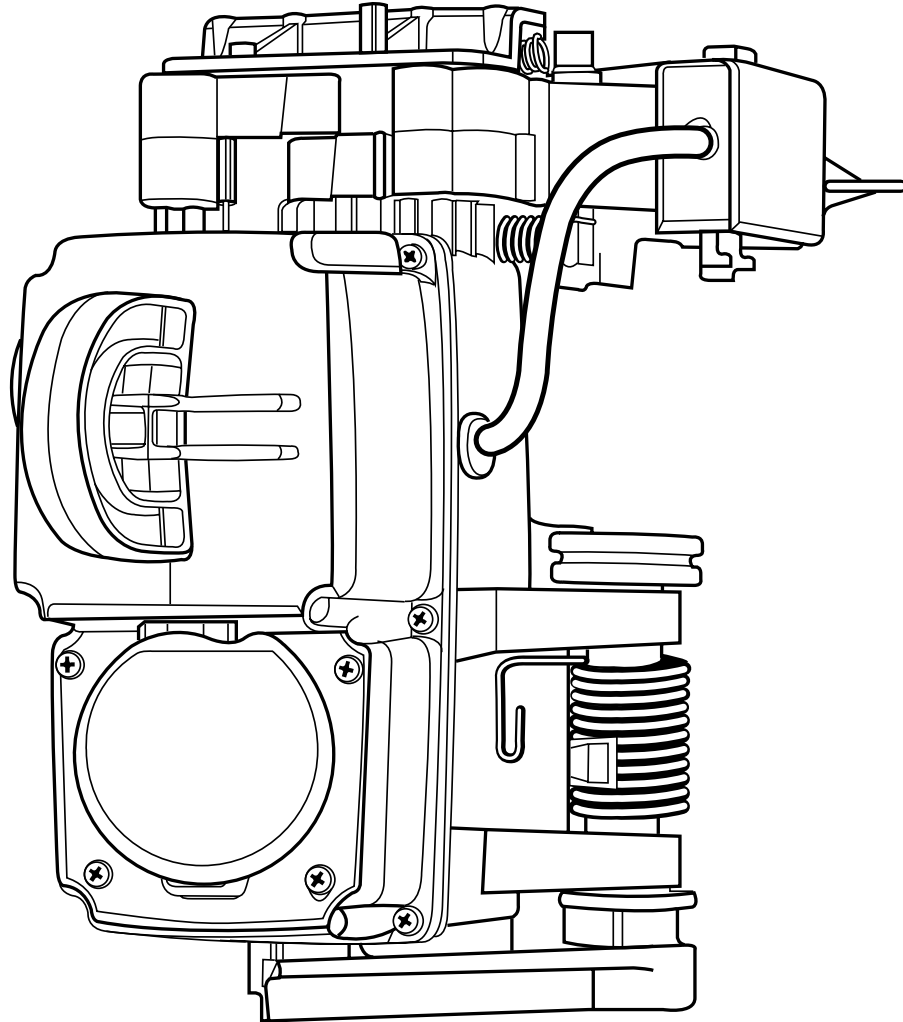


S.T.A.R.™ PATHFINDER™ variable trip current reset faulted circuit indicator installation instructions



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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.

⚠ WARNING

The Eaton Cooper Power series S.T.A.R.™ PATHFINDER™ Variable Trip Current Reset 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 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.™ PATHFINDER Variable Trip Current Reset (CR) faulted circuit indicator (FCI) is cable mounted and indicates the passage of fault current by showing a “fault” flag in the window of the display. When 2.0 A of load current returns to the cable, the FCI will automatically reset.

The FCI is weatherproof, submersible and meets or exceeds ANSI®/IEEE 495-1986™ “Guide for Testing Faulted Circuit Indicators.” The flag will not change position as a result of mechanical shock or vibration.

The PATHFINDER Variable Trip CR faulted circuit indicator consists of an integral clamp-on sensing unit with a patented clamping mechanism that allows one unit to be used on cable sizes from 0.25” to 2.0”. The FCI uses a variable trip design, which senses load current and trips based on a rise in current above normal load. A minimum of 350 A (load current plus fault current) is required to trip the FCI.

Installation procedures

Underground distribution circuits

Primary cable preparation

Proper primary cable preparation is necessary for the Variable Trip CR faulted circuit indicator to work reliably on underground distribution circuits. The FCI can be used on

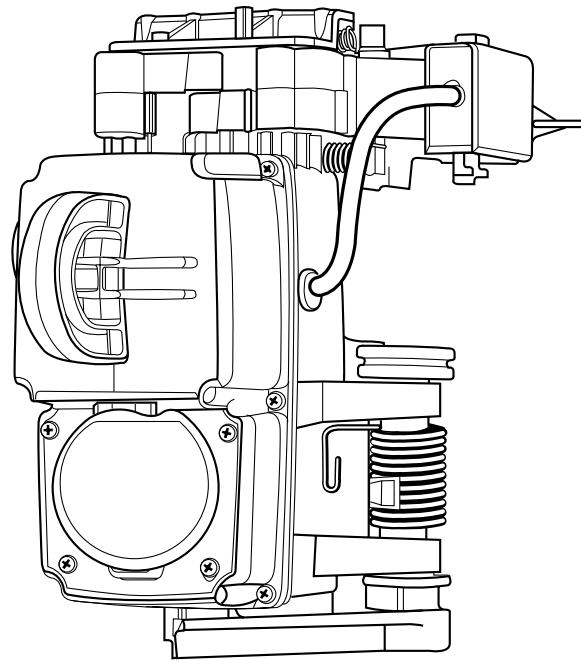


Figure 1. S.T.A.R. Pathfinder variable trip cr faulted circuit indicator

concentric neutral, 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 used on concentric neutral cable, or 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 2-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.**

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.

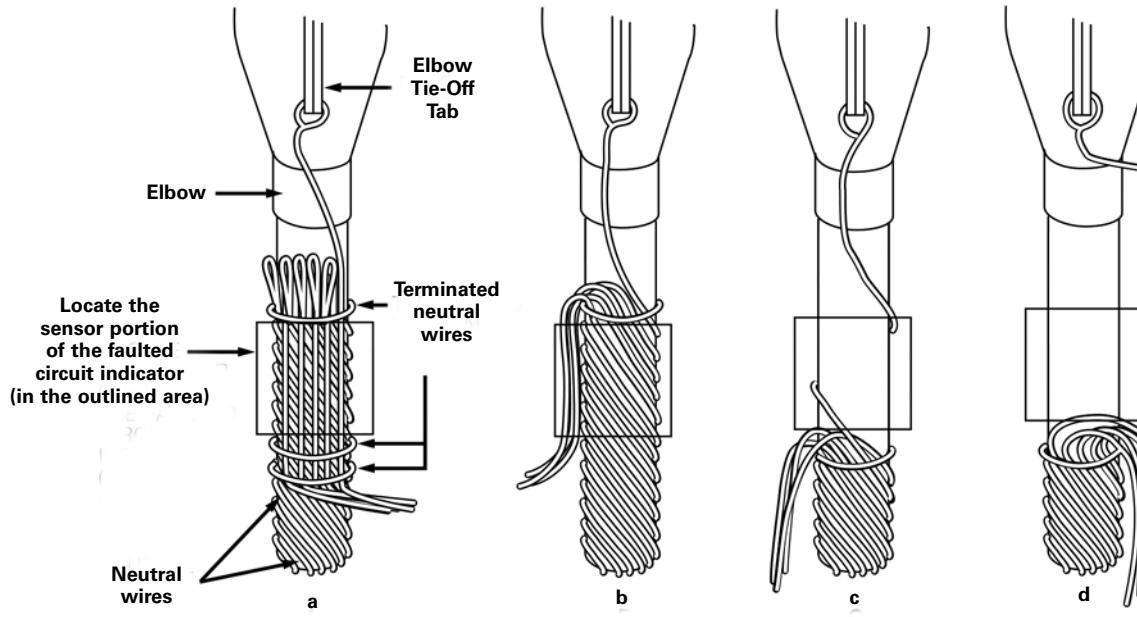


Figure 2. Recommended methods of concentric neutral primary cable preparation

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 2-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 2-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 2-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 3a and 3b). The magnetic field, due to current in the center conductor, will be cancelled by the current in the concentric neutral wires. **DO NOT PLACE THE FAULT INDICATOR AS SHOWN IN FIGURE 3! DOING SO WILL PREVENT THE FCI FROM WORKING PROPERLY.**

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.** 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 4).

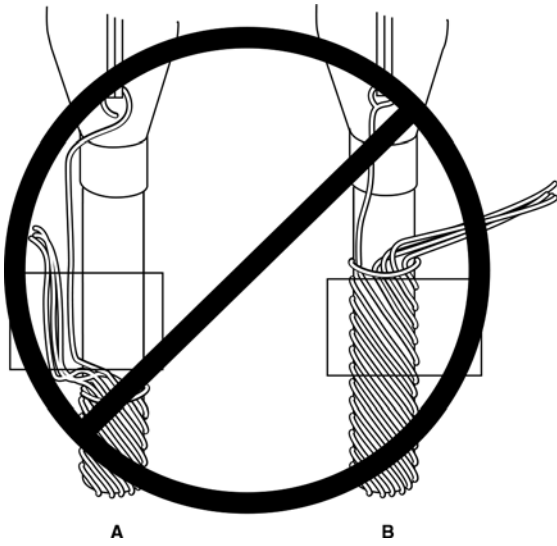


Figure 3. Incorrect methods of concentric neutral primary cable preparation

2. **For applications where the cable diameter is less than 1", 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 6.)
3. **Attach the fault indicator to a shotgun clamp stick using the FCI pulling eye.**

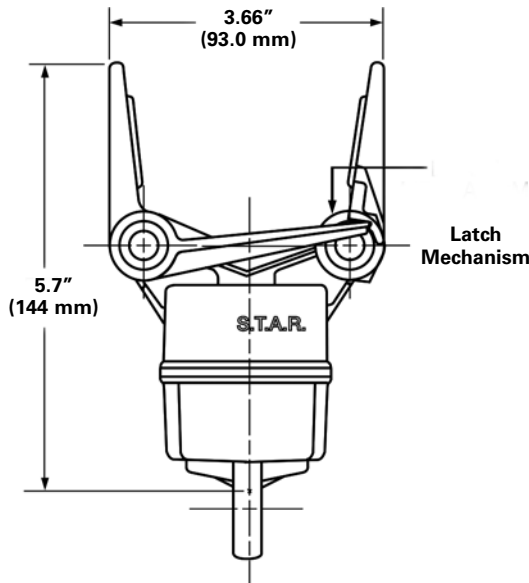


Figure 4. Type CR faulted circuit indicator clamping arms in latched position

- 4a. **Apply a thin layer of silicon lubricant to the inside of the closed core current transformer (CT). Push the fault indicator onto the cable below the elbow at a location shown in Figure 2 while holding the shotgun stick horizontal.** The triggering mechanism will release the clamping arms and securely attach the device to the cable. Note that only the closed core CT need be applied over the region of the cable where the concentric neutral has been removed or double-backed (see Figure 4).
- 4b. **For installation on tape shield cable,** the closed core CT of the FCI should be placed above the location on the cable where the tape shield has been removed or trained back as part of the cable termination. Location of the FCI must be similar to Figure 2 (C or D), or Figure 5 (A or B), for proper operation of the FCI.
5. **Remove the shotgun stick.**

Note: On 200 A loadbreak elbows, the preferred installation is demonstrated in Figure 5A, where the closed core CT is located directly below the test point.

Overhead distribution circuits

1. **Arm the FCI clamping mechanism by carefully grasping both clamping arms, pulling them apart until the trigger mechanism drops into place.** 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 4).
2. **For applications where the cable diameter is less than 1", 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 5).

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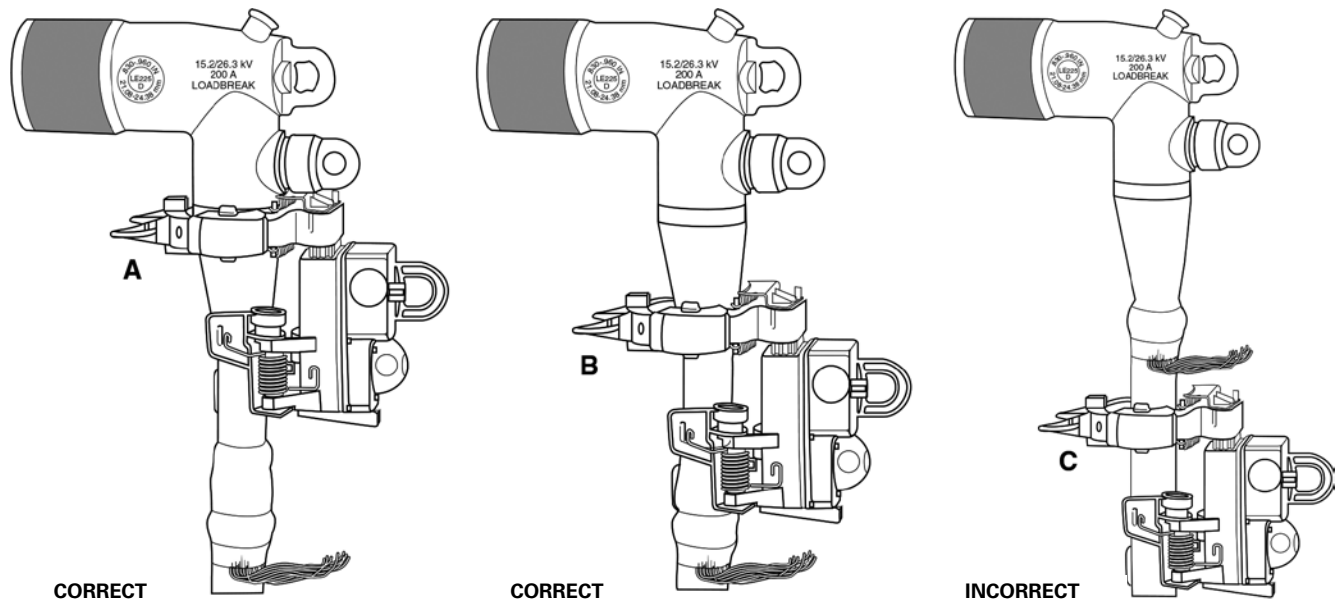


Figure 5. Proper installation of variable trip CR FCI on prepared conductor is shown in figures A and B. Figure C shows the incorrect placement for installation

3. **Apply a thin layer of silicon lubricant to the inside of the closer core current transformer (CT).**
4. **Attach the fault indicator to a shotgun (clamp) stick using the FCI pulling eye.**
5. **Push the fault indicator onto the cable conductor.** Ensure that the CT is around the conductor. The triggering mechanism will release the clamping arms from the latched position, to securely attach the device to the cable.
6. **Remove the clamp stick.**

The S.T.A.R. PATHFINDER CR Type faulted circuit indicator is shipped to the customer in the tripped position. When properly installed, the FCI will reset within 5 minutes on a line with at least 2.0 A continuous load. The FCI reset time may vary depending on the load current level present at the time of installation.

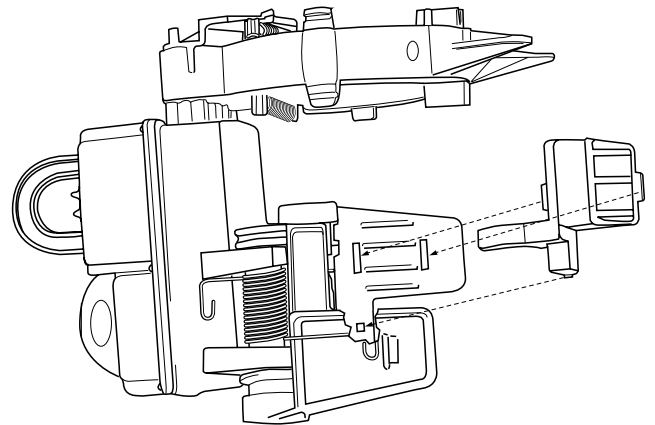


Figure 6. Remove clamp pads attached to each clamping arm on a mechanism where cable diameter exceeds 1"

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, making sure that the center of the cable is centered on the parting line of the current transformer.** This will assist the CT in opening, allowing the cable to exit.
3. **If clamp pads must be used with the FCI upon reinstallation,** ensure that the pads are properly attached to the clamp arms.

Remote display installation

⚠ WARNING

The Eaton Cooper Power series S.T.A.R. PATHFINDER™ Variable Trip Current Reset faulted circuit indicator with remote display and/or auxiliary contact outputs are designed for installation at **GROUND POTENTIAL ONLY**. Remote indicators and auxiliary contacts are not insulated for high voltage application. If high voltage is applied across the fault indicator, flashover may occur, possibly resulting in death, severe personal injury, and equipment damage.

Eaton's Cooper Power series S.T.A.R. Variable Trip CR FCIs are available with a remote FISHEYE or Small Remote display as an option. The remote display can be installed in the sill, door or side wall of a pad-mounted equipment cabinet, to provide a means to view the status of the indicator from outside the cabinet.

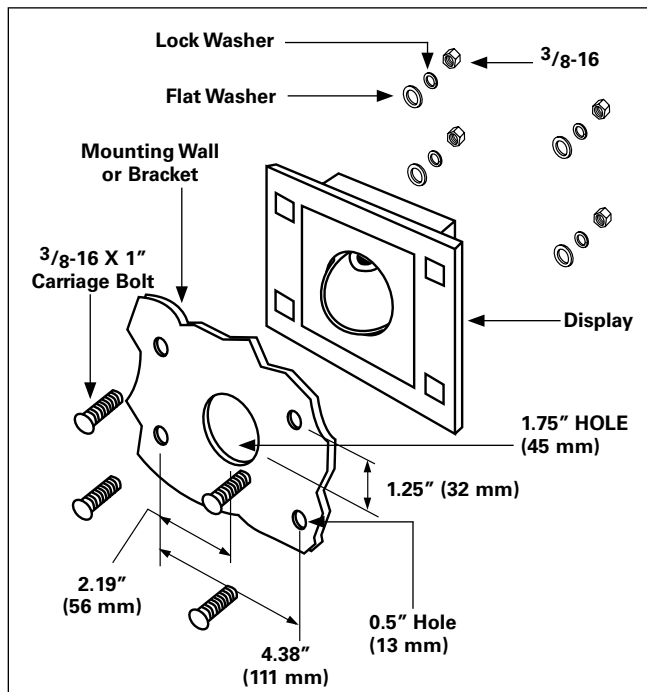


Figure 7. Remote FISHEYE™ display installation diagram

Installation instructions for remote FISHEYE™ display

1. **Punch or drill** four 0.5" (13 mm) and one 1.75" (45 mm) holes in the equipment cabinet sill, sidewall or door, as shown in Figure 7.

⚠ CAUTION

DO NOT cut or drill into the tank of any oil or gas filled equipment.

Hole rims may need to be treated for corrosion resistance. Consult enclosure manufacturer for recommendation.

2. **Position the FISHEYE display** against the back side of the enclosure aligning the four 0.5" (13 mm) holes with the corresponding holes on the FISHEYE display. The indicator ball of the FISHEYE display should protrude through the 1.75" (45 mm) hole and be visible from the outside of the enclosure.
3. **Install the four 3/8-16 UNC carriage bolts** through the four 0.5" holes with the heads on the outside of the enclosure and the bolts extending through the four holes on the FISHEYE display.
4. **Install the four 3/8" flat washers, lock washers,** and hex nuts onto the carriage bolts and hand tighten.
5. **Adjust the display** to the desired alignment and tighten the hex nuts to flatten the lock washers. **DO NOT OVERTIGHTEN THE HEX NUTS.**

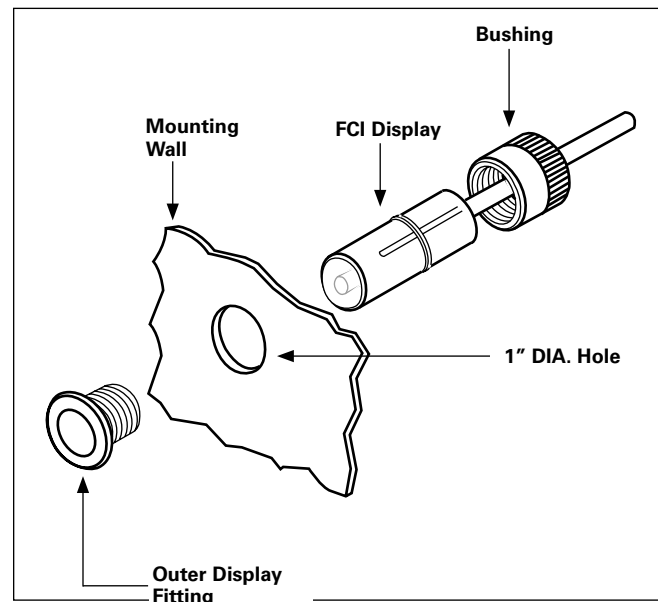


Figure 8. Small remote display installation diagram

Installation instructions for small remote display

1. **Punch or drill** one 1" (25.4 mm) hole in the equipment cabinet sill, sidewall or door, as shown in Figure 8.

Hole rims may need to be treated for corrosion resistance. Consult enclosure manufacturer for recommendation.

⚠ CAUTION

DO NOT cut or drill into the tank of any oil or gas filled equipment.

2. **Insert the outer fitting** through the 1" diameter hole with the threads extending through the hole in the enclosure.
3. **Insert the end of the remote display cable** into the outer display fitting.

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4. **Thread the bushing** at the end of the remote display cable, onto the outer fitting.
5. **Adjust the display** to the desired alignment and tighten the bushing to pull the outer fitting against the front of the enclosure. Tighten sufficiently to prevent removal of the outer fitting from outside the cabinet, but do not overtighten the fittings.

Installation instructions for auxiliary contacts

WARNING

The Auxiliary Contact option is intended solely for use with faulted circuit indicators being installed on dead-front design equipment. DO NOT USE the auxiliary contact feature on fault indicators being applied to overhead conductors or live-front equipment. Exposed ends of the auxiliary contact cable may contact bare conductors or other energized equipment, and may result in electrocution hazard. The faulted circuit indicators should be installed and serviced only by personnel familiar with good safety practice and the handling of high-voltage electrical equipment.

Eaton's Cooper Power series S.T.A.R. PATHFINDER Variable Trip CR FCIs are available with an auxiliary contact as an option. The contact provides a means to monitor the status of the FCI remotely. The contact mirrors the status of the faulted circuit indicator. If the FCI has sensed a fault, the dry contacts will latch closed until the FCI is reset upon restoration of normal system power. If the FCI has been reset, the dry contacts will latch in the open position. A simple control diagram of the contacts is shown in Figure 9.

When the auxiliary contact option is included with the FCI the following applies: the auxiliary contacts provide a relay closure when the FCI is in the faulted position. The contacts are normally open, and the FCI comes supplied with a pair of 6 foot conductor leads. The contacts will open when the FCI is reset with the appropriate system current of at least 2.0 A. The auxiliary contacts are rated as follows:

1 A	30 VDC
0.5 A	125 VAC
0.3 A	110 VAC

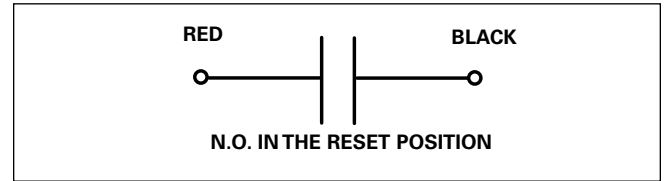


Figure 9. Control drawing of auxiliary contacts

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