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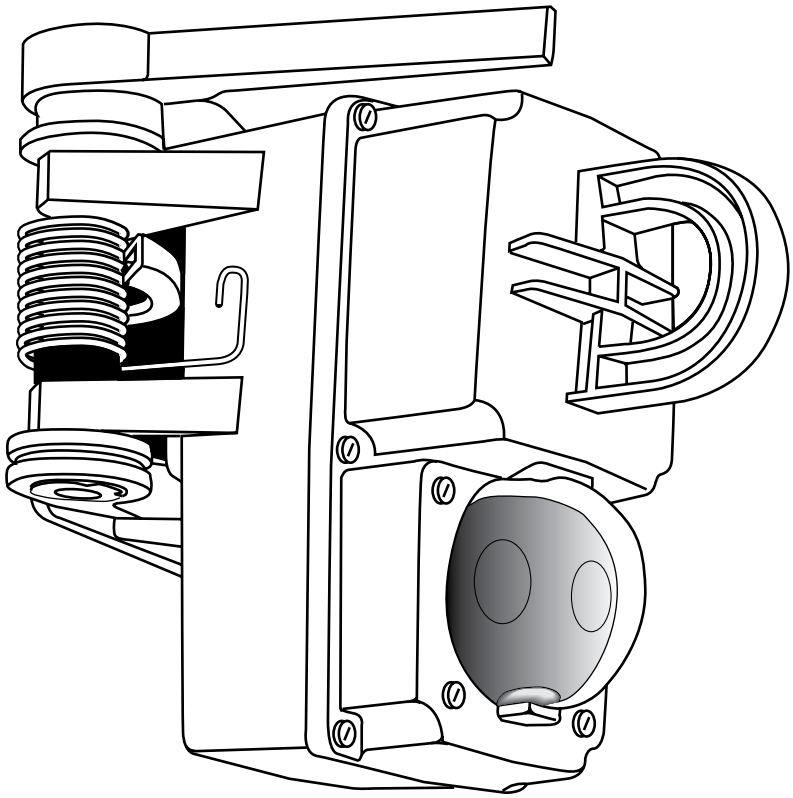
S.T.A.R.™ Type MR faulted circuit indicator installation instructions



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 flash clothing, safety glasses, face shield, hard hat, rubber gloves, 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 high voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and lowvoltage lines and equipment.

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.

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 may result in death, severe personal injury and equipment damage.

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.

⚠ CAUTION

The Eaton Cooper Power series S.TA.R.™ Type MR Faulted Circuit Indicator 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. Read all the instructions before installing the faulted circuit indicator.

Faulted circuit indicators should be installed and serviced only by personnel familiar with good safety practice and the handling of high-voltage electrical equipment. Improper operation, handling, or maintenance can result in death, severe personal injury, and equipment damage.

Product information

The Eaton Cooper Power series S.T.A.R.™ Manual Reset (MR) Faulted Circuit Indicators (FCI) are used on overhead conductors, and in padmounted distribution transformers, sector cabinets, and switchgear applications. The MR FCI indicates the passage of fault current by showing a "fault" flag in the Fisheye™ display window. When the fault is cleared from the system and the line is re-energized, the fault indicator must be manually reset.

The Eaton Cooper Power series S.T.A.R. Faulted Circuit Indicator is weatherproof, submersible and meets or exceeds **ANSI®/IEEE 495-1986™ IEEE** "Guide for Testing Faulted Circuit Indicators". The Fisheye target display will not change status due to mechanical shock or vibration.

The S.T.A.R. MR Faulted Circuit Indicator clamps easily to the conductor by using a standard shotgun stick. The MR FCI can be used on overhead uninsulated, unshielded cable, insulated unshielded cable such as tree wire, and on concentric neutral or other cable types in underground applications. The fault indicator clamping mechanism will allow the indicator to be used on cable sizes from 0.25" (6.4 mm) up to 2.0" (51 mm) in diameter.

The FCI is available with either a high (HI) or low (LO) trip level. A low trip level will activate at approximately 400 A on a 1.2" diameter cable and the high trip operates at approximately 900 A on the same cable size. The trip rating will vary slightly for other cable dimensions. Refer to Figure 2 for trip levels on other cable diameters.

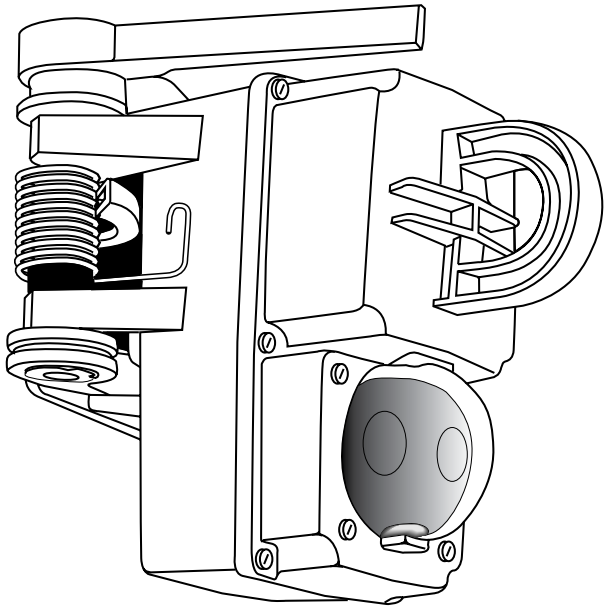

Figure 1. S.T.A.R. Type MR faulted circuit indicator

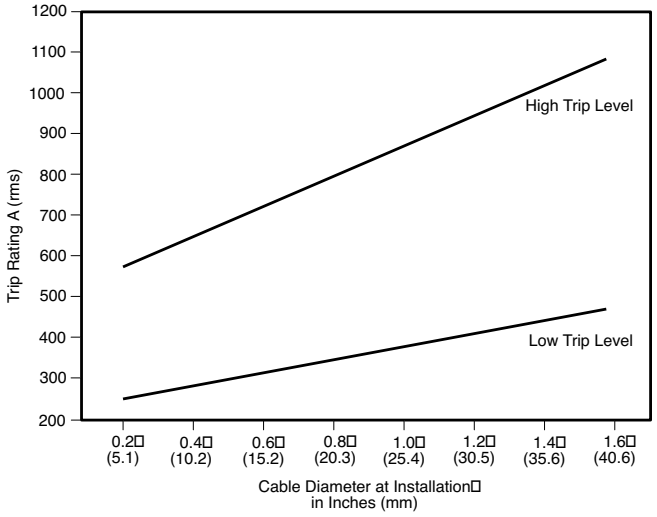

Figure 2. S.T.A.R. Type MR faulted circuit indicator cable diameter vs. Trip value curves

These instructions do not claim to cover all details or variations in the equipment, procedure, or process described, nor to provide directions for meeting every 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.

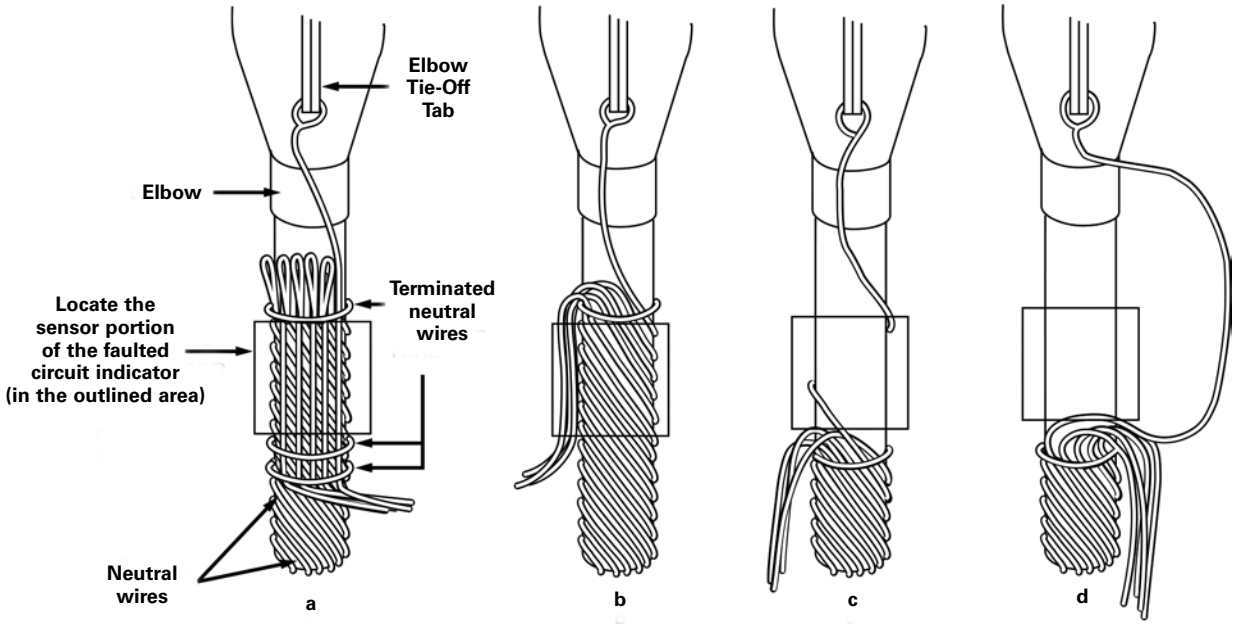

Figure 3. Recommended methods of concentric neutral primary cable preparation

Installation procedures

Primary cable preparation

Proper primary cable preparation is necessary for the Ma nual Reset faulted circuit indicator to work reliably on underground distribution circuits. The FCI can be used on tape shield or drain wire cable. If the cable does not provide a return path for the fault current, the FCI can be installed directly over the cable. If the cable shield provides a return path for the fault current, the FCI will not reliably detect a fault and will require the use of a tape shield or drain wire adapter. When used, the adapter must be installed approximately 3.5" below the elbow to allow space for mounting the FCI on the cable.

One of the following four methods is preferred for installation on concentric neutral primary cable.

Method 1 (Refer to figure 3-a)

1. **Attach one or two strands of the concentric neutral wrapped around the cable to the tie-off tab on the elbow.**
2. **Terminate all of the remaining neutral wires approximately 6" below the elbow.**
3. **Pull the neutral wires straight up and terminate them again just below the elbow.** The wires should then be bent back down the cable which is commonly referred to as "double back".
4. **Terminate the ground wires approximately 6" below the elbow.**

Note: The FCI is installed over the "double back" neutral wires to cancel the effect of current in the neutral. The exact trip value is dependent on the overall diameter of the "double back" neutral wires.

Method 2 (Refer to figure 3-b)

1. **Attach one or two strands of the concentric neutral wrapped around the cable to the tie-off tab on the elbow.**
2. **Terminate all of the remaining neutral wires just below the elbow.** The balance of the neutral wires should be gathered together and "double backed" down the cable and grounded.

Note: The FCI is installed over the "double back" neutral wires to cancel the effect of current in the neutral. The exact trip value is dependent on the overall diameter of the "double back" neutral wires.

Method 3 (Refer to figure 3-c)

1. **Attach one or two strands of the concentric neutral wrapped around the cable to the tie-off tab on the elbow.**
2. **Terminate and ground all of the remaining neutral wires approximately 6" below the elbow.**

Method 4 (Refer to figure 3-d)

1. **Arch one or two strands of the concentric neutral wrapped around the cable and attach it to the tie-off tab on the elbow.** The arch should be large enough to go around the outside FCI when the FCI is installed.

Some installations of improper preparation of the primary cable will result in an inoperable FCI (see Figure 6a and 6b). The magnetic field, due to current in the center conductor, will be cancelled by the current in the concentric neutral wires. DO NOT PREPARE THE PRIMARY CABLE IN ACCORDANCE WITH THE METHODS SHOWN IN FIGURE 6!

Installation of the FCI

1. **Arm the FCI clamping mechanism by carefully grasping both clamping arms, pulling them apart until the trigger mechanism drops into place. (Figure 4).** Stops have been built into the clamping arms such that they can only be opened to the point where the trigger will latch (See Figure 5).
2. **For applications where the cable diameter is less than 1" inch, leave the clamp pads attached to the clamp arms.** On installations where the cable diameter exceeds 1", remove the pads that are attached to each clamping arm. Removing the pads will allow the clamping mechanism to properly attach to larger diameter cables (See Figure 8.)
3. **Attach the fault indicator to a shotgun clamp stick using the FCI pulling eye.**

4a. **For concentric neutral cable applications, push the fault indicator onto the cable below the elbow at a location shown in Figure 3 while holding the shotgun stick horizontal.** The triggering mechanism will release the clamping arms and securely attach the device to the cable. Note that the clamping arms need be applied over the region of the cable where the concentric neutral has been removed or double-backed (See Figure 7).

4b. **For overhead applications, simply push the FCI onto the desired cable.** The triggering mechanism will release the clamping arms and securely attach the device to the cable.

5. **Remove the shotgun stick.**

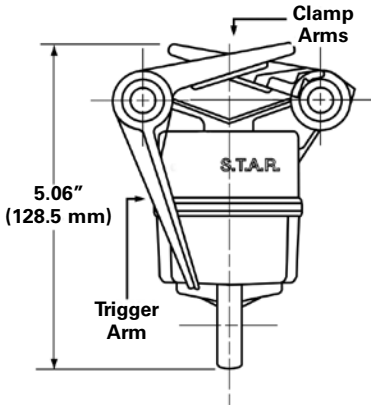

Figure 4. Type MR faulted circuit indicator with clamp in unarmed position

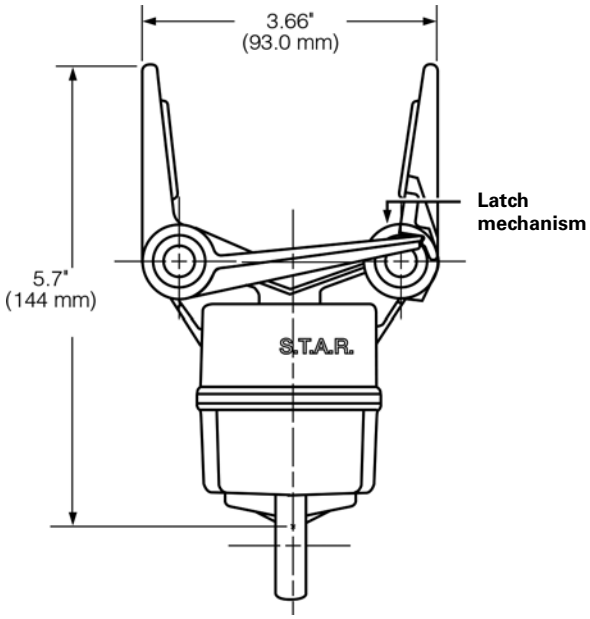

Figure 5. Type MR faulted circuit indicator with clamp in armed position

⚠ WARNING

Care should be used when installing the FCI on a de-energized system without the use of a shotgun stick. When the clamping mechanism closes, the trigger arm swiftly swings toward the pulling eye and injury could occur if fingers or hands are in the trigger arm's path.

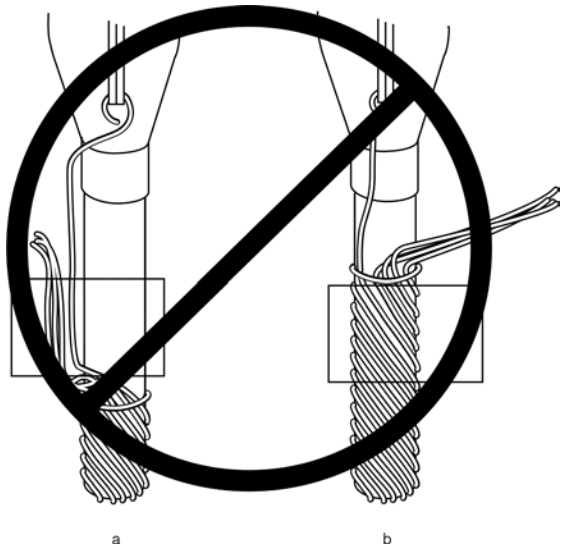

Figure 6. Incorrect methods of concentric neutral primary cable preparation

Removing the FCI

1. **Insert the hook end from the shotgun stick into the pulling eye of the FCI and lock the shotgun stick tight against the FCI body.**
2. **Pull straight back on the hotstick.** For quicker/ simpler removal of the FCI, it can be removed with hot-line gloves.

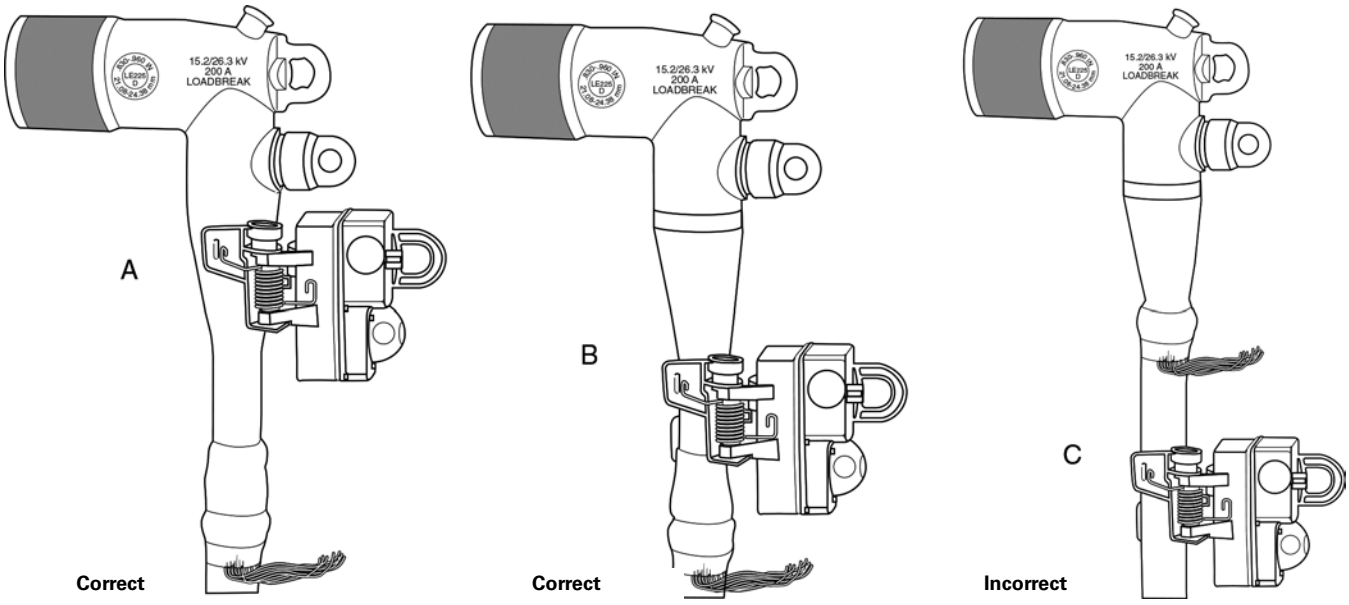

Figure 7. Proper installation of MR FCI on prepared conductor is shown in figures A and B. Figure C shows the incorrect placement for installation

Note: On 200 A loadbreak elbows, the preferred installation is demonstrated in figure 7A, where the clamping arms are located directly below the test point.

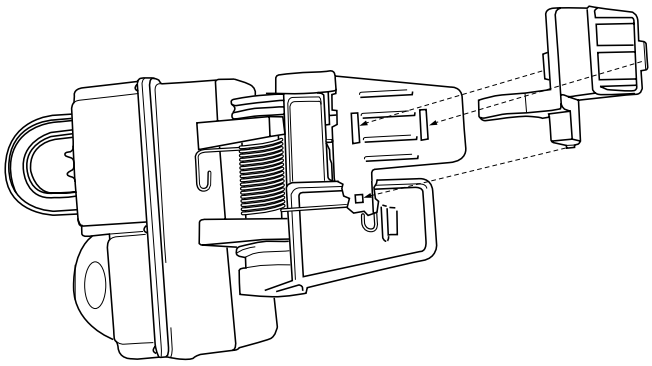

Figure 8. Remove clamp pads attached to each clamping arm on a mechanism where cable diameter exceeds 1"

Figure 9. Manual reset tool

Resetting the fault indicator

The S.T.A.R. MR Type Fault Indicator is shipped in the tripped position. When properly reset with the SMRT reset tool, the display will rotate to the unfaulted position.

1. **In order to reset the MR Type Faulted Circuit Indicator**, a manual reset tool (SMRT) is required (Figure 9).

Figure 10. Type MR faulted circuit indicator

2. **Reset the FISHEYE display by touching the reset tool to the FCI housing below and to the left of the pulling eye (see Figure 10).** If the faulted circuit indicator is installed on an energized overhead line, install the reset tool on the end of a clamp stick (shotgun stick) by grasping the pulling eye of the reset tool. Use the clamp stick to touch the end of the reset tool to the fault indicator housing (see Figure 11).

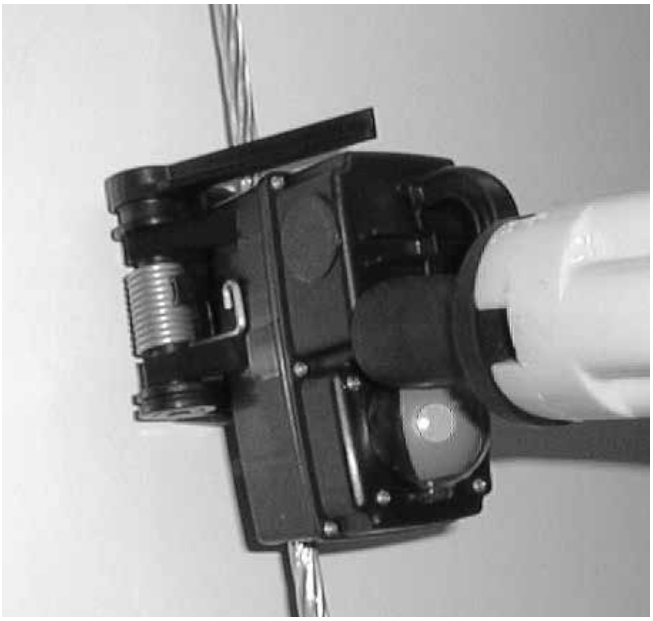

Figure 11. Reset FISHEYE display by touching the reset tool to the FCI housing below and to the left of the pulling eye

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Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Eaton.com/cooperpowerseries

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call 1-877-277-4636 or visit:
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