

# S.T.A.R.™ PATHFINDER™ variable trip test point faulted circuit indicators



## Description

Eaton designs its Cooper Power™ series S.T.A.R.™ PATHFINDER™ variable trip test point faulted circuit indicators (FCI) to quickly and easily locate faulted sections of underground cable systems. These FCIs can be used on both 200 A separable connectors and 600 A terminators with a voltage test point. The removable sleeve allows for use on major manufacturers' loadbreak elbows.

The PATHFINDER variable trip test point FCI features a trip design that senses normal load current and indicates a fault when a significant rise in current, followed by a loss of voltage, is detected. Hence, there is no need to specify a particular trip rating when ordering the variable trip test point FCI. This design ensures fast, reliable and accurate operation.

A long-life Lithium Ion battery provides power to indicate the faulted conditions using a high intensity light-emitting diode (LED) display. The unit will flash for a period of four hours after a fault has occurred. After the four hour period, the LED will stop flashing to conserve battery power; however, the unit retains a record of the fault event, and can be interrogated after the four hour period, using the manual testing/reset tool. The unit retains the memory of the fault event until reset manually, or until normal system power is restored.

Variable trip FCIs provide a reliable means of fault location and isolation. They also eliminate fault chasing methods that are costly and time consuming, and stressful on system components exposed to fault currents.

## Construction

The variable trip FCI is a one-piece housing that can be easily installed with a single shotgun stick using the pulling eye on the FCI. The sensor is designed to minimize proximity effect described as the sensitivity of FCIs to fault currents on other phases of a three-phase installation. The variable trip FCI indicates the passage of fault current by an integral high intensity LED display powered by a Lithium Ion battery.

The sensor housing is made of durable, corrosion resistant materials. The electronic components are completely encapsulated to prevent environmental damage.

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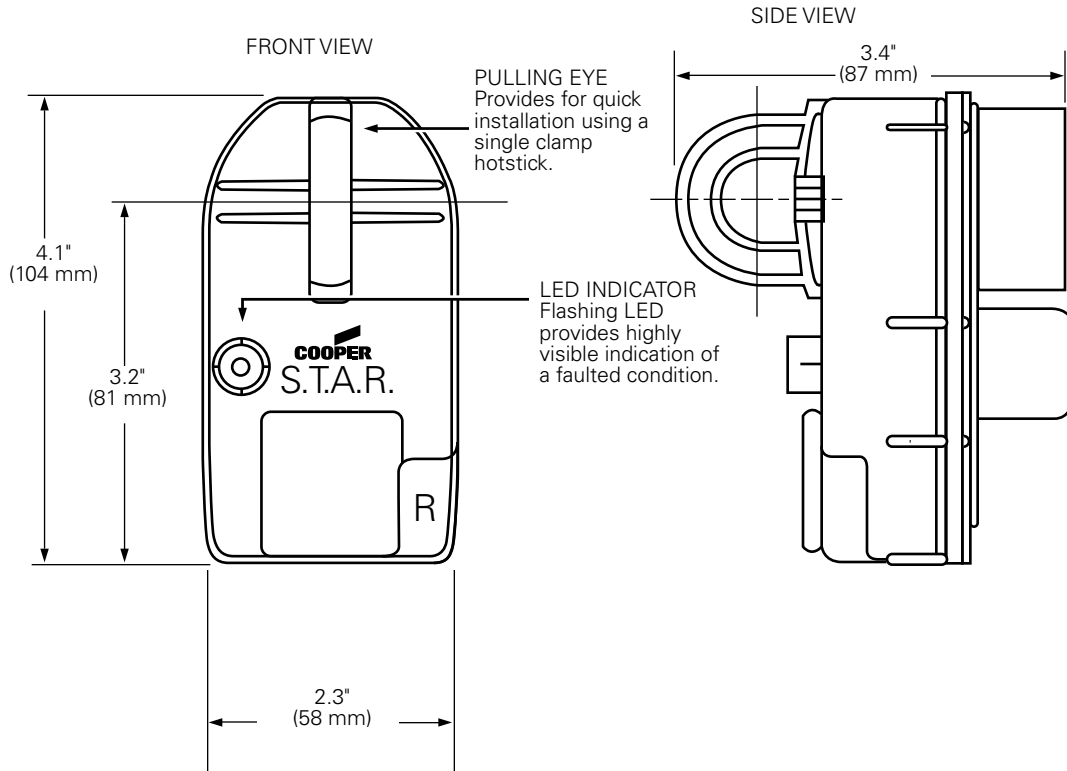


Figure 1. Features and dimensions of the PATHFINDER Variable Trip faulted circuit indicator.



Figure 2. PATHFINDER Variable Trip faulted circuit indicator with fiber optic remote display.

### Trip rating

The S.T.A.R. PATHFINDER variable trip test point FCI features a load sensing design, and trips on a current rise of a particular magnitude over time. Therefore, there is no need to specify a trip rating when ordering the Variable Trip FCI.

### Design features

The **Variable Trip design** eliminates the need to specify a trip rating for the FCI. The load sensing feature adjusts the FCI to normal load conditions. When a fault occurs, the unit senses the rise in system current caused by the fault, followed by the loss of system voltage due to operation of the protective device. Thus, the variable trip FCI provides a "one size fits all" FCI for voltage test points, reducing inventory and eliminating problems caused by misapplication of FCIs.

**Battery Life Optimization Circuitry** ensures maximum life for the battery powering the LED display. After 4 hours of flash time following a fault, the Battery Life Optimization Circuitry (BLOC) feature places the FCI in "sleep" mode. The LED will stop flashing, but the unit will retain a record of the fault occurrence in its memory. The unit can then be interrogated anytime after the 4 hours, using the manual testing/reset tool, to determine if the FCI detected a fault. The event record remains in the memory of the FCI until the unit is manually reset, or until normal system power is restored.

In addition to the variable trip design and BLOC features, an **inrush restraint** feature eliminates false tripping and is standard on all units. The S.T.A.R. PATHFINDER faulted circuit indicator will ignore inrush currents caused by reclosing operations of protective devices on the system. A dead time of 200 rms will activate the inrush restraint feature.

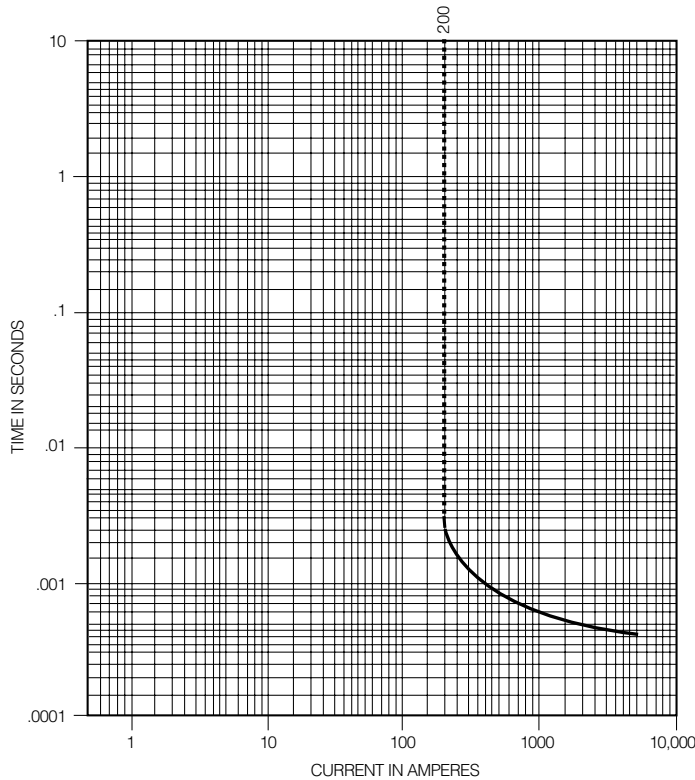


Figure 3. PATHFINDER Variable Trip faulted circuit indicator minimum response curve.

Table 1. Electrical Ratings and Characteristics

Description	Ratings and Characteristics
Power Requirements	Min. 2.4 kV L-G
Power Source (LED display)	1.2 AH Lithium Ion Battery (non-replaceable)
Flashing time	800 Hrs. Minimum
Reset Time	Factory Preset at 4 hrs.; manual reset with testing/reset tool
Event Recording	Stores FCI status following LED reset
Trip Current	Variable; 100 A rise from load current;
Min. Pickup Level	200 A total (fault current + load current)
Trip Response Speed	Response Curve, Figure 4
Fault Withstand Capability	25 kA for 10 cycles per ANSI/IEEE Std 495™-1986 standard
Temperature Range	-40° C to +85° C
Materials (Conductive EPDM Rubber)	Corrosion resistant & submersible per ANSI/IEEE Std 495™-1986 standard
Weight	8.46 ounces (0.24 kg)
Elbow Rating (All Manufacturers)	200 & 600 A and 15, 25 & 35 kV Class
Auxiliary Contact Rating	1 A 30 Vdc
	0.5 A 125 Vac
	0.3 A 110 Vac

A **low pass filter**, also a standard feature, will prevent the S.T.A.R. faulted circuit indicator from tripping on high frequency transients like those caused by cable capacitive discharges.

In addition, the S.T.A.R. faulted circuit indicator is equipped with **temperature compensation** circuitry to assure accurate, reliable performance over the specified temperature range.

Another standard feature is the **reset restraint** circuit. The S.T.A.R. variable trip FCI senses normal line voltage. Reset restraint prevents the fault indicator from falsely resetting due to feedback voltages of less than 80% of the normal voltage measured at the test point.

The quick response time of the S.T.A.R. variable trip faulted circuit indicator allows easy coordination with current limiting fuses. This unique combination of standard features makes the S.T.A.R. Variable Trip TPR faulted circuit indicator extremely reliable.

**Testing**

S.T.A.R. faulted circuit indicators are made of corrosion resistant materials, meeting or exceeding ANSI/IEEE Std 495™-1986 standard, "Guide for Testing Faulted Circuit Indicators". 100% automated production testing verifies the trip operation, and the inrush restraint and reset restraint features.

**Installation**

Installation is quick and easy using a single clampstick. No special tools are required. The variable trip test point FCI easily adapts to most manufacturers' separable connector products. An additional adapter kit may be needed for some manufacturers' older style test points.



Figure 4. Testing/Reset Tool.

The testing/reset tool (SMRT) can be used to test the device prior to installation, or by hotstick after the FCI is installed on a live elbow. To test the FCI, simply touch the reset tool to the Variable Trip FCI housing in the designated area. The LED display will flash slowly for 5 seconds, indicating that the unit has been reset and returned to normal status. The reset procedure also provides positive indication of battery operation. Please refer to *Service Information S320-42-1 S.T.A.R. PATHFINDER Variable Trip TPR Faulted Circuit Indicator Installation Instructions* for installation details.

**Note:** If the PATHFINDER variable trip TPR FCI is removed while indicating a fault, or in the energy saving (BLOC) mode, the device will only reset if installed on a system with the same line voltage at which the device had been previously installed, or, if manually reset using the testing/reset tool. It is recommended that the unit be reset manually using the testing/reset tool, to initialize the unit, after being installed.

## Options

### Remote fiber optic display

Eaton provides remote visual indication of the FCI operation with its Cooper Power series remote fiber optic display. This display can be mounted in transformer and sector cabinets with a single hole installation. The remote fiber optic cable can be ordered using catalog number SFOC.

### Auxiliary contacts

Auxiliary contacts can be added to the standard unit and provide an additional data collection point when used on circuits connected to a SCADA system. The magnetic latching circuit that operates the auxiliary contact ensures a reliable indication.

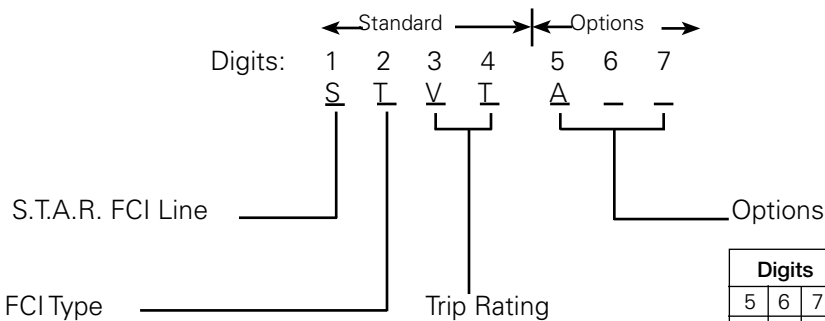
### Testing/reset tool

The manual testing/reset tool can be ordered using catalog number SMRT.

**Table 2. S.T.A.R. PATHFINDER Variable Trip Faulted Circuit Indicator Ordering Information**

#### Catalog Number<sup>1, 2</sup>

Example: A Test Point Reset FCI with a high trip rating and standard 6 ft. auxiliary contacts would have a catalog number STVTA (as shown below).



Digits			Descriptions
5	6	7	
A			Standard Indicator with auxiliary contacts

\* Standard indicator with auxiliary contacts provided with 6 ft. cable length as standard.

Digit 2	Type
T	Test Point Reset

Digits		Trip Rating
3	4	
V	T	Variable Trip

Description	Catalog No.
Adapter Kit for Non-standard Test Points	STAK
Manual Reset/Interrogation Tool	SMRT
Fiber Optic Cable (6 ft.)	SFOC

- Notes:**
1. The S.T.A.R. FCI catalog number may vary in length from 4 digits to 7 digits.
  2. The standard S.T.A.R. FCI catalog number may be truncated after entering digits 1-4. Options may be selected by adding the appropriate code to digits 5, 6, and/or 7.

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For Eaton's Cooper Power series variable trip test point faulted circuit indicator product information call 1-877-277-4636 or visit: [www.cooperpower.com](http://www.cooperpower.com).