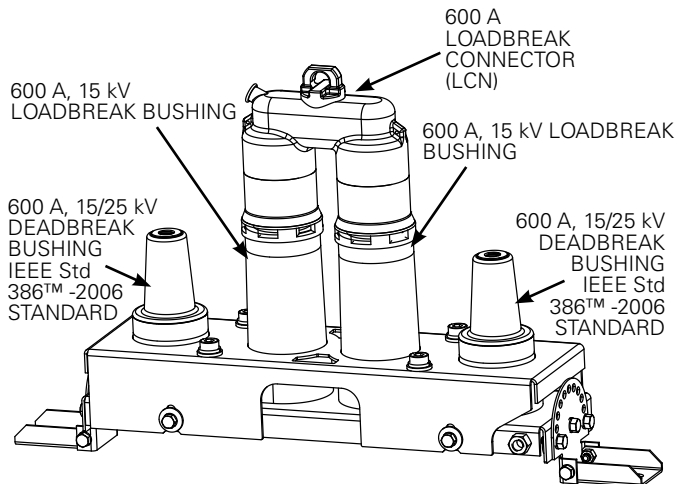


Figure 1. 600 A Cleer loadbreak connector system with in-line bracket (15 kV shown).

Typical configurations

In-line bracket configurations

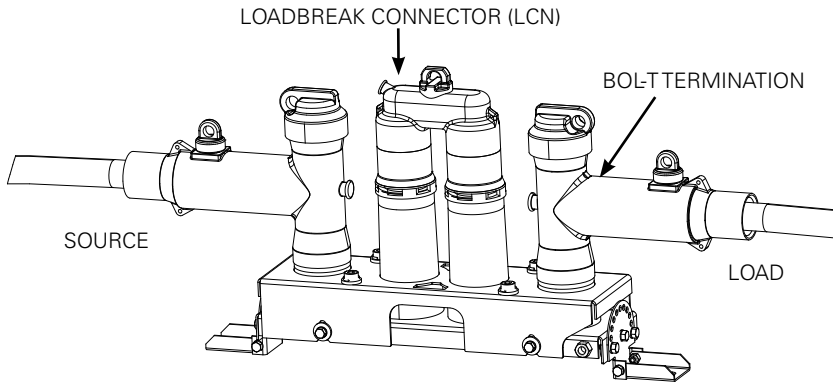


Figure 2. 600 A loadbreak connector system with (2) BOL-T terminations.

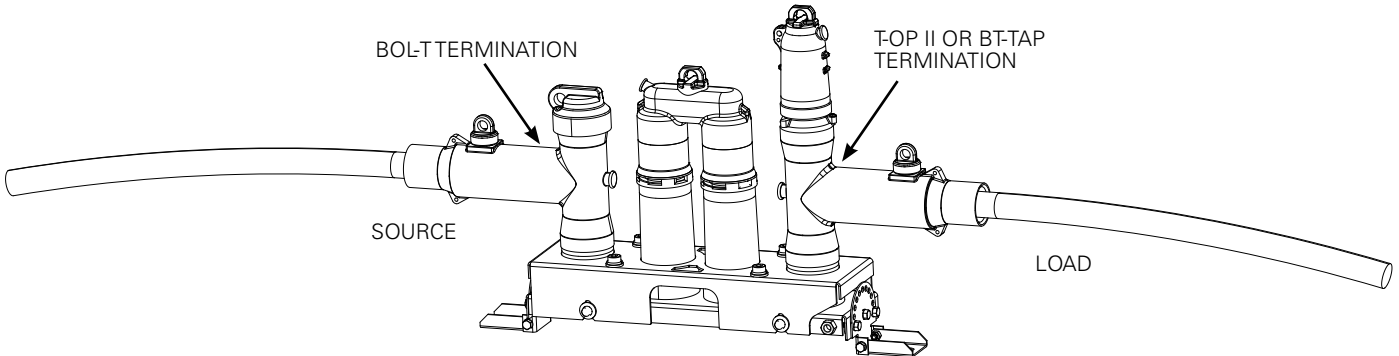


Figure 3. 600 A loadbreak connector system with (1) BOL-T and (1) T-OP II or BT-TAP termination.

Square bracket configurations

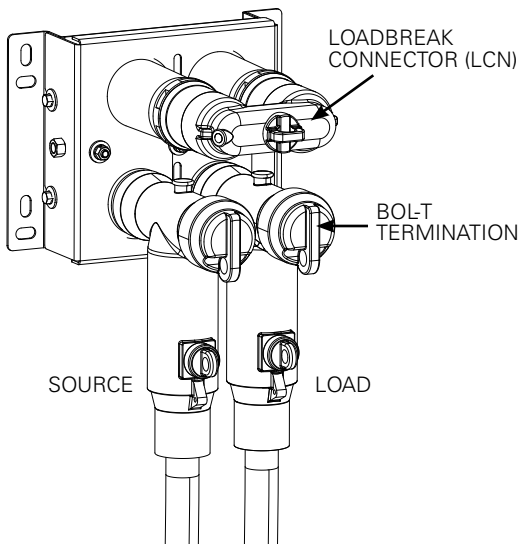


Figure 4. 600 A loadbreak connector system with (2) BOL-T terminations.

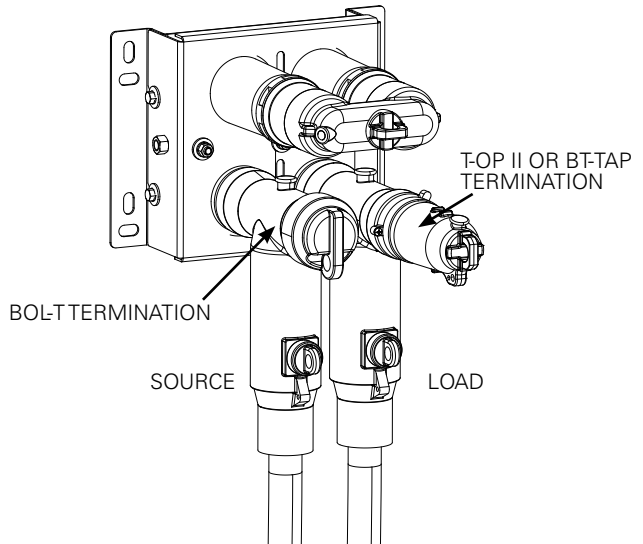


Figure 5. 600 A loadbreak connector system with (1) BOL-T and (1) T-OP II or BT-TAP termination.

Installation instructions

CAUTION

Eaton's 600 A loadbreak connector is designed to be operated in accordance with normal safe operating procedures. These instructions are not intended to supersede or replace existing safety and operating procedures. Terminators must be de-energized during installation and maintenance. Visible break and adequate grounding must be provided before cable work proceeds. (Ensure that the connector is rated for the intended application before it is installed.)

The loadbreak connector should be installed and serviced only by personnel familiar with good safety practice and the handling of high-voltage electrical equipment.

Equipment required

600 A Cleer loadbreak connector includes:

- Molded rubber connector (LCN)
- (2) 2-position 600 A loadbreak/deadbreak junctions with stainless steel bracket
- Mounting feet hardware kit
- Silicone lubricant
- Installation instruction sheet

Tools/Accessories needed:

- 1/2" wrench for mounting feet hardware (customer supplied)
- 1/2" mounting surface hardware (customer supplied)
- 3/4" wrench for mounting surface hardware (customer supplied)

In-line bracket instructions

Step 1

Using supplied 5/16" hardware, loosely attach pivot support/mounting feet assembly to each side of mounting bracket. See Figure 6.

Note: Refer to mounting configurations and dimensions on page 12, Figure 22.

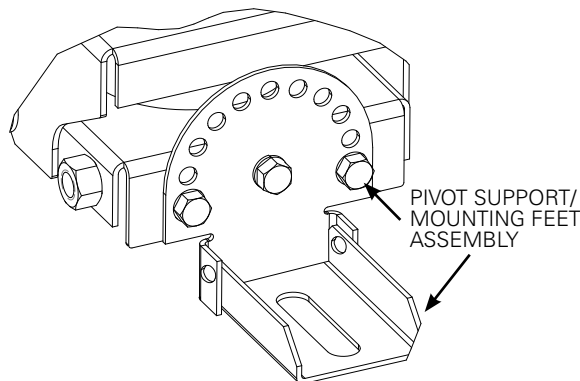


Figure 6. Attach pivot support/mounting feet assembly to bracket.

Step 2

Place assembly against the mounting surface.

Adjust the brackets for proper alignment and mark their location on the mounting surface. See Figure 7.

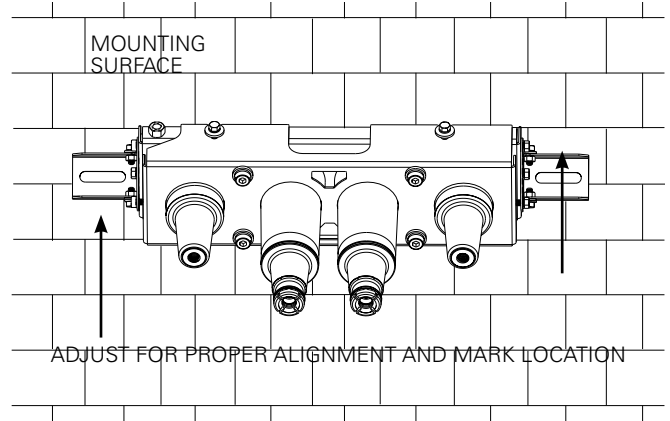


Figure 7. Adjust bracket and mark location.

Step 3

After mounting location has been marked, detach pivot support/mounting feet assembly from bracket. Using 1/2" hardware (customer supplied), mount pivot support/mounting feet assembly on mounting surface according to location marks made in Step 2.

Step 4

With pivot support/mounting feet assembly secure, using supplied 5/16" hardware, mount bracket with junction to pivot support/mounting feet.

Step 5

Adjust bracket to desired angle. Tighten all bolts securely. See Figure 8.

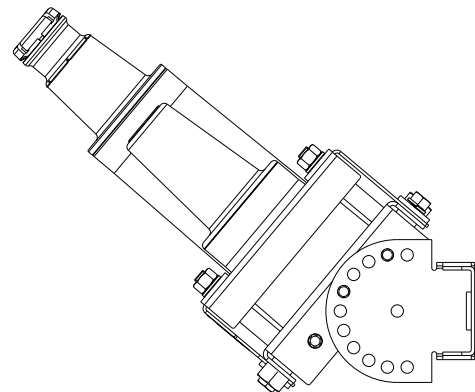


Figure 8. Bracket angle adjustment.

Step 6

Using supplied grounding clamps, connect bracket to system ground. Grounding clamp accommodates wire ranging from #8 sol to 2/0 str.

Attach drain wire of loadbreak connector (LCN) to system ground.

Step 7

Remove protective shipping caps from 600 A deadbreak bushing interfaces. Clean and lubricate.

Step 8

Install mating 600 A deadbreak terminations to each deadbreak bushing per the instructions provided with those kits.

Square bracket installation instructions

Step 1

Using 1/2" hardware (customer supplied) mount assembly to mounting surface or mounting plates of enclosure. See Figure 9.

Note: The assembly should be secured with four (4) bolts using one upper and lower slot on each side of the bracket.

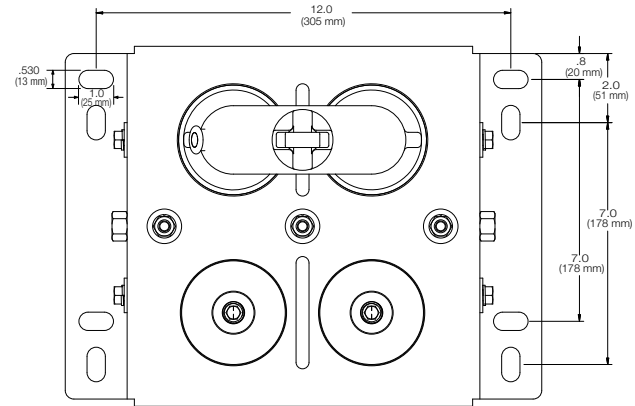


Figure 9. Square bracket dimensions.

Step 2

Using supplied grounding clamps, connect bracket to system ground. Grounding clamp accommodates wire ranging from #8 sol to 2/0 str.

Attach drain wire of loadbreak connector (LCN) to system ground.

Step 3

Remove protective shipping caps from 600 A loadbreak bushing interfaces. Clean and lubricate.

Step 4

Install mating 600 A deadbreak terminations to each deadbreak bushing per the instructions provided with those kits.

Operating instructions

WARNING

High Voltage. Cleer 600 A loadbreak bushings should only be mated with other Cleer 600 A loadbreak products. Do not attempt to mate 200 A loadbreak or 600 A deadbreak products to Cleer 600 A loadbreak bushings. Failure to comply could lead to a fault that may result in death or serious injury.

WARNING

High Voltage. Do not close or pull the Cleer connector slowly onto or off of the bushings during a loadmake or loadbreak operation. Failure to comply could tease the contacts leading to excessive arcing causing a fault that may result in death or serious injury.

WARNING

High Voltage. The Cleer 600 A loadbreak connector system is not designed to be switched under water. When operating the Cleer 600 A loadbreak connector system where moisture is present, such as during a rainstorm, take steps to ensure the connector interfaces stay dry. Failure to comply could lead to a fault that may result in death or serious injury.

Do not connect two different phases of a multiple-phase system. Before closing a single-phase loop, make certain both ends of the loop are the same phase.

Loadmake operation

WARNING

High Voltage. The operator should always use personal protective equipment (insulated gloves, clampstick and eye protection) whenever operating the connector. The operator should always be in the best possible operating position, providing firm footing and enabling a secure grasp of the clampstick positioned to the side of one's torso, while maintaining positive control of the connector before, during and immediately after operation. If there is any question regarding the operator's operating position, de-energize the connector before operation. The operator should not be looking directly at the connector during the moment of circuit interruption or connection. Failure to comply could result in death or serious injury.

Area must be clear of obstructions or contaminations that would interfere with the operation of the loadbreak connector (LCN).

Securely fasten a clampstick to the operating eye of the connector.

Place the loadbreak connector over the bushings, inserting both white arc followers of the probes into both bushings approximately 1-1/2" (38 mm). This will align and stabilize the connector.

WARNING

High Voltage. Verify that BOTH arc followers are approximately 1-1/2" into the bushings. Failure to comply could lead to a fault that may result in death or serious injury.

Turn your back to the bushings and grasp the clampstick securely and obtain good footing. Slam the connector onto the bushing with one firm, quick, and continuous motion.

Turn around and apply a force to the clampstick to push the connector onto the bushing. The yellow latch indicator rings on the bushings should be visible in the connector cuff windows at this point. See Figure 10.

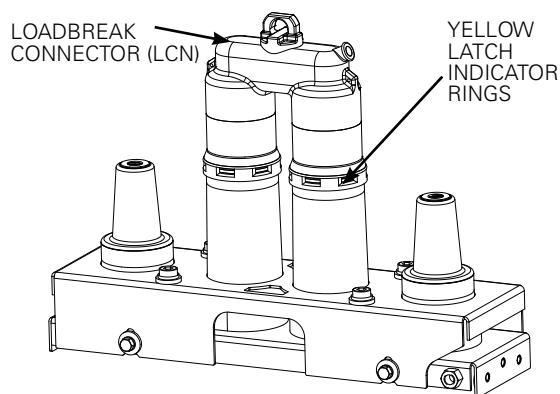


Figure 10. Yellow latch indicator rings are visible.

To check that the connector is properly latched apply a gentle pull force to the clampstick. When latched properly, the connector will slide back off of the bushing about 1/4" (5 mm) and stop. The yellow latch indicator rings on the bushings should not be visible at this point. See Figure 11.

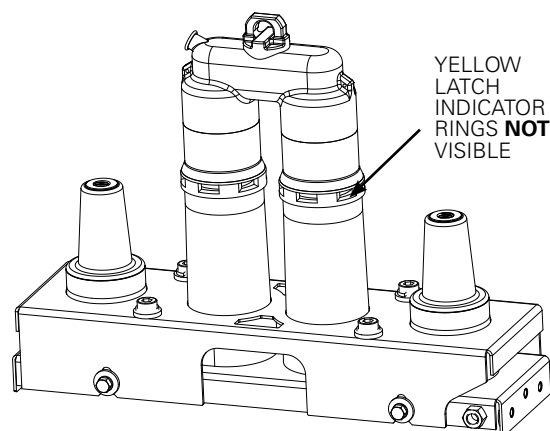


Figure 11. Yellow latch indicator rings are NOT visible.

Fault close

1. It is not recommended that operations be made on known faults.
2. If a fault is experienced, the connector and bushings must be replaced.

Loadbreak operation

Area must be clear of obstructions or contaminants that would interfere with this operation.

Secure connector operating eye firmly onto clampstick and lock.

Thrust clampstick **forward** until the connector moves approximately 1/4" (5 mm) further onto the bushings. This action will break any surface friction between outer surfaces of bushings and inner surfaces of connector interfaces. The yellow latch indicator rings on the bushings should now be visible in the cuff windows of the connector.

Looking away from the connector, pull the clampstick and withdraw the connector from bushings with a fast, firm, straight motion. Minimum amount of travel of connector to break load is 9" (230 mm).

Using the clampstick, move the connector away from the bushings and place the metallic portion of one of the probes directly onto a ground plane. This will discharge any capacitive charge that may still be on the probes. Alternatively, the "C" connector can be mated directly with the Cleer standoff bushing to discharge any capacitive charge that may still be on the probe.

WARNING

High Voltage. If the fiberglass contact tube of one or both loadbreak bushing(s) extends forward, the unit MUST be replaced. Failure to comply could cause thermal runaway failure or failure to successfully fault-close; this may result in serious personal injury.

Place an insulated protective cap with ground wire attached to system ground on the exposed energized bushings using clampstick.

Cable isolation and grounding instructions

CAUTION

The 600 A Cleer grounded elbow is designed to be operated in accordance with normal safe operating procedures. These instructions are not intended to supersede or replace existing safety and operating procedures. The grounding elbow should be installed and service only by personnel knowledgeable of good safety practices and fully trained on the installation and application of high voltage electrical equipment.

For product applications that require ratings or characteristics not shown, contact your Eaton representative for specific recommendations.

Equipment required

- (2) 600 A Cleer grounding elbows
- (2) 600 A Cleer standoff bushings
- (2) 600 A Cleer insulated protective caps
- Silicone lubricant
- Installation instruction sheet

Visible break and visible ground using T-OP II or BT-TAP terminations

WARNING

Visibly inspect grounding elbows, cables, ferrules, and clamps prior to installation to ensure they are complete, undamaged, and there is no corrosion or breakage. Damaged or worn grounding equipment can result in equipment failure that could cause property destruction or personal injury.

WARNING

All associated apparatus must be de-energized during installation or maintenance.

Step 1

Clean and lubricate apparatus

Clean and lubricate interfaces of protective caps and standoff bushings using lubricant supplied or Eaton equivalent.

Step 2

Install standoff bushing

Attach a #14 AWG copper drain wire from the standoff bracket ground lug to system ground.

Securely fasten a clampstick to the eyebolt on standoff bushing bracket and use the clampstick to position the standoff in standoff pocket. Tighten eyebolt against apparatus wall.

Step 3

Remove "C" connector

Refer to Loadbreak Operation shown in Operating Instruction on pages 6 and 7.

Install "C" connector on Cleer standoff bushing.

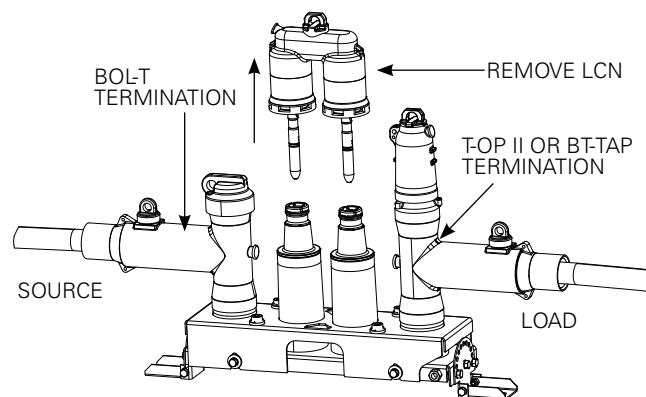


Figure 12. Remove "C" (LCN) connector.

Step 4

Install insulated protective cap

Attach Cleer loadbreak protective cap drain wire to system ground.

Using a clampstick, install a Cleer 600 A loadbreak protective cap on the source-side loadbreak bushing. See Figure 13.

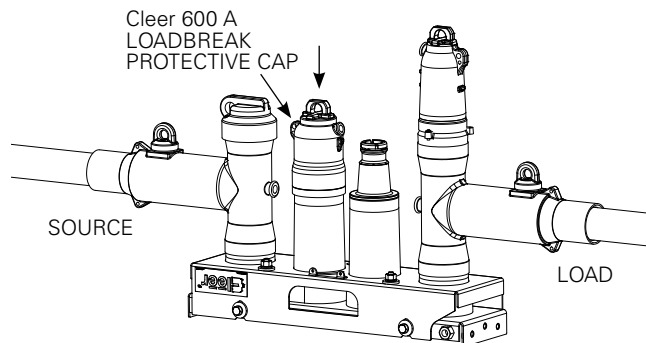


Figure 13. Install 600 A loadbreak protective cap.

Step 5

Remove 200 A protective cap

Using a clampstick, remove 200 A loadbreak protective cap from 200 A loadbreak reducing tap plug. See Figure 14.

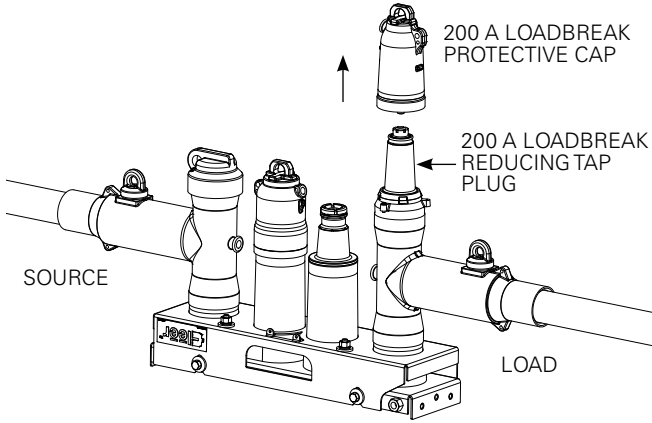


Figure 14. Remove 200 A loadbreak protective cap.

Step 7

Re-install 200 A protective cap

After circuit has been verified as de-energized, using a clampstick, re-install 200 A protective cap on loadbreak reducing tap plug. See Figure 16.

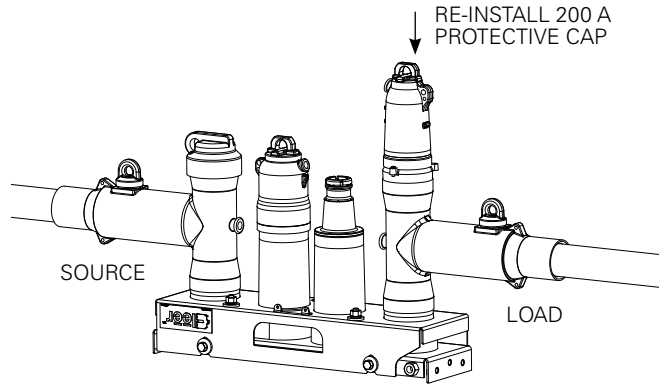


Figure 16. Re-install 200 A protective cap.

Step 6

Test

WARNING

All associated apparatus must be de-energized during installation or maintenance.

WARNING

Do not ground energized cable.

Using appropriate voltage sensing meter, test through 200 A interface to verify circuit is de-energized. See Figure 15.

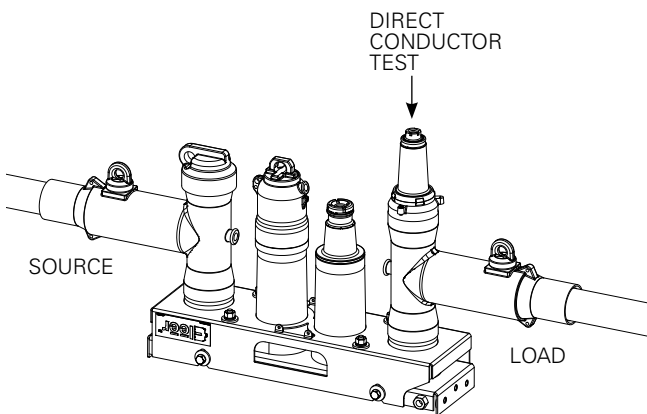


Figure 15. Verify circuit is de-energized.

Step 8

Install Cleer grounding elbow

Using a clampstick, install Cleer grounding elbow on load-side 600 A loadbreak bushing. See Figure 17.

WARNING

The operator should always use personal protective equipment (insulated gloves, clampstick and eye protection) whenever operating the elbow. The operator should always be in the best possible operating position, providing firm footing and enabling a secure grasp of the clampstick, while maintaining positive control of the elbow before, during and immediately after operation. If there is any question regarding the operator's operating position, de-energize the elbow before operation. The operator should not be looking directly at the connector during the moment of circuit interruption or connection. Failure to comply could result in death or serious injury.

Area must be clear of obstructions or contaminations that would interfere with the operation of the loadbreak elbow.

Securely fasten a clampstick to the pulling eye of the grounding elbow.

Place the grounding elbow over the bushing, inserting the white arc follower of the probe into the bushing approximately 1-1/2" (38 mm) until a slight resistance is felt. This will align and stabilize the elbow.

Turn your back to the bushing and grasp the clampstick securely and obtain good footing. Slam the elbow onto the bushing with one quick and continuous motion.

Turn around and apply a force to the clampstick to push the elbow onto the bushing. A popping or snapping sound is often heard when this operation is performed.

To check that the elbow is properly latched apply a gentle pull force to the clampstick. When latched properly the elbow will not slide back off of the bushing.

As a last operation, push on the clampstick to seat the elbow all the way onto the bushing again. This insures that the elbow is latched and was not dislodged during the latching check in previous step above.

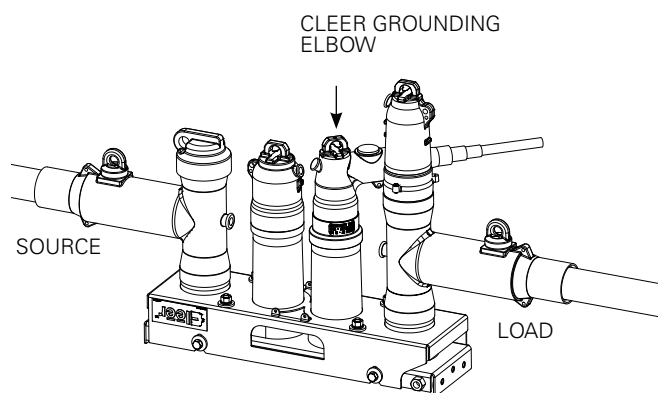


Figure 17. Install Cleer grounding elbow.

Step 9

Repeat process

⚠ WARNING

This procedure must be performed on both ends of the cable for complete grounding.

Repeat steps 1 through 8 on opposite end of cable.

Visible break and visible ground using BOL-T terminations

WARNING

Visibly inspect grounding elbows, cables, ferrules, and clamps prior to installation to ensure they are complete, undamaged, and there is no corrosion or breakage. Damaged or worn grounding equipment can result in equipment failure that could cause property destruction or personal injury.

WARNING

All associated apparatus must be de-energized during installation or maintenance.

Step 1

Clean and lubricate apparatus

Clean and lubricate interfaces of protective caps and standoff bushings using lubricant supplied or Eaton equivalent.

Step 2

Install standoff bushing

Attach a #14 AWG copper drain wire from the standoff bracket ground lug to system ground.

Securely fasten a clampstick to the eyebolt on standoff bushing bracket and use the clampstick to position the standoff in standoff pocket. Tighten eyebolt against apparatus wall.

Step 3

Remove "C" connector

Secure loadbreak "C" (LCN) connector operating eye firmly onto clampstick and lock.

Thrust clampstick **forward** until the connector moves approximately 1/4" (5 mm) further onto the bushings. This action will break any surface friction between outer surfaces of bushings and inner surfaces of connector interfaces. The yellow latch indicator rings on the bushings should now be visible in the cuff windows of the connector.

Looking away from the connector, pull the clampstick and withdraw the connector from bushings with a fast, firm, straight motion. Minimum amount of travel of connector to break load is 9" (230 mm). See Figure 18.

Using the clampstick, move the connector away from the bushings and place the metallic portion of one of the probes directly onto a ground plane. This will discharge any capacitive charge that may still be on the probes.

Install "C" connector on Cleer standoff bushing.

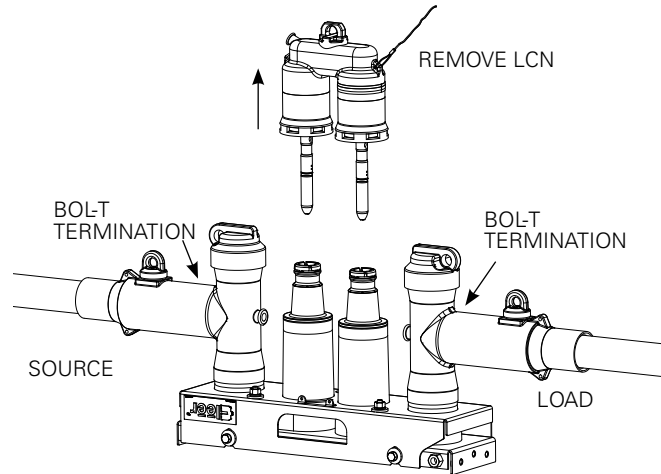


Figure 18. Remove "C" (LCN) connector.

Step 4

Install insulated protective cap

Attach Cleer loadbreak protective cap drain wire to system ground.

Using a clampstick, install a Cleer 600 A loadbreak protective cap on the source-side loadbreak bushing. See Figure 19.

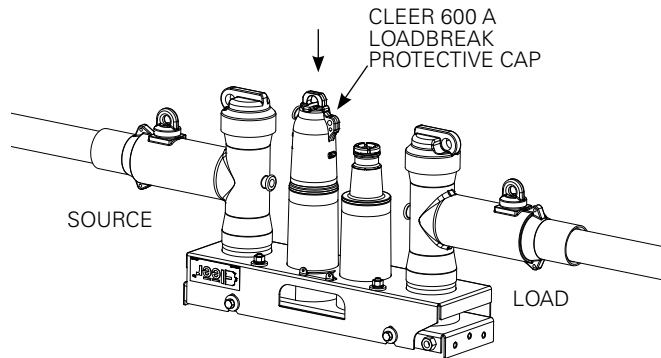


Figure 19. Install Cleer 600 A loadbreak protective cap.

Step 5

Test

Using an appropriate voltage sensing meter, test through the load side 600 A loadbreak bushing interface to verify circuit is de-energized. See Figure 20.

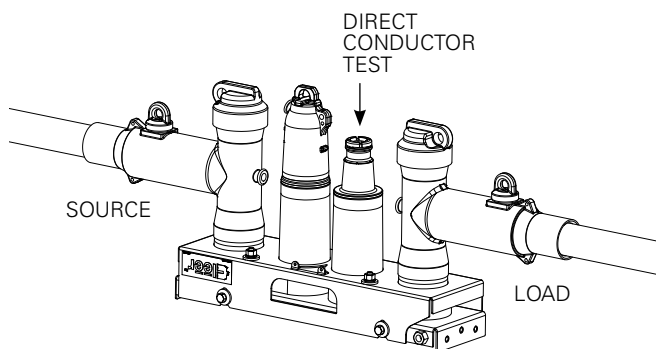


Figure 20. Verify circuit is de-energized.

Step 6

Install grounding elbow

WARNING

All associated apparatus must be de-energized during installation or maintenance.

WARNING

Do not ground energized cable.

If circuit is de-energized, install Cleer 600 A, 15/25 kV grounding elbow cable to system ground. Install grounding elbow on load-side 600 A loadbreak interface. See Figure 21.

WARNING

The operator should always use personal protective equipment (insulated gloves, clampstick and eye protection) whenever operating the elbow. The operator should always be in the best possible operating position, providing firm footing and enabling a secure grasp of the clampstick, while maintaining positive control of the elbow before, during and immediately after operation. If there is any question regarding the operator's operating position, de-energize the elbow before operation. The operator should not be looking directly at the connector during the moment of circuit interruption or connection. Failure to comply could result in death or serious injury.

Area must be clear of obstructions or contaminations that would interfere with the operation of the loadbreak elbow.

Securely fasten a clampstick to the pulling eye of the grounding elbow.

Place the grounding elbow over the bushing, inserting the white arc follower of the probe into the bushing approximately 1-1/2" (38 mm) until a slight resistance is felt. This will align and stabilize the elbow.

Turn your back to the bushing and grasp the clampstick securely and obtain good footing. Slam the elbow onto the bushing with one quick and continuous motion.

Turn around and apply a force to the clampstick to push the elbow onto the bushing. A popping or snapping sound is often heard when this operation is performed.

To check that the elbow is properly latched apply a gentle pull force to the clampstick. When latched properly the elbow will not slide back off of the bushing.

As a last operation, push on the clampstick to seat the elbow all the way onto the bushing again. This insures that the elbow is latched and was not dislodged during the latching check in previous step above.

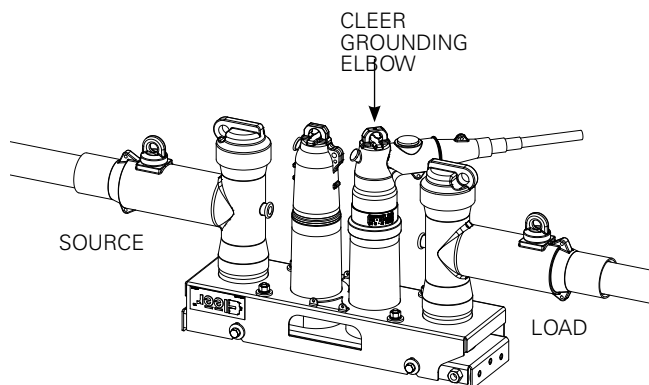


Figure 21. Install Cleer grounding elbow.

Step 7

Repeat process

WARNING

This procedure must be performed on both ends of the cable for complete grounding.

Repeat Steps 1 through 6 on opposite end of cable.

Mounting configurations and dimensions

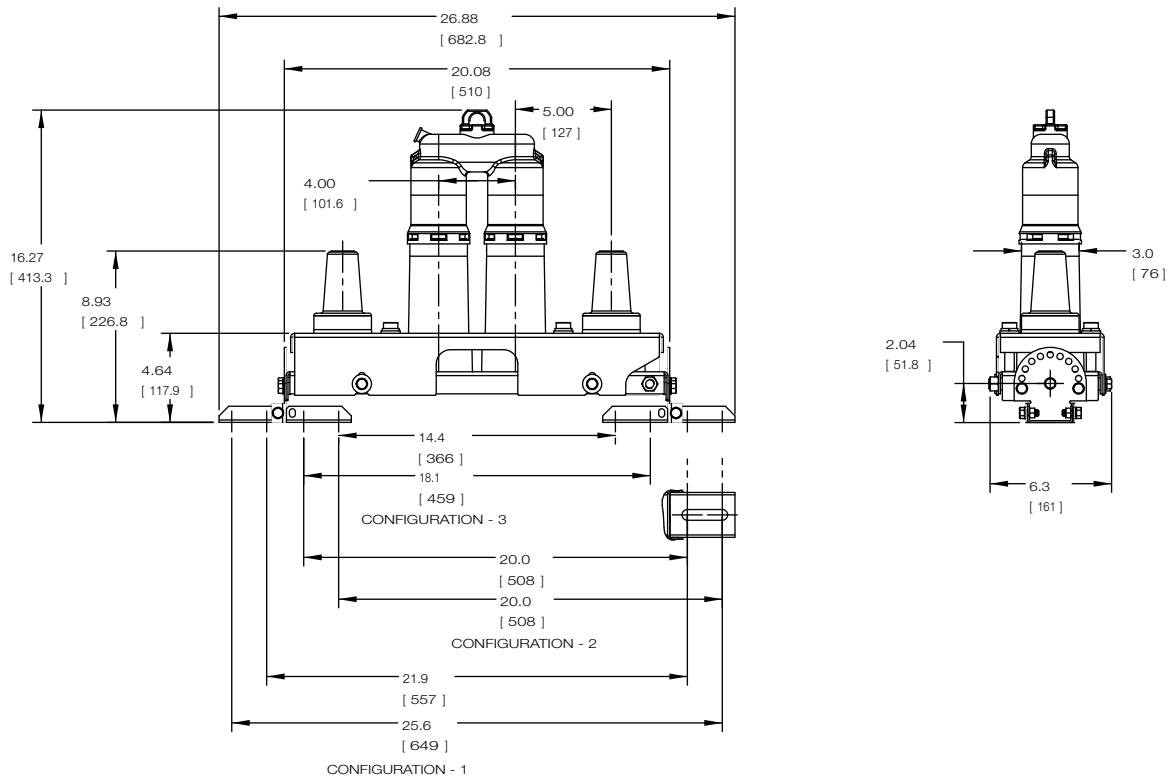


Figure 22. In-line mounting configurations and dimensions.

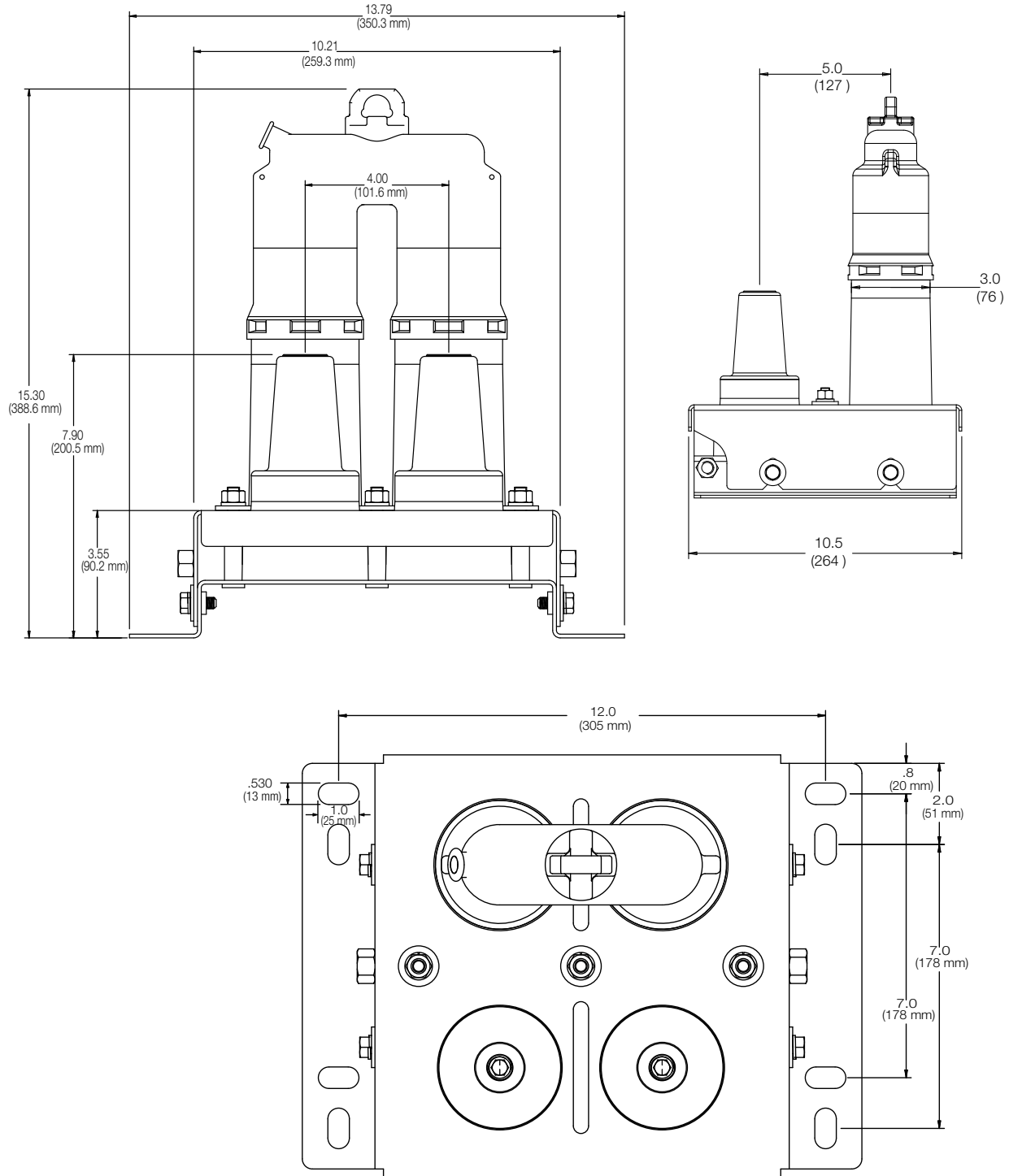


Figure 23. Square mounting configurations and dimensions.

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