

POWER DELIVERY


FISHER PIERCE®

PRODUCT SELECTION GUIDE



PRODUCT CATEGORIES

- Capacitor Controls & Relays
- Faulted Circuit Indicators
- Current Sensors

Thomas & Betts



Capacitor Controls

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Long lasting quality products that deliver maximum value.

For over 60 years, Fisher Pierce has been widely regarded as an innovator in both the design and manufacturing of quality capacitor controls and faulted circuit indicators.



 **FISHER PIERCE®**



QUICK REFERENCE

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Capacitor
Controls** page(s)

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Capacitor Controls

Control capacitors based on VAR, voltage, temperature or time — your choice.

Fisher Pierce® capacitor controls offer a wide range of analog and digital options operating under a variety of parameters, including VAR, voltage, current, temperature and time. Both local and remote units are available with remote communications.

A reliable, flexible means of adding switching capability and automation to your capacitor banks.

Switched capacitor banks benefit utilities by reducing losses due to reactive load current, reducing kVA demand, decreasing customer energy consumption, improving voltage profile and increasing revenue. The use of switched capacitor banks also reduces stress on equipment, resulting in longer service life.

Fisher Pierce® capacitor controls feature a range of analog and digital options with a variety of control parameters, including VAR, voltage, current, temperature and time. Both local and remote units are available with communications. These microprocessor-based smart controls offer the ultimate in versatility and are ideal for any pole-mounted or substation-switched application.

Features	Benefits/Descriptions
Flexible Controls for Different Applications	Easy to set up and operate via front-panel user interface. Programmable control with primary and override control strategies. Override and protective functions. Programmable controls modes include VAR, Voltage, Time, Temperature and Current
Adaptive Controls	Microprocessor-based control featuring adaptive functions that can allow the unit to program itself.
Multi-Step Controls	Multi-step controls are available in 2- or 3-step configurations for use with multiple capacitor banks in substation applications.
Neutral Sensing Relay	Monitors the capacitor bank neutral signal. When neutral exceeds the trip point, the bank will open and remain off-line until manually reset.
Communications	Two-way radio technology from Telemetric to communicate over digital cellular data networks. Dedicated communications microprocessor and flash memory allow use of data radios, cellular, and modem communication technologies. Remote trip/close via SCADA.



Which Fisher Pierce® Capacitor Control is right for your application?



The following table summarizes the applications of Fisher Pierce controls based on system needs.

CONTROL TYPE	AC100	4400	4500	1527 POWERFLEX	MULTI-STEP ANALOG
Voltage Control	X	X	X	X	X
Temperature Control	X	X	X		
Time Control	X	X	X		
Current Control		X	X	X	X
Adaptive VAr Control		X	X		X
Adaptive Voltage Guard		X	X		
Phase Find		X	X		
Data Recording		X	X		
Substation Application with Multiple Racks					X

Fisher Pierce® Series AC100 AutoCap™ Programmable Capacitor Control

Provides voltage, time or temperature control with override function.

The Series AC100 AutoCap™ Programmable Capacitor Control incorporates Fisher Pierce® proven control algorithms providing voltage, time or temperature primary control with programmable override. The new low-profile enclosure with integral meter base simplifies handling during installation and offers a sleek, tight-to-the pole finished installation. Set up the Series AC100 AutoCap™ Control from the easy-to-use front-panel LCD interface or use SmartSet™ II Application Set Up software on your laptop PC and simply download the information via USB connection.



Features	Benefits/Descriptions
Voltage, Time or Temperature Control with Programmable Override	Different models suit a variety of applications.
Low-Profile, Lightweight Enclosure	Easy handling and clean, sleek installation.
Front-Panel Programming Keypad with Audible Confirmation and High-Visibility LCD	Easy, on-the-spot set-up and operation.
SmartSet™ II Application Set Up Software with USB Interface	Optional set-up and operation from a laptop PC.
Audible Manual Mode Alert	Warns you when the enclosure is closed and the controller is left in manual mode.
High-Intensity Status LEDs	Instant visual indication of status.
Flexible Enclosure-Mounting Options Available	Wall- and pole-mounting capabilities available on request.
Neutral Current Sensing Option	Detects neutral current unbalance, indicative of failing capacitor banks.
True RMS Voltage Sensing	Provides the most accurate method of AC voltage measurement.
Nonvolatile Memory	Preserves programming information.
10-year, Replaceable Li-Ion Battery	Long, low-maintenance service life.

Specifications

Input Power Requirements:
95–145V, 60 Hz

Voltage-Sensing Range:
95–145V, 60 Hz

RMS Voltage-Sensing Accuracy:
<± 0.5%

Temperature-Sensing Range:
-40 to 140° F (-40 to 60° C)

Temperature-Sensing Accuracy:
±1.8° F (±1° C)

Seven-Day Time Clock:
8 trip and close setpoints per day

Output Relays:
SPDT (normally open) momentary closure

Computer Operating System Requirements:
Microsoft Windows 98, 2000, XP

Weight: 3.42 lbs.

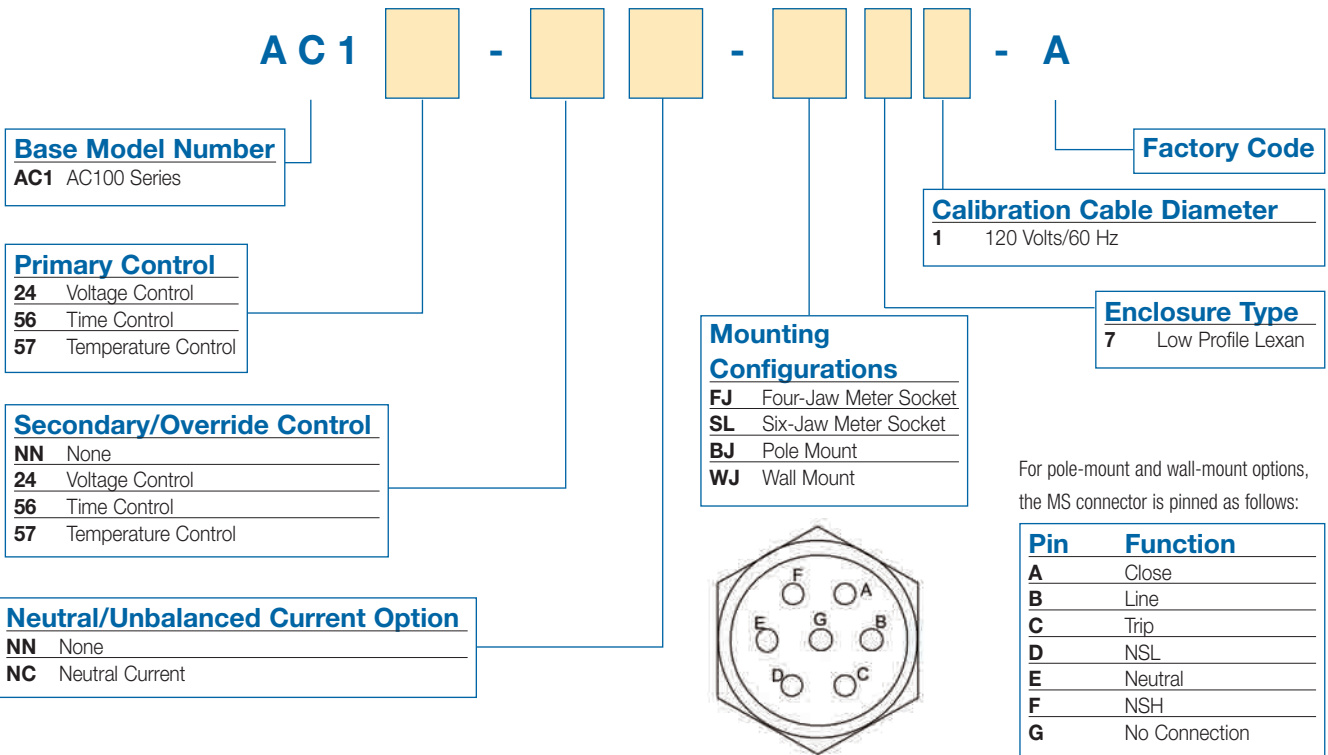


Ordering Information for Fisher Pierce® Series AC100 AutoCap™ Programmable Capacitor Controls

The following diagram shows how to construct a catalog number for a Series AC100 AutoCap Programmable Capacitor Controller.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.



Fisher Pierce® Series 4400 AutoCap™ Adaptive Capacitor Control and Recorder

Take the complexity out of your capacitor bank control.

Simplify switched capacitor bank control with the Fisher Pierce® Series 4400 AutoCap™ Adaptive Capacitor Control and Recorder.

Just plug in the factory-programmed unit and it adapts itself to the installation. No more hassles with sensor wiring or setpoint calculations.

You can install the Series 4400 AutoCap™ Control without ever opening the enclosure!



Fisher Pierce® Series 4400 AutoCap™ Control

Features	Benefits/Descriptions
Adaptive VAR™ Control Mode	Automatically measures capacitor bank size and establishes VAR setpoints for maximum energy-loss reduction.
PhaseFind™ Function	Locates current signal source and compensates for phase rotation and reversed wiring.
Voltage Guard™ Function	Provides adaptive voltage restraint to prevent out-of-range line voltage conditions and capacitor bank cycling.
Reverse Power Functions	Calculate proper VAR setpoints to compensate for altered VAR measurement during this condition (four other control modes are also available for use in reverse power conditions).
True RMS Voltage and Current Sensing	Provides the most accurate method of AC voltage measurement.
Total Harmonic Distortion Recording	Documents conditions that may require harmonic mitigation.
Reverse Trip/Close Detection	Automatically senses reverse wiring of the Close and Trip drive circuits to the capacitor switch, inhibits all switching except manual and indicates error by flashing LED on front panel.
Anti-Hunt Function	Automatically compensates for rapid bank tripping due to cycling loads or interaction from other switched banks on the feeder.
Undervoltage Inhibit Feature	Protects the capacitor bank switch from damage caused by low voltage.
Plug-to-Plug Controller Compatibility	Compatible with existing controllers for easy installation — no adapters or rewiring required.
SmartSet™ Application Software	Windows-based software simplifies programming for up to four seasons.
SmartSet™ Graphs and Reports	Records load data/events for analysis and troubleshooting — no additional software required.
Optional Expanded Recording	Provides even more load data/event recording for analysis and troubleshooting.
Optional PanelSet™ Program	Enables front-panel programming of controller without a laptop PC.
Compact Enclosure	Space-efficient installation.

The Series 4400 AutoCap™ Control offers a variety of features for performance and convenience, including Adaptive VAR™ Control and PhaseFind™ Compensator.

Voltage Guard™ Protection measures voltage change caused by capacitor switching and applies this value to the present line voltage. If Voltage Guard Protection predicts that bank switching will cause the line to exceed preset voltage limits, switching is inhibited, preventing both out-of-range line voltage conditions and capacitor bank cycling.

The Series 4400 AutoCap™ Control automatically corrects for installation errors, such as sensing voltage and current from different phases, reversed current signal wiring, reversed trip/close wiring and calibration errors. It also adjusts to abnormal operating conditions, including reverse power flow, bank hunting, low switching voltage, capacitor can failure (neutral sensing lockout) and excessive bank switching.

A programmable one- to four-season control, the Series 4400 AutoCap™ Control can operate on the basis of VAR, voltage, current, temperature, time and combinations of these inputs. Programming is simple with SmartSet™ application software, which is Windows-based and menu-driven for ease of use. In addition, the Series 4400 AutoCap™ Control offers complete load data event recording and report creation supported by SmartSet™ software.

Exclusive Advantages

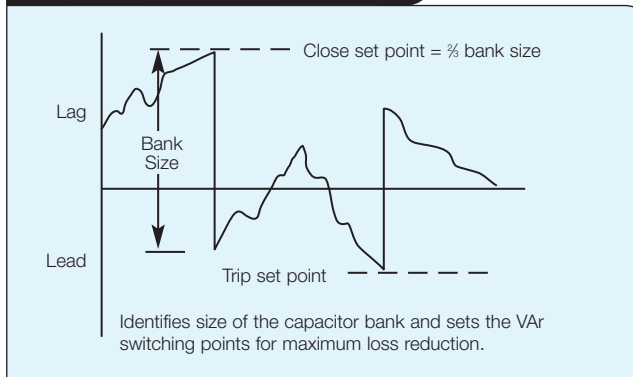
The Fisher Pierce® Series 4400 AutoCap™ Adaptive Capacitor Control and Recorder delivers many new and innovative functions that eliminate the traditional struggle associated with:

- Setting optimum VAR setpoints (Fig. 1 – Adaptive VAR™ Control)
- Finding the voltage change caused by bank switching (Fig. 2 – Adaptive Voltage Guard™ Protection)
- Field wiring (Fig. 3 – PhaseFind™ Compensator)

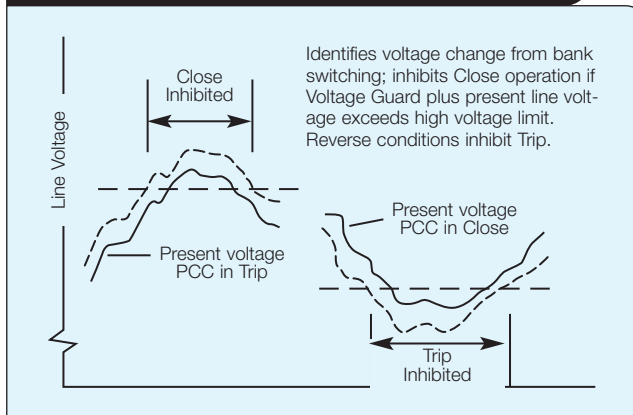
The Series 4400 AutoCap™ Control also provides the following additional functions:

- Real-time monitoring of data readings and controller status through local RS-232 or optical port
- Traditional holiday calendar—10-year predefined, can be user edited
- Individual and block holidays—10-year user programmable
- Daylight Saving Time calendar—10-year predefined, can be edited
- Daily close count limit—User programmable
- Switching time delays/inhibits—For automatic and manual modes with LED indication on controller panel
- Neutral sensing lockout—Trips bank and prevents further capacitor operation, flashes external lamp in the event of capacitor can failure, reset by external button or RS-232 command

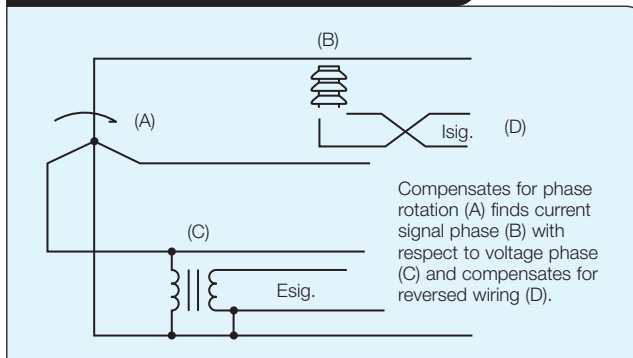
Adaptive VAR™ Control (Fig. 1)



Adaptive Voltage Guard™ Protection (Fig. 2)



PhaseFind™ Compensator (Fig. 3)



Additional AutoCap™ Control Features

Fisher Pierce® Series 4400 AutoCap™ Control builds on more than 30 years of experience in the design, manufacture and application of electronic capacitor controls.



- Standard meter socket mounting; pole or wall mounting available
- Single-phase line current signal input: Line post sensor or CT input for VAR and current control and data recording
- Capacitor bank neutral sensing signal input: Fisher Pierce® split lamination sensor (AT929) or CT/VT neutral sensing input
- Neutral sensing lockout lamp; reset by manual button or command through RS-232
- Shielded ambient temperature sensor
- 9-Pin RS-232 communications port
- Optical communication port available
- 365/366-day time clock includes next century
- Programmable momentary output relays
- Nonvolatile memory
- Independent watchdog timer
- Electromechanical operations counter available
- Internal LCD read-only display available
- Operational status LEDs
- Manual Close/Trip operation and Auto/Manual switches.

SmartSet™ Application Software

The Series 4400 AutoCap™ Control is programmed using Windows-based SmartSet™ software created by Fisher Pierce for greater programming ease. Using SmartSet™ software, the Series 4400 AutoCap™ Control is a multifunction microprocessor-based control, programmable for up to four seasons. You can assign each season its own primary and override functions as listed in the Control Modes table below. The Series 4400 AutoCap™ Control connects to any Windows-based PC via standard RS-232 or optional optical communications port.

Control Modes			
Basic Functions	Override Functions	Voltage Bias	Reverse Power
<ul style="list-style-type: none"> • Adaptive VAR • VAR • Voltage • Current • Time • High Temp • Low Temp 	<ul style="list-style-type: none"> • Voltage • Time • High Temp • Low Temp 	<ul style="list-style-type: none"> • Time • High Temp • Low Temp 	<ul style="list-style-type: none"> • Ignore • Voltage • VAR • Trip and Inhibit • Close and Inhibit

Extensive Data Recording

The Series 4400 AutoCap™ Control provides a full spectrum of user-defined load data and control operations recording capability. Three-phase load data is derived from single-phase measurements and assumes balanced load. All recorded data is easily uploaded via RS-232 or optional optical port. Memory of 32K is standard; expanded 128K memory is also available.

Data Recording Parameters

Load Data Recording

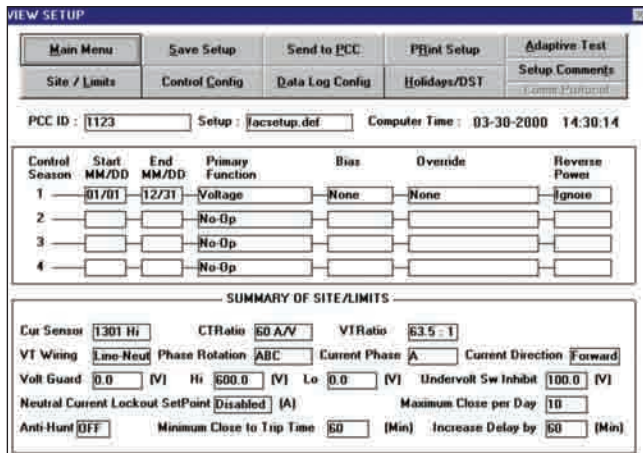
- (1 min. to 4 hour averaging period)
- Date/Time Stamp
- Voltage (Sec. or Line)
- Current (Sec. or Line)
- kVAr (3ø)
- kVA (3ø)
- kW (3ø)
- Power Factor
- Total Harmonics
- Temperature
- Trip/Close Status

Daily Summary Recording

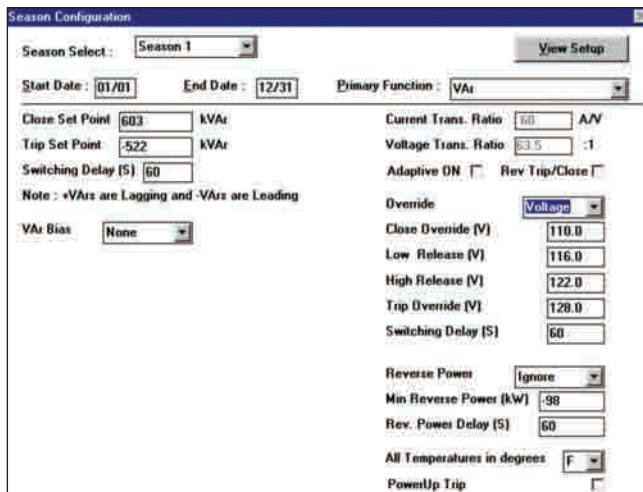
- Date Stamp
- Time of Max./Min. Value
- Daily Max./Min. Voltage
- Daily Max./Min. Current
- Daily Max./Min. (3ø) kVAr
- Daily Max./Min. Temp
- Daily Close Operations
- Daily Close Hours
- Close Ops Running Total

Operations Recording

- Date/Time
- Basic Operations
- Override Operations
- Manual Operations
- Power Up/Power Down
- Voltage Before/Delta
- kVAr Before and After
- kW Before and After
- Reverse Power



View Setup Screen—Allows user to review controller setup and site configuration summary.



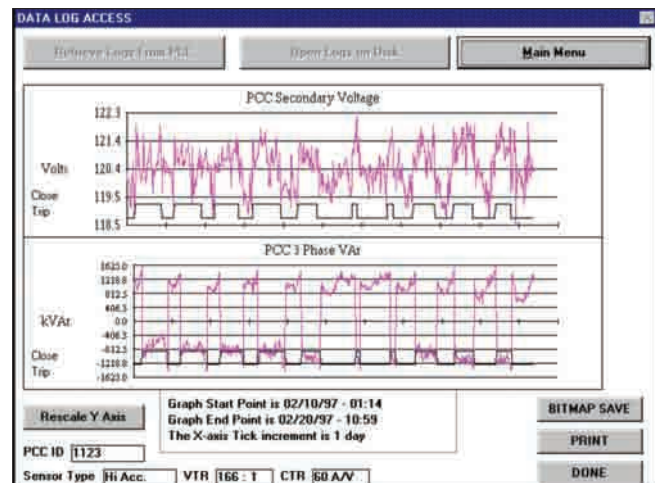
Season Configuration Screen—Fully prompted for easy controller programming.

Report Generation Capability

The SmartSet™ report-generation feature provides spreadsheet format and visual presentation of recorded data as well as many editing features. This capability is integrated into SmartSet™ software — no additional software is required. The ability to graph all load study data, specify time period and superimpose Close/Trip operations is included.

Load Data Reports

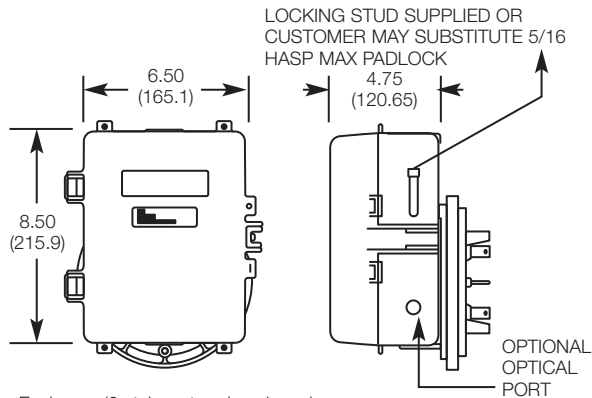
- Spreadsheet format
- Graphing of all load data
- Edit graph time period
- Scale of graph
- Title of graph
- Trip/Close status
- Report printing



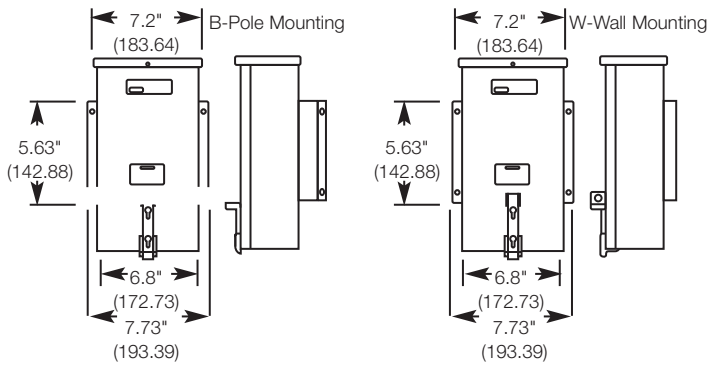
Typical Load Data Graph

Mechanical Data (Series 4400)

See pages 66-69 for more information on Fisher Pierce® Series 1301 PowerFlex™ High-Accuracy Line-Post Current Sensors.



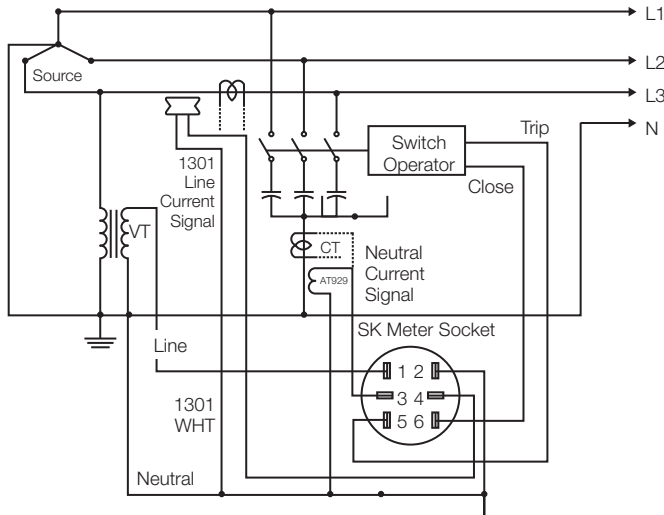
Lexan Enclosure (6 stab meter plug shown)



Aluminum Enclosure

Installation and Preferred Sensor Location

1. 4W-grounded WYE circuit shown.
2. Refer to ordering information for wiring of other socket codes or terminal strip.
3. Refer to instruction manual for complete installation information.



Specifications are subject to change.

Specifications

Specifications for Fisher Pierce® Series 4400 AutoCap™ Adaptive Capacitor Control and Recorder

Voltage Range (Power and True RMS Sensing):
 95–140V, 60 Hz
 190–280V, 60 Hz
 95–125V, 50 Hz
 190–250V, 50 Hz
Sensing Accuracy:
 ±0.5% of reading over temperature
Voltage Control and Override:
 95–140V/190–280V secondary in 0.1V increments
Voltage Bias:
 0–20V/0–40V in 0.1V increments
Voltage Transformer Ratio (VTR):
 1:1 to 1000:1 in 0.1:1 increments

Current: Sensors:
 – Fisher Pierce® Series 1301 line post sensor (60 A/V) ... 4-800A true RMS
 – Lindsey line post sensor (100 A/V) ... 4-800A true RMS
 – CT secondary ... 0.1 – 20A true RMS
Accuracy: ± 1.0% Reading, ± 0.2% Range, ± sensor error.
Angle Accuracy: ... ± 1°, ± sensor error
Current Control—Range/Resolution:
 Line post sensor ... 4-800A in 0.1A increments
 Current Transformer ... 0.1-20A secondary in 0.01A increments
Current Transformer Ratio (CTR):
 5:5 to 2000:5 in 1:5 increments

VAR Control—Range/Resolution:
Adaptive VAR: Limited only by secondary voltage range x current sensing range
3ø kVAR: Range ± 1 to ± 99,999 kVAR in 1 kVAR increments.

Time Control—Range/Resolution:
 Two Close and two Trip settings for each day of the week in 24:00 hour clock, in 1-minute increments

Temperature Control—Range/Resolution:
Sensor located on bottom of enclosure with radiation shield.
Range: -40° to 122°F (-40° to 50°C) outside air ambient.
Accuracy: ± 2° F / 1° C

Temperature Control, Override and Bias:
 – Close on High temperature
 – Close on Low temperature
 – Range ... -40° F to 122° F (-40° C to 50° C) outside air ambient in 1° F (1° C) increments

Serial Communications Port:
 DB9 female connector

Optical Communications Port: Type 2

Operating Humidity Range: 0–95% non-condensing

Surge Withstand: ANSI C62.41-1987

Electrostatic Discharge Test:
 15kV applied to all accessible parts, IEC 801-2

Output Relay Rating: 10A continuous, 50A, 50% PF, 6 cycles make only

Relay Type: Momentary (two relays)

Contact closure period:
 1–1000 sec. in 1-sec. increments.

Fuse Rating:
 Load Fuse – 10A FNM Slo-Blo®
 Controller Fuse – 2A

Enclosures:
Six-Stab Lexan: 8.5"H x 6.5"W x 4.0"D, includes optical port and electromechanical operations counter options
Aluminum: 11.5"H x 7.0"W x 4.0"D, includes optical port and electromechanical counter options

Computer Requirements:
 SmartSet™ setup software requires Windows 3.1 or better

Series 1301 Line-Post Current Sensor Calibration Accuracy at 120A: ± 1%
Linearity Error: 3–1200A, ± 1%
Angle Error: 3–600A, ± 0.50
Temperature Error: ± 0.02% °C
7th Harmonic Response: 82%

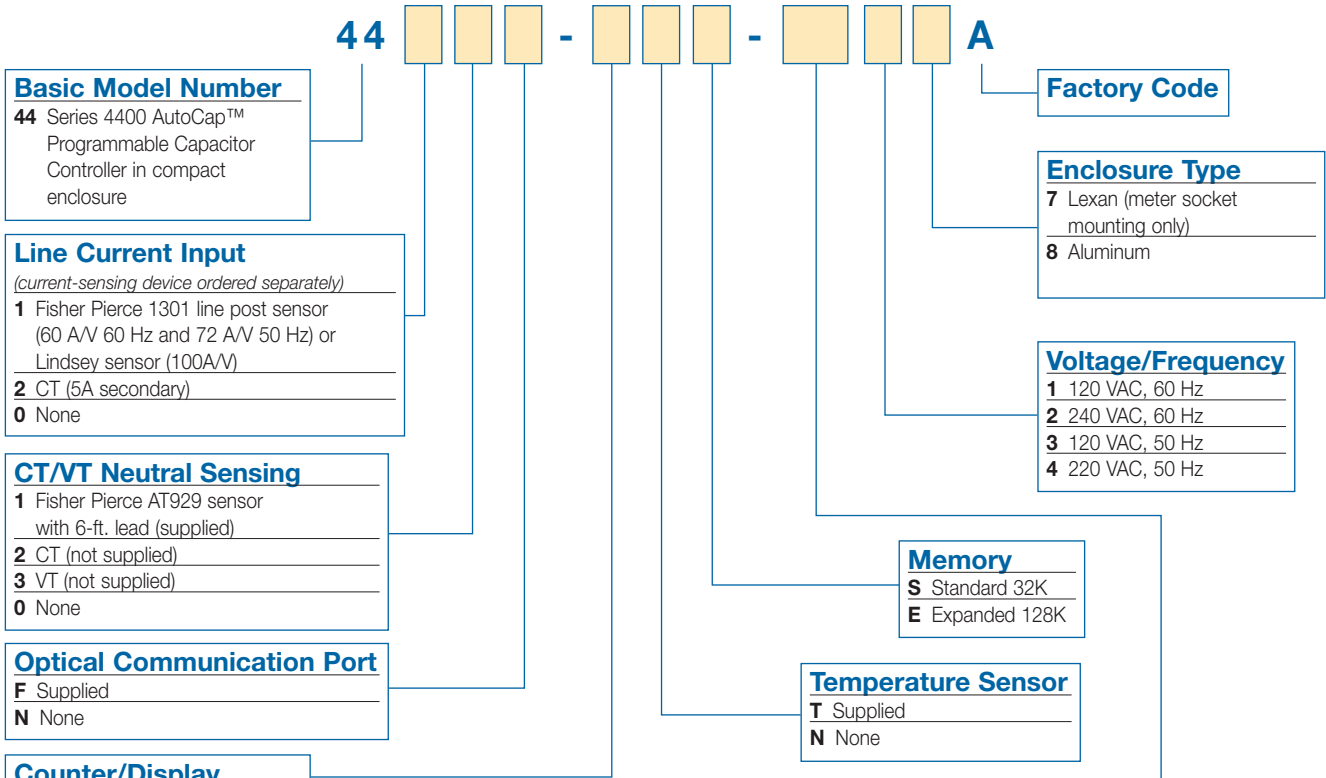
See page 66-69 for complete specifications on Fisher Pierce® Series 1301 Line-Post Current Sensors.

Ordering Information for Fisher Pierce® Series 4400 AutoCap™ Control and Recorder

The following diagram shows how to construct a catalog number for the Series 4400 AutoCap™ Adaptive Capacitor Control and Recorder. See page 28-30 for Fisher Pierce® Series 2100 Meter Sockets.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.



Basic Model Number

44 Series 4400 AutoCap™ Programmable Capacitor Controller in compact enclosure

Line Current Input

(current-sensing device ordered separately)
1 Fisher Pierce 1301 line post sensor (60 A/V 60 Hz and 72 A/V 50 Hz) or Lindsey sensor (100A/V)
2 CT (5A secondary)
0 None

CT/VT Neutral Sensing

1 Fisher Pierce AT929 sensor with 6-ft. lead (supplied)
2 CT (not supplied)
3 VT (not supplied)
0 None

Optical Communication Port

F Supplied
N None

Counter/Display

C Electromechanical counter only
D 2-line display only
E Electromechanical counter and 2-line display (read only)
P Panel Set "Programmable 2-Line Display"
K Panel Set with Mechanical Counter
N None

Factory Code

Enclosure Type

7 Lexan (meter socket mounting only)
8 Aluminum

Voltage/Frequency

1 120 VAC, 60 Hz
2 240 VAC, 60 Hz
3 120 VAC, 50 Hz
4 220 VAC, 50 Hz

Memory

S Standard 32K
E Expanded 128K

Temperature Sensor

T Supplied
N None

Four-Jaw Meter Socket Mounting and Wiring

	1	2	3	4	5	6	Ext. GND Lug	Enclosure	Current Inputs
FJ	L	N/GND	TR	CL	--	--	NO	LEXAN	NONE
GJ	L	N/COM	TR	CL	--	--	YES	LEXAN/ALUM	NONE

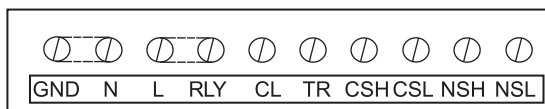
Six-Jaw Meter Socket Mounting and Wiring

	1	2	3	4	5	6	Ext. GND Lug	Enclosure	Current Inputs
SJ	CSL	N/GND	L	TR	CSH	CL	NO	LEXAN	LINE ONLY
TJ	CSL	N	L	TR	CSH	CL	YES	LEXAN/ALUM	LINE ONLY
SM	L	N/GND	CSL	CSH	TR	CL	NO	LEXAN	LINE ONLY
TM	L	N	CSL	CSH	TR	CL	YES	LEXAN/ALUM	LINE ONLY
SL	L	N/GND	NSL	NSH	TR	CL	NO	LEXAN	NEUTRAL ONLY
TL	L	N	NSL	NSH	TR	CL	YES	LEXAN/ALUM	NEUTRAL ONLY
SK	L	N/GND/COM	NSH	CSH	TR	CL	NO	LEXAN	LINE + NEUTRAL
TK	L	N/COM	NSH	CSH	TR	CL	YES	LEXAN/ALUM	LINE + NEUTRAL

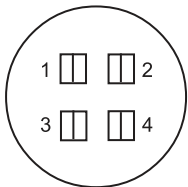
Bracket Mounting with Terminal Strip

	Mounting Location	Ext. GND Lug	Enclosure	Current Inputs	
BJ	Pole	Wire to Terminal Strip	YES	ALUM	NONE, LINE, NEUTRAL, OR LINE + NEUTRAL
WJ	Wall	as shown below			

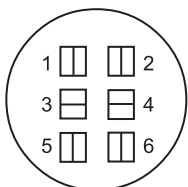
Terminal Strip (Aluminum Enclosure Only)



GND = System ground **N** = Neutral **L** = Line
RLY = Output relay armatures **CL** = Close
TR = Trip **CSH** = Line current signal High
CSL = Line current signal Low
NSH = Neutral current signal High
NSL = Neutral current signal Low
 -- Broken lines between terminals indicate removable jumper



View looking into socket



Socket for CT shorting switch available for SJ and TJ wiring

Fisher Pierce® Series 4000 SmartLink™ Cellular Remote Telemetry Module

Reliable, cost-effective two-way communication for monitoring, control and automation of the Series 4400 AutoCap™ Control.

The Fisher Pierce® Series 4000 SmartLink™ Remote Telemetry Module (RTM) provides reliable and cost-effective two-way communications for monitoring, control and automation of new or existing Fisher Pierce® Series 4400 capacitor bank controls. Electric utility operations personnel can have local and remote control of their capacitor solutions with SCADA override of local control strategies.

The Series 4000 SmartLink™ RTM uses two-way radio technology from Telemetric to communicate over digital cellular data networks. No additional radio equipment, license or local cellular account is required.

You can control and monitor Series 4400 AutoCap™ controls using a secure, web-based reporting application or SCADA/EMS systems using optional software from Telemetric. The Web-based application supports automatic alarm or status reporting sent via e-mail, pager or text message. Additionally, the application supports group commands for controlling groups of capacitor banks.



4000 RTM

4400 Base Control

Features	Benefits/Descriptions
Remote trip/close	Provides the capability to remotely open or close the contacts.
Selection of remote or local operating mode	Allows electric utility operations personnel the choice of local or remote control with SCADA override of local control
Intelligent Monitoring of Series 4400 AutoCap™ Control Analog and Digital Status Points	Triggers automatic status-point change reports based on user-configurable rules (unsolicited report by exception). Also provides user-configurable, time-scheduled reports of selected digital and/or analog status points and query-on-demand reading of selected status points.
Flexible Ordering Options	Available as a field-upgradeable “snap-on” replacement door kit for existing Fisher Pierce® Series 4400 AutoCap™ controls or can be ordered pre-installed and complete from the factory in new Fisher Pierce® Series 4400 AutoCap™ controls.

Remote Control and User Notification

The Telemetric™ Intelligent Web Server displays the Series 4000 SmartLink™ RTM data, performs control operations and configures rule-based actions. Examples include:

- Initiate a control action such as bank switching
- Notify a designated person of a reported event by email, pager or text message
- Send predetermined commands to controls in response to a change in status
- Define a group of controls for sending group commands
- Access monitoring and control functions from a secure Web server or through new or existing SCADA systems using optional Telemetric SCADA-Xchange™ software
- Communication is initiated in four ways:
 1. Control operations from SCADA or users
 2. Automatic report upon status change
 3. Time-scheduled reports, user-selectable from once every minute to once every 240 hours (10 days) in 1-minute increments
 4. User-requested reports through the Telemetric Intelligent Web Server or your SCADA system

Specifications

Points List

Control—Digital Outputs to the Series 4400 AutoCap™ Controller

Change Mode	Remote/Local
Switch Bank	Close/Trip
Reset Daily Close Count	
Clear Neutral Current Lockout	

**Manual toggle switch on Series 4400 AutoCap™ Controller disables all automatic and remote control functions.*

Digital Inputs from the Series 4400 AutoCap™ Control

Close Inhibit	Inhibit/Clear
Trip Inhibit	Inhibit/Clear
Neutral Current Status	Lockout/Clear
VT Wire	Line Neutral/Line-Line
Neutral Current Protection	Enabled/Disabled
Anti-Hunt	Enabled/Disabled
Last Switch Open Command	Trip/Close

Analog Inputs from the Series 4400 AutoCap™ Controller

- Voltage, secondary (V)
- Last Delta E (V)
- Current, primary (A)
- Power, 3PH (kW)
- VAr, 3PH (kVAr)
- Power Factor (through Web access)
- Neutral Current (A)
- Temperature °F
- Total Close Count
- Close Today Count
- Capacitor Control Run time (hrs.)
- Maximum Close Count per Day Setpoint
- Operation Mode
- PCC Identification Number
- Neutral Current Sensor Type
- Current Sensor Phase
- Voltage Transformer Ratio
- Phase Rotation
- Current Direction (Forward/Reverse)
- Current Transformer Ratio
- Current Sensor Type
- Total Angle Correction Degree
- Reverse Power Control Action
- Season Number
- Primary Control Function
- Close Setpoint
- Trip Setpoint

Rules-based Processing of Digital and Analog Status Points

- Alarm report on digital status point change
- Analog range change rules to report analog value changes based upon 3 user-defined setpoint values or a stair-step value

Cellular Data Network

- Transmit Power: 0.6 to 1.2W
- Supports both 850/1900 MHz GSM/GPRS and EDGE digital packet data networks
- Nationwide GPRS support via Cingular Wireless and affiliated roaming partners with a variety of application data plans
- 50 Ohm SMA antenna connector
- Dual-band 850/1900 MHz antenna included

Local Serial Port

- RS-232 communication port for local configuration
- Windows based local configuration software included with Series 4000 SmartLink™ RTM

Intelligent Web Server

- Data is secure and password-protected
- Server authentication using 128-bit encryption key validation
- E-mail, text message or pager notification options

Electrical/Environmental

- 100–135 VAC, 60 Hz
- Power provided via 120V connection to Series 4400 AutoCap™ controller power (front-panel connector)
- Surge withstand: ANSI/IEEE C37.90.1-2002, 4kV min. @ 1.2/50µs surge
- Operating temperature range: -40° C to 70° C

Enclosure Door Kit

- Lexan replacement door for meter socket enclosure
- NEMA 3R rating

Ordering Information for Fisher Pierce® Series 4000 SmartLink™ Cellular Remote Telemetry Module

To order the Fisher Pierce® Series 4000 SmartLink Cellular Remote Telemetry Module, please contact the factory.

Fisher Pierce® Series 4500 AutoCap™ Adaptive Capacitor Control and Recorder

Combines AutoCap™ intelligence with data radios for cost-effective automation of switched capacitors.

The Fisher Pierce® Series 4500 AutoCap™ Control and Recorder with Two-Way Communication combines the intelligence of the AutoCap™ Adaptive Capacitor Control with data radios for cost-effective automation of switched capacitors, providing a powerful tool for discrete feeder management, data gathering, troubleshooting, system evaluation and analysis.



Fisher Pierce® Series 4500 AutoCap™ Control

Features	Benefits/Descriptions
Data Radio	Factory-installed radio modem or cellular telephone.
Adaptive VAR™ Control Mode	Automatically measures capacitor bank size and establishes VAR setpoints for maximum energy-loss reduction.
PhaseFind™ Function	Locates current signal source and compensates for phase rotation and reversed wiring.
Voltage Guard™ Function	Provides adaptive voltage restraint to prevent out-of-range line voltage conditions and capacitor bank cycling.
Reverse Power Functions	Calculate proper VAR setpoints to compensate for altered VAR measurement during this condition (four other control modes are also available for use in reverse power conditions).
True RMS Voltage and Current Sensing	Provides the most accurate method of AC voltage measurement.
Total Harmonic Distortion Recording	Documents conditions that may require harmonic mitigation.
Reverse Trip/Close Detection	Automatically senses reverse wiring of the Close and Trip drive circuits to the capacitor switch, inhibits all switching except manual and indicates error by flashing LED on front panel.
Anti-hunt Function	Automatically compensates for rapid bank tripping due to cycling loads or interaction from other switched banks on the feeder.
Undervoltage Inhibit Feature	Protects the capacitor bank switch from damage caused by low voltage.
Plug-to-Plug™ Controller Compatibility	Compatible with existing controllers for easy installation — no adapters or rewiring required.
SmartSet™ Application Software	Windows-based software simplifies programming for up to four seasons.
SmartSet™ Graphs and Reports	Records load data/events for analysis and troubleshooting — no additional software required.
Optional Expanded Recording	Provides even more load data/event recording for analysis and troubleshooting.
Optional PanelSet™ Program	Enables front-panel programming of controller without a laptop PC.
Compact Enclosure	Space-efficient installation.

Integrated two-way communication is achieved by incorporating the data radio and capacitor control in the same enclosure, eliminating the need for additional communication equipment. Communications management and protocol conversion is performed using a dedicated high-speed processor and flash memory. This permits remote protocol changes and upgrade without the need for costly field modifications.

The Fisher Pierce® Series 4500 AutoCap™ Control enables complete control flexibility using two-way communication. The control can be configured to operate under SCADA control or as a local control with SCADA override. The Series 4500 AutoCap™ Control with cellular telephone and modem provides instant trouble-free, two-way communication. Using any PC/modem and Fisher Pierce® SmartSet™ application software, which is Windows-based and menu-driven, the user can program the control, monitor real-time line conditions and retrieve and graph load survey data. The control can be used as an analytical tool and moved from site to site for verification of capacitor bank operation, load study and investigation of troublesome feeders.

The Series 4500 AutoCap™ Control offers a variety of features for performance and convenience, including Adaptive VAR™ control and PhaseFind™ Compensator.

Exclusive Advantages

The Fisher Pierce® Series 4500 AutoCap™ Adaptive Capacitor Control and Recorder with Two-Way Communications delivers many new and innovative functions to eliminate the traditional struggle associated with:

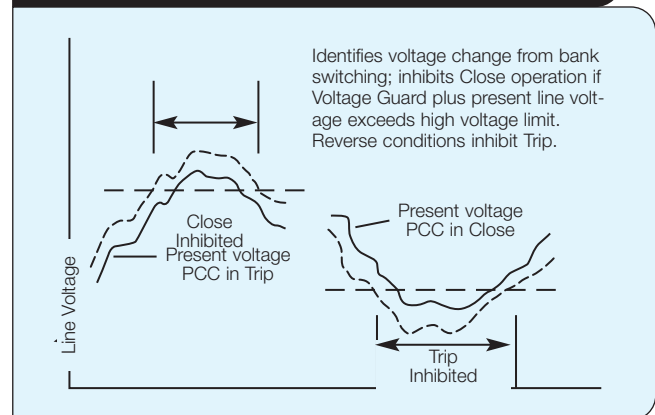
- Setting optimum VAR setpoints (Fig. 1 – Adaptive VAR™ Control)
- Finding the voltage change caused by bank switching (Fig. 2 – Adaptive Voltage Guard™ Protection)
- Field wiring (Fig. 3 – PhaseFind™ Compensator)

Voltage Guard™ Protection measures voltage change caused by capacitor switching and applies this value to the present line voltage. If Voltage Guard Protection predicts that bank switching will cause the line to exceed preset voltage limits, switching is inhibited, preventing both out-of-range line voltage conditions and capacitor bank cycling.

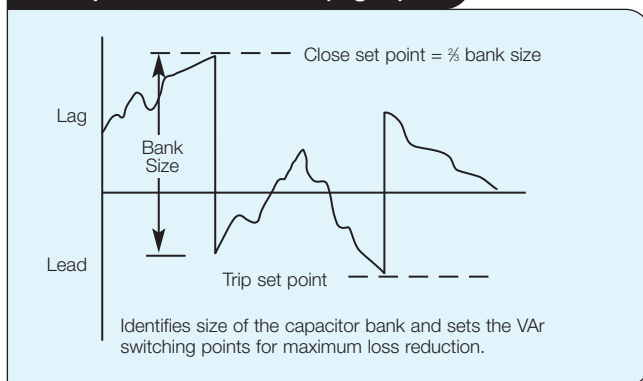
The Series 4500 AutoCap™ Control automatically corrects for installation errors, such as sensing voltage and current from different phases, reversed current signal wiring, reversed trip/close wiring and calibration errors. It also adjusts to abnormal operating conditions, including reverse power flow, bank hunting, low switching voltage, capacitor can failure (neutral current lockout) and excessive bank switching.

A programmable one- to four-season control, the Series 4500 AutoCap™ Control can operate on the basis of VAR, voltage, current, temperature, time and combinations of these inputs. Programming is simple with SmartSet™ application software, which is Windows-based and menu-driven for ease of use. In addition, the Series 4500 AutoCap™ Control offers complete load data/event recording and report creation supported by SmartSet™ software.

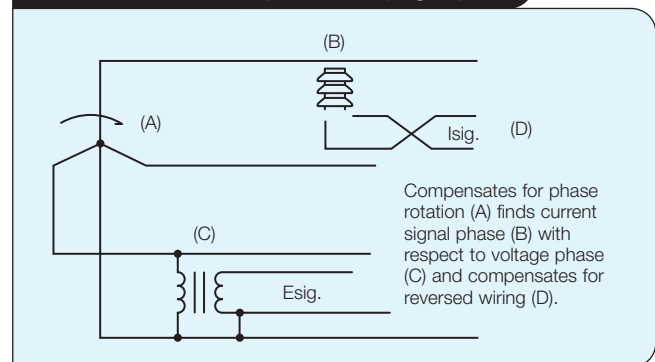
Adaptive Voltage Guard™ Protection (Fig. 2)



Adaptive VAR™ Control (Fig. 1)



PhaseFind™ Compensator (Fig. 3)



Additional AutoCap™ Control Features

Fisher Pierce® Series 4500 AutoCap™ Control builds on more than 30 years of experience in the design, manufacture and application of electronic capacitor controls.

- Standard meter socket mounting; pole or wall mounting available
- Single-phase line current signal input: Line post sensor or CT input for VAR and current control and data recording
- Capacitor bank neutral sensing signal input: Fisher Pierce® split lamination sensor (AT929) or CT/VT neutral sensing current input
- Neutral sensing lockout lamp; reset by manual button or command through RS-232
- Shielded ambient temperature sensor
- 9-Pin RS-232 communications port
- Optical communication port available
- 365/366-day time clock includes next century
- Programmable momentary output relays
- Nonvolatile memory
- Independent watchdog timer



- Electromechanical operations counter available
- Internal LCD read-only display available
- Operational status LEDs
- Manual Close/Trip operation and Auto/Manual switches.

SmartSet™ Application Software

The Series 4500 AutoCap™ Control is programmed using Windows-based SmartSet™ software created by Fisher Pierce for greater programming ease. Using SmartSet™ software, the Series 4500 AutoCap™ Control is a multifunction microprocessor-based control, programmable for up to four seasons. You can assign each season its own primary and override functions as listed in the Control Modes table below. The Series 4500 AutoCap™ Control connects to any Windows-based PC via standard RS-232 or optional optical communications port.

Control Modes			
Basic Functions	Override Functions	Voltage Bias	Reverse Power
<ul style="list-style-type: none"> • Adaptive VAR • VAR • Voltage • Current • Time • High Temp • Low Temp 	<ul style="list-style-type: none"> • Voltage • Time • High Temp • Low Temp 	<ul style="list-style-type: none"> • Time • High Temp • Low Temp 	<ul style="list-style-type: none"> • Ignore • Voltage • VAR • Trip and Inhibit • Close and Inhibit

The Series 4500 AutoCap™ Control also provides the following additional functions:

- Real-time monitoring of data readings and controller status through local RS-232 or optical port
- Traditional holiday calendar—10-year predefined, can be user edited
- Individual and block holidays—10-year user programmable
- Daylight Saving Time calendar—10-year predefined, can be edited
- Daily close count limit—User programmable
- Switching time delays/inhibits—For automatic and manual modes with LED indication on controller panel
- Neutral sensing lockout—Trips bank and prevents further capacitor operation, flashes external lamp in the event of capacitor can failure, reset by external button or RS-232 command

Extensive Data Recording

The Series 4500 AutoCap™ Control provides a full spectrum of user-defined load data and controller operations recording capability. Three-phase load data is derived from single-phase measurements and assumes balanced load. All recorded data is easily uploaded via RS-232 or optional optical port. Memory of 32K is standard; expanded 128K memory is also available.

Data Recording Parameters

Load Data Recording

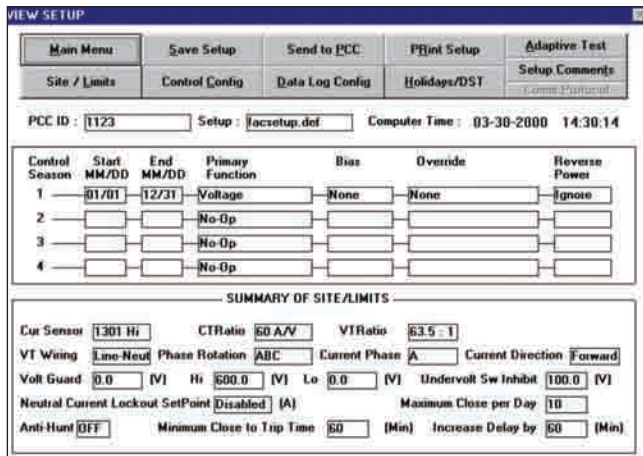
- (1 min. to 4 hour averaging period)
- Date/Time Stamp
- Voltage (Sec. or Line)
- Current (Sec. or Line)
- kVAr (3ø)
- kVA (3ø)
- kW (3ø)
- Power Factor
- Total Harmonics
- Temperature
- Trip/Close Status

Daily Summary Recording

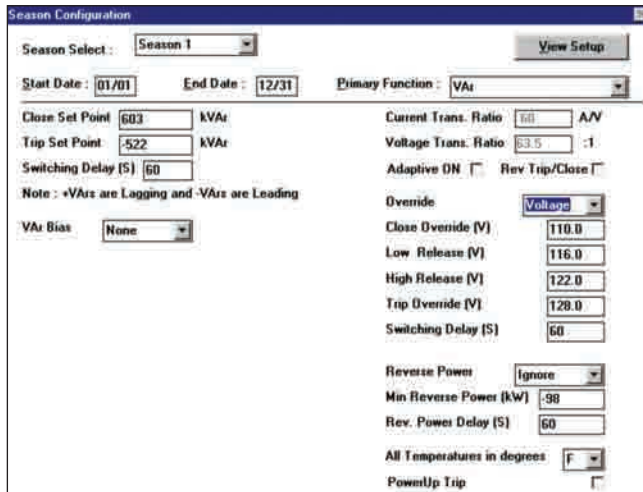
- Date Stamp
- Time of Max./Min. Value
- Daily Max./Min. Voltage
- Daily Max./Min. Current
- Daily Max./Min. (3ø) kVAr
- Daily Max./Min. Temp
- Daily Close Operations
- Daily Close Hours
- Close Ops Running Total

Operations Recording

- Date/Time
- Basic Operations
- Override Operations
- Manual Operations
- Power Up/Power Down
- Voltage Before/Delta
- kVAr Before and After
- kW Before and After
- Reverse Power



View Setup Screen—Allows user to review controller setup and site configuration summary.



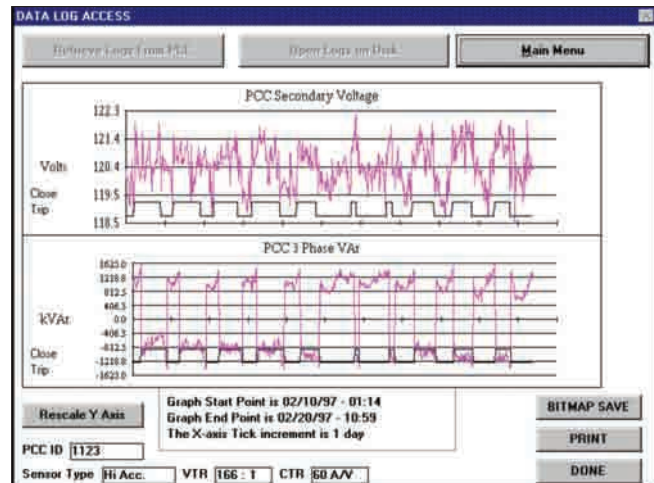
Season Configuration Screen—Fully prompted for easy controller programming.

Report Generation Capability

The SmartSet™ report-generation feature provides spreadsheet format and visual presentation of recorded data as well as many editing features. This capability is integrated into SmartSet™ software — no additional software is required. The ability to graph all load study data, specify time period and superimpose Close/Trip operations is included.

Load Data Reports

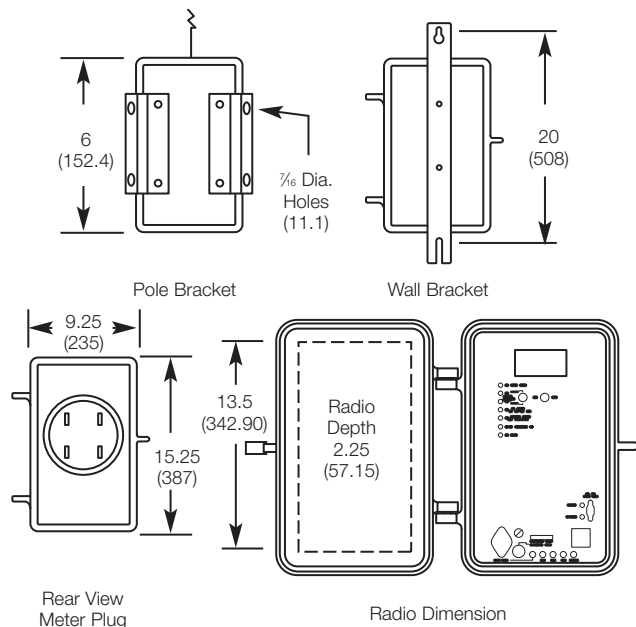
- Spreadsheet format
- Graphing of all load data
- Edit graph time period
- Scale of graph
- Title of graph
- Trip/Close status
- Report printing



Typical Load Data Graph

Mechanical Data (Series 4500)

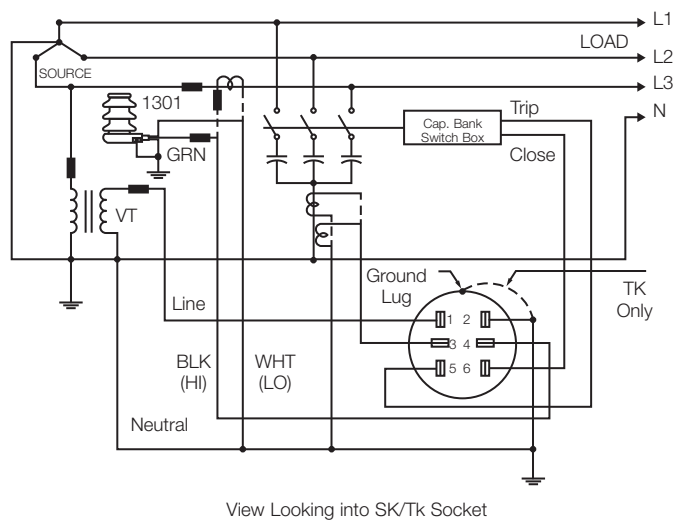
See pages 66-69 for more information on Fisher Pierce® Series 1301 PowerFlex™ High-Accuracy Line-Post Current Sensors.



Installation and Preferred Sensor Location

Notes:

1. 4W-grounded WYE circuit shown.
2. Refer to ordering information for wiring of other socket codes or terminal strip.
3. Refer to instruction manual for complete installation information.



View Looking into SK/Tk Socket

Specifications

Specifications for Fisher Pierce® Series 4500 AutoCap™ Adaptive Capacitor Control and Recorder with Two-Way Communication

Radio

Maximum Radio Dimensions:

13.50"H x 7.25"W x 2.25"D

Radio Power Supply: 13 VDC, 2.0A continuous, 3.0A transmit

Electrical

Operating Voltage Ranges:

95-140V, 60 Hz

90-280V, 60 Hz

95-125V, 50 Hz

190-250V, 50 Hz

Surge Withstand:

ANSI C62.41-1987

Electrostatic Discharge Test:

15kV applied to all accessible parts, IEC 801-2

Output Relay

Number and Type:

2 momentary closure

Maximum Continuous Load: 10A

Maximum Inrush: 50A, 50% PF,

6 cycles, make only

Contact Closure Period:

Programmable 1-120 sec.

in 1-sec. increments

Fuse Rating

Output to Capacitor Switch:

10A FNM Slo-Blo® load fuse

Controller Input: 2A controller fuse.

RS 232 Communications Port:

DB9 female connector

Optical Communications Port:

Type 2

Mechanical

Enclosure: Luran, NEMA 3R

Mounting: 4- or 6-jaw meter base,

wall- or pole-mount bracket

Dimensions: 15.25"H x 9.25"W x 8.50"D

Environmental

Operating Temperature:

-40° C to 80° C (-40° F to 176° F)

Humidity Range:

0 to 95% non-condensing

Measurement Performance

Voltage

Secondary

Resolution: 0.1 VAC

Accuracy: ±0.5% of reading over temperature

Range: Same as operating range, true RMS

Primary

VT Ratio Range:

1:1 to 1000:1 in 0.1:1 increments

Current

Resolution:

Fisher Pierce® 1301 sensor:

0.1A

Lindsey line-post sensor:

0.1A

Current transformer: 0.01A

(secondary)

Accuracy: ±1.0% Reading, ±0.2% Range, ± sensor error

Range:

Fisher Pierce® 1301 sensor

... 4-800A true RMS

Lindsey line-post sensor:

4-800A true RMS

Current transformer:

0.1-20A (secondary)

true RMS

Current Transformer

Ratio (CTR):

5:5 to 2000:5 in

1:5 increments

Reactive Power (VAR):

Resolution: 1kVAR

Range: ±99,999 kVAR

Temperature:

Resolution: 1° F (1° C)

Accuracy: ±4° F (2° C)

Range: -40° C to 60° C

(-40° F to 140° F)

Time Clock:

Resolution: 1 sec.

Accuracy: ±10 min. per yr.

Range: 24-hr. clock

Settings: 1-min. increments

Phase Angle:

Resolution: 0.1°

Accuracy: ±1°, ± sensor error

Range: 0° - 359°

Neutral Current

Resolution:

Fisher Pierce® AT929 sensor:

0.1A

Current Transformer: 0.01A

(secondary)

Potential Device: 0.1V (secondary)

Accuracy: ±2% of reading,

±1% range, ±sensor error

Range:

Fisher Pierce AT929-400 sensor:

1 to 60A

Current Transformer Ratio Sec:

5:5 to 2000:5

Potential Device:

0-60V (secondary)

Controller Processor

Memory Size: 32 kB standard,

128 kB optional

Memory Types: EPROM, NVRAM

and battery-backed RAM

Series 1301 Line-Post Current Sensor

Calibration Accuracy at

120A: ± 1%

Linearity Error: 3-1200A, ± 1%

Angle Error: 3-600A, ± 0.50

Temperature Error: ± 0.02% °C

7th Harmonic Response: 82%

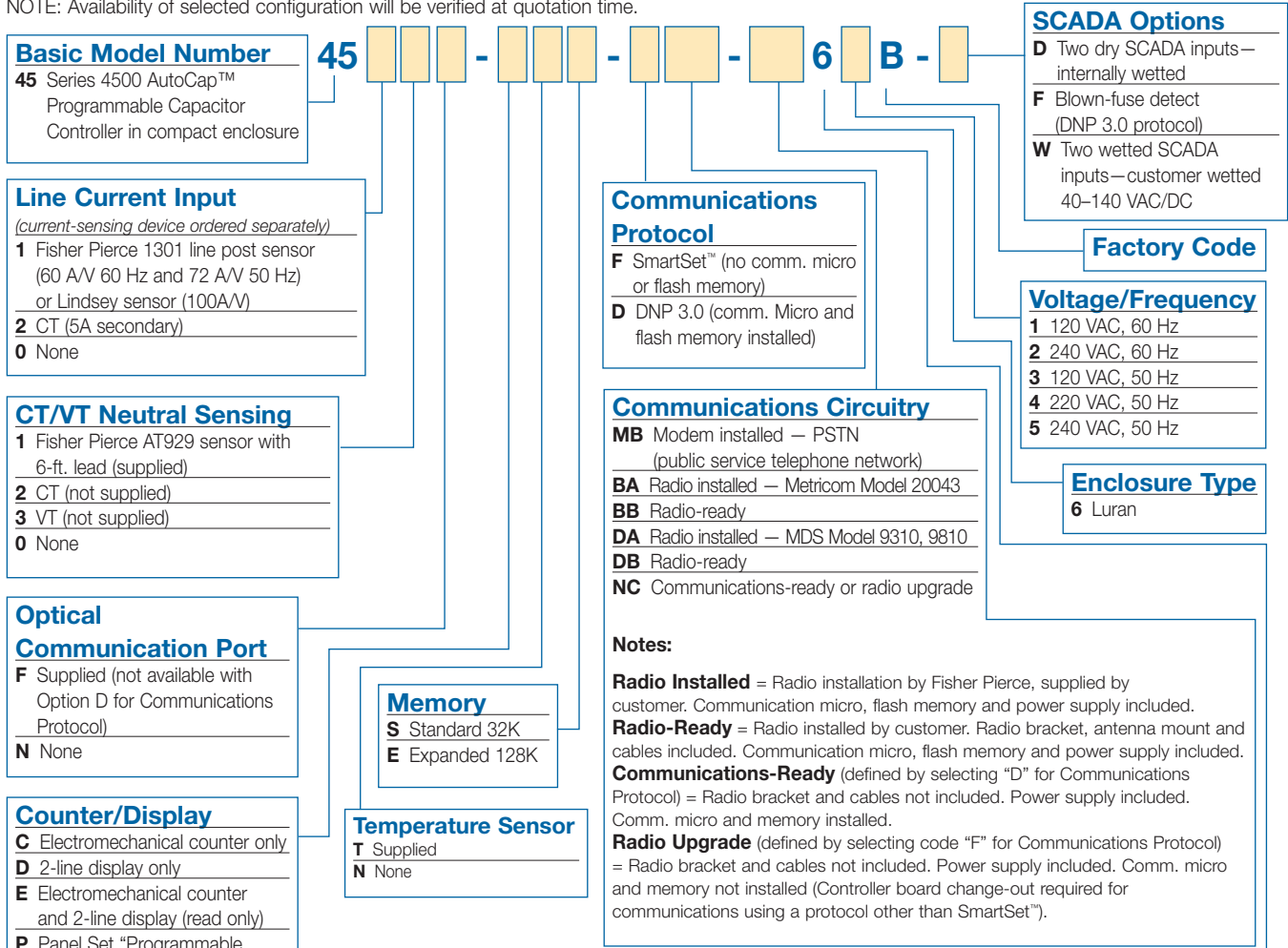
See page 66-69 for complete specifications on Fisher Pierce® Series 1301 Line-Post Current Sensors.

Ordering Information for Fisher Pierce® Series 4500 AutoCap™ Control and Recorder

The following diagram shows how to construct a catalog number for the Series 4500 AutoCap™ Adaptive Capacitor Controller and Recorder.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.



Four-Jaw Meter Socket Mounting and Wiring

	1	2	3	4	5	6	Ext. GND Lug	Current Inputs
FJ	L	N/GND	TR	CL	—	—	NO	NONE
GJ	L	N/COM	TR	CL	—	—	YES	NONE

Six-Jaw Meter Socket Mounting and Wiring

	1	2	3	4	5	6	Ext. GND Lug	Current Inputs
SJ	CSL	N/GND	L	TR	CSH	CL	NO	LINE ONLY
TJ	CSL	N	L	TR	CSH	CL	YES	LINE ONLY
SM	L	N/GND	CSL	CSH	TR	CL	NO	LINE ONLY
TM	L	N	CSL	CSH	TR	CL	YES	LINE ONLY
SL	L	N/GND	NSL	NSH	TR	CL	NO	NEUTRAL ONLY
TL	L	N	NSL	NSH	TR	CL	YES	NEUTRAL ONLY
SK	L	N/GND/COM	NSH	CSH	TR	CL	NO	LINE + NEUTRAL
TK	L	N/COM	NSH	CSH	TR	CL	YES	LINE + NEUTRAL

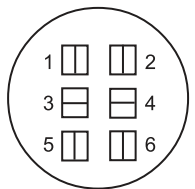
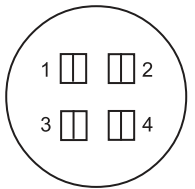
Bracket Mounting with Terminal Strip

Mounting Location	Ext. GND Lug	Current Inputs
BJ Pole	Wire to Terminal Strip	YES NONE, LINE, NEUTRAL, OR LINE + NEUTRAL
WJ Wall	as shown below	

Terminal Strip

⊕ ⊕ ⊕	⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕
CL COM TR	GND N L RLY CL TR CSH CSL NSH NSL
SCADA INPUT	

CL = Close COM = Com TR = Trip GND = System ground
 N = Neutral L = Line RLY = Output relay armatures CL = Close
 TR = Trip CSH = Line current signal High
 CSL = Line current signal Low NSH = Neutral current signal High
 NSL = Neutral current signal Low
 -- Broken lines between terminals indicate removable jumper



Socket for CT shorting switch available for SJ and TJ wiring

Fisher Pierce® Multi-Step Capacitor Switching Control

Flexible and efficient multi-step capacitor switching — ideal for substation applications with multiple capacitor racks.

Fisher Pierce® Multi-Step Capacitor Switching Controls are designed for use with the multiple capacitor racks typically found in substation applications. Choose between 2- or 3-step models and among VAR, Voltage or Line Current control configurations.

To ensure proper sequencing of capacitors, the Multi-Step Control operates (closes) starting with the first step and then activates the second step — and third, if purchased — after a fixed time delay of 60 or 20 seconds standard. When opening capacitors, the sequence is reversed.



Multi-Step Control

Features	Benefits/Descriptions
Variety of Configuration Options	Available in 2- and 3-step models with plug-in sensing modules for VAR, Voltage or Line Current control configuration to meet a wide range of capacitor-control applications.
NEMA 3 Weatherproof Enclosure	Field-proven structural foam or welded aluminum enclosure withstands harsh environmental conditions to provide long, dependable service life in the field.
Built-In Convenience/Reliability Features	Auto/manual switches, operations counter, spare fuse and three-stage surge protection.
Accessible I/O Test Jacks	Located on main panel for easy access.
High-Torque Adjustment Knobs	Maintain your settings even under vibration.
Your Choice of Line-Current Sensing Inputs	Include Fisher Pierce® Series 1301 line post sensor, AT929 underground/padmout sensor or a current transformer (CT).

Specifications

Input Voltage Range:
105–135 VAC, 60 Hz
200–260 VAC, 50 Hz

Output Rating SPDT:
120 VAC; 10A; 50A, 50% PF or
100A, 6 cycles make only

Hipot Test: 1800 VAC, 1 sec.,
ANSI C62.41 1974

Operating Temperature:
-30° C to 60° C
(-220° F to 150° F)

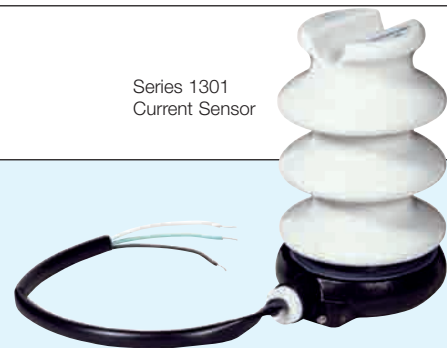
Close Counter:
Pulse operated; all close operations

Current Sensors:
FP Series 1301 or 0–0.5A CT

Voltage Module



Series 1301 Current Sensor



Time Delays:
20 or 60 sec. standard, ±10%

Surge Protection
120 VAC Input: 8450pKA min., 800 VAC max. clamp, 160 joules
Current Sensor: 1000pKA, 200 VAC max. clamp, 30 joules

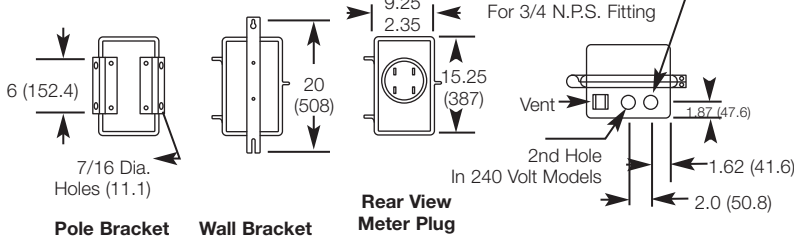
Enclosures:
Structural Foam—
15.25"H x 9.25"W x 8.5"D
Aluminum—18"H x 8"W x 7"D
Available with wall- or pole-mount bracket or 4-/6-stab meter plug

Sensing Modules

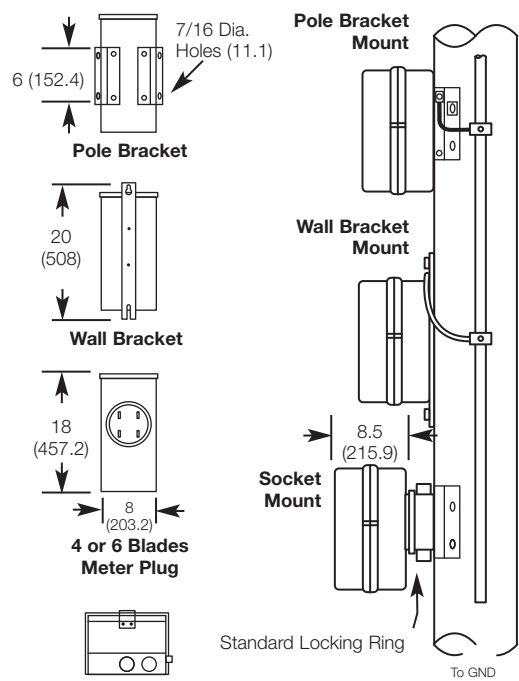
Type	Input	Range	Accuracy
Voltage	VT	105–135 VAC	±1 VAC
Current	Series 1301	3–500A AC	±3% setting ±3% range
Current	CT	0.5–5A AC	±3% Setting ±3% Range
VAR	Series 1301	0–300A lag 0–450A lead	±3% setting ±3% range
VAR	CT	0–1A reactive (lead/lag)	±5% range

Mechanical Data

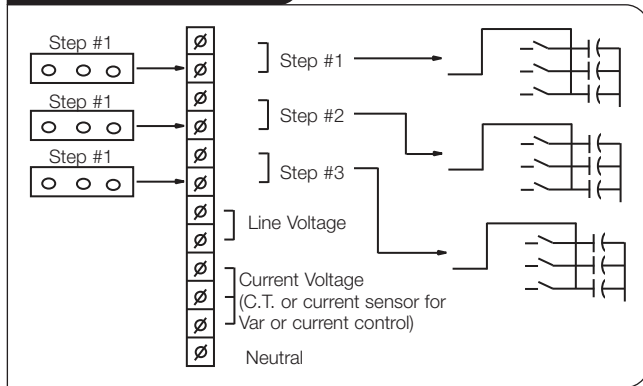
Structural Foam Enclosure



Aluminum Enclosure



Step Control



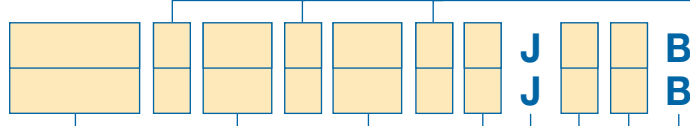
Ordering Information for Fisher Pierce® Multi-Step Capacitor Switching Controls

The following diagram shows how to construct a catalog number for a Multi-Step Capacitor Switching Control.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.

For 2-Step Controller:
For 3-Step Controller:



First Step

- 2406** Voltage
- 4604** VAR, use Fisher Pierce® Series 1301 standard line post sensor, 3ø, 4W, Wye system
- 4608** VAR, use 5A CT 3ø, 4W, Wye system
- 4609** VAR, use 5A CT 3ø, 3W, Delta system
- 4620** VAR, use Fisher Pierce® Series 1301 high accuracy line post sensor, 3ø, 4W, Wye system
- 4844** Line current, use Fisher Pierce® Series 1301 standard or high accuracy line post sensor
- 4846** Line current, use 5A CT

Second and/or Third Step

- 35** Voltage
- 36** Line current, use with 4844
- 37** Line current, use with 4846
- 38** VAR, use with 4604
- 39** VAR, use with 4608
- 40** VAR, use with 4609
- 64** VAR, use with 4620

Time Delay

- D** 60 seconds (standard)
- B** 20 seconds (standard)

Model Generation

- B** Step Controller

Operating Information

- 3** 240V, 50Hz, 5A fuse
- 5** 120V, 50Hz, 5A fuse
- 6** 120V, 60Hz, 5A fuse
- 8** 120V, 60Hz, 10A fuse

Enclosure

- 3** Aluminum, 8"W x 7"D x 18"H
- 6** Structural Foam, 9.25"W x 8.5"D x 15.25"H
- 2** None

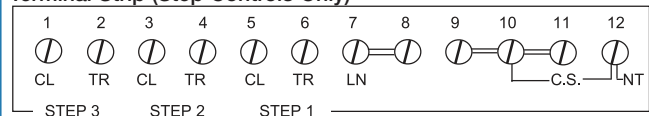
Mounting Configuration

- W** Flat wall bracket
- B** Wrap-around pole bracket

External Wiring Connections

- J** 12-terminal wiring strip

Terminal Strip (Step Controls Only)



Jumper Connections
Isolated Output, no jumper 7 to 8 (terminal 8 = switching voltage)

Consult factory for additional options.

Fisher Pierce® Series 1527 PowerFlex™ Neutral Sensing Relay

Takes failed capacitor banks off-line in switched or non-switched capacitor sites.

The Fisher Pierce® Series 1527 PowerFlex™ Neutral Sensing Relay monitors capacitor bank neutral current. When the neutral signal exceeds the trip point, the Series 1527 Neutral Sensing Relay will trip the capacitor bank off-line (close lockout) until manually reset. A flashing red lamp on the bottom of the enclosure alerts utility personnel to a close lockout condition. A momentary (alarm) contact is also available for remote signaling of a failing capacitor bank.

The Series 1527 Neutral Sensing Relay may be used at switched or non-switched capacitor sites. When used in conjunction with a switching control's CLOSE output, the neutral sensing control will protect the capacitor bank from an eruption caused by failing packs within a capacitor can.



The neutral signal can be monitored by any of the following:

- Fisher Pierce® Series 1301 line-post current sensor
- Fisher Pierce® Series AT929 current sensor
- 5A current transformer
- 20 VAC voltage transformer in series with the neutral conductor
- 15V ampere potential device (3Ø Delta)

Fisher Pierce® Series 1301 and AT929 current sensors can be installed without cutting or splicing the neutral conductor.

Available as a wall- or pole-mounted unit, the Fisher Pierce® Series 1527 Neutral Sensing Relay is housed in a weatherproof, UV-resistant, molded structural foam enclosure. Easily accessed panel controls enable adjustments to trip, alarm and time delay

Features	Benefits/Descriptions
Field-Adjustable Trip and Alarm Setpoint/Time Delay	Maximizes versatility to suit specific needs by allowing user to select both trip and alarm setpoints and trip and alarm time delay within supported ranges.
External Flashing Trip Lamp	Visibly alerts utility personnel to a closed lockout condition.
Optional Remote Alarm Contact	Provides remote signaling of a failing capacitor bank.
MOV Surge Protected	Enhances reliability by safeguarding against damage from transient surges.

Specifications

Input Voltage:
105–135 VAC, 60 Hz
200–260 VAC, 50 Hz

Burden:
2 VA, quiescent mode
9 VA, close lockout

Input Signal:
1–60A, Series 1301 or AT929
0.5–5A, CT
1–20 VAC, voltage transformer
1–15 VA, potential device

Trip Ranges:
1–6A; x 1, x 3 and x 10
(Series 1301 and AT929)
1–5A; x 0.5 and x 1 (5A CT)
1–5 VAC; x 1, x 2 and x 4
(20V transformer or 15 VA device)

Accuracy: ±10% of setting

Time Delay:
1–60 seconds adjustable
(trip and alarm, common delay)

Accuracy: ±20% of setting

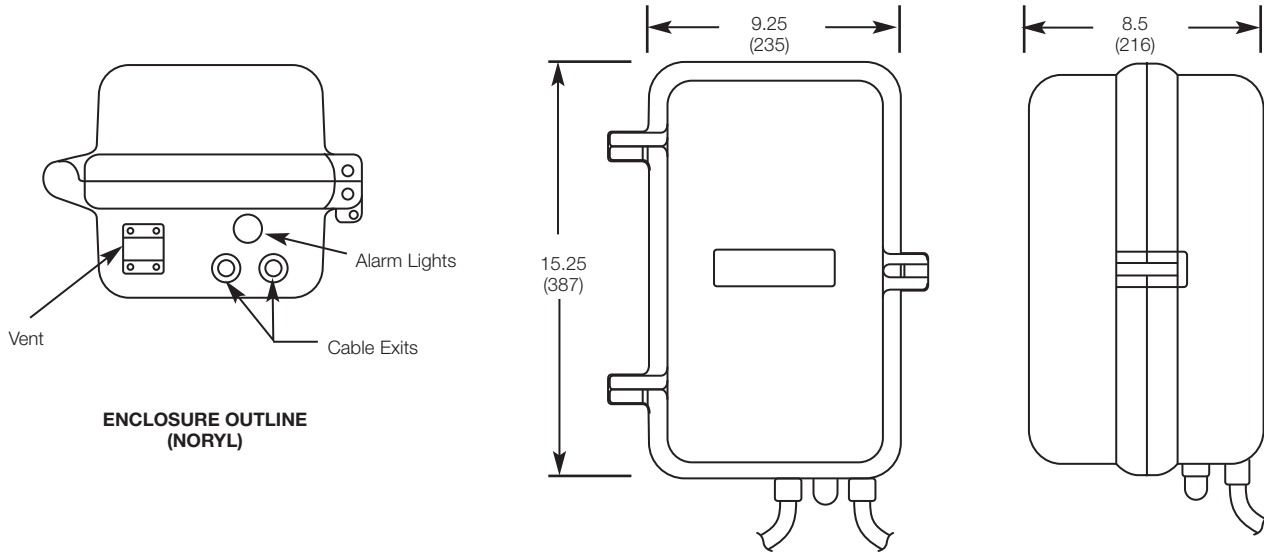
Operating Temperature:
-30° C to 60° C (-22° F to 150° F)

Harmonic Rejection:
3rd (180 Hz), 30dB
5th (300 Hz), 34dB
7th (420 Hz), 38dB

Output Contacts:
SPDT (latching)—10A continuous, 50A, 50% pf or 100A, 6 cycles, make only
DPDT (energized)—25A continuous

Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)

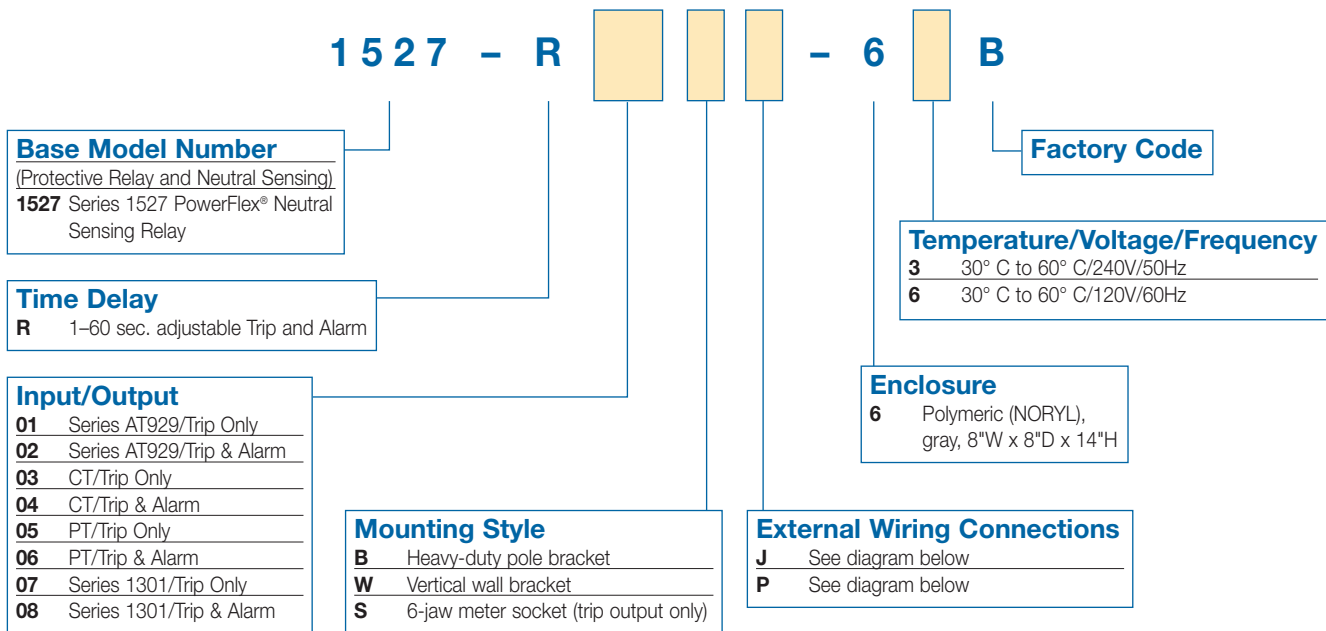


Ordering Information for Fisher Pierce® Series 1527 PowerFlex™ Neutral Sensing Relay

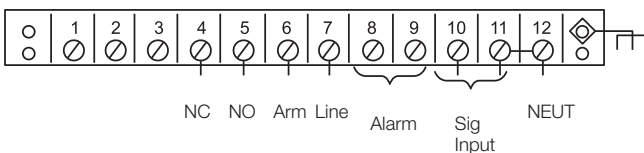
The following diagram shows how to construct a catalog number for a Series 1527 Neutral Sensing Relay.

□ Indicates field that must be filled in to complete order.

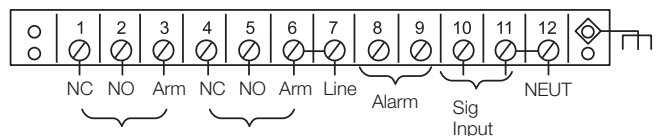
NOTE: Availability of selected configuration will be verified at quotation time.



Code J Output (SPDT)



Code P Output (DPDT)



Fisher Pierce® Series 1580 Fixed Capacitor Bank Neutral Sensing Indicator

Alerts you to failed capacitors in fixed distribution capacitor banks.

The Fisher Pierce® Series 1580 Neutral Sensing Indicator continuously monitors the neutral conductor of a fixed distribution capacitor bank. When a capacitor fails and blows the fuse in one phase of the bank, the capacitor neutral signal becomes unbalanced. This unbalance is sensed by the Series 1580 Neutral Sensing Indicator.



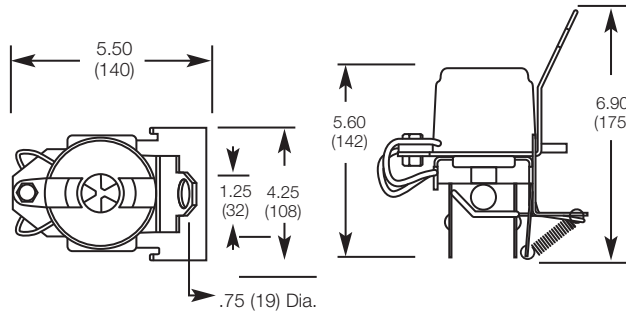
The design of the Series 1580 Neutral Sensing Indicator is based on the field-proven Fisher Pierce® line of faulted circuit indicators. The Series 1580 uses the current sensor to detect neutral current unbalance, as well as to provide power for its circuitry, so no battery is required for operation.

Attached to a neutral conductor, the Series 1580 provides a continuous check on the capacitor bank. When it senses a high neutral current (typically 15 amps), it flashes a high-intensity LED with the flashing rate indicating the magnitude of the neutral current.

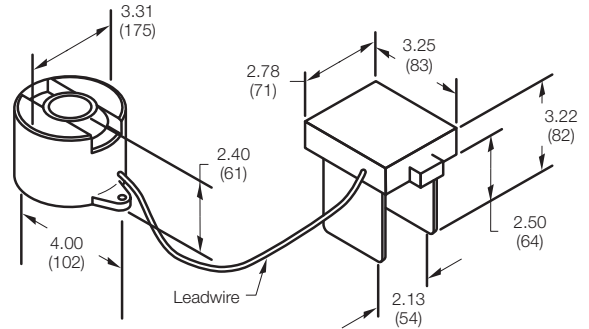
Features	Benefits/Descriptions
High-Intensity LED	Provides clear visual indication of neutral current unbalance. Flash rate indicates magnitude of neutral current.
No Battery Required	Low maintenance; draws operating current for its circuitry from the current sensor—no battery to check or change.
Simple Design	Ships fully assembled for easy installation.
Choice of Mounting Styles	Choose between hotstick or tie-wrap mounting.
Remote or Integral Sensor	Enables mounting of unit either separate from (10-ft. distance) or together with current sensor to suit different user needs.
Lexan Housing and Epoxy-Coated Sensors	Protection from moisture to ensure long, trouble-free service life.

Mechanical Data

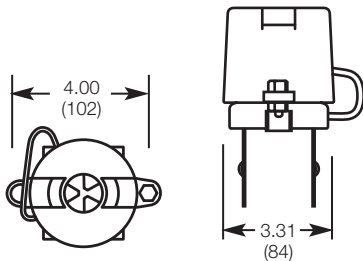
(all dimensions in inches with millimeter equivalents in parentheses)



Indicator with Attached Sensor — Hotstick Mounting

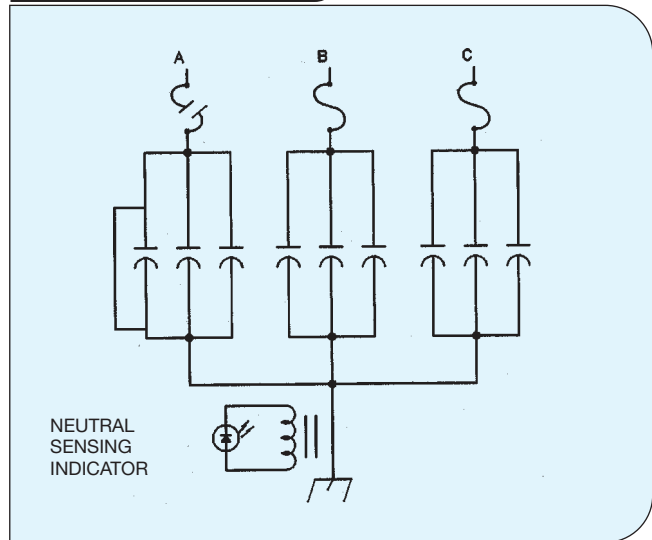


Remote Bracket Mounting Indicator



Indicator with Attached Sensor — Tie-Wrap Mounting

Installation Application



Specifications

- Operating Range: 15–200A
- Operating Temperature Range: -40° C to 85° C
- Continuous Load Current: 200A
- Overload Capability: 25,000A for 10 cycles
- Maximum Cable Diameter: 1 3/4"

Ordering Information for Fisher Pierce® Series 1580 Fixed Capacitor Bank Neutral Sensing Indicator

CAT. NO.	DESCRIPTION
1580-10	Indicator with hotstick clamp
1580-20	Indicator with 10-ft. remote sensor and tie-wrap mounting
1580-30	Indicator with integral sensor and tie-wrap mounting

Fisher Pierce® Series 2100 Meter Sockets

Designed for faster, easier installation.

Fisher Pierce® Series 2100 Meter Sockets streamline, simplify and standardize pole-mounted meter socket installations. Series 2100 Meter Sockets offer a variety of options to meet specific utility applications. Prewired units greatly reduce installation time and ship complete with all wiring in place and hardware installed, ready for mounting.



2102BFA



2101NFN



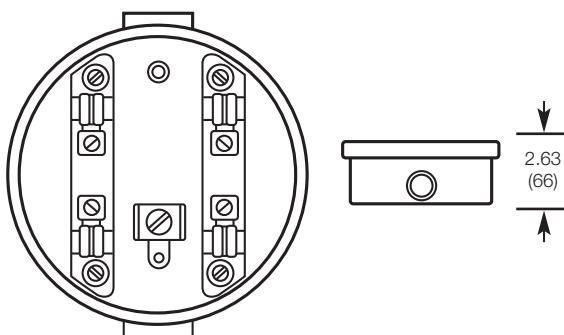
2115BSJ-W20

Features	Benefits/Descriptions
Variety of Options	Flexibility to meet the needs of many utility applications.
Prewired Sockets	Ship ready to install for maximum efficiency.

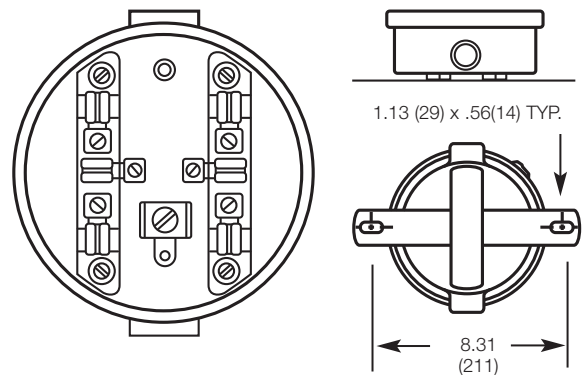
Series 2100 and 2110 Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)

4-Jaw Socket

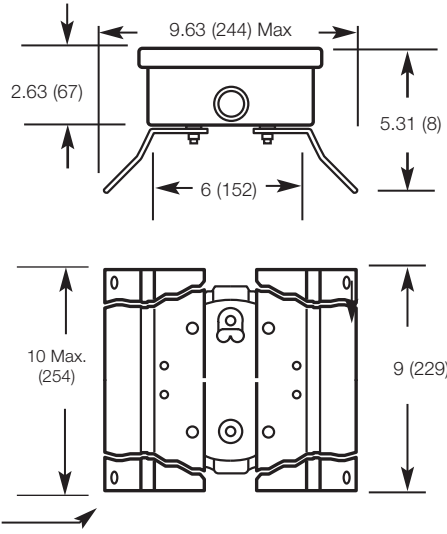
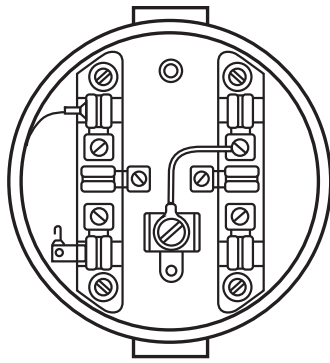


6-Jaw Socket



Fisher Pierce® Series 2100 Meter Sockets

6-Jaw Socket with Automatic Shorting Device



Capacitor Controls

Specifications

Capacity:
100A, 600V

Terminals:
Set-screw type up to #2 conductors

Hub Size:
1" internal type

Enclosure:
Die-cast aluminum

Breakouts:
Provided in back of each socket

Sealing Ring:
Snap-action standard

Options:
Padlock type on B options

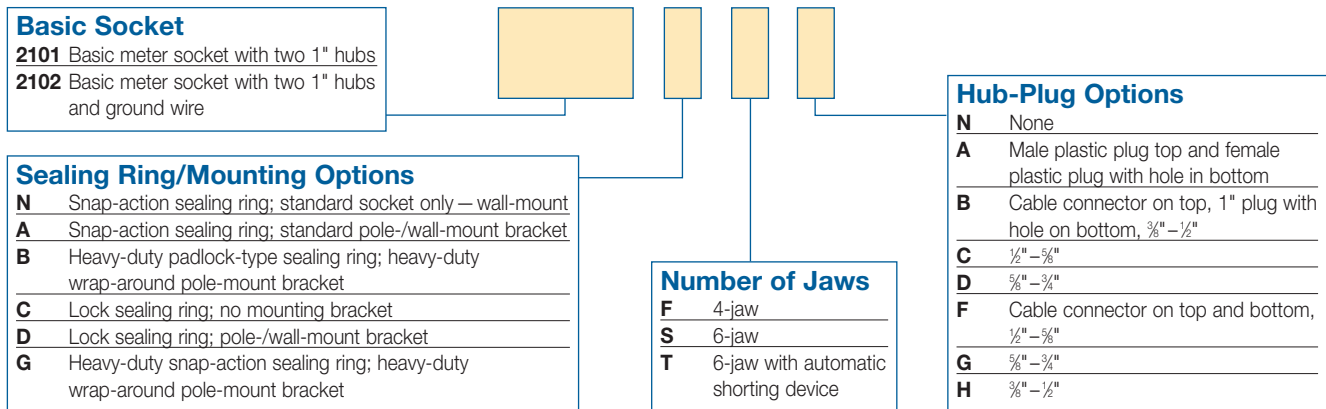
Cable Type:
See ordering information

Ordering Information for Fisher Pierce® Series 2101 and 2102 Meter Sockets

The following diagram shows how to construct a catalog number for a Series 2101 or 2102 Meter Socket.

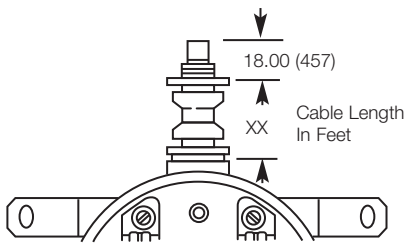
□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.

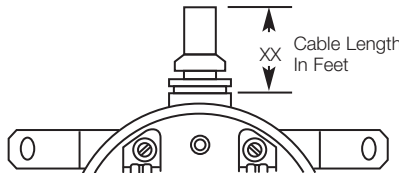


Series 2111/2115 Cable Connector Mechanical Data

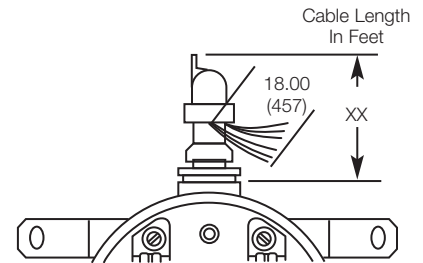
All dimensions in inches with millimeter equivalents in parentheses. XX: Length in feet — specified by customer.



Connector at Cable End

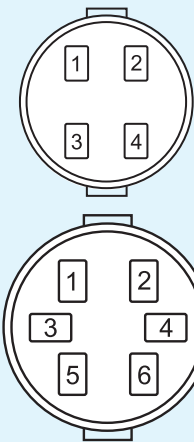


No Cable Termination at Top



Weatherhead at Cable End

Wiring for Prewired Units



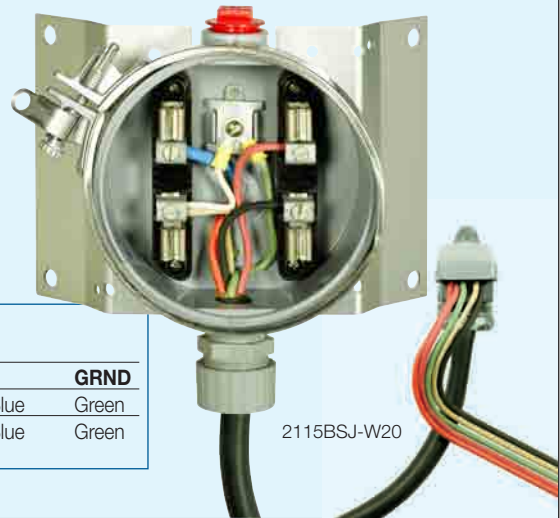
4-Jaw Wiring

Code	1	2	Jaw #	3	4	GRND
J	Black	White		Red	Blue	Green

6-Jaw Wiring

Code	1	2	Jaw #	3	4	5	6	GRND
J	Orange	White		Black	Red	Yellow	Blue	Green
M	Black	White		Orange	Yellow	Red	Blue	Green

Specifications subject to change.



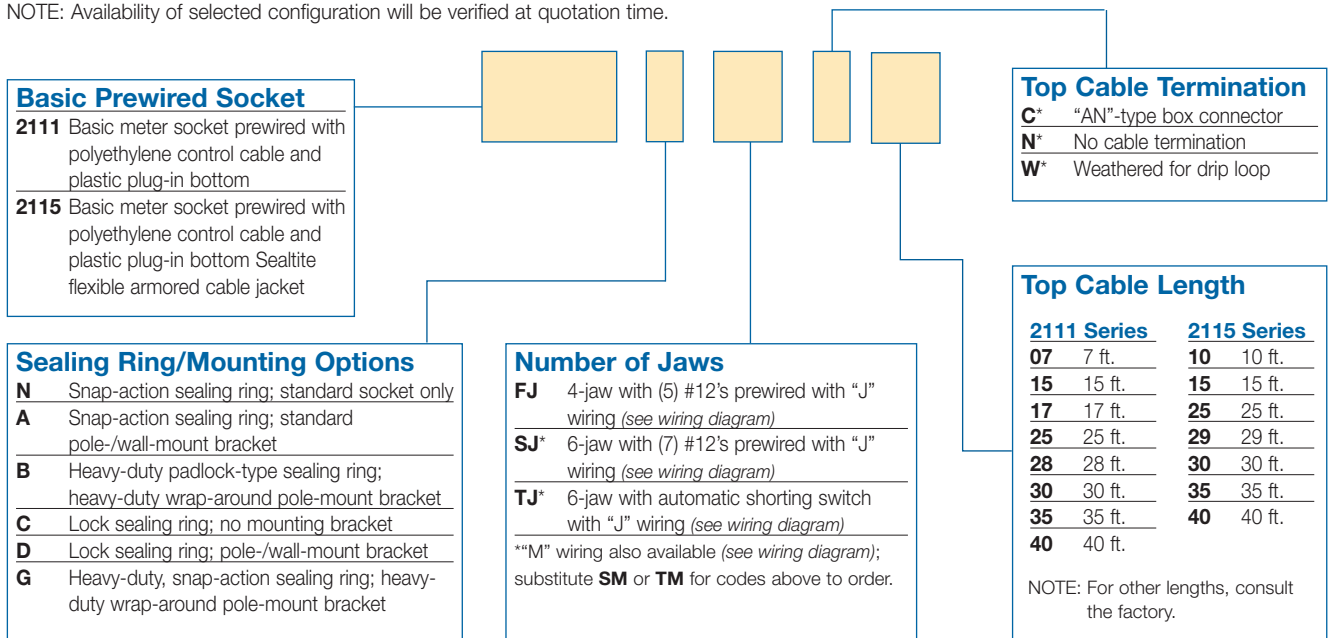
2115BSJ-W20

Ordering Information For Fisher Pierce® Series 2111 and 2115 Prewired Meter Sockets

The following diagram shows how to construct a catalog number for a Series 2111 or 2115 Meter Socket.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.





QUICK REFERENCE

Fisher Pierce® Overhead and Underground Faulted Circuit Indicators

page(s)

Series 1548.	35–37
Series 1547.	38–40
Series 1514/1515.	41–43
Series 1541/42/43	44–45
Series 1516.	46–47
SmartNet™	48
Series 5000.	49–52
TPM Series	53–56
UCM Series.	57–58
OLM Series.	59–61
V2	62
PD35	63–64

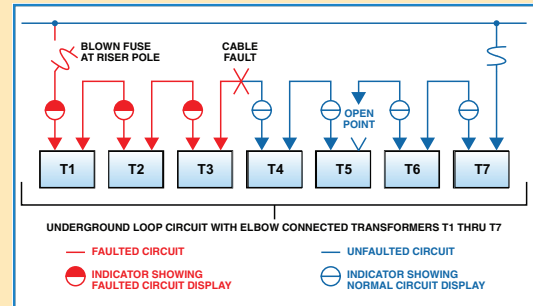
Faulted Circuit
Indicators

Improve your service restoration time.

Fisher Pierce® Faulted Circuit Indicators (FCIs) for both overhead and underground applications are cost-effective tools to locate faults faster, enabling you to reduce outage duration — and customer complaints. For more than 40 years, Fisher Pierce® has provided utilities with reliable, competitive solutions for fault location. As the need for system information increases, you can always turn to Fisher Pierce® for fault-location solutions.

Quickly locate faulted cable or equipment in overhead and underground distribution systems through 35kV (L-G).

With a complete line of cable-mount and test-point mounted faulted circuit indicators, voltage indicators and phase indicators, Fisher Pierce has the right fault-indication solution to meet your system's performance needs. Fisher Pierce® fault indicators reduce outage duration by quickly pinpointing the location of faults. As illustrated in the circuit diagram, the fault is located between the last tripped indicator and the first untripped indicator. Once identified, this section can be switched to become the new open point, allowing full service restoration to the rest of the customers during repairs.



Faulted Circuit Indicators

Features	Benefits/Descriptions
Adaptive Trip™ Logic	Most flexible and recommended for the majority of applications, less chance for misapplication, can handle load growth.
AccQTrip™ Logic Circuitry	“Off-the-trip” logic circuit with high/low trip setting selection prevents false tripping due to transient current surges or system overloading.
Inrush Restraint	More reliable fault detection. Eliminates false tripping due to capacitor inrush and cold load pickup.
Temporary Fault Detection	Helps locate nuisance temporary faults.
Highly Visible Strobe, LED and Fluorescent Orange Flag Indication Options	Easier viewing in daylight, as well as during outage / storm conditions.
Multiple Reset Options	Supporting current, voltage and time allows proper FCI choice for any application.
Directional Capability	Allows for fault sensing based on phase relationship for network applications.
Internal Adjacent Phase Shielding	Prevents electromagnetic interference from adjacent phase conductors.

What is...

...Inrush Current and Inrush Restraint?

Circuit inrush is a condition that occurs when a de-energized circuit becomes energized, such as from cold load pickup or recloser operation. The inrush of current is caused by the many loads attached to the circuit. The amount of inrush current depends upon the length of the circuit and circuit loading. Fault indicators without inrush-restraint logic would sense high inrush current and provide a false indication that a fault occurred. For this reason, Fisher Pierce® has developed inrush-restraint logic to mitigate the possibility of false trips due to inrush current.

...Backfeed and Backfeed Restraint?

Distribution system capacitors have been identified as a potential source of backfeed trips downstream of the actual faulted location. Field-testing has characterized most backfeeds from this source to have duration of less than 1 cycle. The backfeed-restraint feature applies to the trip algorithm, which ignores any overcurrent with a duration of less than 1.5 cycles. This feature can greatly improve the reliability of the FCI targets during an outage condition. System Consideration: The backfeed-restraint feature is not recommended if the clearing time of the protective device is faster than 2 cycles and the expected fault current magnitude is less than 300 amps.

...Trip Logic?

In non-adaptive trip applications, trip logic is the fixed or programmable current level at which the FCI is set to switch the indicator to the “tripped” or “fault” position.

...Reset Logic?

Reset logic is the means by which the FCI returns the indicator to the “un-tripped” or “no fault” position.

...Directional Fault capability?

After a settling period is satisfied when a feeder is energized, a phase relationship is learned, stored and considered normal power flow. When the trip current is sensed, the phase angle is calculated and compared to the normal phase angle. If the measured relationship is within the normal relationship, the FCI will indicate a valid fault. If the measured relationship is outside the predetermined phase relationship, the FCI will not trip to indicate a fault.

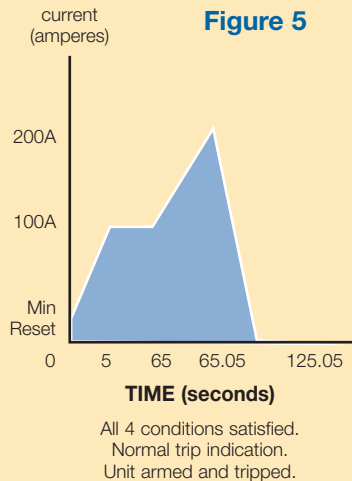
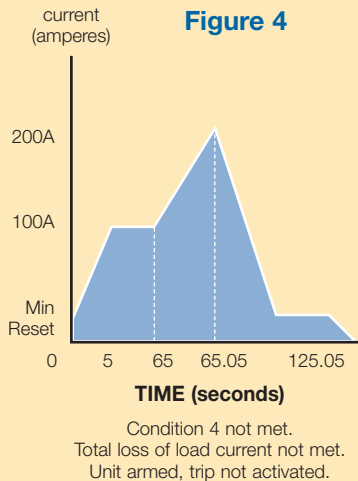
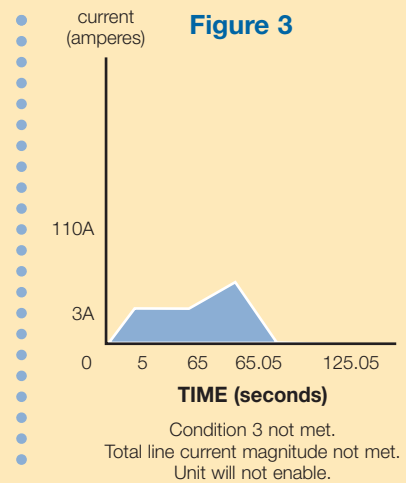
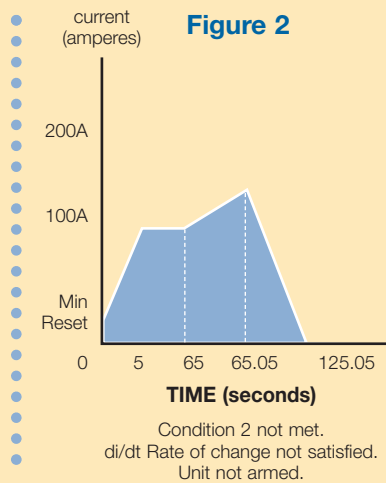
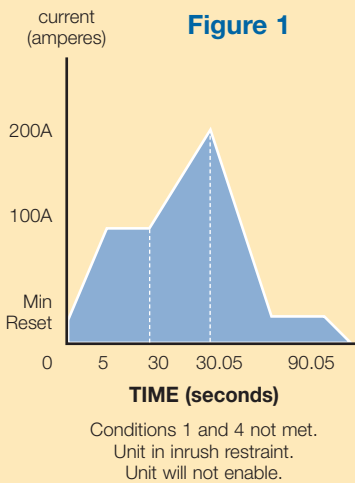
How does Fisher Pierce® Adaptive Trip™ logic work?

Full criteria for the Adaptive Trip™ FCI to trip are as follows:

1. Range of operation is from the minimum reset current level (dependent on model selected) to 800A maximum. Load current within this range must be present for at least 60 seconds to energize the unit to sense a fault condition.
2. When a system disturbance occurs, the line current must increase by a minimum of the preset fault current level (dependent on model selected) within a 50 msec. time frame.
3. The total current must be greater than the original load current plus the preset fault current level to enable operation of the indicator.
4. Following the current increase, a loss of line current for 150 msec. (duration dependent on model selected), must take place within 40–60 seconds, confirming that the increase resulted from a fault and not from a sudden load increase.

All four of these steps must take place in proper sequence for the Adaptive Trip™ FCI to indicate that a fault has occurred.

Example based on model parameters: Reset Current = 3A; Trip Current = 100A di/dt



Which Fisher Pierce FCI is recommended for your application?

Faulted Circuit Indicators

	1580	1548	1547	1543	1542	1541	1516	1515	1514	TPMVF	TPMVL	TPMVOL	TPMTL	UCMTL	OLMVOL	OLMVF	OLMVL	OLMTL
Reference page	26	36	39	45	45	45	47	42	42	52	52	52	52	56	58	58	58	58
Overhead	X	X	X					X	X						X	X	X	X
Underground			X	X	X	X	X	X	X	X	X	X	X	X				
Padmounted Enclosure	X		X	X	X	X	X	X	X	X	X	X	X	X				
Residential/Secondary			X	X	X	X	X	X	X									
Sectionalizing Cabinet			X	X		X		X	X									
Close Proximity Enclosure (3" center-to-center cables)								X	X	X	X	X	X	X				
Backfeed Restraint		X								X	X	X			X	X	X	
Inrush Restraint		X	X	X	X	X	X	X	X	X	X	X			X	X	X	
Temporary Fault Detection		X																
Directional Fault Capability (Option)									X									
Neutral Current (Cap. Banks)	X																	
Phase(s)	1	1	1	3	2	1	1	3	1	1	1	1	1	1	1	1	1	1
Trip Logic																		
Fixed Current Trip		X		X	X	X	X	X	X									
Adaptive Trip		X	X															
High/Low trip										X	X	X	X	X	X	X	X	X
Reset Logic																		
Current		X	X															
Voltage							X			X	X	X				X	X	
Time		X	X	X	X	X		X	X			X	X	X	X	X	X	X
Manual		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fault Indication Options																		
LED	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X
Fluorescent Flag		X	X				X	X	X	X								
Flag & LED		X							X									
Strobe Light		X																
Fiber Optic Display			X	X	X	X		X	X		X	X	X	X				
Audible Alarm				X	X	X												
Radio Transmitter		X	X					X	X									
SCADA Contacts			X				X		X									
Batteryless Options	X									X						X		

Fisher Pierce® Series 1548 Overhead FCIs

Reliable fault indication for single-phase overhead applications.



FCIs with Radio Transmitters

Series 1548 radio FCIs can signal faults to handheld receivers, radio receivers and the SmartLink™ Series 5000 cellular remote terminal unit (RTU) systems integrated with SCADA- and web-based reporting systems. Status, alarms and other event notifications can be integrated into SCADA systems, as well as sent to customer-designated personnel via e-mail, pager or text message. Having precise fault information reduces outage duration, improves system reliability and lowers operation costs.

Trip/Reset Tool AT2186-10
Manual trip/reset test for both permanent and temporary fault indication using hotstick-mountable reset tool.



Faulted Circuit Indicators

Features	Benefits/Descriptions
Trip Logic	Adaptive or fixed current trip with inrush restraint logic. Adaptive trip logic eliminates the need for trip-rating selection or revision with changing load.
Reset Logic	Automatic reset with return of load current and/or time reset of permanent fault indication. Automatic time reset for temporary fault indication. Manual trip test and reset capabilities using hotstick-mountable trip/reset tool.
Fault Indication	Visual indication choices of LED, 5-LED Array, Flag or Strobe Light. Highly viewable 360° indication (Strobe or LED). Radio fault reporting capability also available.
Mounting	Hotstick mounting with automatic torque limiting.
Replaceable Lithium Battery	Offers 10-year, maintenance-free service life. (Note that Flag model has non-replaceable battery).
Supports a Wide Range of Conductors	Mounts on conductors with diameters from 0.14" to 1.20" (3.56mm to 30.48mm).
Optional Features Available	Options include temporary/permanent fault indication, instantaneous recloser coordination feature and backfeed restraint using a delay-trip scheme (requires protective device to pass two cycles minimum of fault current before closing).

Specifications

System Voltage

Flag, Strobe Models:
44kV max.

LED, Radio Models:
69kV max.

Continuous Withstand Load:
1,000A max.

Operating Temperature:
-40° C to 85° C

Reset Time Accuracy:
±10% at 23° C

Current Reset:
3A or 8A min. (model specific)

Fixed Trip Current Level:
50 to 1,500A

Adaptive Trip:
100 di/dt, 300 di/dt

Fault Withstand:
25kA for 10 cycles (per ANSI/IEEE 495-1986)

Trip Accuracy:
±10% at 23° C

Battery:
Replaceable 10-yr. Lithium Cell (flag model non-replaceable)

Battery Operating Life at 23° C

Single Ultra Bright LED & Flag:
1,000 operating hrs.

5 Red LED:
400 operating hrs.

Strobe:
120 operating hrs.

Radio with LED:
800 operating hrs.

Temporary Fault Model

1 Amber (temporary fault) LED:
1,500 operating hrs.

4 Red (permanent fault) LED:
400 operating hrs.

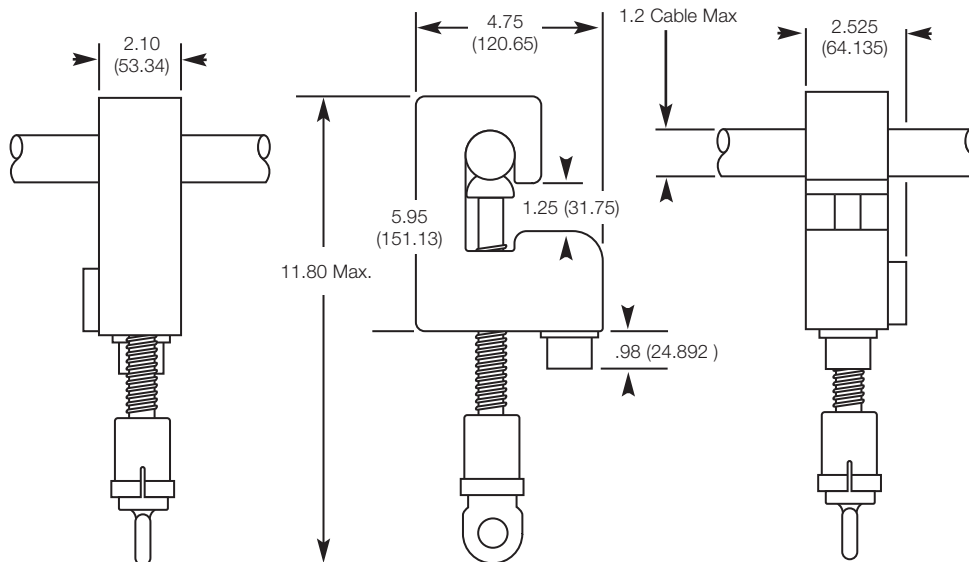
Housing: Semi-conductive UV-stable polycarbonate

Cable Diameter: 0.14" to 1.2" (3.56mm to 30.48mm)

Certifications:
Complies with ANSI/IEEE 495-1986

Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)



Ordering Information for Fisher Pierce® Series 1548 Overhead FCIs

Recommended Models

CAT. NO.	Description
1548FH-ANC3-L-N-A	Branch Feeder (3A min. load, 100A increase within 50 msec. di/dt adaptive trip)
1548FH-BDC3-L-N-A	Main Feeder (3A min. load, 300A di/dt adaptive trip, 24 msec. delay for backfeed restraint)
1548FH-BDC3-X-N-A-1	Temporary Fault Indication (3A min. load, 100A increase with 50 msec. di/dt adaptive trip); permanent fault indication with 4 hr. delay reset with 60 sec. current reset override, temporary fault indication with 8 hr. time delayed reset
Accessories	
AT2186-10	Manual test and reset tool
A615	Battery for L option
A616	Battery for L, X and R options
H2403-10	Battery renewal sticker

The following diagram shows how to construct a catalog number for the Series 1548 FCI.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.

1548 □ H - □ - □ - □ - 3 - □ - □ - A - □

Faulted Circuit Indicators

Basic Model

F Standard offering, reclose dead time of 150 msec. (loss of current >150 msec.), 3A min. load current required for reset, adaptive and fixed inrush trip logic options available.

G Special application offering for temporary fault detection where reclose recognition time of 32 msec. is required. Recommended for circuits with fast protection settings capable of opening and reclosing in less than 10 cycles. Available with adaptive trip logic only. Requires 8A min. load current required for reset. No current auto reset should be specified.

Trip/Inrush Logic Options

Adaptive Trip

A Adaptive trip requires: 60 sec. continuous min. load current; arming time <¼ cycle fault current; loss of current within 60 sec. of fault current

B Same as A with 24ms ±20% delay trip (backfeed restraint)

Fixed Trip

C Inrush restraint active for 32 msec. from power up, thereafter, undelayed trip curve ±10% accuracy

D 32 msec. delayed trip ±20%, current trip ±10% accuracy

U Undelayed current trip ±10% accuracy, standard trip

Trip/Current

Adaptive Trip

N 100A di/dt adaptive trip*

D 300A di/dt main feeder applications**

Fixed Trip

0.5	50A
1	100A
2	200A
3	300A
4	400A
5	500A
6	600A
8	800A
10	1000A
12	1200A
15	1500A

*100A at 20A load current to 300A at 600A load current

**300A at 20A load current to 400A at 350A load current

Factory Code

Temporary Fault Reset Time

A Temporary fault not selected

- 1 4 hrs.
- 2 8 hrs.
- 3 12 hrs.
- 4 24 hrs.
- 5 Manual reset

Factory Code

Transmitter Phase Encoder

- A** Phase A
- B** Phase B
- C** Phase C
- T** Tap
- N** No transmitter available for Options F, T, L of Indicator Options

Indicator Options

- L** Single ultra-bright LED (standard for applications up to 69kV max.)
- J** 5 ultra-bright LEDs for increased visibility display (standard for applications up to 69kV max.)
- X** Temporary fault indication option 4 red, 1 amber LED (standard for applications up to 69kV max.)
- T** Strobe light (for applications up to 44kV max.)
- R** Radio with single LED (for applications up to 69kV max.)
- F** Flag (for applications up to 44kV max.)
- H** Flag and LED (non-replaceable battery) (for applications up to 44kV max.)

Reset Time-Delay

LED, Radio, Strobe, or Flag

C 4-hr. automatic with current reset override (60 sec. after restoration of power)

N 4-hr. automatic

Z 60 seconds after restoration of power, otherwise no automatic reset

P 24-hr. automatic

T Manual reset only, most commonly used with flag model since batteries are not used for indication. Requires tool AT2186-10

Fisher Pierce® Series 1547 Adaptive Trip™ FCIs

For single-phase underground or overhead applications.

- Trip Logic: Adaptive current trip with inrush restraint logic.
- Reset Logic: Automatic reset with return of load current and/or time reset of fault indication. Manual reset also available.
- Fault Indication: Visual indication choices of Flag, LED or 10-ft. remote fiber optic display. Integrated radio transmitter with or without LED also available.

Other Features

- SCADA output available
- Durable Lexan housing
- Sturdy, epoxy-coated sensors
- Mounting kits available to enable view-plate mounting for padmount applications



Faulted Circuit Indicators

Features	Benefits/Descriptions
Trip Logic	Adaptive current trip with inrush restraint logic.
Reset Logic	Automatic reset with return of load current and/or time reset of fault indication. Manual reset also available.
Fault Indication	Visual indication choices of Flag, LED or 10-ft. remote fiber optic display. Integrated radio transmitter with or without LED also available.
SCADA Output Available	N.O. or N.C. contact enables fault indication alert to be integrated into SCADA systems.
Durable Lexan Housing and Epoxy-Coated Sensors	Protection from moisture promotes long, maintenance-free service life.
Mounting Kits Available	Enables view-plate mounting for padmount applications.

Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)

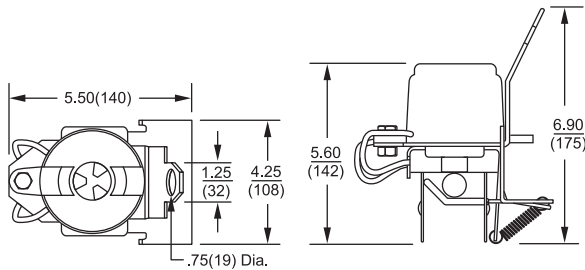


Figure A — Indicator with Attached Sensor. Hotstick Mounting.

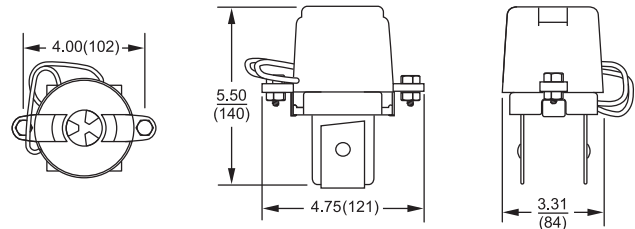


Figure B — Indicator with Attached Sensor. Tie-Wrap Mounting.

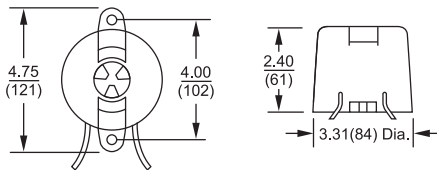


Figure C — Bracket/Surface Mounting.

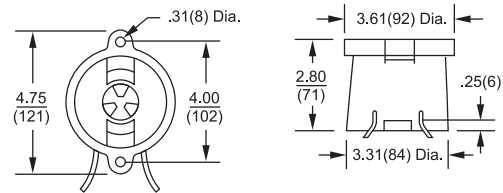


Figure D — Window/Flush Mounting.

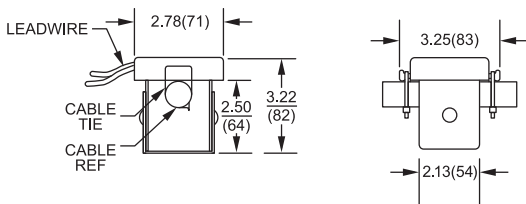


Figure E — Remote Sensor. Tie-Wrap Mounting.

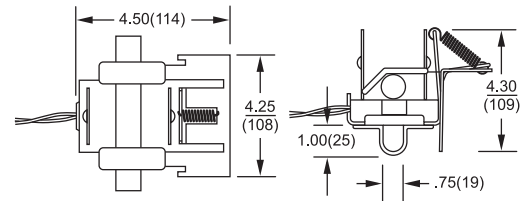


Figure F — Remote Sensor. Hotstick Mounting.



Specifications

Operating Speed:

Coordinates with properly applied current-limiting fuses, provided FCI trip-set and trip-release conditions are satisfied

Fault Withstand Capability:

25kA for 10 cycles per ANSI/IEEE 495-1986

Operating Current Range:

Min. reset current to 800A for trip operation

Continuous Current Rating:

800A max.

Submersibility:

Tested to 30 ft.

Reset Function:

Resets to normal indication according to unit selected from Ordering Information
Reset Delay Options

Reset Current Level:

1½" sensor with U-lamination:	1.0A
2½" sensor with U-lamination:	1.5A
1½" sensor w/o U-lamination:	2.0A
2½" sensor w/o U-lamination:	3.0A

Life Expectancy:

(Series 1547A flag type) 20+ years

Rated Battery Life:

800 hrs. of operation. Lithium cell, rated for 10-yr. life.
(Series 1547B LED type;
Series 1547C fiber optic type)

Line Current Adjust:

Adjusts to line current 40–60 sec. after line current exceeds min. reset current

Trip Operation:

- a) Trip Enable Condition: Occurs whenever line current increases by the rate of 100A (or greater) within 3 cycles
- b) Trip Indication: FCI indicates trip only when line current drops 0.5A above min. reset current within 40–60 sec. after trip-set condition occurs

Approx. Shipping Weight:

2.0 lbs.

Operating Temperature:

-40° C to 85° C

Certifications:

Complies with ANSI/IEEE 495-1986

Ordering Information for Fisher Pierce® Series 1547 Adaptive Trip™ FCIs

The following diagram shows how to construct a catalog number for the Series 1547 FCI. Not all combinations are possible; consult factory.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.



Faulted Circuit Indicators

BASIC MODEL

- 1547A** Standard Faulted Circuit Indicator Flag type
- 1547B** Standard Faulted Circuit Indicator LED type
- 1547C** Standard Faulted Circuit Indicator.
10-ft. Remote Fiber Optic cable display*
- 1547D** Integral Radio Transmitter LED type
- 1547E** Integral Radio Transmitter. No LED type**

* Consult Factory for other cable lengths
** For special applications

Indicator Mounting Options

- B** Bracket/Surface Mount (See Mechanical Data Fig. C)
- P*** Window/Flush Mount (See Mechanical Data Fig. D)
- M** Tie-Wrap Mount (See Mechanical Data Fig. B)
- H*** Hotstick Mount with Clamp
(See Mechanical Data Fig. A)

* See Series 1547A and 1547B options

Reset Delay

Flag with Manual Reset

- P** 24-hr. reset time delay after power restoration
- W** 4-hr. reset time delay after power restoration
- Z** 60-sec. reset time delay after power restoration
- R** Manual reset only

LED or Remote Fiber Optic

- C** 4-hr. reset with current override
- E** 4-hr. reset with current and manual reset override
- M** 4-hr. reset with manual reset
- N** 4-hr. reset with manual trip and manual reset
- T** 4-hr. reset time delay with current override;
manual trip and manual reset override

1547D/1547E Radio FCI

(manual trip, manual reset)

- J** 4-hr. reset with current override
- K** 4-hr. reset time delay
- Z** 60-sec. reset time delay only

Sensor Mounting

- S** Remote tie-wrap (see Mechanical Data Fig. E)
- G** Integral tie-wrap (see Mechanical Data Fig. B)
- H** Remote hotstick (see Mechanical Data Fig. F)
- T** Integral hotstick (see Mechanical Data Fig. A)

Transmitter Phase Encoding

- A** Phase A
- B** Phase B
- C** Phase C
- T** Tap

Close Proximity

- R** Raised zero reference to 7A
- N** Standard

Lead Length between Sensor and Display

- 10** 10 ft. (standard)
- XX** Specify length in feet. (30 ft. max.)
- N** None. Attached indicator sensor units,
"M" or "H" sensor termination

SCADA Output

- A** N.O. (10-ft. lead)
- B** N.C. (10-ft. lead)
- N** No SCADA

Reset Current

- M*** 1.0A (1%" sensor with U-lamination)
- L*** 1.5A (2%" sensor with U-lamination)
- B** 2.0A (1%" sensor)
- D** 3.0A (2%" sensor)

* Equipped with snap-on U-lamination sensor for circuit isolation. Recommended for padmount or underground applications.

Consult Factory for Series 1547A and 1547B Options:

Mechanical (for both LED and flag indicators)

- P(1):** Window-mounting kit (AT2050-1)
Bracket-mounting kits (N1767-1, -2, -3)
Reset tool (AT2186)

TRIP: Manual trip override (LED) (overhead applications only)

Underground Application Note

A solution to problem FCI applications caused by close proximity cable placement and orientation is to set the loss of current operate point at 7A. This raised zero reference point greatly improves the adjacent field immunity of the Adaptive Trip FCI. The option is available only with time delayed reset and closed core U-lam sensor. When ordering, add the suffix "R" to the model number. A 3" minimum separation between adjacent cables is recommended for installation.

Fisher Pierce® Series 1514/15 Current-Reset FCIs

For single-phase or three-phase underground or overhead applications.

- Trip Logic: Adaptive current trip with inrush restraint logic.
- Reset Logic: Automatic reset with return of load current and/or time reset of fault indication. Manual reset also available.
- Fault Indication: Visual indication choices of Flag, LED or 10-ft. remote fiber optic display. Integrated radio transmitter with or without LED also available.



Faulted Circuit Indicators

Other Features

- SCADA output available
- Durable Lexan housing
- Sturdy, epoxy-coated sensors
- Mounting kits available to allow view-plate mounting for padmount applications

Features	Benefits/Descriptions
Trip Logic	Fixed current trip with inrush restraint logic.
Reset Logic	Automatic time reset with return of load current and/or time reset of fault indication. Manual reset also available.
Fault Indication	Visual indication choices of Flag, LED or 6-ft. remote fiber optic display. Integrated radio transmitter with LED also available.
SCADA Output Available	N.O. contact enables fault indication alert to be integrated into SCADA systems.
Durable Lexan Housing and Epoxy-Coated Sensors	Protection from moisture promotes long, maintenance-free service life.

Specifications

System Voltage: 29.3 kV max	Operating Temperature: - 40° C to 85° C
Trip Current: Factory preset from 50 to 1,500A	Submersibility: Tested to 30 ft.; exceeds ANSI/IEEE 495-1986
Trip Current Accuracy: ± 10%	Life Expectancy: 30+ years (flag type)
Trip Response Speed: Coordinates with properly applied current-limiting or expulsion fuses	Rated Battery Life: 10 years (long-life lithium cell)
Reset Current: Factory preset for 1.2, 1.5, 3.0 and 5.0A	Model 1514B/1515B — 800 hrs. of operation
Fault Withstand Capability: 25 kA for 10 cycles per ANSI/IEEE 495-1986	Model 1514D — 300 hrs. of operation
Maximum Continuous Load Current: 1,000A	Warranty: 3 years
	Certifications: Complies with ANSI/IEEE 495-1986



Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)

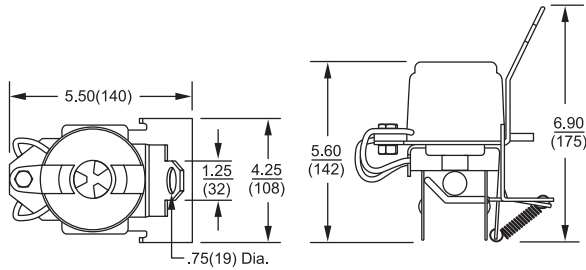


Figure A — Indicator with Attached Sensor. Hotstick Mounting.

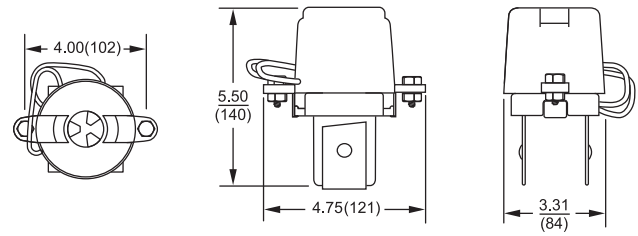


Figure B — Indicator with Attached Sensor. Tie-Wrap Mounting.

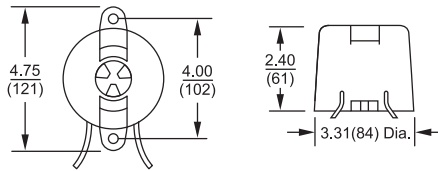


Figure C — Bracket/Surface Mounting.

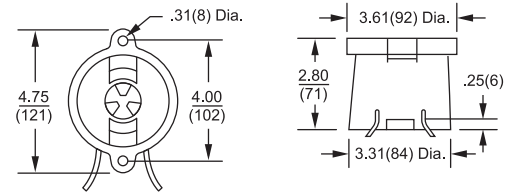


Figure D — Window/Flush Mounting.

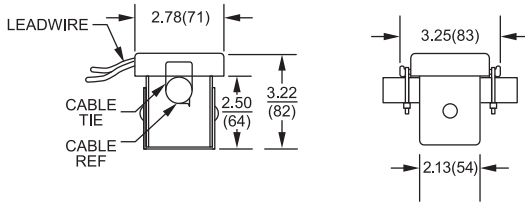


Figure E — Remote Sensor. Tie-Wrap Mounting.

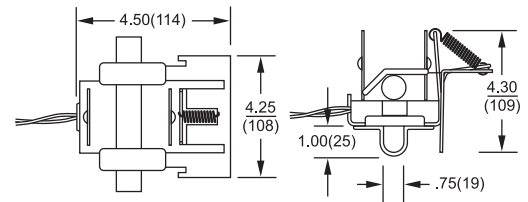


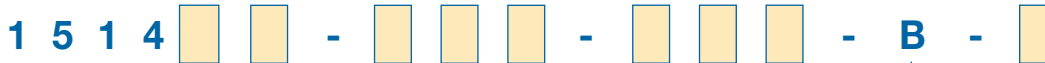
Figure F — Remote Sensor. Hotstick Mounting.

Ordering Information Fisher Pierce® Series 1514/15 Current-Reset FCIs

The following diagram shows how to construct a catalog number for the Series 1514 or 1515 FCI. Not all combinations are possible; consult factory.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.



Faulted Circuit Indicators

Basic Model	
1514	Single-phase (one sensor, one indicator)
1515	Three-phase (three sensors, one indicator)
Unit requires current in all three phases to reset	
1514S/1515W	Flag display
1514A/1515A*	Flag display and single (N.O.) latching SCADA output contact
1514B/1515B	LED Display (non-replaceable battery)
1514C/1515C	Remote, 6-ft. fiber optic LED display (requires "M" mounting)
1514D/1515H	Integral Radio/LED display, requires hotstick mounting LED/Flag Display (non-replaceable battery), inrush restraint only, remote bracket or panel-mount underground or hotstick overhead applications
1514M/1515M*	Flag display with momentary (N.O.) SCADA output

*SCADA Contacts: 3.0A @ 125/250 VAC; 1/10 hp @ 250 VAC, 10-ft. cable length

Indicator Mounting Options	
B	Bracket/surface mounting (remote from sensor)
P(1)	Window/flush mounting (remote from sensor)
H(2)	Hotstick mounting, attached indicator/sensor (B and D sensors only, one phase only)
M	Tie-wrap mounting (attached indicator/sensors)

Consult factory for options: Manual reset tool (AT2186)
 (1) Special Lexan mounting kit (AT2050-1) for Code "P" mounting is available.
 (2) Special Lexan spacer (F2079) available for small (<1" dia.) conductor overhead installation.

Trip Setting	
0.5	50A
1	100A
2	200A
3	300A
4	400A
6	600A
8	800A
10	1,000A
12	1,200A
15	1,500A

Transmitter Phase Encoding	
A	Phase A (1514D only)
B	Phase B (1514D only)
C	Phase C (1514D only)

Max. Cable Diameter	
B	1 1/8"
D	2 3/8"
K	2 7/8"
M*	1 1/8"
L*	2 3/8"
N*	2 7/8"

Sensor Termination	
S	Terminates with remote lead connected to sensor
T	Sensor and indicator attached to hotstick clamp
H	Hotstick clamp attached to sensor (1 1/8" and 2 3/8" sensors only)
G	Remote LED, removable fiber optic cable

Lead Length between Sensor and Display	
10	10 ft. (standard)
XX	Specify length in feet (30 ft. max.)
N	None. Attached indicator sensor units, "G" or "T" sensor termination

Minimum Reset Current Level	
1.2	1.2A ("M" sensor only)
1.5	1.5A ("L" & "N" sensors only)
3	3A

Inrush Restraint/Reset Delay Options	
Flag Display (1514A, 1514M, 1514S, 1515A, 1515M, 1515W), Manual Reset Override	
A	Standard trip curve, 10 to 30-sec. delay after restoration of power
Z	Inrush restraint, 60-sec. reset time delay after restoration of power
W	Inrush restraint, 4-hr. reset time delay after restoration of power
N	Inrush restraint, no automatic reset, manual reset only
P	Inrush restraint, 24-hr. reset time delay after restoration of power
LED Display (1514B, 1514C, 1514R, 1515B, 1515C, 1515R), Inrush Restraint	
W	4-hr. reset time delay after fault occurrence
C	Same as W with current reset override upon energization of line
N	Same as W with manual trip and manual reset override
T	Same as N with current reset override
M	Same as W with manual reset override
E	Same as C with manual reset override
Radio Indication (1514D), Inrush Restraint, Manual Trip and Manual Reset Override	
K	4-hr. reset time delay after fault occurrence
J	Same as K with current reset override upon energization of line
Z	60-sec. time delay after fault occurrence

Underground Application Note

A solution to problem FCI applications, caused by close proximity cable placement and orientation, is to set the loss of current operate point at 7A. This raised zero reference point greatly improves the adjacent field immunity of the Adaptive Trip FCI. The option is available only with time delayed reset and closed core U-lam sensor. When ordering, add the suffix "R" to the model number. A 3" minimum separation between adjacent cables is recommended for installation.

Fisher Pierce® Series 1541/42/43 Automatic Time Reset FCIs

For single-phase, two-phase or three-phase underground applications.

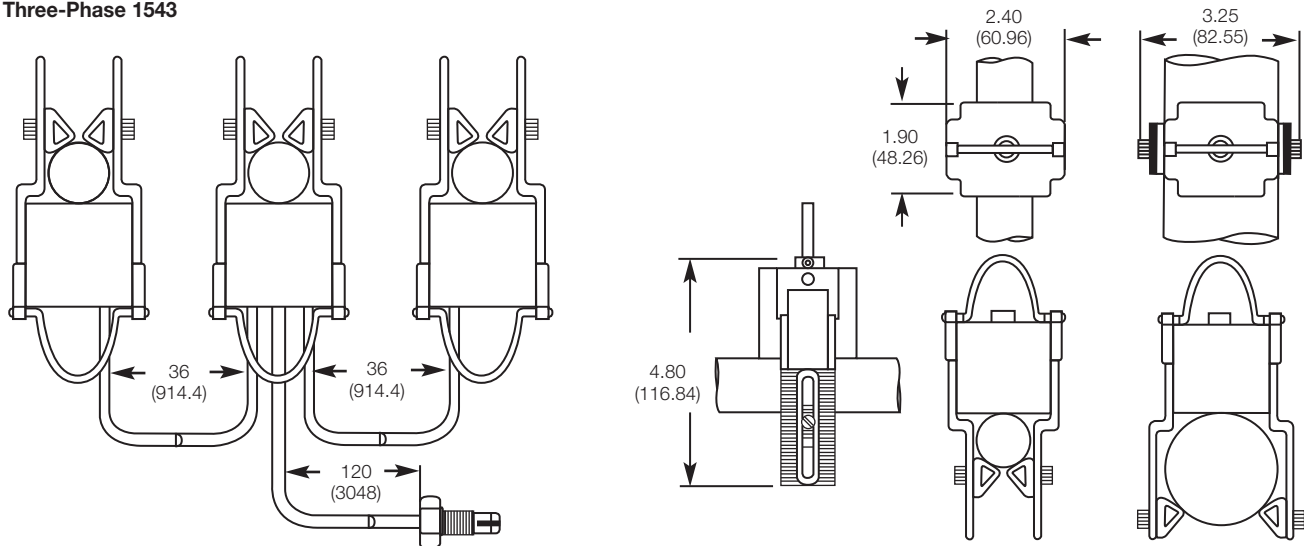
Faulted Circuit Indicators



Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)

Three-Phase 1543



Features	Benefits/Descriptions
Trip Logic	Fixed current trip with inrush delay.
Reset Logic	Automatic time reset of fault indication. Manual reset also available.
Fault Indication	Visual indication choices of LED with replaceable or non-replaceable battery. Audible alarm fault indication with replaceable battery also available.
Optional Features Available	Permanent or removable remote fiber optic display.

Specifications

Fault Registration:

Red, high-intensity LED with choice of hard-wired or fiber optic cable remote mounting or audible intermittent beeper signal

Trip current:

Factory preset to customer specifications within range of 50A and 100A to 1,500A in 100A increments

Trip Current Accuracy:

±10% of trip rating (calibrated using 1" dia. cable for 400A trip or less or 2.0" dia. cable for greater than 400A trip)

Trip Response Speed:

Consult trip curves (coordinated to properly applied link, expulsion, power and current-limiting fuses)

Reset Time:

4 hrs., 2 hrs., 1 hr., manual trip/reset standard

Overload Capacity:

Capable of withstanding 25,000A for 10 cycles

Continuous Load Current:

Rated at 1,000A max.

Temperature Range:

-40° C to 85° C

Submersibility:

Tested to 30 ft.

Operating Battery Life:

800 hrs. for LED indication, 160 hrs. for audible indication, both with 10-yr. life at 20° C

Battery:

Long-life lithium cell

Cable Ranges:

0.63" (16mm) to 1.58" (40mm); 1.58" (40mm) to 2.36" (60mm); 2.36" (60mm) to 3.55" (90mm)

Remote Fiber Optic Options:

Permanent or removable (10 ft. standard, 30 ft. max.)

Certifications:

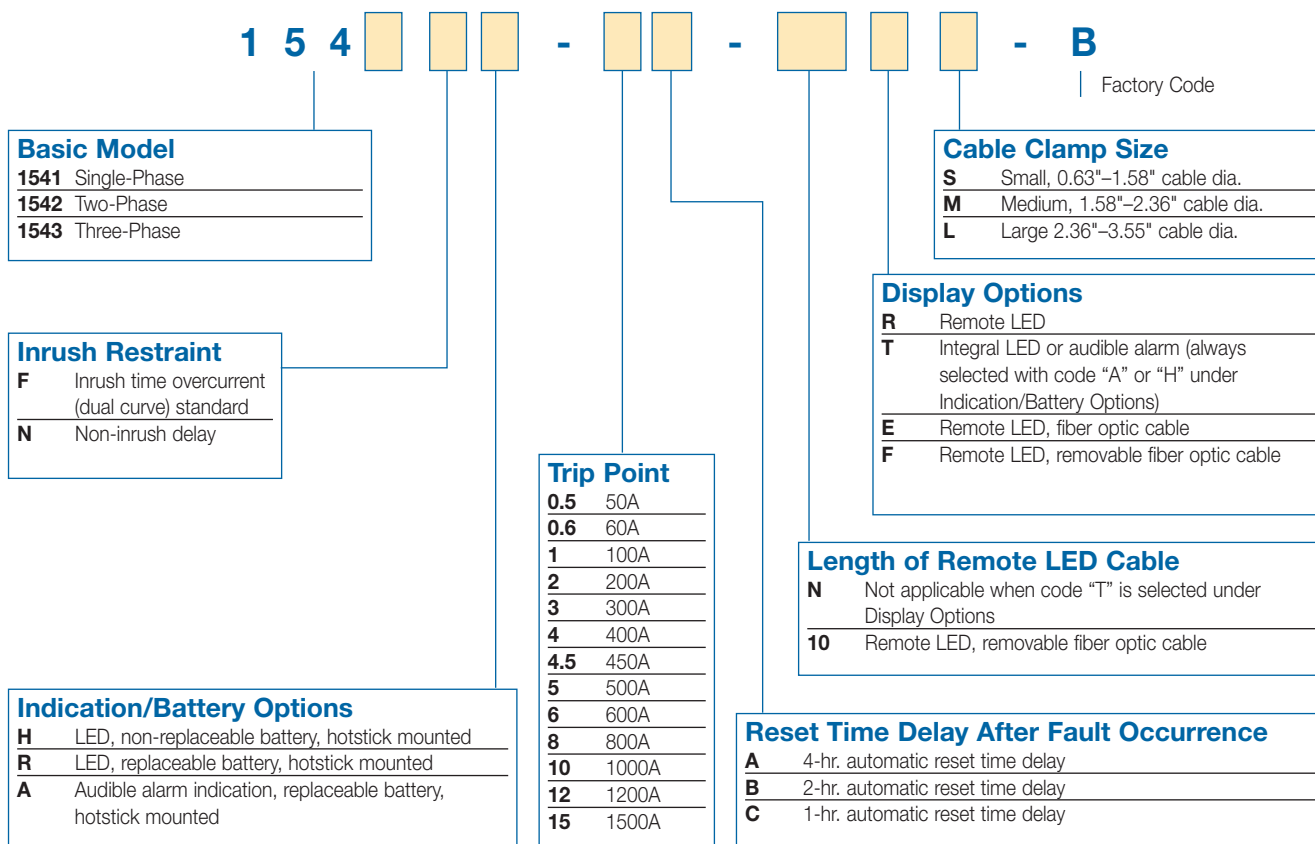
Complies with ANSI/IEEE 495-1986

Ordering Information for Fisher Pierce® Series 1541/42/43 Automatic Time Reset FCIs

The following diagram shows how to construct a catalog number for Series 1541/1542/1543 FCIs. Not all combinations are possible; consult factory for ordering assistance.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.



Fisher Pierce® Series 1516 Voltage Reset FCIs

For single-phase underground applications.

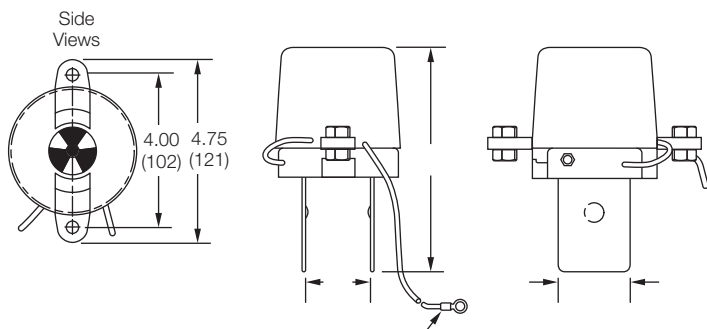
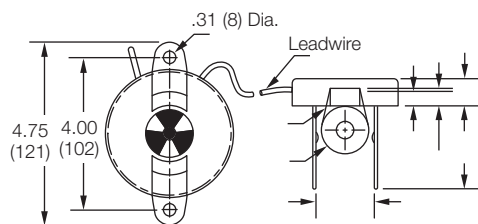


Faulted Circuit Indicators

Mechanical Data

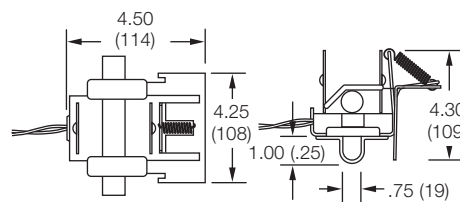
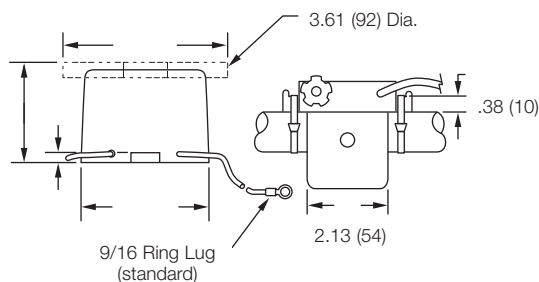
(all dimensions in inches with millimeter equivalents in parentheses)

Remote Sensor Leads. Tie-Wrap Mounting.



Indicator with Attached Sensor without U-Lamination. Tie-Wrap Mounting.

Flange on panel/flush mounting units only. See Indicator/Mounting Options of ordering information Code "P"



Remote Sensor Leads. Hotstick Mounting.

Features	Benefits/Descriptions
Trip Logic	Fixed current trip with inrush restraint.
Reset Logic	Automatic reset after restoration of secondary voltage. Manual reset also available.
Fault Indication	Visual indication choice of Flag only.

Specifications

Trip Current:
Factory preset from 100 to 1,500A

Trip Current Accuracy:
±10%

Trip Response Speed:
Coordinates with properly applied current-limiting fuses

Reset Voltage (factory preset):
120V Rating: 102V min.
277V Rating: 235V min.

Max. Reset Response Time:
60 sec.

Reset Lead Length:
4 or 6 ft.

Life Expectancy:
±20 yrs.

Fault Withstand Capability:
25kA for 10 cycles per ANSI/IEEE 495-1986

Secondary Voltage Surge Withstand Capability:
Conforms to ANSI/IEEE C62.41

Max. Continuous Load Current:
1,000A

Operating Temperature:
-40° C to 85° C

Submersibility: Tested to 20 ft.

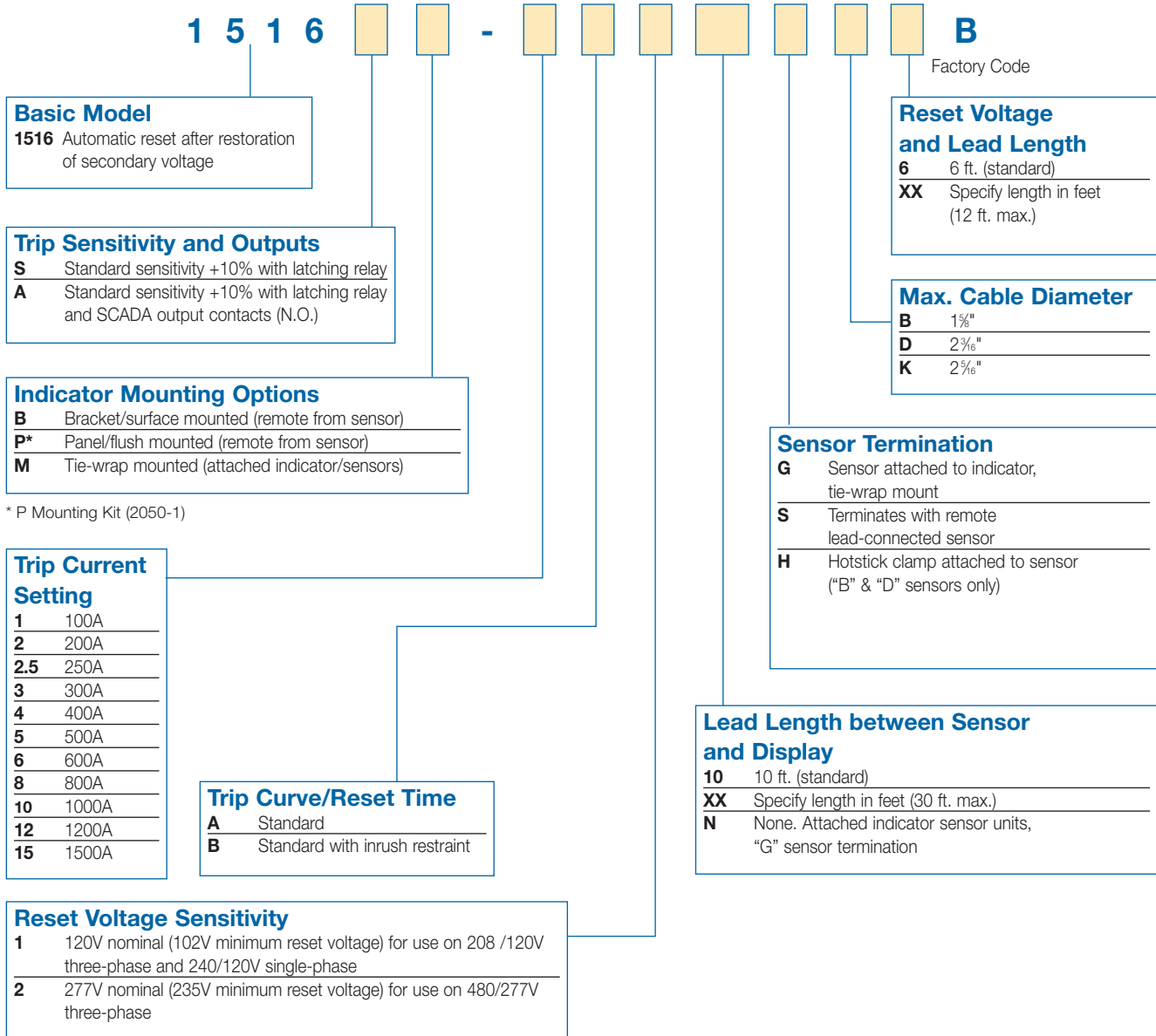
Certifications:
Complies with ANSI/IEEE 495-1986

Ordering Information for Fisher Pierce® Series 1516 Voltage-Reset FCIs

The following diagram shows how to construct a catalog number for Series 1516 FCIs. Not all combinations are possible; consult factory for ordering assistance and for information on available mounting kits and brackets.

□ Indicates field that must be filled in to complete order.

NOTE: Availability of selected configuration will be verified at quotation time.



Fisher Pierce® Model 16514AM-45102 SmartNet™ Directional Network FCI

For single-phase underground applications.

Operation

- Max. operational current: 25kA per ANSI 495
- Max. current withstand: 40kA for 10 cycles with no damage
- When the feeder is energized, the unit's control algorithm initiates a settling period to allow unwanted transients to dampen. After the settling period is satisfied, a phase relationship is learned, stored and considered normal power flow. When the trip current is sensed, the phase angle is compared to the learned phase angle and, if within the pre-determined phase relationship, is considered a valid fault.



Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)

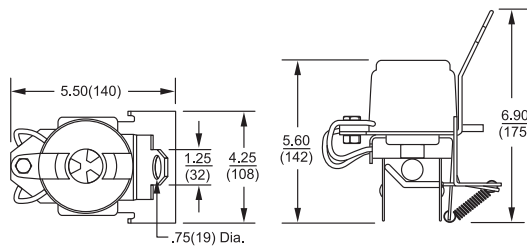


Figure A — Indicator with Attached Sensor. Hotstick Mounting.

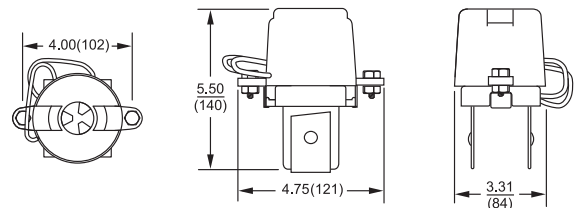


Figure B — Indicator with Attached Sensor. Tie-Wrap Mounting.

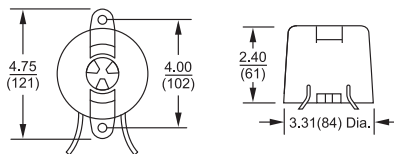


Figure C — Bracket/Surface Mounting.

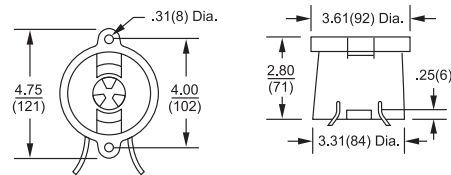


Figure D — Window/Flush Mounting.

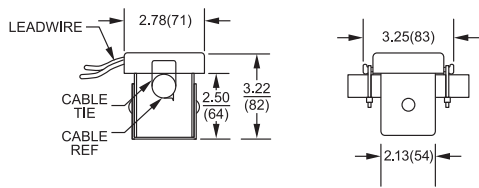


Figure E — Remote Sensor. Tie-Wrap Mounting.

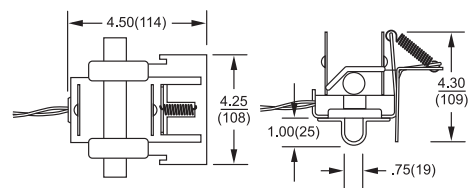


Figure F — Remote Sensor. Hotstick Mounting.

Features	Benefits/Descriptions
Trip Logic	Programmable fixed-current trip.
Reset Logic	Automatic reset of fault indication; manual reset also available.
Fault Indication	Visual indication choice of LED only.

Ordering Information for Fisher Pierce® Model 16514AM-45102 SmartNet™ Directional Network FCI

To order Fisher Pierce® Model 16514AM-45102 SmartNet™ Directional Network FCIs, please contact the factory.

Fisher Pierce® SmartLink™ Series 5000 Cellular RTU for Fisher Pierce® FCIs

Reliable, cost-effective, two-way communication for fault reporting.

The Fisher Pierce® SmartLink™ Series 5000 integrated cellular Remote Terminal Unit (RTU) provides reliable and cost-effective two-way communication for automated fault reporting from Fisher Pierce® Series 1548 radio FCIs. Electric utility operations personnel can have precise fault alarms and data fed to a variety of applications in seconds, increasing response time and system reliability.

The SmartLink™ Series 5000 RTU uses technology from Telemetric to communicate over the digital or analog cellular data networks, with coverage available to over 98% of the population in North America. No additional radio equipment, license or local cellular account is required. The SmartLink™ Series 5000's intelligent processor provides flexible reporting of permanent and temporary fault conditions. Utilities can access a secure, web-based fault-reporting application or integrate automatic fault reporting into SCADA/EMS systems using optional software from Telemetric.

The secure, web-based application displays device data that can be queried or polled remotely. A variety of user-specified fault alarms can be configured to notify a designated person of a reported event by e-mail, pager or text message.



Faulted Circuit Indicators

Features	Benefits/Descriptions
Uses local RF signal	Reports fault alarms from up to four Series 1548 radio FCIs (A, B, C phase + tap), located up to 100 feet away
Immediate Reporting of Alarm Conditions	Provides instant notification of: Permanent fault on any phase, phase status; fault-cleared status by phase; overvoltage or undervoltage setpoints on control power phase; and low battery alarm.
Immediate or Off-Peak Reporting of Momentary Fault Data	User-configurable to receive instant notification of momentary fault data or wait for lower-cost off-peak hours.
Nationwide GPRS Support	Communicates over cellular data networks via Cingular Wireless and affiliated roaming partners with a variety of application data plans, with coverage available to more than 98% of the North American population.
RTU Status-Point Querying	Available at any time through the web-based application or by SCADA/EMS using optional Telemetric™ SCADA-Xchange™ software.
RTU Battery-Status Check and Low-Battery Alarms	Sent automatically to ensure continuous, reliable operation.

How Radio FCIs help locate and report faults.

Helps crews locate faults easily when fault indicators are not directly visible.



1548 FCI In Field Location



SmartLink™ 5000



Cell Tower

No Utility
Communication
Infrastructure Required



RTU/SCADA
System



Designed for distribution
RTU/SCADA overhead systems



1560-1
Handheld Receiver



1560-2, -3, -4
Fixed-Mount Receiver



Utility Control Room

Faulted Circuit
Indicators

Specifications
Fault Indicator Receiver

Operating Frequency:
312 MHz

Receiver Range:
100 ft. min. typical

Receiver Sensitivity Adjustment:
Selectable via local configuration or web application to max. range of local RF radio (low gain, high gain)

Certification:
Complies with FCC part 15 emissions

Cellular Radio Technology

Dual-band, dual-mode supporting GSM/GPRS 850/1900 MHz; nationwide GPRS support via Cingular Wireless and affiliated roaming partners with a variety of application data plans

Transmit Power:
0.6 to 1.2W

External mounted antenna, flexible dual-band (850/1900) cellular, SMA(F) connector

Fault receiver antenna (312 MHz RF system, BNC connector)

Measurement Points List - Calls & Polling

- Permanent fault status indication from radio FCI
- Control Power Voltage Measurements: Undervoltage/Overvoltage Value Alarm
- Control Power Status (Outage)
- Battery Status
- Temporary Fault Data
- Time Scheduled Calls
- Alarm Calls (permanent fault, clearing, phase status, low battery)
- Polling of all status and analog points

Intelligent Web Server

- Data is secure and password protected
- Server authentication using 128-bit encryption key validation
- E-mail, text message or pager notification options

Local Serial Port

RS-232 communications port for local configuration.
Windows-based configuration software included with RTU

Front-Panel LED Indicators

Qty.	Color	Label (Indication)
1	Green	Cellular Communication Present
1	Green	Processor OK
4	Red	Fault Received (A, B, C and Tap)
1	Tri-Color	Radio Signal Strength Indicator

Electrical/Environmental

Operating Voltage:
95 – 135 VAC, 60Hz

Surge Withstand:
ANSI/IEEE C37.90.1-2002, 4kV min.
@ 1.2/50 µs surge

FNM style Slo-Blo® fuse, barrel-mounted

Operating temperature range:
-40° C to 70° C

Battery Backup

Standard:
Lead Acid, rechargeable 12V
(3 to 5 yrs. expected service life)

Carryover Time:
4-hr. typical, 3-hr. min.

Recharge Time after 3–4-hr. Carryover:
6 hrs. typical

Accessibility:
Front-panel replaceable.

Status message sent weekly or by request.

Enclosure

Lexan enclosure for meter socket mounting

NEMA 3R Rating

Security latch for meter seal or 3/8" hasp padlock

Fisher Pierce® Series 1650 Receivers for FCIs

Drive-By FCI Status.

Faulted Circuit Indicators

1560-1
Handheld Receiver

Specifications

- Frequency: 312 MHz
- Range: 100 ft. max.
- Power: 9V battery
- Handheld
- Complies with FCC Part 15 emissions



1560-2, -3, -4
Fixed-Mount Receiver

Specifications

- Frequency: 312 MHz
- Range: 100 ft. max.
- Power: 9–12 VDC, 20mA external
- Complies with FCC Part 15 emissions



Ordering Information for Fisher Pierce® SmartLink™ 5000 Cellular RTU and Radio Receivers

CAT. NO.	DESCRIPTION
3175B0126G1	SmartLink™ 5000 Cellular RTU (includes battery back-up and antennas)
1560-1	Handheld Receiver with audible and LED indicator
1560-2	RTU/SCADA Radio Receiver with 3 dry contact outputs for Phase A, B and C (includes mounting bracket)
1560-3	RTU/SCADA Radio Receiver with 1 dry contact output for Phase A, B or C (includes mounting bracket)
1560-4	RTU/SCADA Radio Receiver with 4 dry contact outputs for Phase A, B, C and tap (includes mounting bracket)

Fisher Pierce® TPM Series Test Point Fault Indicators

Mount directly to any IEEE 386 standard capacitive test point.

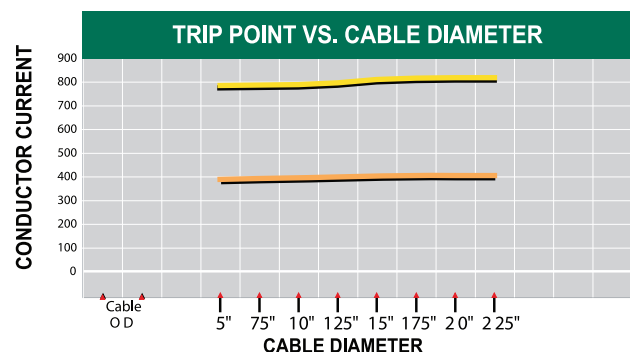
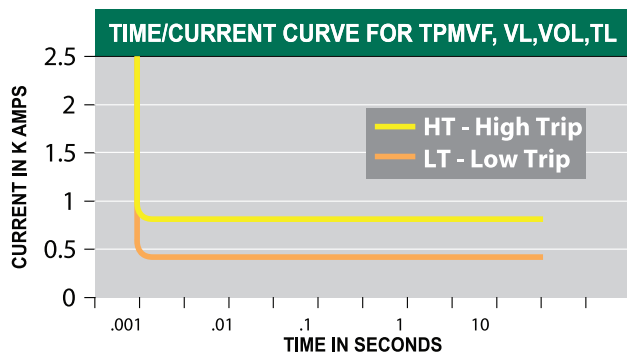
Fisher Pierce® Test Point Mounted Fault Indicators consist of a solid-state current sensor connected to a faulted-circuit display, providing a clear visual means for quickly locating faulted cables and equipment on underground distribution systems.

Designs incorporate advanced circuit logic and monitoring system protection operation to prevent the indicator from tripping unless an overcurrent condition is followed by a loss of system voltage. Trip and reset operations are automatic, and for versatility and convenience, the same indicator may be used for 5KV thru 35KV applications.



Faulted Circuit
Indicators

Features	Benefits/Descriptions
AccQTrip™ Logic Circuitry	Prevents false indications in voltage-reset units due to inrush currents, cold load pickup and overloading.
High/Low Trip-Setting Selection	Requires no minimum load current and no load surveys.
Internal Magnetic Shielding	Prevents adjacent phase effects.
1 msec. Trip Response	Coordinates with current-limiting fuses, as well as other protection devices
Magnetically Latched Flag	Prevents flag indication from changing state due to shock or vibration.
Test Point Mounting	Mounts directly to 200 and 600 amp elbows, splices and other cable accessories equipped with IEEE 386 standard capacitive test points from Fisher Pierce™ and other manufacturers.
Built-In Pulling Eye	Enables safe, easy hotstick installation and removal from test points.
Durable Construction	Enclosed in a rugged, yet lightweight and compact, sealed, impact- and corrosion-resistant Lexan housing with EPDM molded-rubber test point mounting boot.

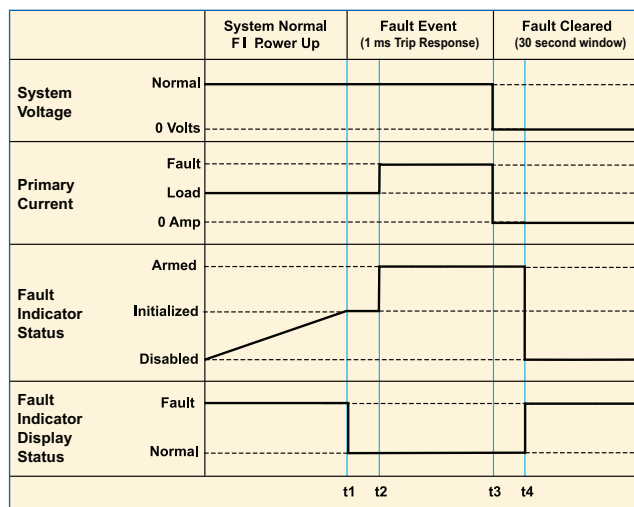


Basic Operation

A faulted circuit produces an associated magnetic field, which closes a reed switch in the indicator, resulting in a tripped display. Trip response occurs in .001 seconds (1 msec.), allowing the fault indicator to properly coordinate with all types of circuit-protection schemes, including current-limiting fuses. To eliminate confusing false trips, voltage-reset indicators are equipped with inrush, backfeed, overload and cold-load pick-up restraint circuitry. Current sensors feature internal shielding to prevent inadvertent tripping when located in close proximity to adjacent phases, such as in junction-mounted applications.

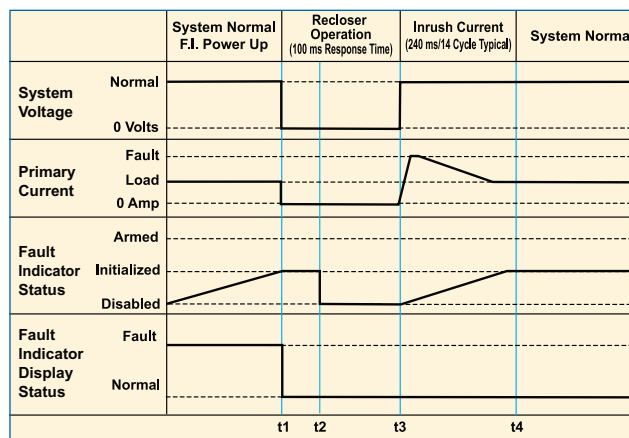
Faulted-Circuit Operation

- t1** Fault Indicator is connected to the system and powers up. At 5kV, this takes 3 minutes for the test point mounted unit and 6 minutes for the overhead type unit. At higher voltages, power-up time is shorter.
- t2** Fault current is detected. Fault Indicator is armed after 1 msec. Fault Indicator display shows Normal.
- t3** Breaker/recloser locks out and voltage drops.
- t4** Voltage is lost. A 30-second time window allows for the protective device to clear the fault and reclose. Indicator changes state.



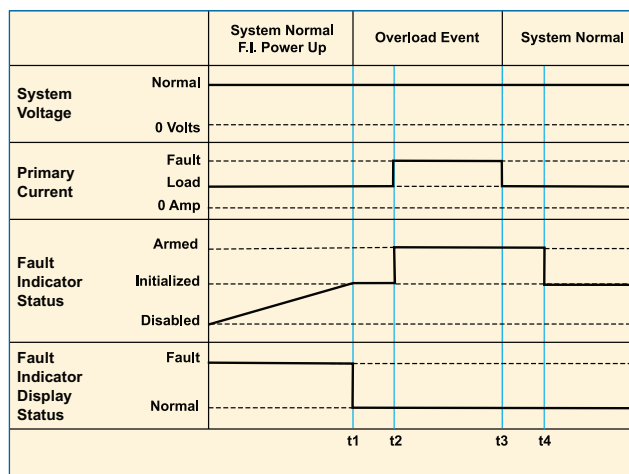
Inrush-Restraint Operation

- t1** Fault Indicator is connected to the system and powers up. At 5kV, this takes 3 minutes for the test point mounted unit and 6 minutes for the overhead type unit. At higher voltages, power-up time is shorter.
- t1-t2** Upline recloser/breaker operation due to fault on another phase. After 100 msec. (t2), the Fault Indicator is disabled because no fault current is detected.
- t3** Recloser closes back. Voltage is back to normal. Unfaulted phases see inrush. No change in the Fault Indicator display.



Overloading Operation

- t1** Fault Indicator is connected to the system and powers up. At 5kV, this takes 3 minutes for the test point mounted unit and 6 minutes for the overhead type unit. At higher voltages, power-up time is shorter.
- t2** Device downline from Fault Indicator switches, creating an overload. Fault Indicator is armed after 1msec. Fault Indicator display shows Normal.
- t3** Overload condition over. Fault Indicator does not change state.
- t4** After 30 seconds, Fault Indicator goes back to initialized state.



Specifications

Specifications for TPM Voltage Operated, Time Reset, LED Display: Model TPMVOL

Nominal Voltage 4.16-60kV (L-L)	LED Display Time 4 Hour – Standard
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Reset Time 4 Hour – Standard (longer times available upon request)
Trip Response Time 1mS	Power Source³ 3.6 Volt Lithium Thyonil Chloride Battery
Fault Clearing Time¹ .001 – 30 Seconds Subsequent to Arming	Battery Capacity 2.4 Ah
Maximum Surge Level 25kA 10 Cycles 60 Hz	Battery Operating Life 1200 Flash Hours Minimum
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Battery Storage Life 15-20 Years
Inrush/Backfeed Restraint 100mS (Disable Delay)	Temperature Range -40° C to 85° C
Load Current Requirements None	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Power Up Requirement 3 Minutes @ 5kV	Weight 258 Grams
Display Type Flashing Super Bright LED	Certifications Complies with ANSI/IEEE 495-1986
Flash Rate 30 Flashes per Minute	

Specifications

Specifications for TPM Voltage Reset, LED Display: Model TPMVL

Nominal Voltage 4.16-60kV (L-L)	LED Display Time 4 Hour – Standard
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Voltage Reset Time 6 Minutes @ 5kV
Trip Response Time 1mS	Power Source³ 3.6 Volt Lithium Thyonil Chloride Battery
Fault Clearing Time¹ .001 – 30 Seconds Subsequent to Arming	Battery Capacity 2.4 Ah
Maximum Surge Level 25kA 10 Cycles 60 Hz	Battery Operating Life 1200 Flash Hours Minimum
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Battery Storage Life 15-20 Years
Inrush Restraint Response 100mS (Disable Delay)	Temperature Range -40° C to 85° C
Load Current Requirements None	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Power Up Requirement 3 Minutes @ 5kV	Weight: 258 Grams
Display Type Flashing Super Bright LED	Certifications: Complies with ANSI/IEEE 495-1986
Flash Rate 30 Flashes per Minute	

Specifications

Specifications for TPM Voltage Reset, Flag Display: Model TPMVF

Nominal Voltage 4.16-60kV (L-L)	Minimum Reset Voltage 5kV (Beginning Initializing Sequence)
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Voltage Reset Time 3 Minutes @ 5kV
Trip Response Time 1mS	Power Source Volt Test Point Powered
Fault-Clearing Time¹ .001 – 30 Seconds Subsequent to Arming	Temperature Range -40° C to 85° C
Maximum Surge Level 25kA 10 Cycles 60 Hz	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Weight 258 Grams
Inrush Restraint Response 100mS (Disable Delay)	Certifications: Complies with ANSI/IEEE 495-1986
Load Current Requirements None	
Display Type Mechanical Flag	

Specifications

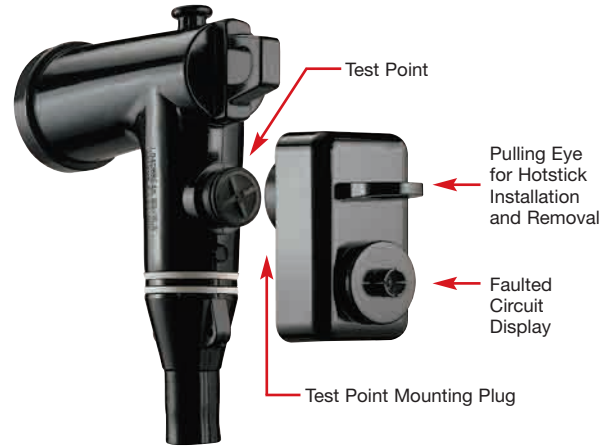
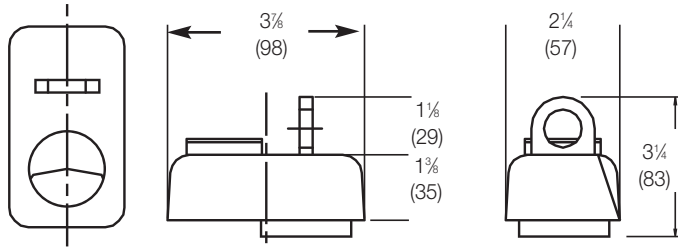
Specifications for TPM Time Reset, LED Display: Model TPMTL

Nominal Voltage 4.16-60kV (L-L)	Power Source³ 3.6 Volt Lithium Thyonil Chloride Battery
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Battery Capacity 2.4 Ah
Trip Response Time 1mS	Battery Operating Life 1200 Flash Hours Minimum
Maximum Surge Level 25kA 10 Cycles 60 Hz	Battery Storage Life 15-20 Years
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Temperature Range -40° C to 85° C
Power Up Requirement None	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Display Type Flashing Super Bright LED	Weight 258 Grams
Flash Rate 30 Flashes per Minute	Certifications: Complies with ANSI/IEEE 495-1986
Reset Time 4 Hour – Standard	

1. Prevents false trips due to short time interruptions without loss of voltage.
2. Inrush restraint is standard on voltage reset models. It is not available on the time reset models.
3. Battery powers LED and it is active only when LED is ON. Lithium Thyonil Chloride batteries provide accurate indication throughout the entire temperature range.

Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)



Faulted Circuit Indicators

Ordering Information for Fisher Pierce® TPM Series Test Point Fault Indicators

CAT. NO.	DESCRIPTION
TPMTL-[_]	Time Reset with LED Display (auto-resets to normal after 4 hrs.; may also be manually reset using an FTT test tool)
TPMVF-[_]	Voltage Reset with Flag Display (auto-resets to normal after system voltage restoration; reset requires 5kV min. voltage with time required for reset proportional to system voltage)
TPMVL-[_]	Voltage Reset with LED Display (auto-resets to normal after system voltage restoration; reset requires 5kV min. voltage with time required for reset proportional to system voltage)
TPMVOL-[_]	Voltage Operated, Time Reset, LED Display (auto-resets after 4 hrs.; longer time resets available upon request)
CAT. NO. SUFFIX	DESCRIPTION
-LT	For 200A. All fused taps use LOW trip rating. For URD applications, use LOW trip rating.
-HT	For 600A. For URD applications, use HIGH trip rating.

NOTE: For overhead bulk feeder applications, use HIGH or LOW trip ratings (whichever is greater than the minimum pickup setting of the related protection device). AccQTrip™ and AccQClamp™ are trademarks of Quality Indications, Inc.



Fisher Pierce® UCM Series Underground Clamp Type Fault Indicators

Locate faulted cables and equipment on underground distribution systems.

Self-powered Fisher Pierce® UCM Series Underground Clamp Type Fault Indicators consist of a solid-state current sensor connected to a faulted circuit display. Units are designed for direct installation to an underground power cable using a spring-loaded, over-center toggle clamp mounting provision. The clamp accommodates cables ranging from .4" to 2.2" diameter and includes retainer pads to prevent slip and twist.

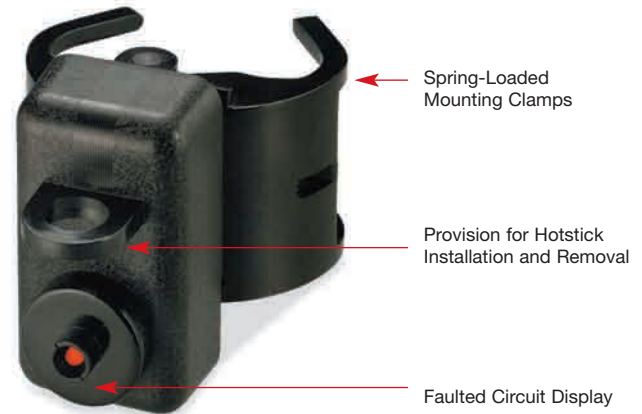
The clamp positions the cable conductor at a constant distance from the current sensor, maintaining indicator trip accuracy over the entire range of cable sizes. Designs feature compact, shielded and sealed, corrosion-resistant construction. The indicator is enclosed in a durable, impact-resistant Lexan® housing and includes a built-in pulling eye for easy hotstick installation and removal from the cable.



Faulted Circuit Indicators

Basic Operation

A faulted circuit produces an associated magnetic field, which closes a reed switch in the indicator, resulting in a tripped display. Trip response occurs in .001 seconds, allowing the fault indicator to properly coordinate with all types of circuit protection schemes including current-limiting fuses. Series VCM fault indicators are constructed with an internally shielded current sensor that prevents inadvertent tripping when located in close proximity to adjacent phases, such as junction-mounted applications.



Features	Benefits/Descriptions
AccQClamp™ Mounting Provision	Universal one-size-fits-all design automatically adjusts.
High/Low Trip Setting Selection	No minimum load current requirement and no load surveys needed.
Trip Response of .001 Seconds	Coordinates with current-limiting fuses, as well as other protection devices.
Internal Magnetic Shielding	Prevents adjacent phase effects.

TYPICAL INSTALLATION

Install Fault Indicator in Area Shown

As shown, proper installation of VCM cable mounted fault indicators requires routing cable neutral wires to prevent the ground return from affecting trip accuracy. Similar procedures should be followed for tape, wire, LC or other types of shielded cable constructions.

Do not install indicator directly over the concentric neutral to avoid misindication (Fig. 4).

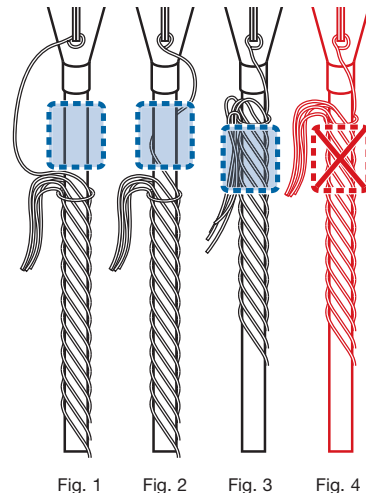
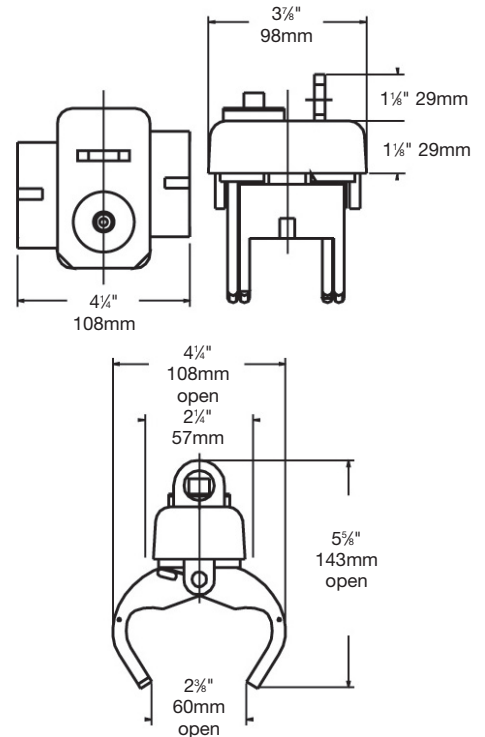


Fig. 1 Fig. 2 Fig. 3 Fig. 4

Specifications

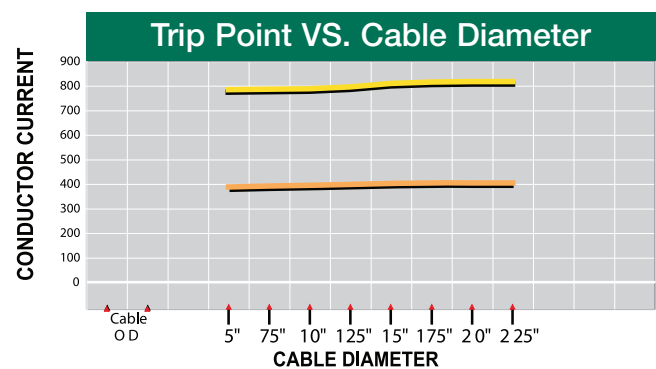
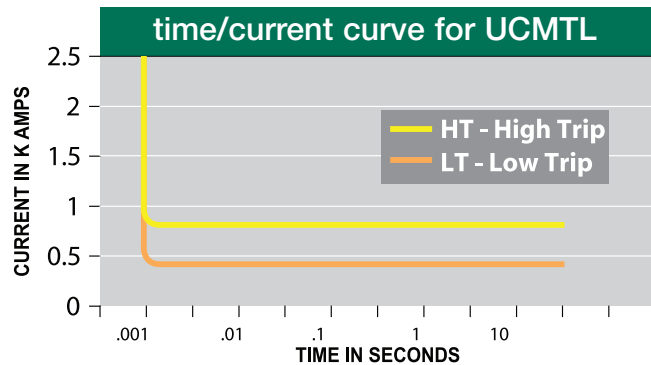
Specifications for UCM Time-Reset, LED Display: Model UCMTL

Nominal Voltage 4.16-60kV (L-L)	Power Source¹ 3.6 Volt Lithium Thionil Chloride Battery
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Battery Capacity 2.4 Ah
Trip Response Time 1mS	Battery Operating Life 1200 Flash Hours Minimum
Maximum Surge Level 25kA 10 Cycles 60 Hz	Battery Storage Life 15-20 Years
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Temperature Range -40° C to +85° C
Display Type Flashing Super Bright LED	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Flash Rate 30 Flashes per Minute	Weight 258 Grams
Reset Time 4 Hour - Standard	Certification Complies with ANSI/IEEE 495-1986



NOTES:

- 1) Battery powers LED and it is active only when LED is ON. Lithium Thionil Chloride batteries provide accurate indication throughout the entire temperature range.



Ordering Information for Fisher Pierce® UCM Series Underground Clamp Type Fault Indicators

CAT. NO. PREFIX	DESCRIPTION
UCMTL	Time Reset with LED Display (Indicator auto-resets to normal after a four hour time duration. Indicator may also be manually reset using an FTT test tool.)
CAT. NO. SUFFIX	DESCRIPTION
LT	All fused taps use LOW trip rating. For 200 amp circuits. URD applications, use LOW trip rating.
HT	For 600 amp. circuits. URD Applications, use high trip rating.

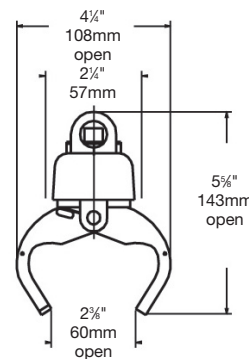
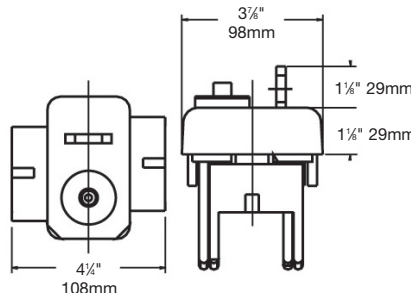
NOTE: For overhead bulk feeder applications, use HIGH or LOW trip ratings (whichever is greater than the minimum pickup setting of the related protection device).

AccQTrip™ and AccQClamp™ are trademarks of Quality Indications, Inc.

Fisher Pierce® Series OLM Overhead Line Fault Indicators

Locate faulted circuits and equipment on overhead distribution systems.

Self-powered Fisher Pierce® Series OLM Overhead Line Fault Indicators consist of a solid-state current sensor connected to a faulted circuit display. Advanced circuit logic monitors system protection operation and prevents indicator tripping unless an overcurrent condition is followed by a loss of system voltage. Trip and reset operations are automatic, and the same indicator may be used for 5kV thru 35kV line-to-ground applications. These compact, sealed and corrosion-resistant units are designed for direct installation to an overhead line using a spring-loaded, over-center toggle clamp. Equipped with retainer pads to prevent slip and twist, the clamp positions the conductor at a constant distance from the current sensor, maintaining trip accuracy over the entire conductor diameter range of .4" to 2.2".

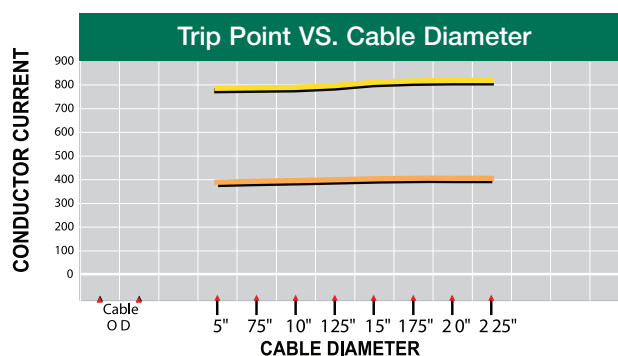
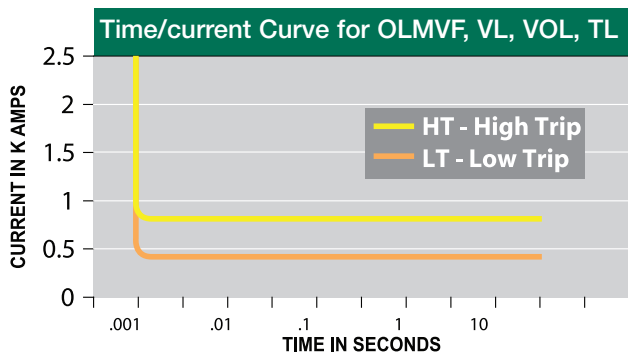


Basic Operation

A faulted circuit produces a magnetic field, which closes a reed switch in the indicator and causes a tripped display. A trip response time of .001 seconds enables the indicator to properly coordinate with all circuit-protection schemes, including current-limiting fuses. To eliminate confusing false trips, indicators feature inrush, overload and cold-load pick-up restraint circuitry as standard. Internal shielding of current sensors prevents inadvertent tripping when in close proximity to adjacent phases.

Faulted Circuit Indicators

Features	Benefits/Descriptions
AccQTrip™ Logic Circuitry	In voltage reset units prevents false indications due to inrush currents, cold load pickup and overloading.
AccQClamp™ Mounting Provision	Universal one-size-fits-all design automatically adjusts.
High/Low Trip Setting Selection	No minimum load current requirement and no load surveys needed.
Trip Response of .001 Seconds	Coordinates with current-limiting fuses, as well as other protection devices.
Internal Magnetic Shielding	Prevents adjacent phase effects.
Magnetically Latched Flag Indication	Flag indication will not change states due to shock or vibration.
Lightweight Enclosure	Compact and sealed



Specifications

Specifications for OLM Voltage Operated, Time Reset, LED Display: Model OLMVOL

Nominal Voltage 4.16-60kV (L-L)	LED Display Time 4 Hour – Standard
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Reset Time 4 Hour – Standard (longer times available upon request)
Trip Response Time 1mS	Power Source³ 3.6 Volt Lithium Thyonil Chloride Battery
Fault Clearing Time¹ .001 – 30 Seconds Subsequent to Arming	Battery Capacity 2.4 Ah
Maximum Surge Level 25kA 10 Cycles 60 Hz	Battery Operating Life 1200 Flash Hours Minimum
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Battery Storage Life 15-20 Years
Inrush/Backfeed Restraint 100mS (Disable Delay)	Temperature Range -40° C to 85° C
Load Current Requirements None	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Power Up Requirement 6 Minutes @ 5kV	Weight 258 Grams
Display Type Flashing Super Bright LED	Certifications Complies with ANSI/IEEE 495-1986
Flash Rate 30 Flashes per Minute	

Specifications

Specifications for OLM Voltage Reset, LED Display: Model OLMVL

Nominal Voltage 4.16-60kV (L-L)	LED Display Time 4 Hour – Standard
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Voltage Reset Time 6 Minutes @ 5kV
Trip Response Time 1mS	Power Source³ 3.6 Volt Lithium Thyonil Chloride Battery
Fault Clearing Time¹ .001 – 30 Seconds Subsequent to Arming	Battery Capacity 2.4 Ah
Maximum Surge Level 25kA 10 Cycles 60 Hz	Battery Operating Life 1200 Flash Hours Minimum
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Battery Storage Life 15-20 Years
Inrush Restraint Response 100mS (Disable Delay)	Temperature Range -40° C to 85° C
Load Current Requirements None	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Power Up Requirement 6 Minutes @ 5kV	Weight: 258 Grams
Display Type Flashing Super Bright LED	Certifications: Complies with ANSI/IEEE 495-1986
Flash Rate 30 Flashes per Minute	

Specifications

Specifications for OLM Voltage Reset, Flag Display: Model OLMVF

Nominal Voltage 4.16-60kV (L-L)	Minimum Reset Voltage 5kV (Beginning Initializing Sequence)
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Voltage Reset Time 6 Minutes @ 5kV
Trip Response Time 1mS	Power Source Volt Test Point Powered
Fault-Clearing Time¹ .001 – 30 Seconds Subsequent to Arming	Temperature Range -40° C to 85° C
Maximum Surge Level 25kA 10 Cycles 60 Hz	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Weight 258 Grams
Inrush Restraint Response 100mS (Disable Delay)	Certifications: Complies with ANSI/IEEE 495-1986
Load Current Requirements None	
Display Type Mechanical Flag	

Specifications

Specifications for OLM Time Reset, LED Display: Model OLMTL

Nominal Voltage 4.16-60kV (L-L)	Power Source³ 3.6 Volt Lithium Thyonil Chloride Battery
Nominal Trip Ratings Low, 400 Amp; High, 800 Amp	Battery Capacity 2.4 Ah
Trip Response Time 1mS	Battery Operating Life 1200 Flash Hours Minimum
Maximum Surge Level 25kA 10 Cycles 60 Hz	Battery Storage Life 15-20 Years
Effect of Adjacent Phase Internal Shielding Prevents Adjacent Phase Effects	Temperature Range -40° C to 85° C
Power Up Requirement None	Housing Material Mounting Boot – EPDM Conductive Rubber Housing Body – UV Stabilized Polycarbonate Polymer
Display Type Flashing Super Bright LED	Weight 258 Grams
Flash Rate 30 Flashes per Minute	Certifications: Complies with ANSI/IEEE 495-1986
Reset Time 4 Hour – Standard	

1. Prevents false trips due to short time interruptions without loss of voltage.
2. Inrush restraint is standard on voltage reset models. It is not available on the time reset models.
3. Battery powers LED and it is active only when LED is ON. Lithium Thyonil Chloride batteries provide accurate indication throughout the entire temperature range.

Ordering Information for Fisher Pierce® Series OLM Overhead Line Fault Indicators

CAT. NO. PREFIX	DESCRIPTION	RESET OPERATION
OLMTL	Time Reset with LED Display	Indicator auto-resets to normal after a four hour time duration. indicator may also be manually reset using an FTT test tool.
OLMVF	Voltage Reset with Flag Display	Indicator auto-resets to normal after system voltage restoration. Reset requires 5kV minimum voltage to operate. Reset operation time is proportional to system voltage.
OLMVL	Voltage Reset with LED Display	Example: at 15kV, reset occurs 30 seconds after system voltage restoration.
OLMVOL	Voltage Operated, Time Reset, LED Display	Indicator auto-resets after a four hour time duration. Longer time resets are available upon request.
CAT. NO. SUFFIX	DESCRIPTION	
LT	All fused taps use LOW trip rating For 600 amp. Overhead applications, use LOW trip rating.	
HT	For 600 amp. Overhead applications, use HIGH trip rating.	

Accessories for Series TPM, VCM and OLM Fault Indicators

FTT (Field Test Tool)

Permits field testing and reset of fault indicators and provides assurance that the indicator is properly functioning. The test tool is lightweight, portable and incorporates a built-in magnet which operates the indicator trip and reset functions. The unit is equipped with provisions for hotstick handling and operation.

FO-Cable06

Remote Fiber Optic Indicator for Underground Fault Indicators with LED Display can be extended to the outside of enclosures and/or vaults for ease of access and fault location. All the hardware for mounting the remote end of the cable to the enclosure is included. The display has a large reflective bolt to enhance visibility.



Ordering Information for Fisher Pierce® Fault Indicator Accessories

CAT. NO.	DESCRIPTION
FTT	Field Test Tool, overall dimensions 2" wide x 3" high x 5.8" deep
FO-CABLE06	Remote Fiber Optic Indicator for UFI

V2 Voltage Indicator

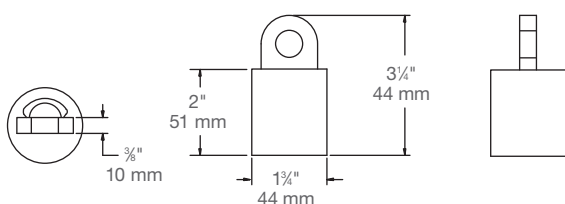
Easy way to visually determine the energized status of underground distribution circuits.

The V2 Voltage Indicator consists of a self-powered voltage sensor connected to a neon light that flashes when energized. Simply plug it into any IEEE 836 standard capacitive test point to determine the energized status of underground distribution circuits. Because the flash rate is proportional to the phase-to-phase system voltage, as indicated in the chart, one V2 model supports a wide range of applications – from 5 to 35kV.

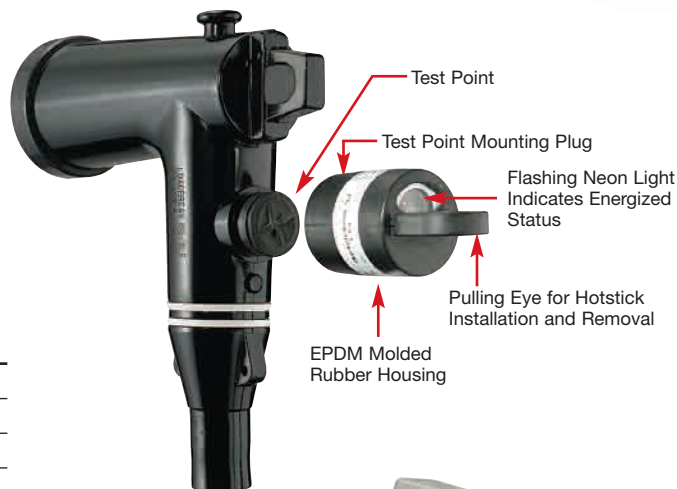


Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)



VOLTAGE	FLASH RATE	VOLTAGE	FLASH RATE
5kV	20	25kV	140
10kV	40	30kV	160
15kV	70	35kV	180
20kV	100		



V2-TB Test Box for easy field testing of V2 Voltage Indicators.

If the V2 Neon Voltage Indicator indicates a power failure in an underground distribution circuit, you'll want to ensure that it's actually the circuit that's failed and not the V2 itself. For fast, simple assurance, field test the V2 with the compact, portable V2-TB Voltage Indicator Test Box, powered by replaceable C batteries.



Features	Benefits/Descriptions
Wide Application Range	Single model supports applications from 5kV to 35kV.
Easy to Read	Flash rate per minute indicates system voltage (see chart below).
IEEE 386 Test Interface	Mounts to 200 and 600 amp elbows, splices and other cable accessory components equipped with IEEE 386 capacitive test points from Fisher Pierce® or other manufacturers.
Rugged Construction	Molded EPDM-rubber housing for shielded, sealed and corrosion-resistant construction.
Built-In Pulling Eye	Enables safe, easy hotstick installation and removal from test point.
20-Year Neon Bulb	Yields long, maintenance-free service life.
Testable with V2-TB	Easily tested for confirmation of proper operation with the V2-TB voltage indicator test box.

Ordering Information for Fisher Pierce® V2 Voltage Indicator — Test Point Mounted

CAT. NO.	DESCRIPTION
V2	Voltage Indicator with Neon Display
V2-TB	Voltage Indicator Test Box

PD35 Voltage and Phasing Indicator

Safely determine the correct phasing and energized status of single- and three-phase underground distribution circuits from 5kV to 35kV.

Designed for hotstick operation, the PD35 Voltage and Phasing Indicator eliminates direct exposure to high voltage while using established indirect test methods for capacitance-coupled, cable connection test points. Its advanced, low-impedance, solid-state circuitry provides accurate and reliable readings with sensitivity as low as 1.5kV phase to ground.

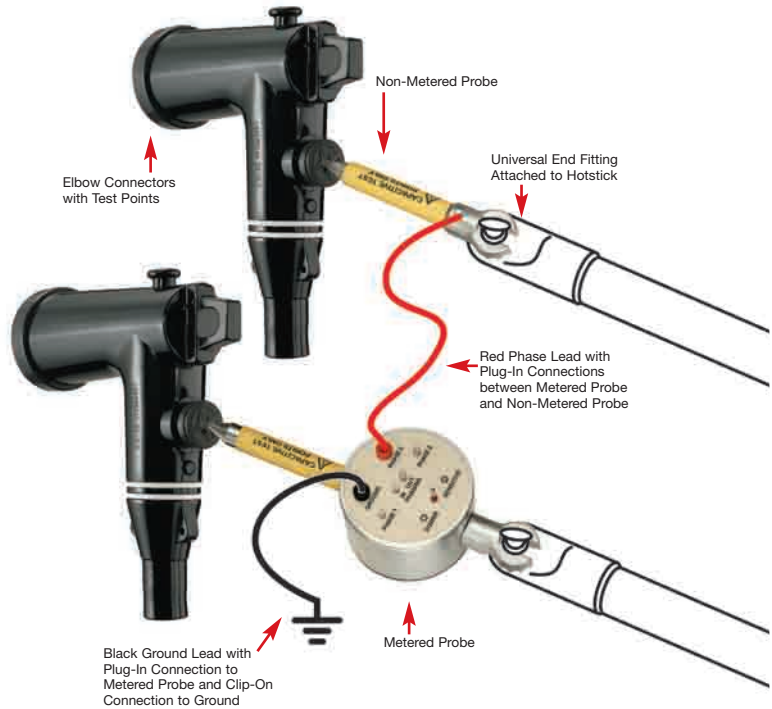


Faulted Circuit Indicators

Features	Benefits/Descriptions
IEEE 386 Test Interface	Designed for use on 200 and 600 amp elbows, splices and other cable accessory components equipped with IEEE 386 capacitive test points from Fisher Pierce® or other manufacturers.
Universal End Fittings	Enable convenient mounting to existing hotsticks.
Rugged Construction	Housed in an impact-resistant case to withstand field conditions.
LED Indicator Lights	Easy to read test results.
Lightweight and Battery-Powered	Highly portable for field use and powered by a standard, replaceable 9V battery — no external power source required.

How to Use the PD 35 Voltage and Phasing Indicator

- 1. Attach the metered probe to a hotstick and connect the BLACK ground lead.**
- 2. Switch the meter to the ON position.** The red LED power light will illuminate, indicating that battery voltage is sufficient. All other LED indicators will momentarily light, showing that the meter is operating properly.
- 3. To test for voltage,** touch the metered probe to the test point on the cable connection. The amber PHASE 1 LED will illuminate, showing that the high-voltage circuit is energized.
- 4. To test for proper phasing,** attach the non-metered probe to an additional hotstick and connect the RED phase lead from the metered probe to the non-metered probe. Touch one probe to the test point on one of the cable connections. Touch the other probe to the test point on the other cable connection.
 - The **amber PHASE 1** and **PHASE 2 LEDs** will illuminate, showing that each of the high-voltage circuits are energized.
 - If the circuits are **IN PHASE**, the **green LED** will illuminate.
 - If the circuits are **OUT of PHASE**, the **red LED** will illuminate.



Ordering Information for Fisher Pierce® PD35 Voltage and Phasing Indicator

CAT. NO.	DESCRIPTION
PD-35	Voltage & Phasing Indicator



QUICK REFERENCE

**Fisher Pierce®
Current Sensors** page(s)

Series 1301 66-69

Current Sensors



Economical and reliable current measurement for capacitor switching, load surveying or protective relaying.

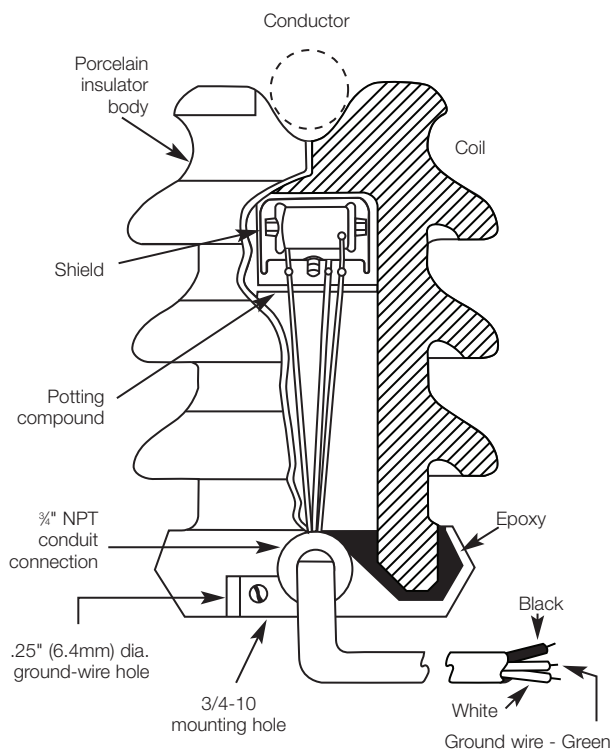
Fisher Pierce® current sensors consist of a porcelain line-post insulator with an embedded current-sensing coil, which provides a safe, low-voltage signal proportional to line current. There's no need for conductor cutting, dead-ending or jumpers to use them with capacitor controls, RTUs and other monitoring/control equipment — which translates into installation and equipment cost savings of up to 40% over the use of conventional current transformers (CTs) and potential transformers (PTs).

Fisher Pierce® Series 1301 PowerFlex™ High-Accuracy Line-Post Current Sensors

Offers a unique combination of safety, installation without service interruption, space savings and low installed cost.

Fisher Pierce® Series 1301 PowerFlex™ High-Accuracy Line-Post Current Sensors provide reliable current measurement for distribution systems — from zero to thousands of amps. The sensor consists of a porcelain line-post insulator with an embedded coil, which is inductively coupled to the conductor mounted in the insulator top groove. The voltage induced in the coil is directly proportional to the alternating current in the primary conductor. This signal may be used for capacitor switching, load surveying or protective relaying.

Current Sensors



Features	Benefits/Descriptions
Easy Installation	Simply fasten conductor to sensor with any nonferrous-material conductor tie.
No Line Cutting or Dead-Ending Required	No service interruption or loss of revenue.
Rugged, Long-Life, No-Maintenance Design	Withstands continuous high current, transients and switching surges.
Broad Operating Range	Meets increasing load requirements without requiring sensor change.
Low Output Voltage	Only 1V per 60A of line current — eliminates dangerous shock hazards, and output need not be shorted when disconnected.

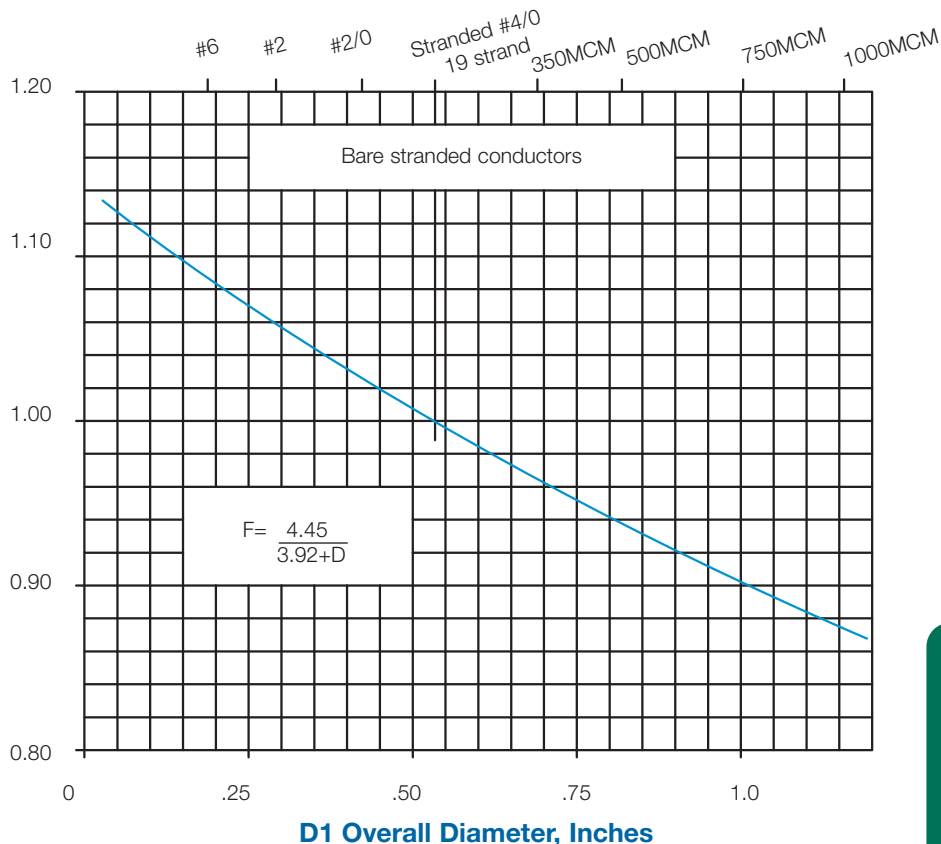
Correction Curve

The output voltage of a sensor varies inversely with the center-line spacing between the sensing coil and the primary conductor. While output differences are small, it may be desirable to provide correction in certain applications. Variations from the Fisher Pierce® standard size of #4/0 bare stranded copper cable are given above. This information is for round conductors only. Information regarding special conditions is available upon request.

For 60 Hz: $I \text{ line} = \frac{60 \times E_{\text{out}}}{F}$

For 50 Hz: $I \text{ line} = \frac{72 \times E_{\text{out}}}{F}$

F1 Calibration Factor for Conductor Diameter



Current Sensors

Specifications

	Model 1301-17A	Model 1301-47A	Model 1301-27A
Nominal three-phase rating, kV	15	25	35
Maximum operating voltage to ground, kV	9.5	15	22
60 Hz dry flashover, kV	80	95	110
60 Hz wet flashover, kV	55	60	85
Impulse flashover, positive kV	105	140	180
Impulse flashover, negative kV	130	175	205
Impulse withstand, kV	95	130	160
Radio influence test voltage, kV	10	15	22
Radio influence voltage at 1 MHz, microvolts	110	500	500
Dry arcing distance, inches	6.5	9.5	11.5
Leakage distance, inches	11	17	25
Weight, pounds	13	19	28
Cantilever strength, pounds	2,000	1,700	1,500



Characteristics

Performance Characteristics

High Accuracy	
Sensitivity (A / OutputV)	60 A/VAC @60 Hz 72 A/VAC @ 50 Hz
Source Impedance (ohms)	2.1 K = (1.2 K = j1.7K)
Calibration Accuracy at 120A	1%
Linearity Error, % Change In Sensitivity	<1.0% (3-1200A)
Angle Error, 3-600 A, Change In Degrees	< 0.50
Temperature Error Change In Sensitivity	+/- 0.02% °C
7th Harmonic Response %, (100% = 7 x 60 Hz output)	82%

Typical Sensor Installation Characteristics

	Amplitude Percent	Angle Degree	
Conductor Size % Correction	See Correction Curve (on previous page)	N/A	
Left and Right * ** Center	-0.8 -1.3	±0.5 0.0	<p>Equal Phase Spacing</p>
30" Horizontal Phase Spacing Left and Right * ** Center	-0.4 -0.6	±0.2 0.0	
20" Vertical Phase Spacing Top Center * Bottom **	+9.1 +3.1 -7.7	±3.0 ±10.9 ±2.5	<p>Equal Phase Spacing</p>
30" Vertical Phase Spacing Top Center * Bottom **	+5.9 +1.4 -5.3	±1.9 ±7.3 ±1.7	
Triangular Left * ** Center Right	-1.6 +3.8 -2.5	±1.5 ±0.9 ±2.4	

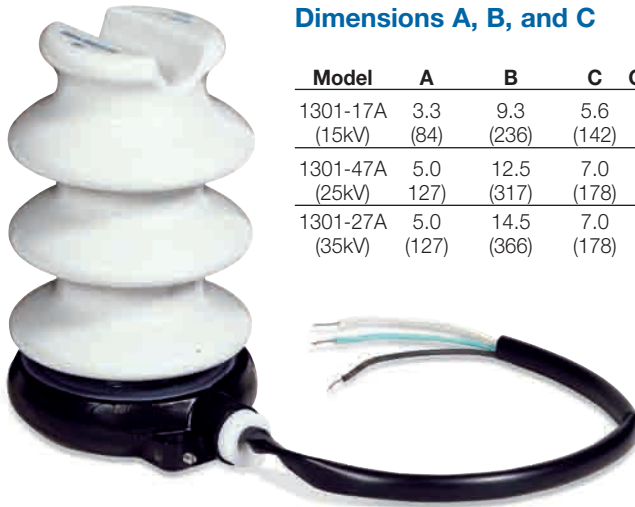
* Recommended for current sensing.

** Recommended for VAR sensing.

Recommend Shielded Cable for Applications Where Power + Sensor Cables are Routed in a Common Conduit.

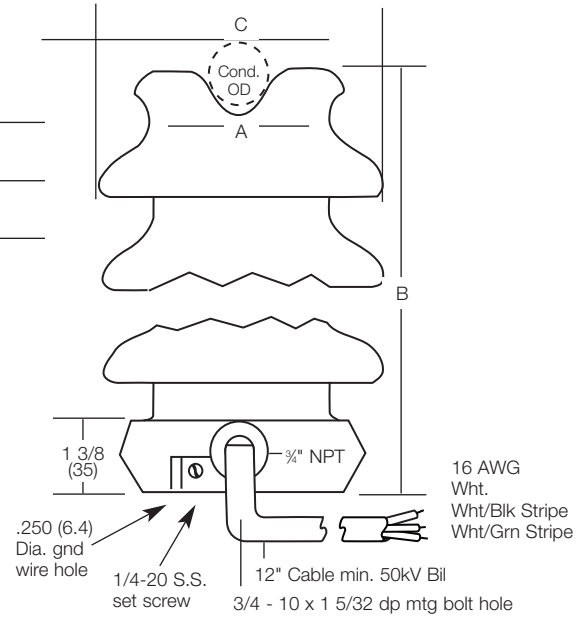
Mechanical Data

(all dimensions in inches with millimeter equivalents in parentheses)

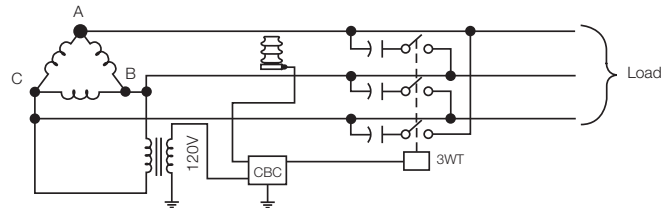
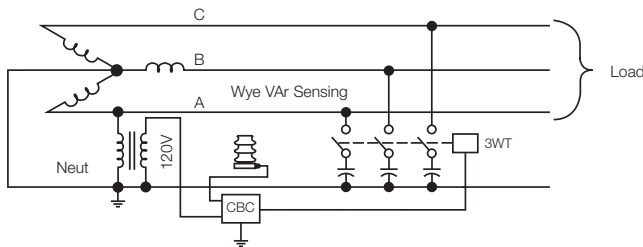


Dimensions A, B, and C

Model	A	B	C	Max. Cond. Dia.
1301-17A (15kV)	3.3 (84)	9.3 (236)	5.6 (142)	1.5 (38)
1301-47A (25kV)	5.0 (127)	12.5 (317)	7.0 (178)	2.0 (51)
1301-27A (35kV)	5.0 (127)	14.5 (366)	7.0 (178)	2.0 (51)



Installation and Preferred Sensor Location



Series 1301 High-Accuracy Sensors may be used interchangeably with all Series 1301 input current-sensing controls except VAR controls. VAR controls are field adjustable for either high accuracy or discontinued standard sensors. Refer to model number cross reference below.

Ordering Information for Fisher Pierce® Series 1301 PowerFlex™ High-Accuracy Line-Post Sensors

Voltage Class (L-L)	CAT. NO. STANDARD ACCURACY (FOR REPLACEMENT ONLY)	CAT. NO. HIGH ACCURACY
15kV	1301-11A	1301-17A
25kV	1301-41A	1301-47A
35kV	1301-21A	1301-27A



POWER DELIVERY



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