
CATALOG

Fisher Pierce®

Indicators, sensors & controls



**Thomas & Betts is now ABB
Installation Products, but our long
legacy of quality products and
innovation remains the same. From
connectors that help wire buildings
on Earth to cable ties that help put
machines in space, we continue to
work every day to make, market,
design and sell products that
provide a smarter, safer and more
reliable flow of electricity, from
source to socket.**

Table of contents

004–007	Faulted circuit indicators overview
008–010	Overhead faulted circuit indicators
011–022	Underground faulted circuit indicators
023–027	Cellular RTUs and receivers
028–033	Clamp-type faulted circuit indicators
034–043	Test point indicators
044–047	Current sensors
048–072	Capacitor controls
073	Index

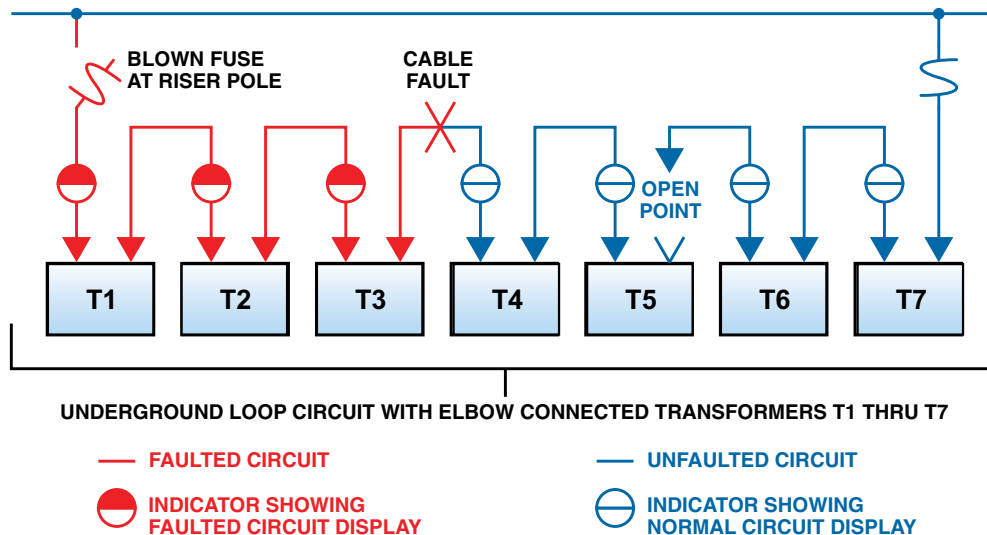
Overview

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

- Adaptive Trip™ logic 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 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 enable 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



Overview

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 “untripped” 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.

Overview

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 800 A 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 = 3 A; Trip current = 100 A di/dt

- 01 Conditions 1 and 4 not met. Unit in inrush restraint. Unit will not enable.
- 02 Condition 2 not met. di/dt Rate of change not satisfied. Unit not armed.
- 03 Condition 3 not met. Total line current magnitude not met. Unit will not enable.
- 04 Condition 4 not met. Total loss of load current not met. Unit armed, trip not activated.
- 05 All 4 conditions satisfied. Normal trip indication. Unit armed and tripped.

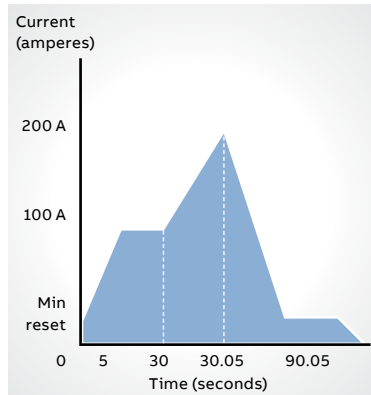


Figure 1

01

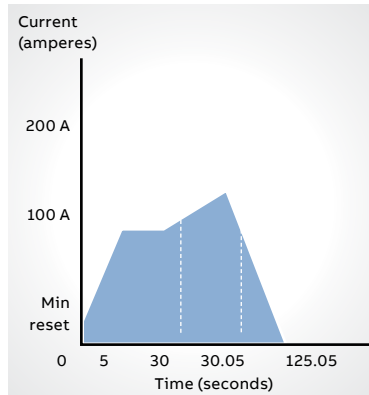


Figure 2

02

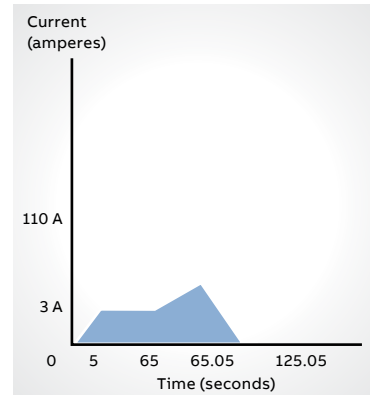


Figure 3

03

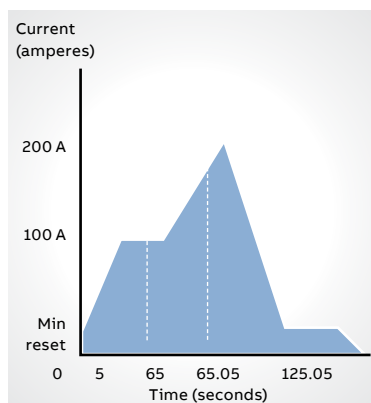


Figure 4

04

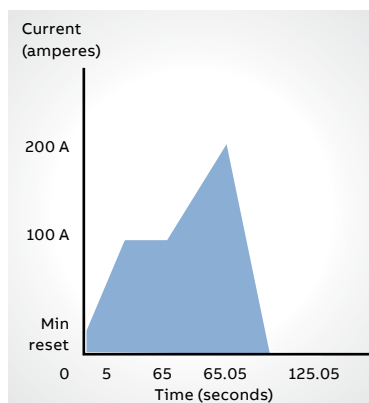


Figure 5

05

Overview

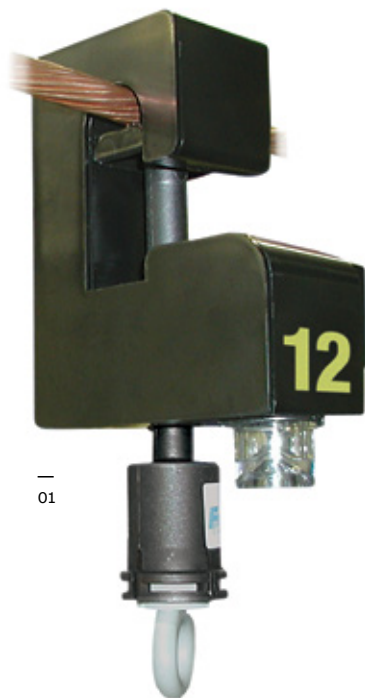
Which Fisher Pierce® FCI is recommended for your application?

	1580	1548	1547	1543	1542	1541	1516	1515	1514	TPMVF	TPMVL	TPMVOL	TPMTL	UCMTL	OLMVOL	OLMVF	OLMVL	OLMTL
Overhead	●	●	-	-	-	-	-	-	-	-	-	-	-	-	●	●	●	●
Underground	-	-	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-	-
Test point installation	-	-	-	-	-	-	-	-	-	●	●	●	●	-	-	-	-	-
Backfeed restraint	-	●	-	-	-	-	-	-	-	●	●	●	-	-	●	●	●	-
Inrush restraint	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	-	-	-
Temporary fault detection	-	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Directional fault capability (1514AM-45102)	-	-	-	-	-	-	-	-	●	-	-	-	-	-	-	-	-	-
Neutral current (cap. banks)	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	●	-	●	●	●	●	●	●	-	-	-	-	-	-	-	-	-
Adaptive trip	-	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
High/low trip	-	-	-	-	-	-	-	-	-	●	●	●	●	●	●	●	●	●
Reset logic																		
Current	-	●	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Voltage	-	-	-	-	-	-	●	-	-	●	●	●	-	-	●	●	●	-
Time	-	●	●	●	●	●	-	●	●	-	-	●	●	●	●	-	-	●
Manual	-	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Fault indication options																		
LED	●	●	●	●	●	●	-	●	●	-	●	●	●	●	●	-	●	●
Fluorescent flag	-	●	●	-	-	-	●	●	●	●	-	-	-	-	-	●	-	-
Strobe light	-	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fiber optic display	-	-	●	●	●	●	-	●	●	-	●	●	●	●	-	-	-	-
Radio transmitter	-	●	●	-	-	-	-	●	●	-	-	-	-	-	-	-	-	-
SCADA contacts	-	-	●	-	-	-	●	-	●	-	-	-	-	-	-	-	-	-
Batteryless options	●	-	-	-	-	-	-	-	-	●	-	-	-	-	-	●	-	-

Overhead faulted circuit indicators

Fisher Pierce® series 1548 overhead FCIs

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



—
01



Swipe here

Reliable fault indication for single-phase overhead applications.

- Adaptive or fixed current trip with inrush restraint logic
- Adaptive trip logic eliminates the need for trip-rating selection or revision with changing load
- 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
- Visual fault indication choices of LED, 5-LED array, flag or strobe light; highly viewable 360° indication (strobe or LED); radio fault reporting capability also available
- Hotstick mounting with automatic torque limiting
- Replaceable lithium battery offers 10-year, maintenance-free service life (Flag model has non-replaceable battery)
- Mounts on conductors with diameters from 0.14" to 1.20" (3.56 mm to 30.48 mm)
- 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)

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.

Overhead faulted circuit indicators

Specifications

System voltage:

- Flag, strobe models: 44 kV max.
- LED, radio models: 69 kV max.

Continuous withstand load: 1,000 A max.

Operating temperature: -40 °C to 85 °C

Reset time accuracy: $\pm 10\%$ at 23 °C

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

Fixed trip current level: 50 to 1,500 A

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

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

Trip accuracy: $\pm 10\%$ 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 LEDs: 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) LEDs: 400 operating hrs.

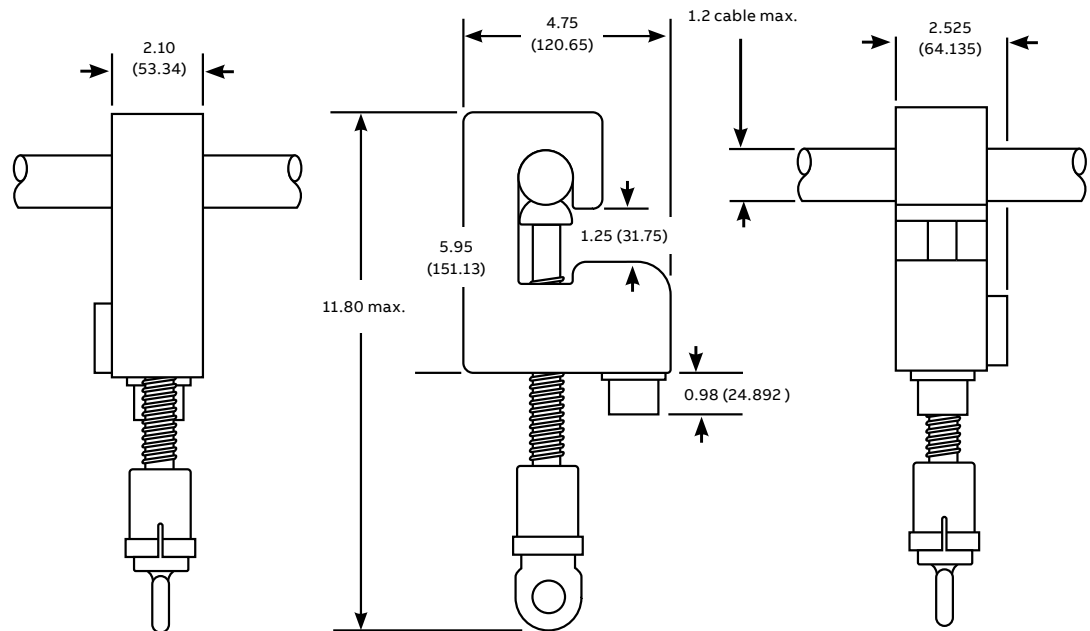
Housing: Semi-conductive UV-stable polycarbonate

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

Certifications:

- Complies with ANSI/IEEE 495-1986

Mechanical data



(All dimensions in inches with millimeter equivalents in parentheses)

Overhead faulted circuit indicators

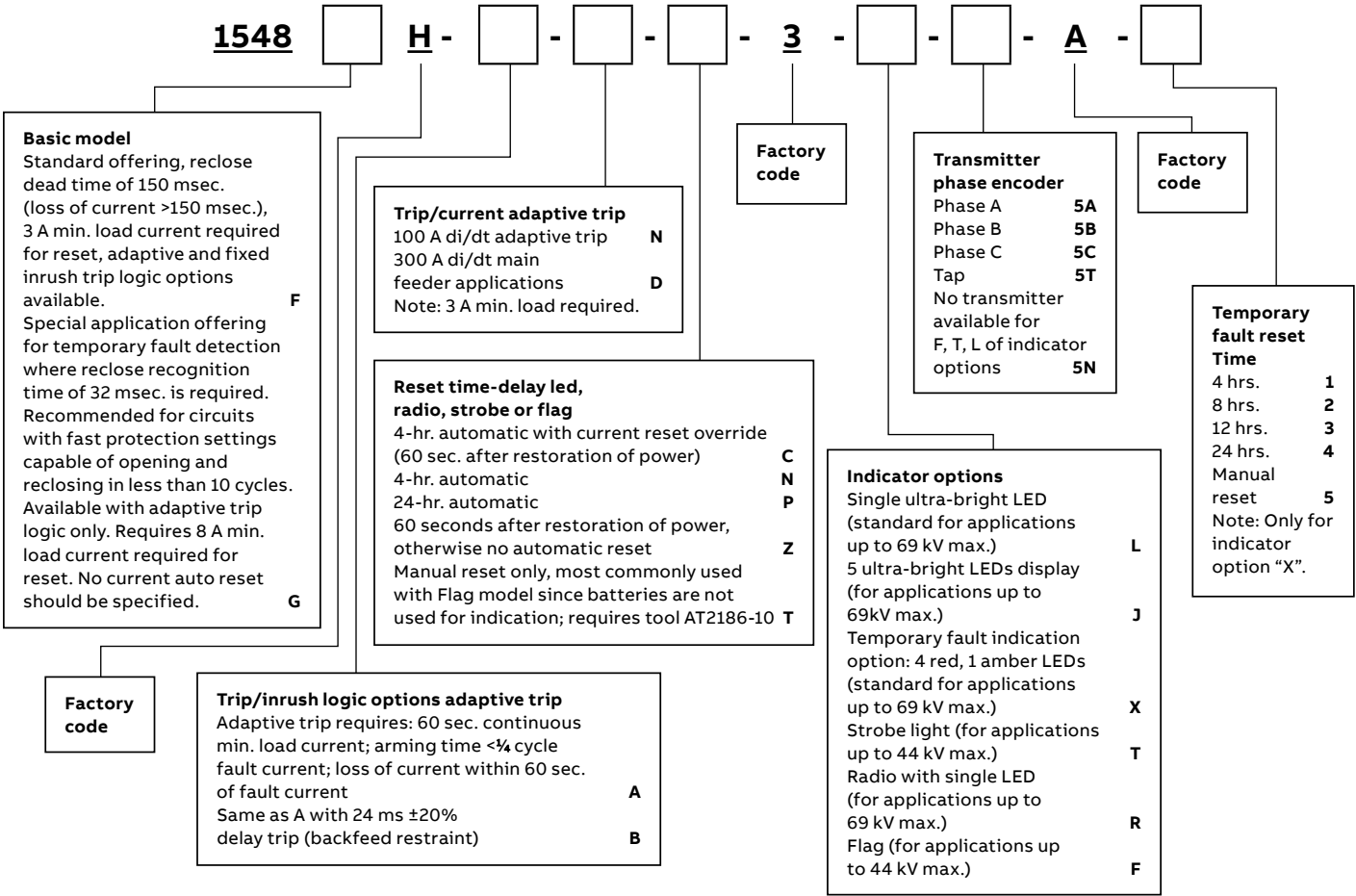
Fisher Pierce® series 1548 overhead FCIs

Fisher Pierce series 1548 overhead FCIs

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



Underground faulted circuit indicators

Fisher Pierce® series 1547 Adaptive Trip™ FCIs



For single-phase underground or overhead applications.

- Adaptive current trip with inrush restraint logic
- Automatic reset with return of load current and/or time reset of fault indication; manual reset also available
- Visual fault indication choices of Flag, LED or 10-ft. remote fiber optic display; integrated radio transmitter with or without LED also available
- N.O. or N.C. contact enables fault indication alert to be integrated into SCADA systems
- Durable Lexan housing and epoxy-coated sensors protect against moisture for long, maintenance-free service life
- Mounting kits available, enable view-plate mounting for padmount applications

Mechanical data

01 Figure A – Indicator with Attached sensor. Hotstick mounting.

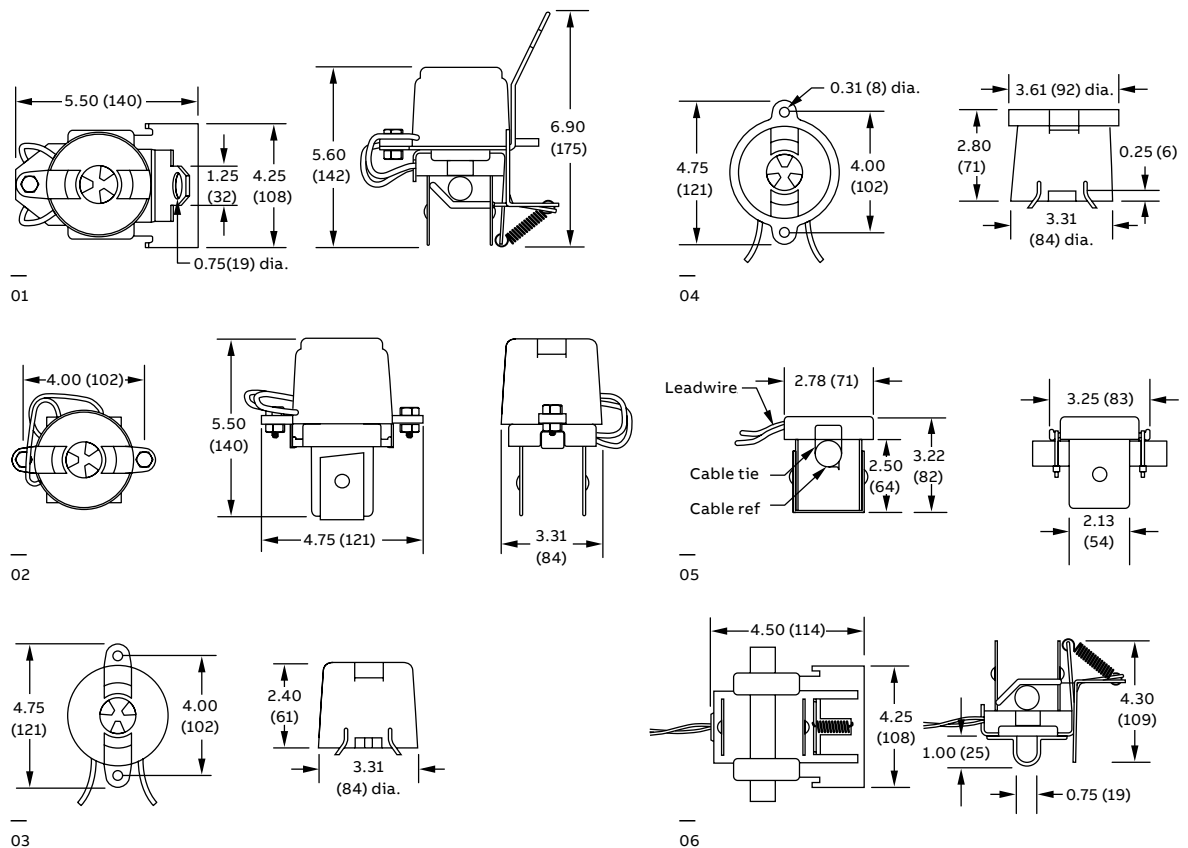
02 Figure B – Indicator with attached sensor. Tie-wrap mounting.

03 Figure C – Bracket/surface mounting.

04 Figure D – Window/flush mounting.

05 Figure E – Remote sensor. Tie-wrap mounting.

06 Figure F – Remote sensor. Hotstick mounting.



Underground faulted circuit indicators

Specifications

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

Fault withstand capability: 25 kA for 10 cycles per ANSI/IEEE 495-1986

Operating current range: Min. reset current to 800 A for trip operation

Continuous current rating: 800 A 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: 1.0 A;
- 2¾" sensor with U-lamination: 1.5 A;
- 1½" sensor w/o U-lamination: 2.0 A;
- 2¾" sensor w/o U-lamination: 3.0 A

Life expectancy: 20+ years (series 1547A flag type)

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: Trip enable condition: Occurs whenever line current increases by the rate of 100 A (or greater) within 3 cycles; Trip indication: FCI indicates trip only when line current drops 0.5 A 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

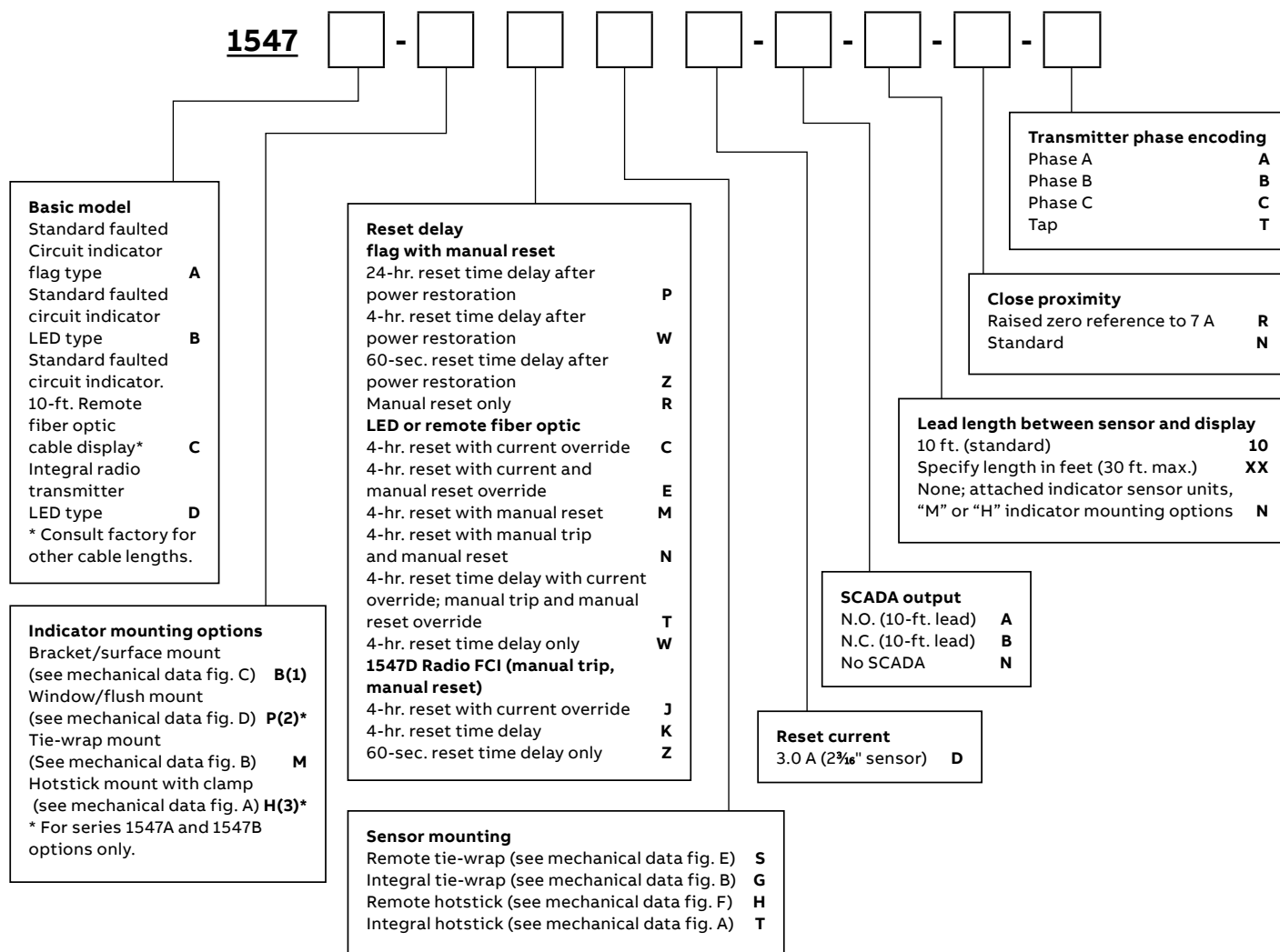


Underground faulted circuit indicators

Fisher Pierce® series 1547 Adaptive Trip™ FCI

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.



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 7 A. 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.

Consult factory for lower reset currents.

Consult factory for Series 1547A and 1547B options:

Mechanical (for both LED and flag indicators) —

B(1) Bracket/surface mount kit (N1767-1, -2, -3)

P(2) Lexan window/flush mount kit (AT2050-1), reset tool (AT2186)

H(3) Manual trip override kit (LED) (overhead applications only)

Underground faulted circuit indicators

Fisher Pierce® series 1514/15

current-reset FCIs

For single-phase or three-phase underground applications.

- **Trip logic:** Adaptive 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 fault indication choices of Flag, LED or 10-ft. remote fiber optic display; integrated radio transmitter with or without LED also available
- N.O. contact enables fault indication alert to be integrated into SCADA systems
- Durable Lexan housing and epoxy-coated sensors protect against moisture for long, maintenance-free service life
- Mounting kits available to allow view-plate mounting for padmount applications

Specifications

System voltage: 29.3 kV max

Trip current: Factory preset from 50 to 1,500 A

Trip current accuracy: $\pm 10\%$

Trip response speed: Coordinates with properly applied current-limiting or expulsion fuses

Reset current: Factory preset for 1.2, 1.5, 3.0 and 5.0 A

Fault withstand capability: 25k A for 10 cycles per ANSI/IEEE 495-1986

Maximum continuous load current: 1,000 A

Operating temperature: - 40 °C to 85 °C

Submersibility: Tested to 30 ft.; exceeds ANSI/IEEE 495-1986

Life expectancy: 30+ years (flag type)

Rated battery life: 10 years (long-life lithium cell)

Model 1514B/1515B: 800 hrs. of operation

Model 1514D: 300 hrs. of operation

Warranty: 3 years

Certifications: Complies with ANSI/IEEE 495-1986



Underground faulted circuit indicators

Mechanical data

01 Figure A – Indicator with attached sensor. Hotstick mounting.

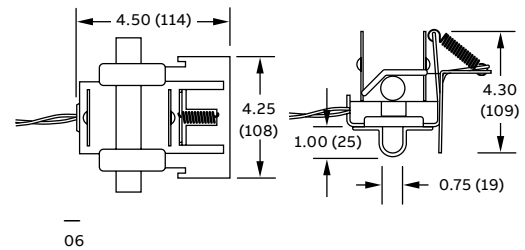
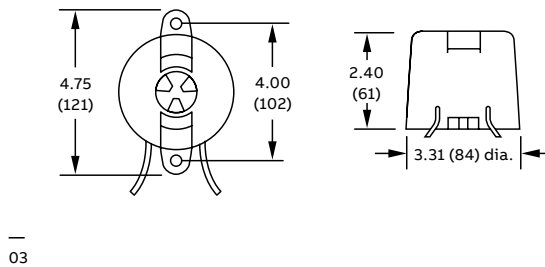
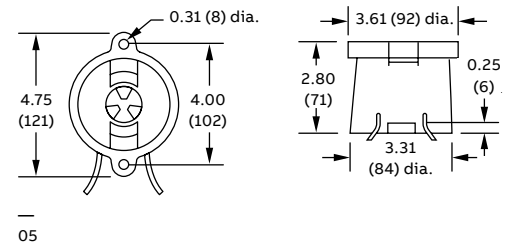
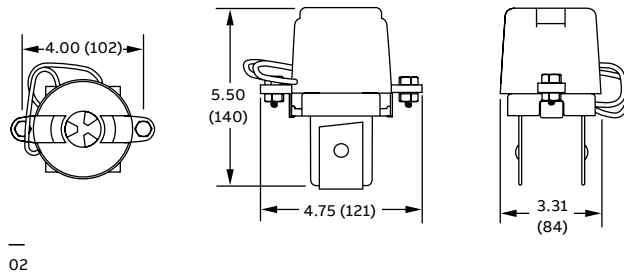
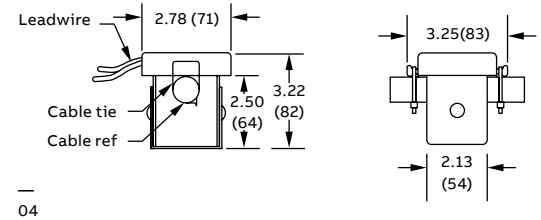
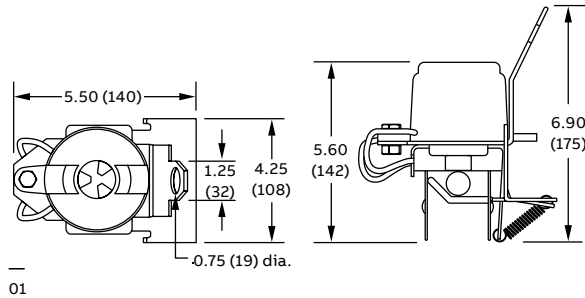
02 Figure B – Indicator with attached sensor. Tie-wrap mounting.

03 Figure C – Bracket/surface mounting.

04 Figure E – Remote sensor. Tie-wrap mounting.

05 Figure D – Window/flush mounting.

06 Figure F – Remote sensor. Hotstick mounting.



(All dimensions in inches with millimeter equivalents in parentheses)

Underground faulted circuit indicators

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 for ordering assistance.

☐ Indicates field that must be filled in to complete order.
Note: Availability of selected configuration will be verified at quotation time.

1514 or 1515 ☐ ☐ ☐ - ☐ **3** ☐ - ☐ ☐ - **B** - ☐

Basic model

Single-phase (one sensor, one indicator) **1514**

Three-phase (three sensors, one indicator) **1515**

Unit requires current in all three phases to reset **1515**

Flag display **1514S/1515W**

Flag display and single (N.O.) latching SCADA output contact **1514A/1515A***

LED display (non-replaceable battery) **1514B/1515B**

Remote, 6-ft. fiber optic LED display (requires "M" mounting) **1514C/1515C**

Integral radio/LED display (requires "M" mounting) **1514D**

Flag display with momentary (N.O.) SCADA output **1514M/1515M***

* SCADA contacts: 3.0 A @ 125/250 V AC; 1/10 hp @ 250 V AC, 10 ft. cable length.

Minimum reset current level

Consult factory for **Factory code** lower reset currents.

Factory code

Lead length between sensor and display

10 ft. (standard) **10**

Specify length in feet (30 ft. max.) **XX**

None. Attached indicator sensor units, "G" or "T" sensor termination **N**

Sensor termination

Terminates with remote lead connected to sensor **S**

Sensor and indicator attached to hotstick clamp **T**

Hotstick clamp attached to sensor (1 $\frac{1}{8}$ " and 2 $\frac{3}{16}$ " cable diameter only) **H**

Sensor attached to indicator, tie-wrap mount **G**

Indicator mounting options

Bracket/surface mounting (remote from sensor) **B**

Window/flush mounting (remote from sensor) **P(1)***

Hotstick mounting (attached indicator/sensor) (B and D sensors only, one phase only) **H(2)****

Tie-wrap mounting (attached indicator/sensors) **M**

Trip setting (amps)

0.5	50
1	100
2	200
3	300
4	400
6	600
8	800
10	1,000
12	1,200

Max. cable diameter (in.)

1 $\frac{1}{8}$ "	B
2 $\frac{3}{16}$ "	D
2 $\frac{1}{2}$ "	K
1 $\frac{1}{2}$ "	M**
2 $\frac{3}{16}$ "	L**
2 $\frac{1}{2}$ "	N**

** Has a snap-on U lamination for circuit isolation.

Transmitter phase encoding

Phase A (1514D only) **A**

Phase B (1514D only) **B**

Phase C (1514D only) **C**

Inrush restraint/reset delay options

Flag display (1514A, 1514M, 1514S, 1515A, 1515M, 1515W), manual reset override

Standard trip curve, 10- to 30-sec. delay after restoration of power **A**

Inrush restraint, 60-sec. reset time delay after restoration of power **Z**

Inrush restraint, 4-hr. reset time delay after restoration of power **W**

Inrush restraint, no automatic reset, manual reset only **N**

Inrush restraint, 24-hr. reset time delay after restoration of power **P**

LED display (1514B, 1514C, 1514R, 1515B, 1515C, 1515R), inrush restraint

4-hr. reset time delay after fault occurrence **W**

Same as W with current reset override upon energization of line **C**

Same as W with manual trip and manual reset override **N**

Same as N with current reset override **T**

Same as W with manual reset override **M**

Same as C with manual reset override **E**

Radio indication (1514D), inrush restraint, manual trip and manual reset override

4-hr. reset time delay after fault occurrence **K**

Same as K with current reset override upon energization of line **J**

60-sec. time delay after fault occurrence **Z**

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

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. Manual Reset tool (AT2186)

* Special Lexan mounting kit (AT2050-1) available.

** Special Lexan spacer (F2079) available for small (<1" dia.) conductor overhead installation.

Underground faulted circuit indicators

Fisher Pierce® series 1541/42/43 automatic time reset FCIs

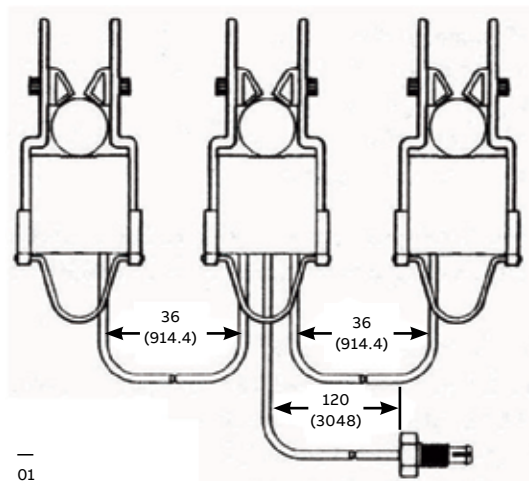


For single-phase, two-phase or three-phase underground applications.

- Fixed current trip with inrush delay
- Automatic time reset of fault indication; manual reset also available
- Visual fault indication choices of LED with replaceable or non-replaceable battery; audible alarm fault indication with replaceable battery also available
- Optional permanent or removable remote fiber optic display available

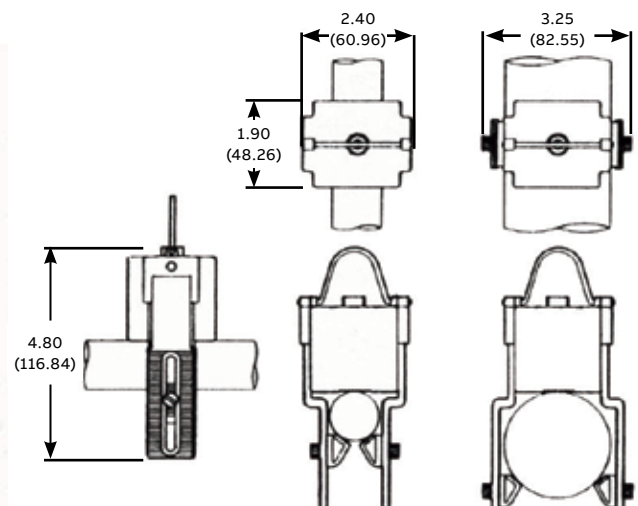
Mechanical data

01 Three-phase 1543



01

(All dimensions in inches with millimeter equivalents in parentheses)



Underground faulted circuit indicators

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 50 A and 100 A to 1,500 A in 100 A increments

Trip current accuracy: ±10% of trip rating (calibrated using 1" dia. cable for 400 A trip or less or 2.0" dia. cable for greater than 400 A 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 25,000 A 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

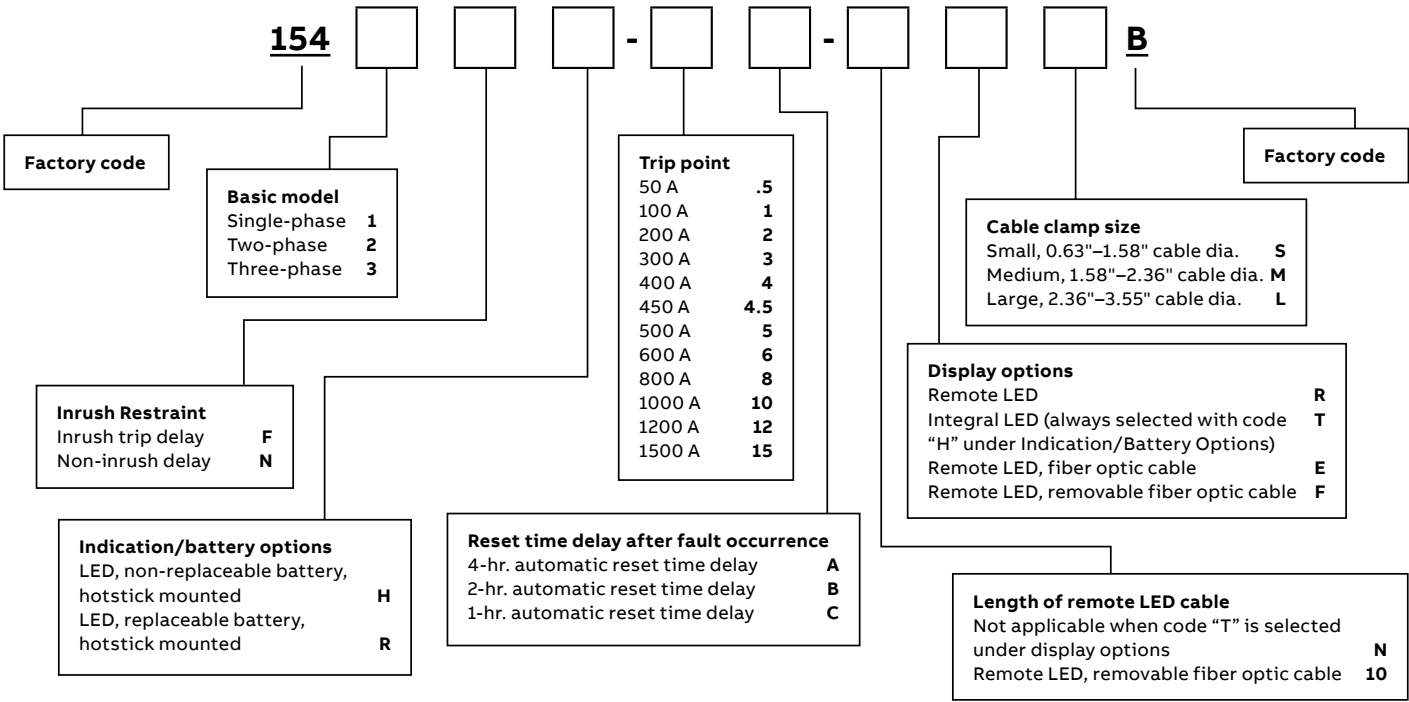
Cable ranges: 0.63" (16 mm) to 1.58" (40 mm); 1.58" (40 mm) to 2.36" (60 mm); 2.36" (60 mm) to 3.55" (90 mm)

Remote fiber optic options: Permanent or removable (10 ft. standard, 30 ft. max.)

Certifications: Complies with ANSI/IEEE 495-1986

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



Underground faulted circuit indicators

Fisher Pierce® series 1516 voltage reset FCIs



For single-phase underground applications.

- Fixed current trip with inrush restraint
- Automatic reset after restoration of secondary voltage; manual reset also available
- Flag model provides visual fault indication

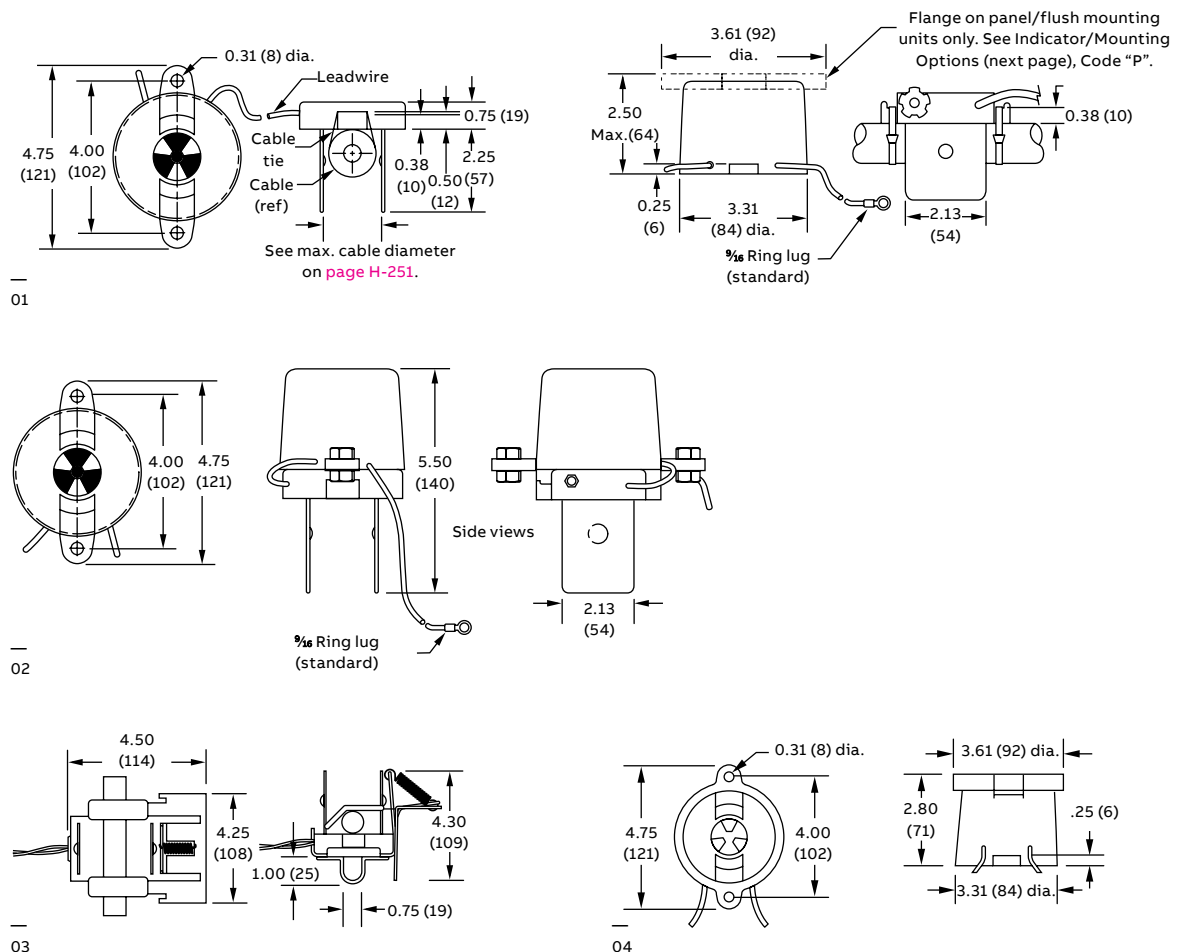
Mechanical data

01 Remote sensor leads.
Tie-wrap mounting.

02 Indicator with
attached sensor
without U-lamination.
Tie-wrap mounting.

03 Remote sensor leads.
Hotstick mounting.

04 Window/flush
mounting.



(All dimensions in inches with millimeter equivalents in parentheses)

Underground faulted circuit indicators

Specifications

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

Trip current accuracy: $\pm 10\%$

Trip response speed: Coordinates with properly applied current-limiting fuses

Reset voltage (factory preset): 120 V rating: 102 V min.; 277 V rating: 235 V min.

Max. Reset response time: 60 sec.

Reset lead length: 4 or 6 ft.

Life expectancy: ± 20 yrs.

Fault withstand capability: 25 kA for 10 cycles per ANSI/IEEE 495-1986

Secondary voltage surge withstand capability:
Conforms to ANSI/IEEE C62.41

Max. continuous load current: 1,000 A

Operating temperature: -40 °C to 85 °C

Submersibility: Tested to 20 ft.

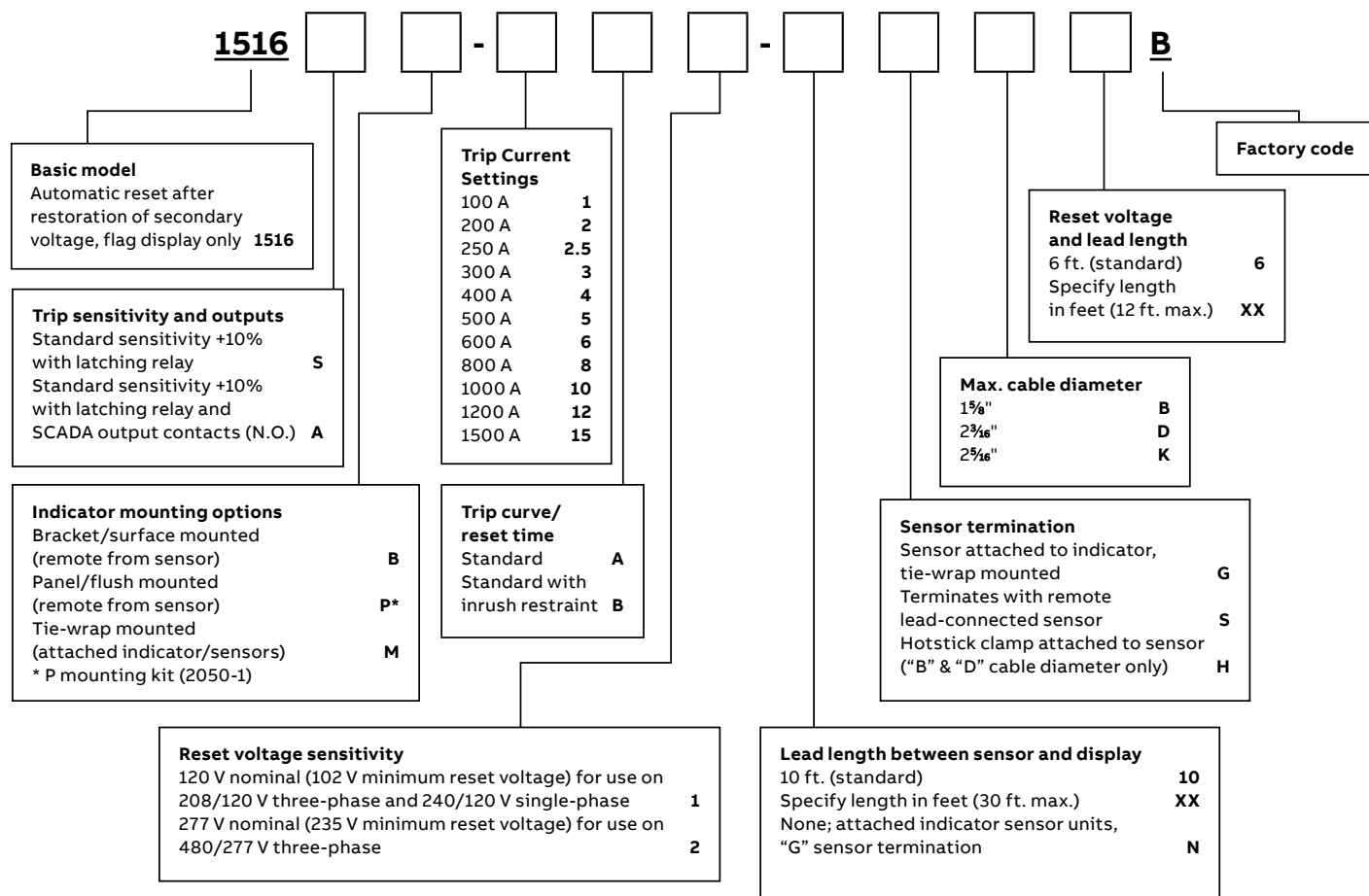
Certifications: Complies with ANSI/IEEE 495-1986

Fisher Pierce® series 1516 underground FCIs – Secondary voltage reset

The following diagram shows how to construct a catalog number for the Series 1516 FCI.

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.



Underground faulted circuit indicators

Fisher Pierce® model 1514A-45102 SmartNet® directional network FCI



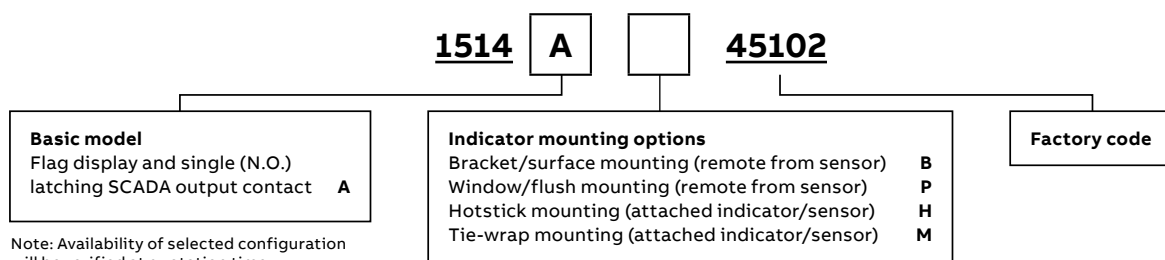
For single-phase underground applications.

- Programmable fixed-current trip
- Automatic reset of fault indication; manual reset also available
- Max. operational current: 25 kA per ANSI 495
- Max. current withstand: 40 kA for 10 cycles with no damage

Operation

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.

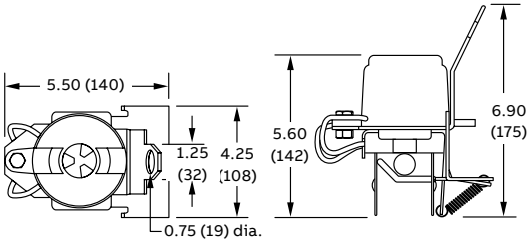
1514 Underground FCI – Directional network



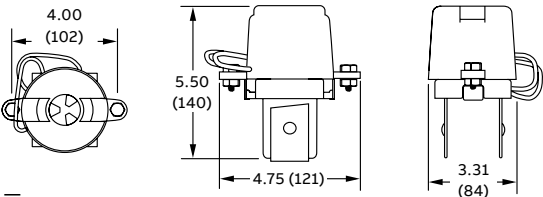
Underground faulted circuit indicators

Mechanical data

01 Figure A – Indicator with attached sensor. Hotstick mounting.



02 Figure B – Indicator with attached sensor. Tie-wrap mounting.



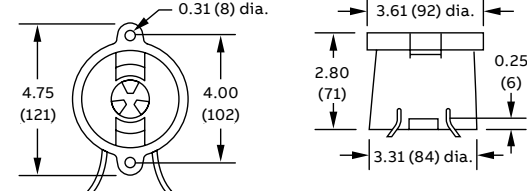
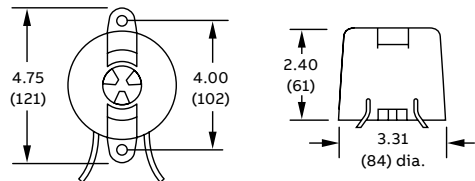
03 Figure C – Bracket/surface mounting.

01

04 Figure D – Window/flush mounting.

02

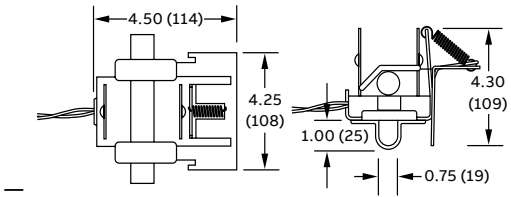
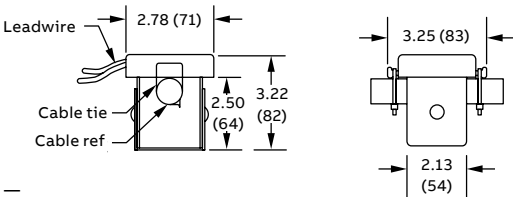
05 Figure E – Remote sensor. Tie-wrap mounting.



06 Figure F – Remote sensor. Hotstick mounting.

03

04



05

06

Note: To order Fisher Pierce model 1514AM-45102 SmartNet™ directional network FCIs, please contact the factory.

Cellular RTUs and receivers

Fisher Pierce® SmartLink® series 5000 cellular RTU for Fisher Pierce FCIs

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

- 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
- 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
- User-configurable to receive instant notification of momentary fault data or to wait for lower-cost off-peak hours
- 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 is 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 are sent automatically to ensure continuous, reliable operation

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.



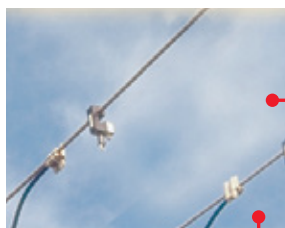
Cellular RTUs and receivers

How radio FCIs help locate and report faults.

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

Designed for distribution RTU/SCADA overhead systems.

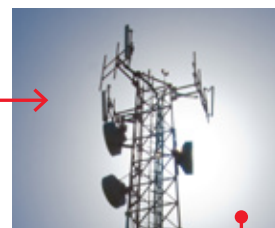
- 01 1548 FCI in field location.
- 02 SmartLink® 5000.
- 03 Cell tower.
- No utility communication infrastructure required.
- 04 1560-1 Handheld receiver.
- 05 1560-2, -3, -4 Fixed-mount receiver.
- 05 Utility control room.



01



02



03

RTU/SCADA system



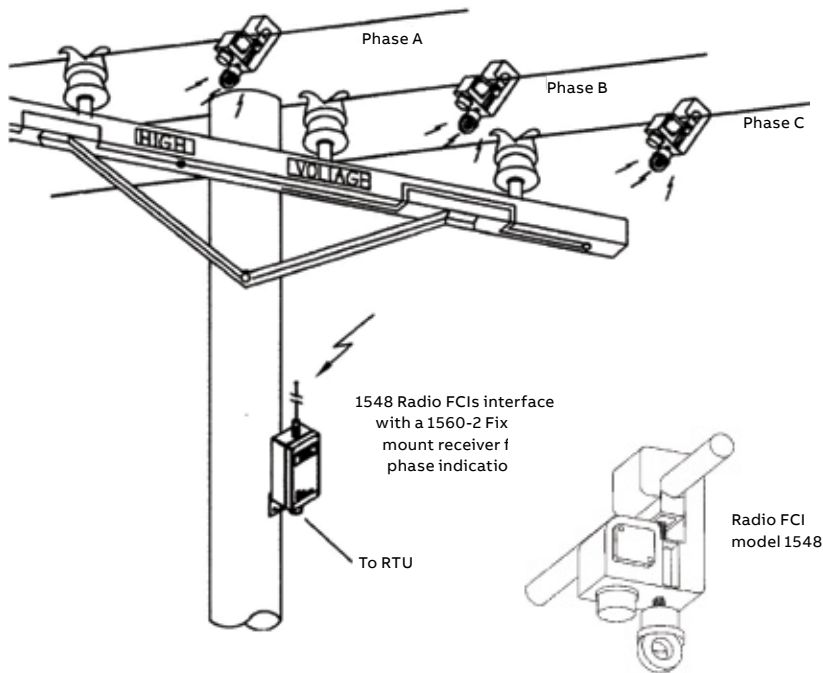
04



05

Cellular RTUs and receivers

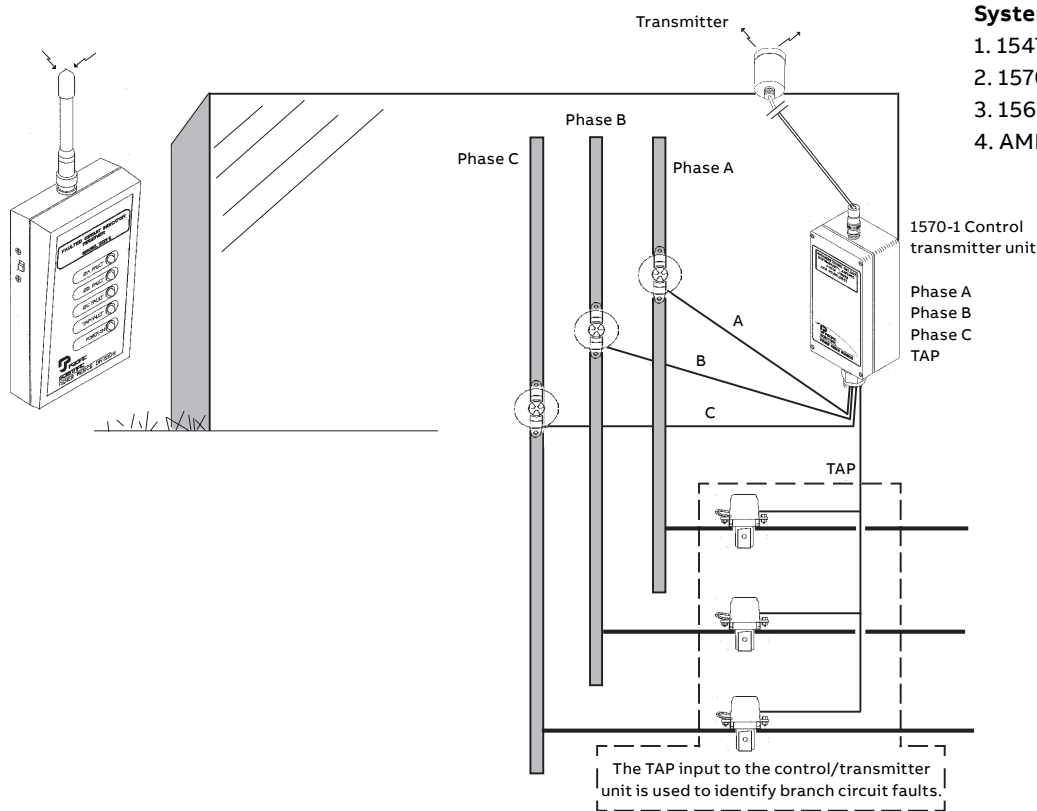
Overhead installation



System:

1. 1548 radio FCI
2. 1560 receiver
3. MI gateway/RTU

Underground installation



System:

1. 1547 or 1514 radio FCI
2. 1570 transmitter
3. 1560 receiver
4. AMI gateway/RTU

Cellular RTUs and receivers

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 1.2 W

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 V AC, 60 Hz

Surge withstand: ANSI/IEEE C37.90.1-2002, 4 kV 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 12 V (3 to 5 yrs. expected service life)

Carryover time: 4 hrs. typical, 3 hrs. 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® SmartLink® 5000 cellular RTU

Cat. no.	Description
3175B0126G1	SmartLink® 5000 cellular RTU (includes battery back-up and antennas)

Cellular RTUs and receivers

Drive-by FCI status.



- 1560-1**
Handheld receiver specifications
- Frequency: 312 MHz
 - Range: 100 ft. max.
 - Power: 9 V 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 V DC, 20 mA external
 - Complies with FCC Part 15 emissions

Fisher Pierce® series 1560 receivers for FCIs

Cat. no.	Description
JH-1560-1	Handheld receiver with audible and LED indicator
JH-1560-2	RTU/SCADA Radio receiver with (3) dry contact outputs for phase A, B and C (includes mounting bracket)
JH-1560-3	RTU/SCADA Radio receiver with (1) dry contact output for phase A, B or C (includes mounting bracket)
JH-1560-4	RTU/SCADA Radio receiver with (4) dry contact outputs for phase A, B, C and tap (includes mounting bracket)



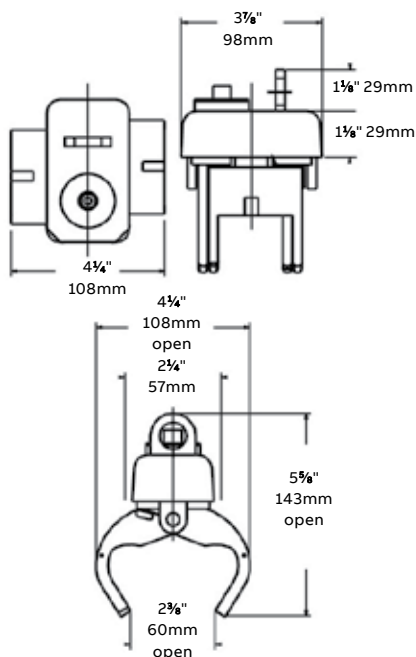
- 1570-1**
Control/fixed-mount receiver specifications
- Frequency: 312 MHz
 - Range: 100 ft. max.
 - Power: 9–12 V DC, 20 mA external
 - Complies with FCC Part 15 emissions

Fisher Pierce® series 1570 control/transmitter for FCIs

Cat. no.	Description
JH-1570-1	Control/transmitter unit with (4) dry contact outputs for phase A, B, C and tap

Clamp-type faulted circuit indicators

Fisher Pierce® series OLM overhead line fault indicators



Locate faulted circuits and equipment on overhead distribution systems.

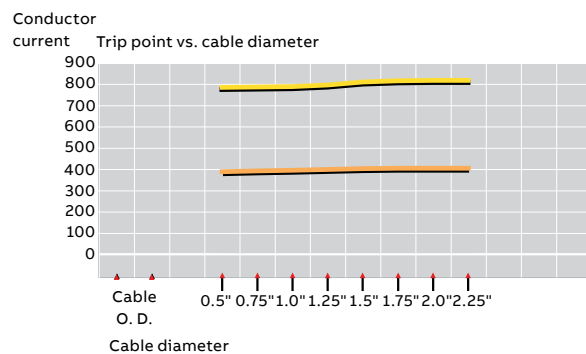
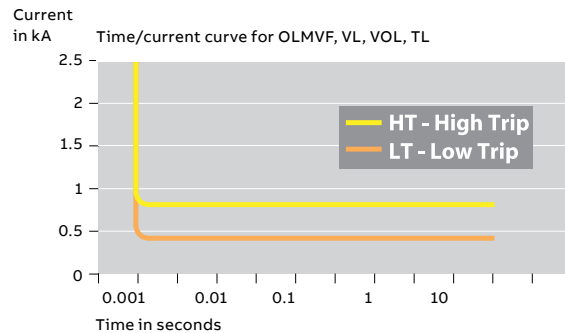
- AccQTrip™ logic circuitry in voltage reset units prevents false indications due to inrush currents, cold load pickup and overloading
- AccQClamp™ mounting provision – Universal one-size-fits-all design automatically adjusts
- High/low trip setting selection eliminates minimum load current and the need for load surveys
- Trip response of 0.001 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
- Compact and sealed lightweight enclosure

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 5 kV thru 35 kV 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 0.4" to 2.2".

Clamp-type faulted circuit indicators

Basic operation



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 0.001 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.

Clamp-type faulted circuit indicators

Specifications

Specifications for OLM voltage operated, time reset, LED display: Model OLMVOL

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; High, 800 A
- **Trip response time:** 1 ms
- **Fault clearing time¹:** 0.001–30 seconds subsequent to arming
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Inrush/backfeed restraint:** 100 ms (disable delay)
- **Load current requirements:** None
- **Power up requirement:** 6 minutes @ 5 kV
- **Display type:** Flashing super-bright LED
- **Flash rate:** 30 flashes per minute
- **LED display time:** 4 hours standard
- **Reset time:** 4 hours standard (longer times available upon request)
- **Power source³:** 3.6 V lithium thionyl chloride battery
- **Battery capacity:** 2.4 Ah
- **Battery operating life:** 1200 flash hours minimum
- **Battery storage life:** 15–20 years
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM; Conductive rubber housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

Specifications for OLM Voltage Reset², flag display: Model OLMVF

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; High, 800 A
- **Trip response time:** 1 ms
- **Fault-clearing time¹:** 0.001–30 seconds subsequent to arming
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Inrush restraint response:** 100 ms (disable delay)
- **Load current requirements:** None
- **Display type:** Mechanical flag
- **Minimum reset voltage:** 5 kV (beginning initializing sequence)
- **Voltage reset time:** 6 minutes @ 5 kV
- **Power source:** Volt test point powered
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM conductive rubber; housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

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 thionyl chloride batteries provide accurate indication throughout the entire temperature range.

Clamp-type faulted circuit indicators

Specifications

Specifications for OLM voltage reset², LED display: Model OLMVL

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; high, 800 A
- **Trip response time:** 1 ms
- **Fault clearing time¹:** 0.001–30 seconds subsequent to arming
- **Maximum surge level:** 25 kA 10 Cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Inrush restraint response:** 100 ms (disable delay)
- **Load current requirements:** None
- **Power up requirement:** 6 minutes @ 5 kV
- **Display type:** Flashing super-bright LED
- **Flash rate:** 30 flashes per minute
- **LED display time:** 4 hours standard
- **Voltage reset time:** 6 minutes @ 5 kV
- **Power source³:** 3.6 V lithium thionyl chloride battery
- **Battery capacity:** 2.4 Ah
- **Battery operating life:** 1200 flash hours minimum
- **Battery storage life:** 15–20 years
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM conductive rubber; housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

Specifications for OLM time reset, LED display: Model OLMTL

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; high, 800 A
- **Trip response time:** 1 ms
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Power up requirement:** None
- **Display type:** Flashing super-bright LED
- **Flash rate:** 30 flashes per minute
- **Reset time:** 4 hours standard
- **Power source³:** 3.6 V lithium thionyl chloride battery
- **Battery capacity:** 2.4 Ah
- **Battery operating life:** 1200 flash hours minimum
- **Battery storage life:** 15–20 years
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM conductive rubber; housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

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 thionyl chloride batteries provide accurate indication throughout the entire temperature range.

Clamp-type faulted circuit indicators

Fisher Pierce® UCM series underground clamp-type fault indicators



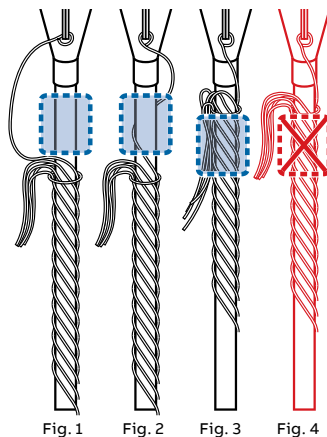
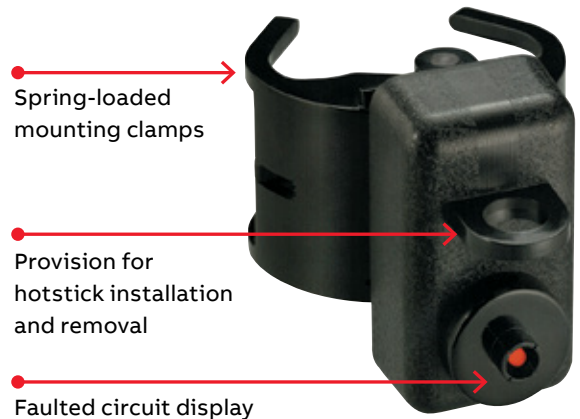
Locate faulted cables and equipment on underground distribution systems.

- AccQClamp™ mounting provision – universal one-size-fits-all design automatically adjusts
- High/low trip setting selection eliminates minimum load current requirement and need for load surveys
- Trip response of 0.001 seconds coordinates with current-limiting fuses, as well as other protection devices
- Internal magnetic shielding prevents adjacent phase effects

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 0.4" 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.

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 0.001 seconds, allowing the fault indicator to properly coordinate with all types of circuit protection schemes including current-limiting fuses. Series UCM 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.



Typical installation

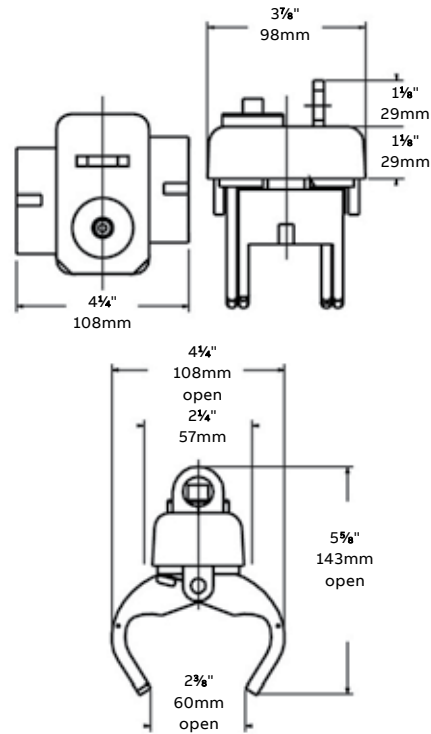
Install fault indicator in area shown.

As shown, proper installation of UCM 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).

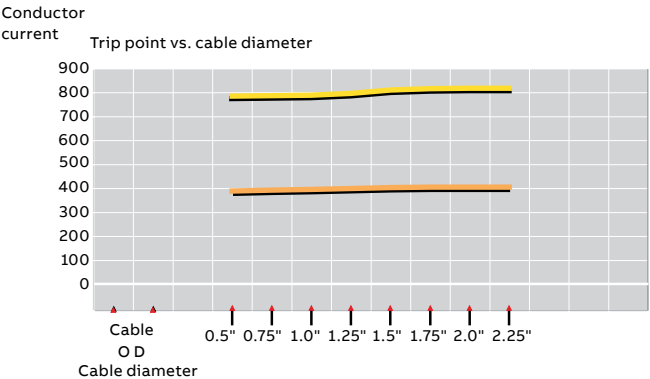
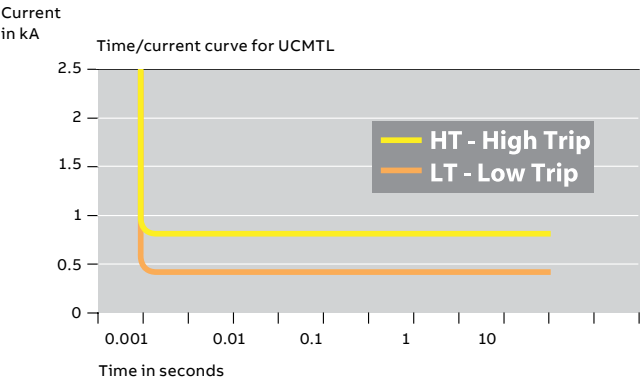
Clamp-type faulted circuit indicators

Specifications for UCM time-reset, LED display: Model UCMTL



- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; high, 800 A
- **Trip response time:** 1 ms
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Display type:** Flashing super-bright LED
- **Flash rate:** 30 flashes per minute
- **Reset time:** 4 hours standard
- **Power source¹:** 3.6 V lithium thionyl chloride battery
- **Battery capacity:** 2.4 Ah
- **Battery operating life:** 1200 flash hours minimum
- **Battery storage life:** 15–20 years
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM
conductive rubber housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certification:** complies with ANSI/IEEE 495-1986

Notes: 1) Battery powers LED and it is active only when LED is ON. Lithium thionyl chloride batteries provide accurate indication throughout the entire temperature range.



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	For 200-amp circuits. URD applications, use LOW trip rating. All fused taps use LOW trip rating.
HT	For 600-amp circuits. URD applications, use HIGH trip rating.

Test point indicators

Fisher Pierce® TPM series test point fault indicators



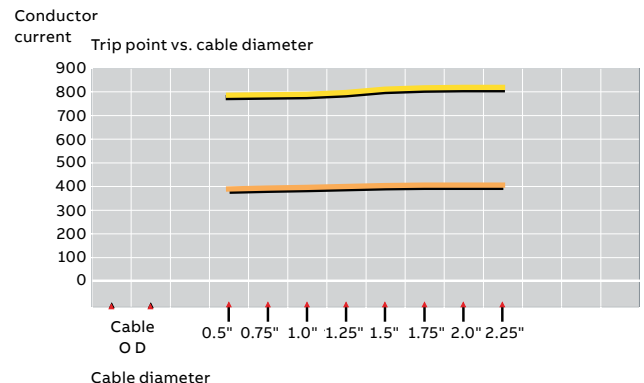
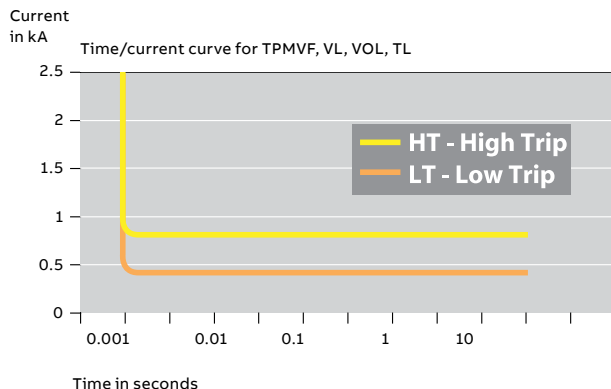
Mount directly to any IEEE 386 standard capacitive test point.

- 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
- Mounts directly to 200 A and 600 A 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
- Enclosed in a rugged, yet lightweight and compact, sealed, impact- and corrosion-resistant Lexan® housing with EPDM molded-rubber test point mounting boot

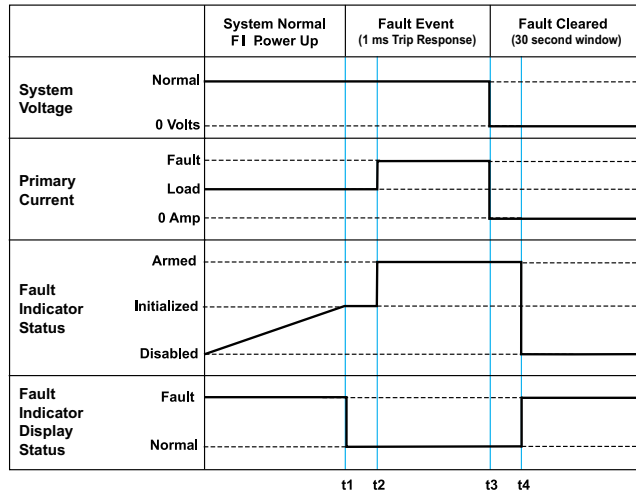
Fisher Pierce test point mounted fault indicators consist of a solid-state current sensor connected to a faulted-circuit display, providing a clear visual means for quickly locating faulted cables and equipment on underground distribution systems. Designs incorporate advanced circuit logic and monitoring 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 5 kV thru 35 kV applications.

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 0.001 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.



Test point indicators



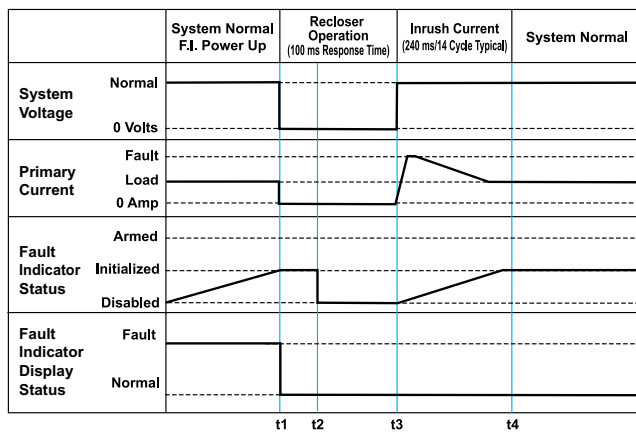
Faulted-circuit operation

t1: Fault indicator is connected to the system and powers up. At 5 kV, this takes three minutes for the test point mounted unit and six 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.

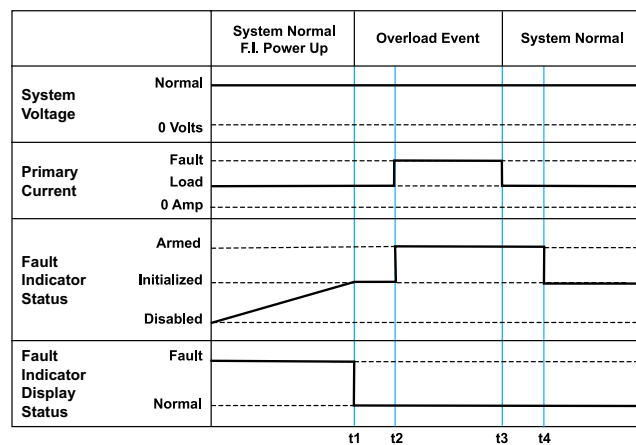


Inrush-restraint operation

t1: Fault indicator is connected to the system and powers up. At 5 kV, this takes three minutes for the test point mounted unit and six 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 5 kV, this takes three minutes for the test point mounted unit and six 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. After 30 seconds, fault indicator goes back to initialized state.

t4: Voltage is lost. A 30-second time window allows for the protective device to clear the fault and reclose. Indicator changes state.

Test point indicators

Specifications

Specifications for TPM voltage operated, time reset, LED display: Model TPMVOL

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; high, 800 A
- **Trip response time:** 1 ms
- **Fault clearing time¹:** 0.001–30 seconds subsequent to arming
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Inrush/backfeed restraint:** 100 ms (disable delay)
- **Load current requirements:** None
- **Power up requirement:** 3 minutes @ 5 kV
- **Display type:** Flashing super-bright LED
- **Flash rate:** 30 flashes per minute
- **LED display time:** 4 hours standard
- **Reset time:** 4 hours standard (longer times available upon request)
- **Power source³:** 3.6 V lithium thionyl chloride battery
- **Battery capacity:** 2.4 Ah
- **Battery operating life:** 1200 flash hours minimum
- **Battery storage life:** 15–20 years
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM; conductive rubber housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

Specifications for TPM voltage reset², flag display: Model TPMVF

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; high, 800 A
- **Trip response time:** 1 ms
- **Fault clearing time¹:** 0.001–30 seconds subsequent to arming
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Inrush/backfeed restraint:** 100 ms (disable delay)
- **Load current requirements:** None
- **Power up requirement:** 3 minutes @ 5 kV
- **Display type:** Mechanical flag
- **Minimum reset voltage:** 5 kV (beginning initializing sequence)
- **Voltage reset time:** 3 minutes @ 5 kV
- **Power source:** Volt test point powered
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM; conductive rubber housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

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 thionyl chloride batteries provide accurate indication throughout the entire temperature range.

Test point indicators

Specifications

Specifications for TPM voltage reset²,

LED display: Model TPMVL

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; high, 800 A
- **Trip response time:** 1 ms
- **Fault clearing time¹:** 0.001–30 seconds subsequent to arming
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Inrush/backfeed restraint:** 100 ms (disable delay)
- **Load current requirements:** None
- **Power up requirement:** 3 minutes @ 5 kV
- **Display type:** Flashing super-bright LED
- **Flash rate:** 30 flashes per minute
- **LED display time:** 4 hours standard
- **Voltage reset time:** 6 minutes @ 5 kV
- **Power source³:** 3.6 V lithium thionyl chloride battery
- **Battery capacity:** 2.4 Ah
- **Battery operating life:** 1200 flash hours minimum
- **Battery storage life:** 15–20 years
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM; Conductive rubber housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

Specifications for TPM time reset,

LED display: Model TPMTL

- **Nominal voltage:** 4.16–60 kV (L-L)
- **Nominal trip ratings:** Low, 400 A; high, 800 A
- **Trip response time:** 1 ms
- **Maximum surge level:** 25 kA 10 cycles 60 Hz
- **Effect of adjacent phase:** Internal shielding prevents adjacent phase effects
- **Power up requirement:** None
- **Display type:** Flashing super-bright LED
- **Flash rate:** 30 flashes per minute
- **Reset time:** 4 hours standard
- **Power source³:** 3.6 V lithium thionyl chloride battery
- **Battery capacity:** 2.4 Ah
- **Battery operating life:** 1200 flash hours minimum
- **Battery storage life:** 15–20 years
- **Temperature range:** -40 °C to 85 °C
- **Housing material:** Mounting boot – EPDM; Conductive rubber housing body – UV-stabilized polycarbonate polymer
- **Weight:** 258 grams
- **Certifications:** Complies with ANSI/IEEE 495-1986

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 thionyl chloride batteries provide accurate indication throughout the entire temperature range.

Test point indicators

Mechanical data

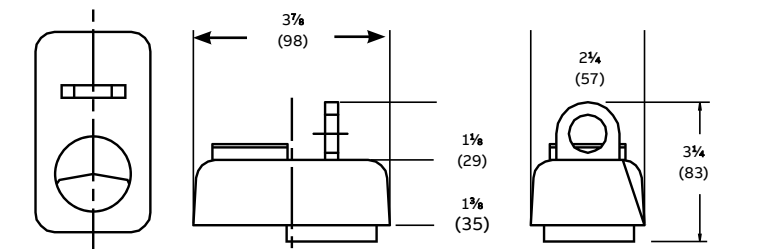


Fisher Pierce® TPM series test point fault indicators

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 5 kV 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 5 kV 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 200 A. 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.

Dimensions



(All dimensions in inches with millimeter equivalents in parentheses)

Test point indicators

Series OLM overhead line fault indicators

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 5k V minimum voltage to operate. Reset operation time is proportional to system voltage.
OLMVL	Voltage reset with LED display	Example: at 15 kV, 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 200 A. Overhead applications, use LOW trip rating.
HT	For 600 A. Overhead applications, use HIGH trip rating.

Accessories for series TPM, UCM 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.

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

Test point indicators

V2 Voltage indicator



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

- Single model supports applications from 5 kV to 35 kV
- Flash rate per minute indicates system voltage (see chart on following page)
- Mounts to 200 A and 600 A elbows, splices and other cable accessory components equipped with IEEE 386 capacitive test points from Fisher Pierce® or other manufacturers
- 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
- Easily tested for confirmation of proper operation with the V2-TB voltage indicator test box

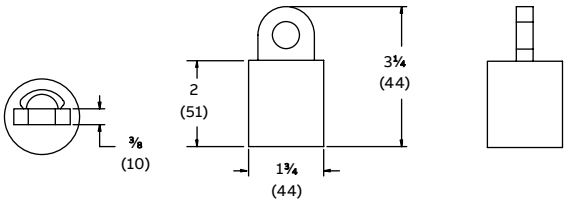
The V2 voltage indicator consists of a self-powered voltage sensor connected to a neon light that flashes when energized. Simply plug it into any IEEE 836 standard capacitive test point to determine the energized status of underground distribution circuits. Because the flash rate is proportional to the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

Test point indicators

Mechanical data

Voltage (kV)	Flash rate
5	20
10	40
15	70
20	100

Voltage (kV)	Flash rate
25	140
30	160
35	180



(All dimensions in inches with millimeter equivalents in parentheses)



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.

V2 voltage indicator – Test point mounted

Cat. no.	Description
V2	Voltage indicator with neon display
V2-TB	Voltage indicator test box

Test point indicators

PD35 Voltage and phasing indicator

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

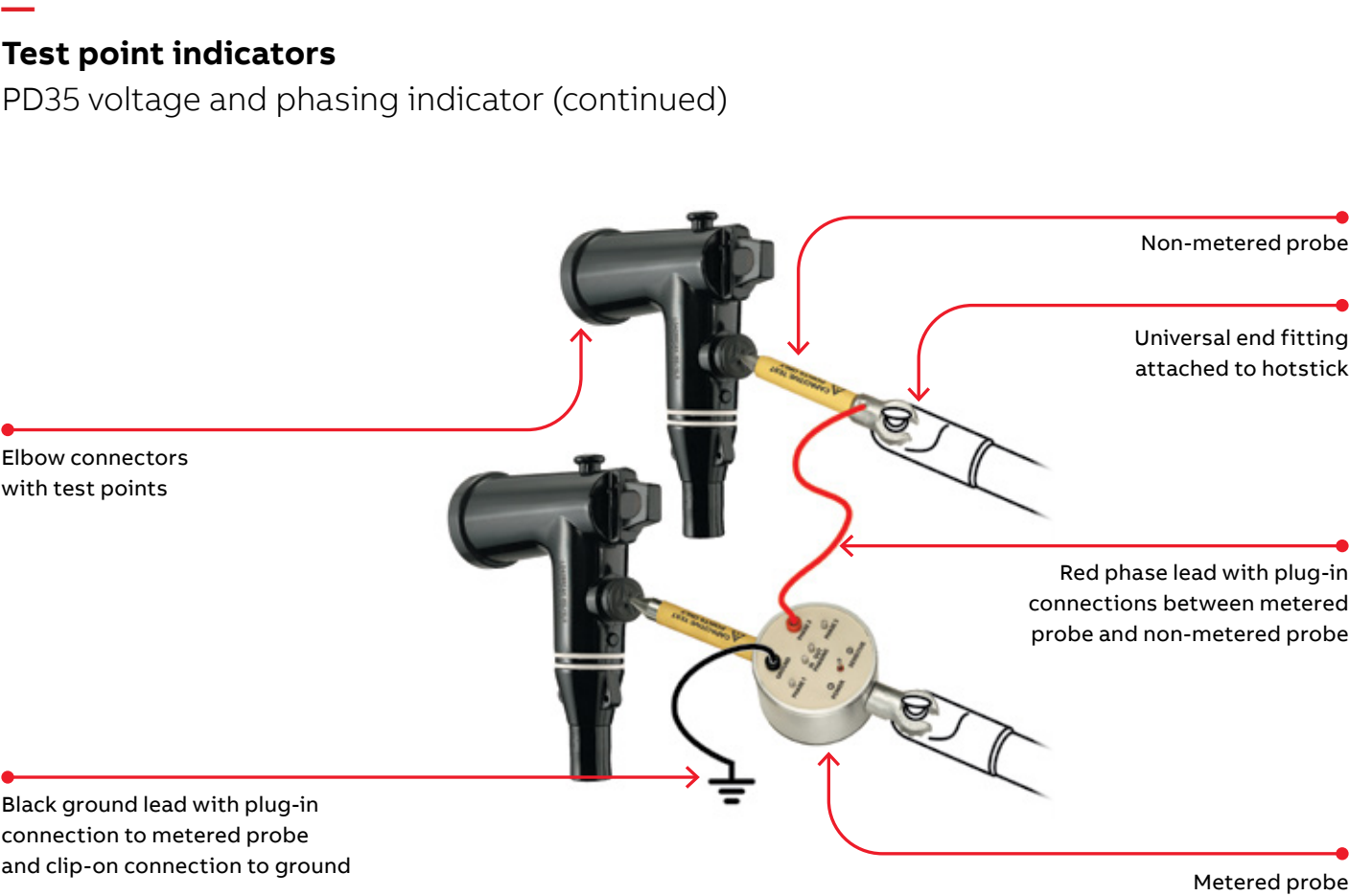
- Designed for use on 200 A and 600 A elbows, splices and other cable accessory components equipped with IEEE 386 capacitive test points from Fisher Pierce® or other manufacturers
- Universal end fittings enable convenient mounting to existing hotsticks
- Rugged construction – Housed in an impact-resistant case to withstand field conditions
- LED indicator lights provide easy-to-read test results
- Highly portable for field use and powered by a standard, replaceable 9V battery

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 1.5 kV phase to ground.

How to use the PD35 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.





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Fisher Pierce® PD35 voltage and phasing indicator

Cat. no.	Description
PD-35	Voltage & phasing indicator

Current sensors

Fisher Pierce® series 1301 PowerFlex® high-accuracy line-post current sensors



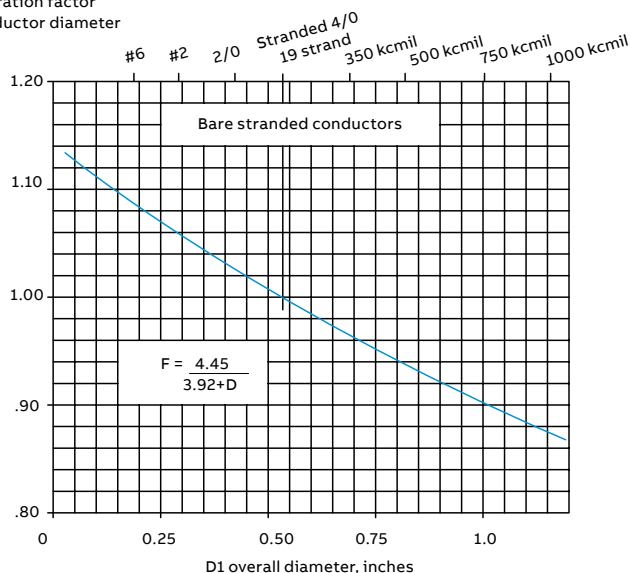
Offers a unique combination of safety, installation without service interruption, space savings and low installed cost.

- 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 1 V per 60 A 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 AWG bare stranded copper cable are given above. This information is for round conductors only. Information regarding special conditions is available upon request.

F1 calibration factor
for conductor diameter



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

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

Fisher Pierce® series 1301 PowerFlex® high-accuracy line-post current sensors
(continued)

Conductor

Coil

Porcelain insulator body

Shield

Potting compound

$\frac{3}{4}$ " NPT conduit connection

$\frac{1}{4}$ " (6.4 mm) dia. ground-wire hole

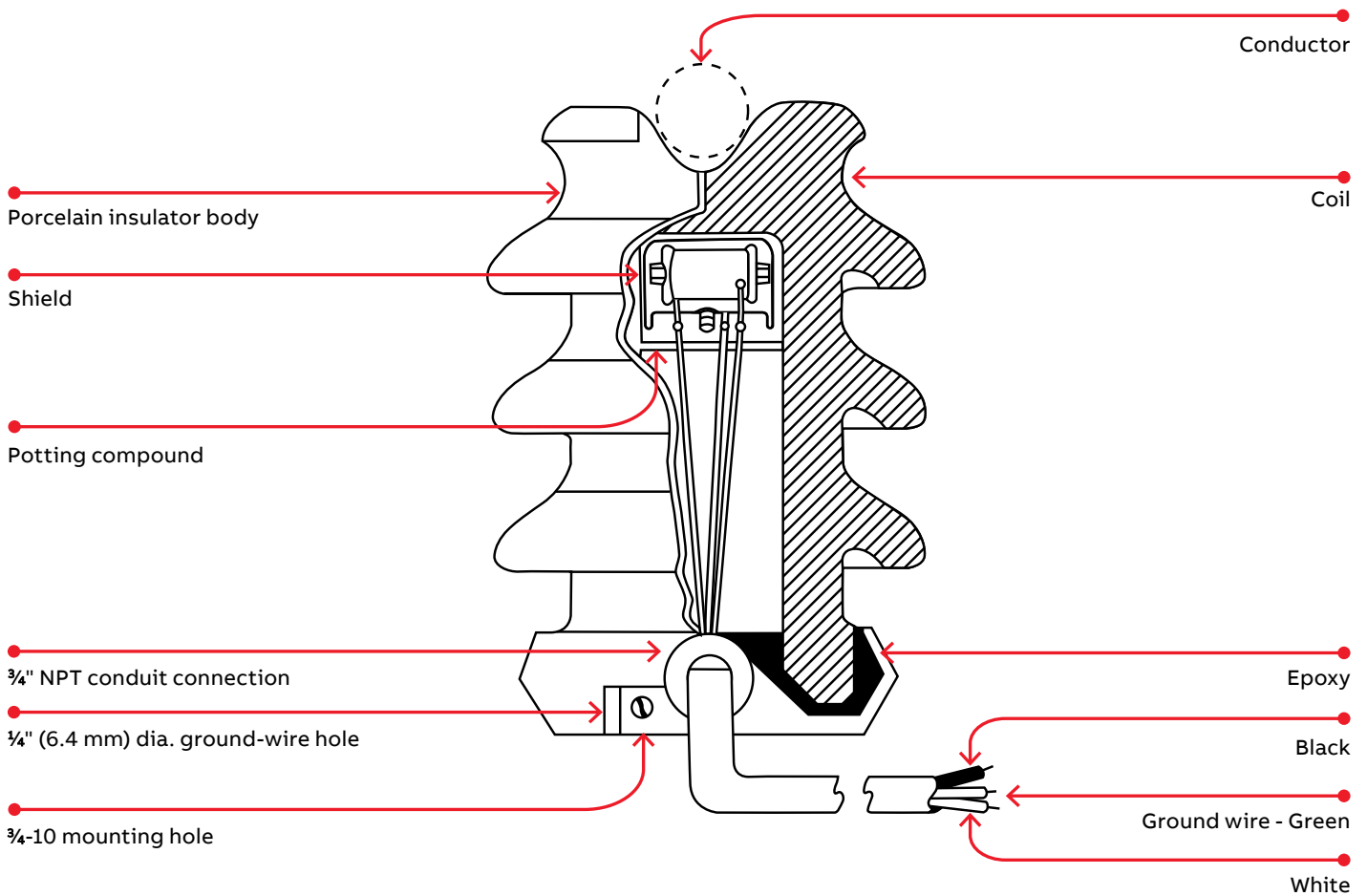
$\frac{3}{4}$ -10 mounting hole

Epoxy

Black

Ground wire - Green

White



Current sensors

Ratings, performance characteristics & typical sensor installation characteristics

Ratings

	Model 1301-17 A	Model 1301-47 A	Model 1301-27 A
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



Performance characteristics

	High accuracy
Sensitivity (A/output V)	60 A/V AC @ 60 Hz 72 A/V AC @ 50 Hz
Source impedance (ohms)	2.1 K = (1.2 K = j1.7 K)
Calibration accuracy at 120 A	1%
Linearity error, % change in sensitivity	<1.0% (3–1200 A)
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
	See correction curve (on previous page)	N/A
Conductor size % correction		
Left and right * **	-0.8	±0.5
Center	-1.3	0
30" Horizontal phase spacing		
Left and right * **	-0.4	±0.2
Center	-0.6	0
20" Vertical phase spacing		
Top	+9.1	±3.0
Center *	+3.1	±10.9
Bottom **	-7.7	±2.5
30" Vertical phase spacing		
Top	+5.9	±1.9
Center *	+1.4	±7.3
Bottom **	-5.3	±1.7
Triangular		
Left * **	-1.6	±1.5
Center	+3.8	±0.9
Right	-2.5	±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.

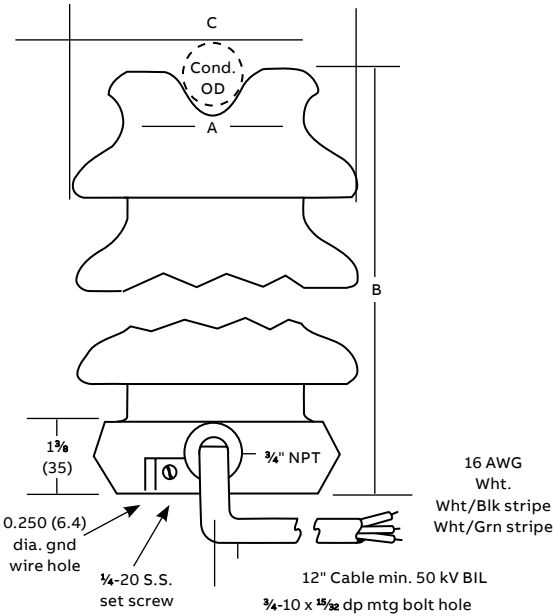
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Current sensors

Mechanical data

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 high-accuracy sensors. Refer to catalog number cross reference below.



(All dimensions in inches with millimeter equivalents in parentheses)

—
Dimensions A, B and C

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

—
Fisher Pierce® series 1301 PowerFlex™ high-accuracy line-post sensors

Cat. no. high accuracy	Voltage class (L-L) (kV)	
1301-17A-xx*		15
1301-47A-xx*		25
1301-27A-xx*		35

* Designates cable length.

Capacitor controls

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

- 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
- Microprocessor-based control featuring adaptive functions allow the unit to program itself
- 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

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.





Capacitor controls

Which Fisher Pierce® capacitor control is right for your application?

- 01 AC4500
- 02 AC4400
- 03 AC100



01



02



03

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

Control type	AC100	4400	4500
Voltage control	●	●	●
Temperature control	●	●	●
Time control	●	●	●
Current control	-	●	●
Adaptive VAr control	-	●	●
Adaptive voltage guard	-	●	●
Phase find	-	●	●
Data recording	-	●	●

Capacitor controls

Fisher Pierce® series AC100 AutoCap® programmable capacitor control



Provides voltage, time or temperature control with override function.

- Models with voltage, time or temperature control with programmable override suit a variety of applications
- Low-profile, lightweight enclosure for easy handling and clean, sleek installation
- Front-panel programming keypad with audible confirmation and high-visibility LCD provide easy, on-the-spot set-up and operation
- SmartSet™ II Application Set Up software with USB interface enables 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 provide instant visual indication of status
- 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 for long, low-maintenance service life

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.

Capacitor controls

Specifications

Electrical

Operating voltage ranges: 95–145 V AC, 60 Hz ± 0.5 Hz

Surge withstand: ANSI C62.41 (6 kV)/EN61000 ANSI C62.41–1987 (6 kV)

Electrostatic discharge test: IE10004–2, (15 kV air discharge and 8 kV contact applied to all accessible areas)

Output relay:

- Number: Two
- Type: Momentary closure
- Maximum continuous load: 30 A resistive load at 120 V AC
- Maximum inrush: 50 A, 50% pF, 6 cycles at make only
- Contact closure period: Programmable 0 to 1000 secs in steps of 1 second. (0 seconds corresponds to 00 seconds)

Fuse rating:

- Controller input: 1.5 A, 250 V, 5 x 14.5 mm, Littlefuse® 229 01.5 or equivalent
- Output to capacitor switch: 10 A Slo-Blo®, 250 V, 1.5" x $\frac{3}{8}$ ", fiber cartridge, Littlefuse FLM 10 or equivalent
- USB 1.1 communications port: Type B

Mechanical

Enclosure: Lexan®, NEMA 3R

Mounting: 4- or 6-jaw meter base wall or pole bracket

Dimensions: 9.68"H x 7.0"W x 7.29"D (Lexan) (deep cover, meter base)

Environmental

Operating temperature: -40 °C to 70 °C (-40 °F to 158 °F); -20 °C to 70 °C (for radio models)

Humidity range: 0–95% (non-condensing)

Measurement performance

voltage (secondary):

- Resolution: 0.1 V AC
- Accuracy: $\pm 0.5\%$ of reading over the operating temperature range
- Range: 95 V AC–145 V AC true RMS, 60 Hz primary
- Ratio range: 1:1 to 1000:1, in 1:1 increments

Temperature:

- Resolution: 1 °F (1 °C)
- Accuracy: ± 2 °F (1 °C) (-40 °F to 140 °F) outside air ambient

Real time clock:

- Resolution: 0.1 minute
- Accuracy: ± 11 minutes/year at 25 °C
- Range: 25-hour clock
- Settings: 1-minute increments

Neutral current:

- Resolution: Fisher Pierce AT929 sensor: 0.1 A
- Accuracy: $\pm 2\%$ of reading, $\pm 0.5\%$ of full scale plus

Sensor range:

- Fisher Pierce AT929 sensor: 1 to 60 A

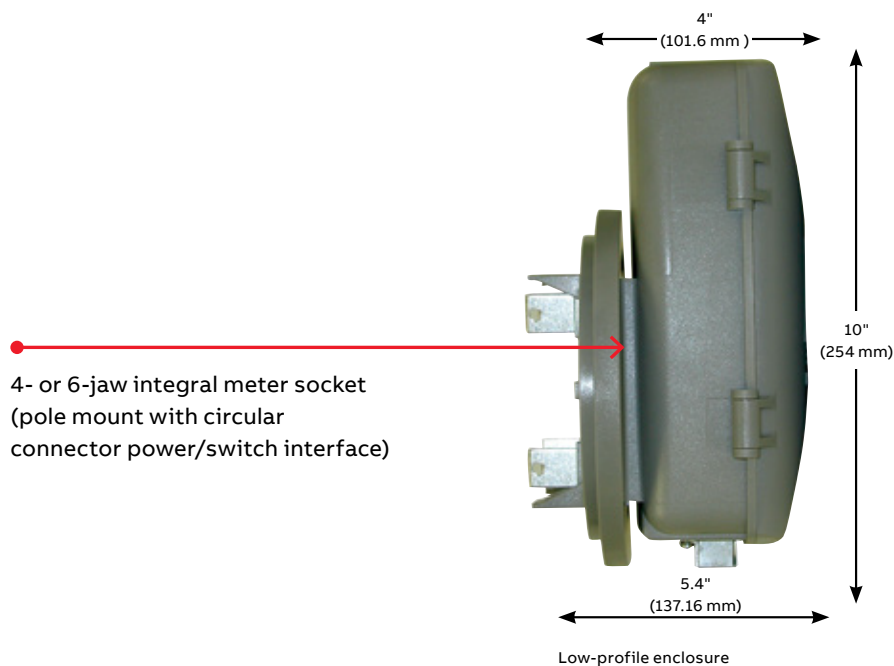
Controller processor

Memory size: 64 KB (standard)

Memory type: Flash, 3 KB RAM

Capacitor controls

Specifications (continued)



Capacitor controls

Specifications (continued)

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.

AC1

Basic model
AC100 AutoCap
Programmable control

-

Primary control
Voltage control 24
Radio control 26
Time control 56
Temperature control 57

-

Override control
None NN
Voltage control 24
Radio control 26
Time control 56
Temperature control 57

-

Radio protocol
REMS102 R
FP11, Type E E
FP11, Type D D
None N
FP11, Type G G
FP11, Type F N

-

Neutral current
Neutral current selected C
None N

-

7

1

A

Factory code

Calibration code
120 V AC, 60 Hz 1

Enclosure type
Low-profile Lexan 7

Wire configuration

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
SL	L	N/GND	NSL	NSH	TR	CL	No	Lexan	Neutral only
TL	L	N	NSL	NSH	TR	CL	Yes	Lexan/ alum.	Neutral only

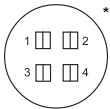
Wrap-around pole bracket mounting with circular MS type connector‡

	A	B	C	D	E	F	G	Ext. GND lug	Current inputs
BJ	CL	L	TR	NSL	N	NSH	Not connected	Yes	Neutral only

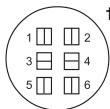
Flat wall bracket mounting with circular MS type connector

	A	B	C	D	E	F	G	Ext. GND lug	Current inputs
WJ	CL	L	TR	NSL	N	NSH	Not connected	Yes	Neutral only

Lexan is a registered trademark of Sabic Innovative Plastics IP B.V.



View looking into socket



Socket for CT shorting switch available for SJ and TJ wiring



‡

Capacitor controls

Fisher Pierce® series 4400 AutoCap® adaptive capacitor control and recorder

—
01 Fisher Pierce series
4400 AutoCap control

Take the complexity out of your capacitor bank control.

- 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, and 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 is compatible with existing controllers for easy installation – No adapters or rewiring required
- SmartSet™ Windows® based software simplifies programming for up to four seasons
- SmartSet graphs, reports and 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 for space-efficient installation



Capacitor controls

—
01 Adaptive VAr (Fig. 1). Identifies size of the capacitor bank and sets the VAr switching points for maximum loss reduction.

—
02 Adaptive Voltage Guard Protection. Identifies voltage change from bank switching; inhibits close operation if Voltage Guard plus present line voltage exceeds high voltage limit. Reverse conditions inhibit trip.

—
03 PhaseFind Compensator. Compensates for phase rotation (A) finds current signal phase (B) with respect to voltage phase (C) and compensates for reversed wiring (D).

Simplify switched capacitor bank control with the Fisher Pierce® series 4400 AutoCap® adaptive capacitor control and recorder. 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 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. Just plug in the factory-programmed unit and it adapts itself to the installation – There are more hassles with sensor wiring or setpoint calculations. What's more, you can install the series 4400 AutoCap Control without ever opening the enclosure!

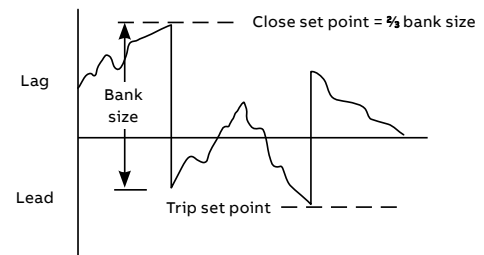
Exclusive advantages

The Fisher Pierce series 4400 AutoCap adaptive capacitor control and recorder delivers many new and innovative functions that eliminate the traditional struggle associated with:

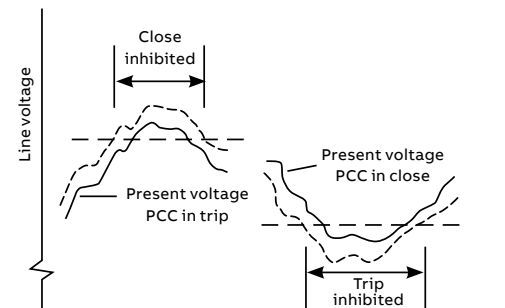
- Setting optimum VAr setpoints (Fig. 1 – Adaptive VAr Control)
- Finding the voltage change caused by bank switching (Fig. 2 – Adaptive Voltage Guard Protection)
- Field wiring (Fig. 3 – PhaseFind Compensator)

The series 4400 AutoCap control also provides the following additional functions:

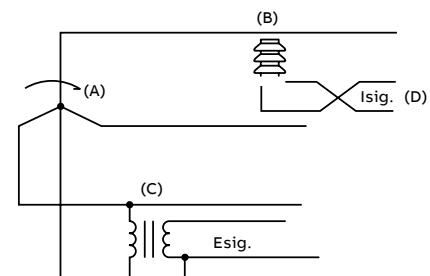
- Real-time monitoring of data readings and controller status through local RS-232 or optical port
- Traditional holiday calendar – 10-year predefined, can be user edited
- Individual and block holidays – 10-year user programmable
- Daylight Saving Time calendar – 10-year predefined, can be edited
- 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



—
01



—
02



—
03



Capacitor controls

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
- 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
Adaptive VAr	Voltage	Time	Ignore
VAr	Time	High temp	Voltage
Voltage	High temp	Low temp	VAr
Current	Low temp		Trip and inhibit
Time			Close and inhibit
High temp			
Low temp			

Capacitor controls

- 01 View setup screen – Allows user to review controller setup and site configuration summary.
- 02 Season configuration screen – Fully prompted for easy controller programming.
- 03 Typical load data graph

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.

The 'VIEW SETUP' screen displays the following configuration details:

- Buttons:** Main Menu, Save Setup, Send to PCC, Pjtest Setup, Adaptive Test, Site / Links, Control Config, Data Log Config, Holidays/DST, Setup Comments.
- Fields:** PCC ID: 1123, Setup: Facetup.def, Computer Time: 03-30-2000 14:38:14.
- Control Table:**

Control Season	Start MM/DD	End MM/DD	Primary Function	Bias	Override	Reverse Power
1	01/01	12/31	Voltage	None	None	Ignore
2			No Op			
3			No Op			
4			No Op			
- SUMMARY OF SITE/LIMITS:**
 - On Sensor: 1301 Hz, CTRatio: 80 A/V, VTRatio: 83.5:1
 - VT Wiring: Line Head, Phase Rotation: AEC, Current Phase: A, Current Direction: Forward
 - Volt Guard: 8.0 (V), Hi: 888.0 (V), Lo: 8.0 (V), Undervolt Sw Inhibit: 100.0 (V)
 - Neutral Current Lockout SetPoint: Disabled (A), Maximum Close per Day: 10
 - Anti-Hunt: OFF, Minimum Close to Trip Time: 60 (Min), Increase Delay by: 60 (Min)

01

The 'Season Configuration' screen for Season 1 includes the following settings:

- Season Select:** Season 1
- Start Date:** 01/01, **End Date:** 12/31, **Primary Function:** Vlt
- Close Set Point:** 503 kVar, **Current Trans. Ratio:** 10 A/V
- Trip Set Point:** -522 kVar, **Voltage Trans. Ratio:** 83.5:1
- Switching Delay (S):** 60, **Adaptive ON:** Rev Trip/Close
- Note:** +Wss are Logging and -Vlt are Loading
- Vlt Bias:** None
- Override:** Voltage
- Close Override (V):** 110.0, **Low Release (V):** 116.0
- High Release (V):** 122.0, **Trip Override (V):** 128.0
- Switching Delay (S):** 60
- Reverse Power:** Ignore, **Min Reverse Power (kW):** 90
- Rev. Power Delay (S):** 60
- All Temperatures in degrees:** F
- PowerUp Trip:** []

02

Data recording parameters

Load data recording *	Daily summary recording	Operations recording
Date/time stamp	Date stamp	Date/time
Voltage (sec. or line)	Time of max./Min. value	Basic operations
Current (sec. or line)	Daily max./min. voltage	Override operations
kVAr (3Ø)	Daily max./min. current	Manual operations
kVA (3Ø)	Daily max./min. (3Ø) kVAr	Power up/power down
kW (3Ø)	Daily max./min. temp	Voltage before/delta
Power factor	Daily close operations	kVAr before and after
Total harmonics	Daily close hours	kW before and after
Temperature	Close ops running total	Reverse power
Trip/close status		

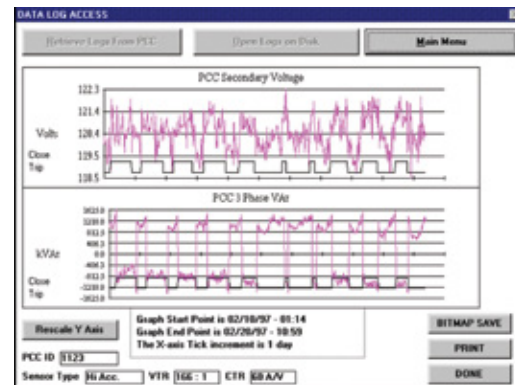
* 1 min. to 4 hour averaging period

Report generation capability

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 failure (neutral sensing lockout) and excessive bank switching.

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



03

Capacitor controls

Specifications

Voltage range power and true RMS sensing:

95–140 V, 60 Hz; 190–280 V, 60 Hz; 95–125 V, 50 Hz;
190–250 V, 50 Hz

Sensing accuracy: $\pm 0.5\%$ of reading
over temperature

Voltage control and override: 95–140 V/190–280 V
secondary in 0.1 V increments

Voltage bias: 0–20 V/0–40 V in 1 V 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): 4–800 A true RMS
- Lindsey line post sensor (100 A/V) 4–800 A true RMS
- CT secondary 0.1–20 A true RMS

Accuracy: $\pm 1.0\%$ reading; $\pm 0.2\%$ range,
 $\pm$ sensor error

Angle accuracy: $\pm 1^\circ$, $\pm$ sensor error

Current control range/resolution:

- Line post sensor 4–800 A in 0.1 A increments
- Current transformer 0.1–20 A secondary
in 0.01 A 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
- 3 ϕ kVAr: Range ± 1 to $\pm 99,999$ kVAr in 1 kVAr
increments

Time control range/resolution: Two close and two
trip settings for each day of the week in 24 hour
clock, in 1-minute increments

Temperature control range/resolution:

- Sensor: Located on bottom of enclosure
with radiation shield
- Range: -40 °F 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: 15 kV applied to all
accessible parts, IEC 801-2

Output Relay Rating: 10A continuous. 50 A, 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 – 10 A FNM Slo-Blo®
- Controller fuse – 2 A

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 120 A: $\pm 1\%$:**

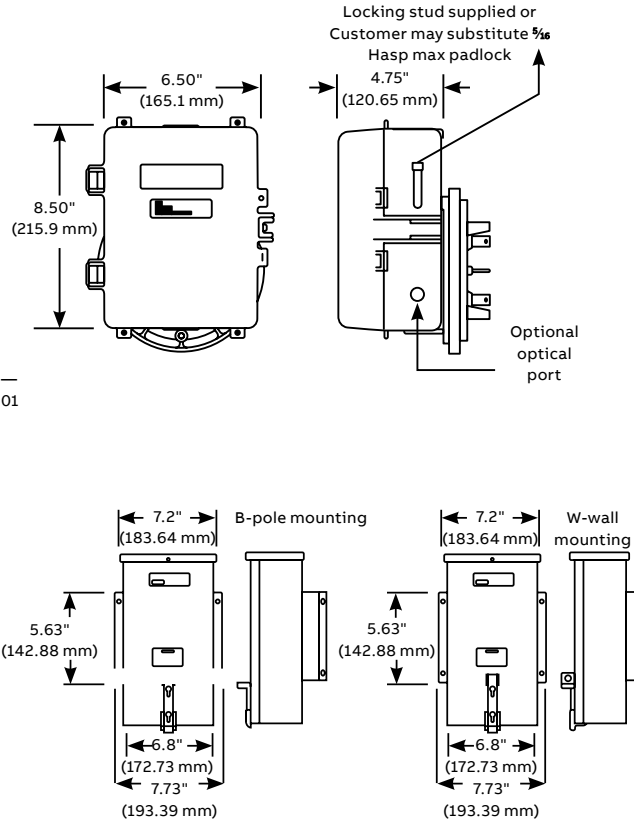
- Linearity error: 3–1200 A, $\pm 1\%$
- Angle error: 3–600 A, ± 0.50
- Temperature error: $\pm 0.02\%$ °C;
- 7th harmonic response: 82%

See pages 44–47 for complete specifications on
Fisher Pierce® series 1301 line-post current sensors.

Capacitor controls

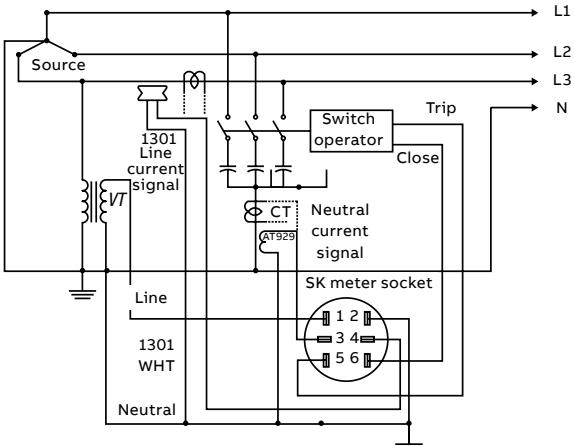
Mechanical data (series 4400)

- 01 Lexan® enclosure
(6 stab meter
plug shown)
- 02 Specifications are
subject to change.
- 03 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.

See pages 44–47 for more information on Fisher Pierce® series 1301 PowerFlex® high-accuracy line-post current sensors.

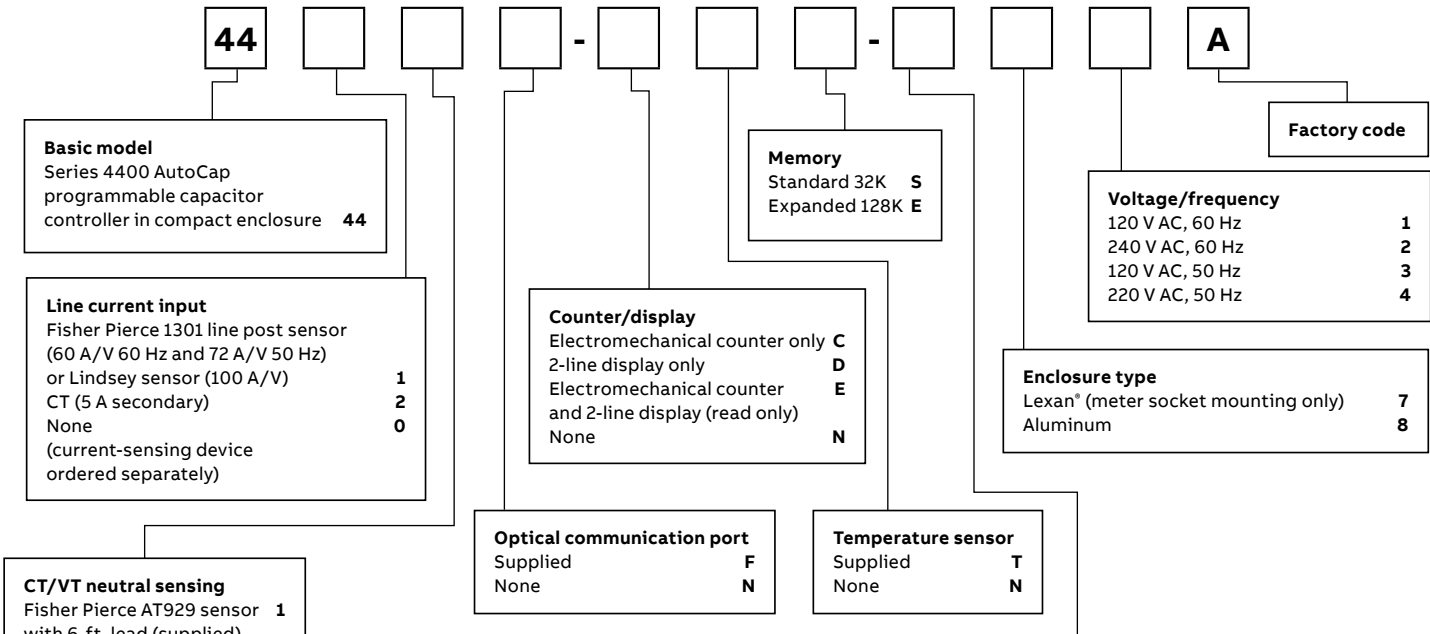


Capacitor controls

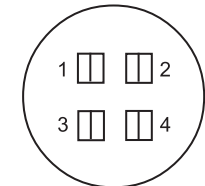
Specifications (continued)

The following diagram shows how to construct a catalog number for the Series 4400 AutoCap® adaptive capacitor control and recorder. See pages 70–72 for Fisher Pierce® series 2100 Meter Sockets.

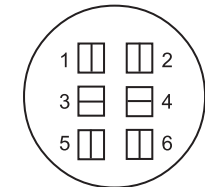
Indicates field that must be filled in to complete order.
Note: Availability of selected configuration will be verified at quotation time.



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 as shown below					Yes	Aluminum	None, line, neutral, or line + neutral
WJ	Wall								



View looking into socket



Socket for CT shorting switch available for SJ and TJ wiring



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
Lexan is a registered trademark of Sabic Innovative Plastics IP B.V.

Capacitor controls

Fisher Pierce® series 4500 AutoCap® adaptive capacitor control and recorder

—
01 Fisher Pierce series
4500 AutoCap control

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

- 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 provide 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 and 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 is compatible with existing controllers for easy installation – No adapters or rewiring required
- SmartSet™ Windows® based software simplifies programming for up to four seasons
- SmartSet graphs and reports record 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 for space-efficient installation



Capacitor controls

- 01 Adaptive VAr Control (Fig. 1). Identifies size of the capacitor bank and sets the VAr switching points for maximum loss reduction.
- 02 Adaptive Voltage Guard protection (Fig. 2). Identifies voltage change from bank switching; inhibits close operation if Voltage Guard plus present line voltage exceeds high voltage limit. Reverse conditions inhibit Trip.
- 03 PhaseFind Compensator (Fig. 3). Compensates for phase rotation (A) finds current signal phase (B) with respect to voltage phase (C) and compensates for reversed wiring (D).

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.

The unit enables integrated two-way communication 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 control can be configured to operate under SCADA control or as a local control with SCADA override. 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.

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.

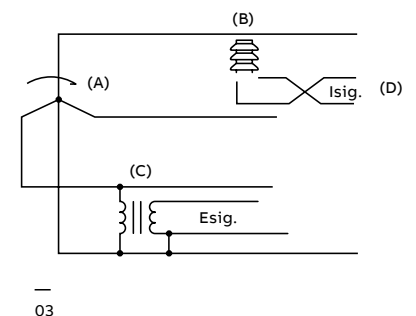
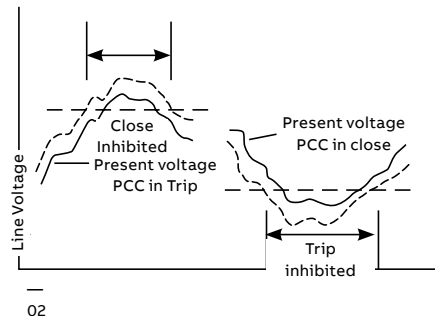
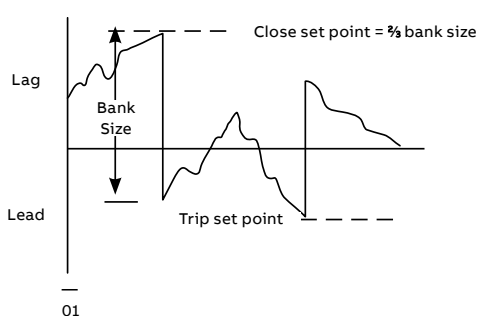
The series 4500 AutoCap control automatically corrects for installation errors, such as sensing voltage and current from different phases, reversed current signal wiring, reversed trip/close wiring and calibration errors. It also adjusts to abnormal operating conditions, including reverse power flow, bank hunting, low switching voltage, capacitor 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. In addition, the series 4500 AutoCap control offers complete load data/event recording and report creation supported by SmartSet software.

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)



Capacitor controls

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
- 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 (right). The Series 4500 AutoCap Control connects to any Windows® based PC via standard RS-232 or optional optical communications port.

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



Control modes

Basic functions	Override functions	Voltage bias	Reverse power
Adaptive VAR	Voltage	Time	Ignore
VAR	Time	High temp	Voltage
Voltage	High temp	Low temp	VAR
Current	Low temp		Trip and inhibit
Time			Close and inhibit
High temp			
Low temp			

Capacitor controls

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 *	Daily summary recording	Operations recording
Date/time stamp	Date stamp	Date/time
Voltage (sec. Or line)	Time of max./min. value	Basic operations
Current (sec. Or line)	Daily max./min. voltage	Override operations
kVAr (3Ø)	Daily max./min. current	Manual operations
kVA (3Ø)	Daily max./min. (3Ø) kVAr	Power up/power down
kW (3Ø)	Daily max./min. temp	Voltage before/delta
Power factor	Daily close operations	kVAr before and after
Total harmonics	Daily close hours	kW before and after
Temperature	Close ops running total	Reverse power
Trip/close status		

* 1 min. to 4 hour averaging period.

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.

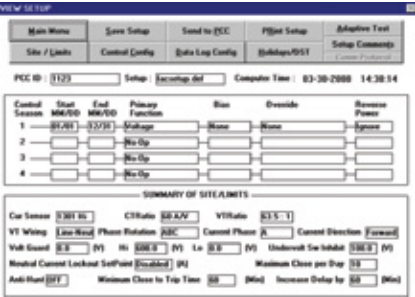
Load data reports

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

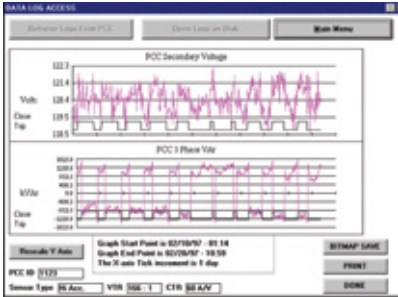
01 View setup screen – Allows user to review controller setup and site configuration summary.

02 Season configuration screen – Fully prompted for easy controller programming

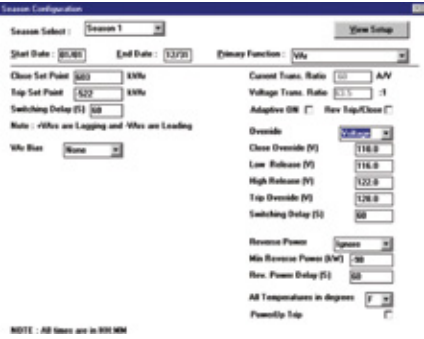
03 Typical load data graph



01



03

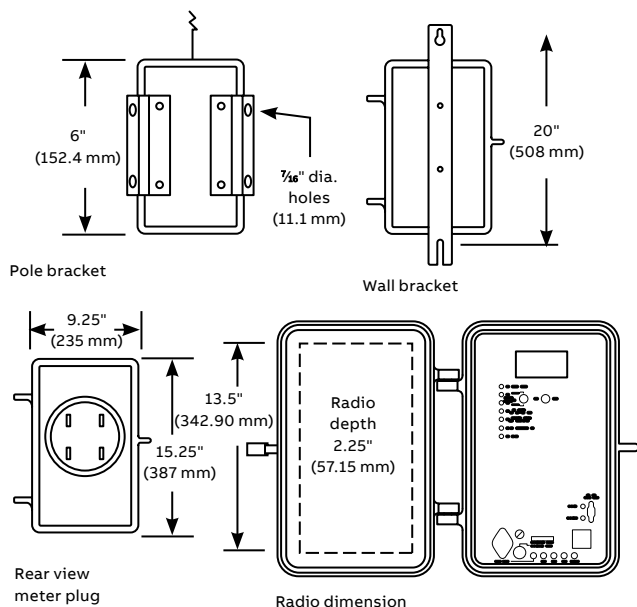


02

Capacitor controls

Mechanical data (series 4500)

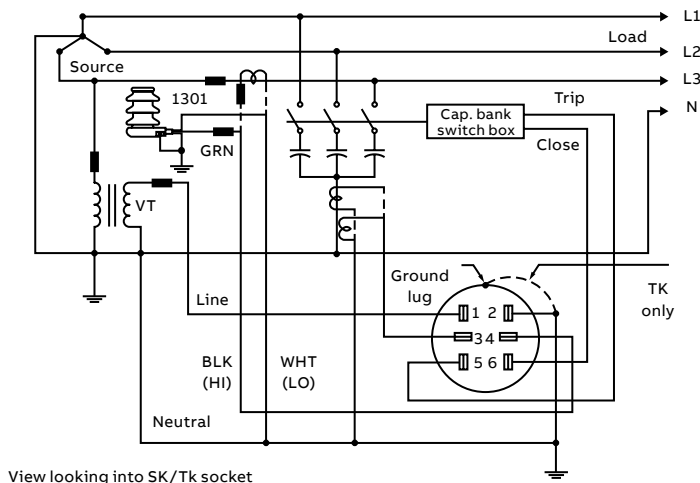
See pages 44–47 for more information on Fisher Pierce® series 1301 PowerFlex® high-accuracy line-post current Sensors.



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 V DC, 2.0 A continuous, 3.0 A transmit

• Electrical

- Operating voltage ranges: 95–140 V, 60 Hz; 190–280 V, 60 Hz; 95–125 V, 50 Hz; 190–250 V, 50 Hz
- Surge withstand: ANSI C62.41-1987
- Electrostatic Discharge Test: 15 kV applied to all accessible parts, IEC 801-2

• Output relay

- Number and type: 2 momentary closure
- Maximum continuous load: 10 A
- Maximum inrush: 50 A, 50% pF, 6 cycles, make only
- Contact closure period: Programmable 1–120 sec. in 1-sec. increments

• Fuse rating

- Output to capacitor switch: 10 A FNM Slo-Blo® load fuse
- Controller input: 2 A 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

Capacitor controls

Specifications (continued)

Measurement performance

• Voltage

- Secondary
Resolution: 0.1 V AC
Accuracy: $\pm 0.5\%$ 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: 0.1 A
Lindsey line-post sensor: 0.1 A
Current transformer: 0.01 A (secondary)
Accuracy: $\pm 1.0\%$ Reading, $\pm 0.2\%$ range, $\pm$ sensor error
Range: Fisher Pierce® 1301 sensor: 4–800 A true RMS
Lindsey line-post sensor: 4–800 A true RMS
Current transformer: 0.1–20 A (secondary) true RMS
Current transformer ratio (CTR): 5:5 to 2000:5 in 1:5 increments

• Reactive power (VAR):

- Resolution: 1 kVAR
- Range: $\pm 99,999$ 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: $\pm 1^\circ$, $\pm$ sensor error
- Range: 0°–359°

• Neutral current

- Resolution: Fisher Pierce AT929 sensor: 0.1 A
Current transformer: 0.01 A (secondary)
Potential device: 0.1 V (secondary)
- Accuracy: $\pm 2\%$ of reading, $\pm 1\%$ range, $\pm$ sensor error
- Range: Fisher Pierce AT929-400 sensor: 1 to 60 A
Current transformer ratio sec: 5:5 to 2000:5
Potential device: 0–60 V (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 120 A: $\pm 1\%$

- Linearity error: 3–1200 A, $\pm 1\%$
- Angle error: 3–600 A, ± 0.50
- Temperature error: $\pm 0.02\%$ °C
- 7th harmonic response: 82%

See pages 44–47 for complete specifications on Fisher Pierce series 1301 line-post current sensors.

Capacitor controls

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.

45 **-** **6** **B** **-**

Basic model
Series 4500 AutoCap programmable capacitor controller in compact enclosure **45**

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

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

Optical communication port
Supplied (not available with Option D for communications protocol) **F**
None **N**

Counter/display
Electromechanical counter only **C**
2-line display only **D**
Electromechanical counter and 2-linedisplay (read only) **E**
None **N**

Memory
Standard **S** 32K
Expanded **E** 128K

Communications protocol
SmartSet™ (no comm. micro or flash memory) **F**
DNP 3.0 (comm. Micro and flash memory installed) **D**

Communications circuitry*
Modem installed – PSTN (public service telephone network) **MB**
Radio installed – Metricom Model 20043 **BA**
Radio-ready **BB**
Radio installed – MDS Model 9310, 9810 **DA**
Radio-ready **DB**
Communications-ready or radio upgrade **NC**

Enclosure type
Luran **6**

Voltage/frequency
120 V AC, 60 Hz **1**
240 V AC, 60 Hz **2**
120 V AC, 50 Hz **3**
220 V AC, 50 Hz **4**
240 V AC, 50 Hz **5**

Factory code

SCADA options
Two dry SCADA inputs – Internally wetted **D**
Blown-fuse detect (DNP 3.0 protocol) **F**
Two wetted SCADA inputs – Customer wetted 40–140 V AC/DC **W**

Temperature sensor
Supplied **T**
None **N**

*Notes: **Radio installed** = Radio installation by Fisher Pierce, supplied by customer. Communication micro, flash memory and power supply included. **Radio-ready** = Radio installed by customer. Radio bracket, antenna mount and cables included. Communication micro, flash memory and power supply included. **Communications-ready** (defined by selecting "D" for Communications Protocol) = Radio bracket and cables not included. Power supply included. Comm. micro and memory installed. **Radio upgrade** (defined by selecting code "F" for Communications Protocol) = Radio bracket and cables not included. Power supply included. Comm. micro and memory not installed (Controller board change-out required for communications using a protocol other than SmartSet).

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

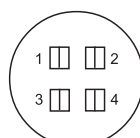
	1	2	3	4	5	6	Ext. GND Lug	Current inputs
SJ	CSL	N/GND	L	TR	CSH	CL	No	Line only
TJ	CSL	N	L	TR	CSH	CL	Yes	Line only
SM	L	N/GND	CSL	CSH	TR	CL	No	Line only
TM	L	N	CSL	CSH	TR	CL	Yes	Line only
SL	L	N/GND	NSL	NSH	TR	CL	No	Neutral only
TL	L	N	NSL	NSH	TR	CL	Yes	Neutral only
SK	L	N/GND/COM	NSH	CSH	TR	CL	No	Line + neutral
TK	L	N/COM	NSH	CSH	TR	CL	Yes	Line + neutral

Bracket mounting with terminal strip

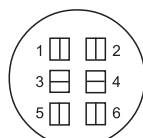
Mounting location	Ext. GND lug	Current inputs
BJ Pole	Wire to terminal strip as shown below	Yes
WJ Wall	–	None, line, neutral, Or line + neutral

GND N L RLY CL TR CSH CSL NSH NSL

Terminal strip



View looking into socket



Socket for CT shorting switch available for SJ and TJ wiring

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

Capacitor controls

Fisher Pierce® series 1580 fixed capacitor bank neutral sensing indicator

Alerts you to failed capacitors in fixed distribution capacitor banks.

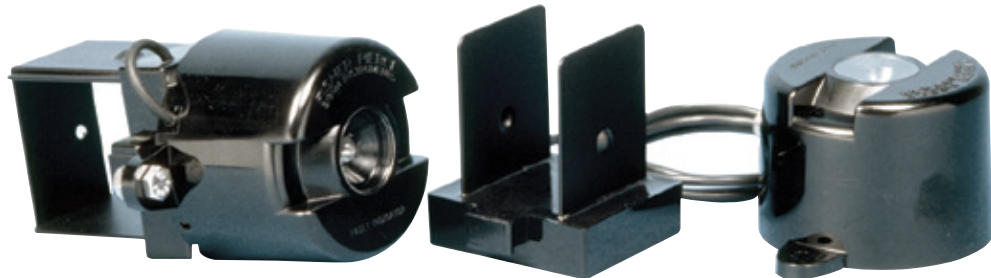
- High-intensity LED provides clear visual indication of neutral current unbalance, and flash rate indicates magnitude of neutral current
- Low maintenance; draws operating current for its circuitry from the current sensor – no battery to check or change
- Ships fully assembled for easy installation
- 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 protect against moisture to ensure long, trouble-free service life

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 A), it flashes a high-intensity LED with the flashing rate indicating the magnitude of the neutral current.

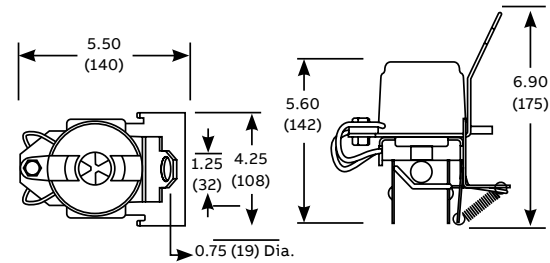
* Lexan is a registered trademark of Sabic Innovative Plastics IP B.V.



Capacitor controls

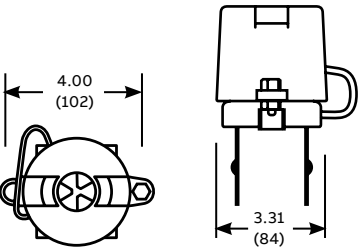
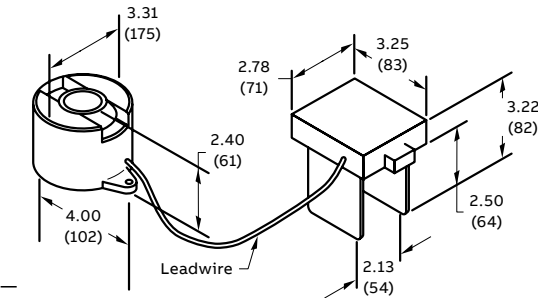
Mechanical data

- 01 Indicator with attached sensor – hotstick mounting
- 02 Remote bracket mounting indicator
- 03 Indicator with attached sensor – tie-wrap mounting



- Specifications**
- Operating range: 15–200 A
 - Operating temperature range: -40 °C to 85 °C
 - Continuous load current: 200 A
 - Overload capability: 25,000 A for 10 cycles
 - Maximum cable diameter: 1½"

01

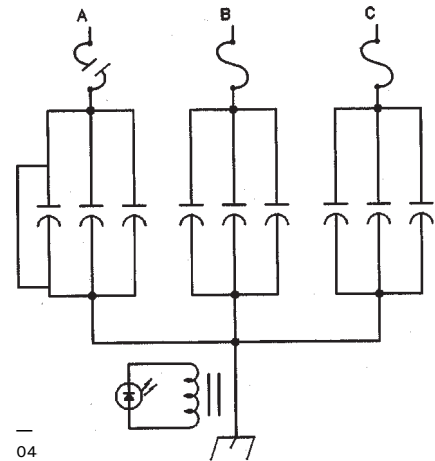


03

(All dimensions in inches with millimeter equivalents in parentheses)

Installation application

- 04 Neutral sensing indicator



04

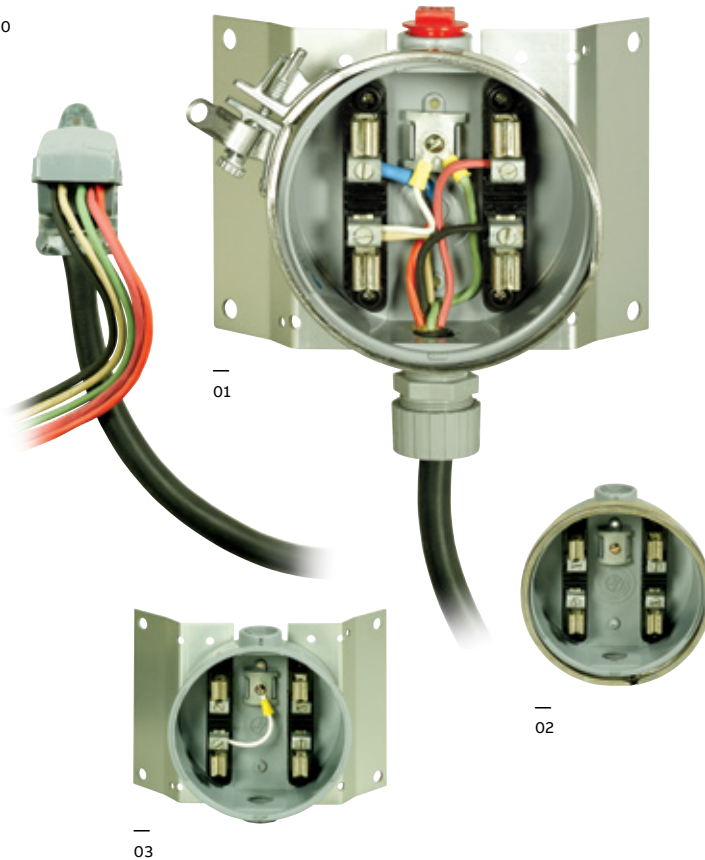
Fisher Pierce® series 1580 fixed capacitor bank neutral sensing indicator

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
1580-45134	Indicator with contact output

Capacitor controls

Fisher Pierce® series 2100 meter sockets

—
01 2115BSJ-W20
—
02 2101NFN
—
03 2102BFA

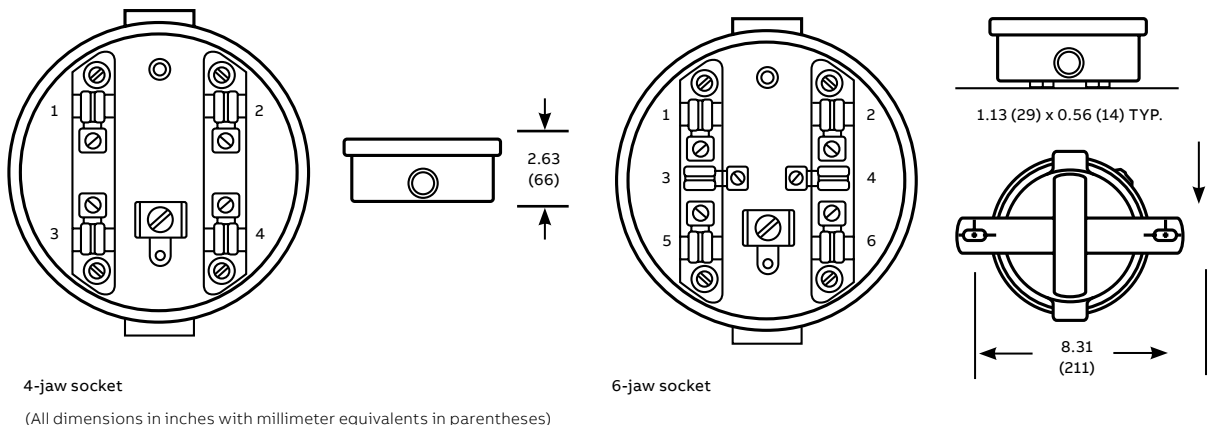


Designed for faster, easier installation.

- Variety of options provide flexibility to meet the needs of many utility applications
- Prewired sockets ship ready to install for maximum efficiency

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.

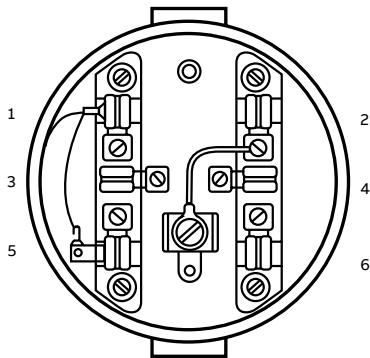
Series 2100 and 2110 mechanical data



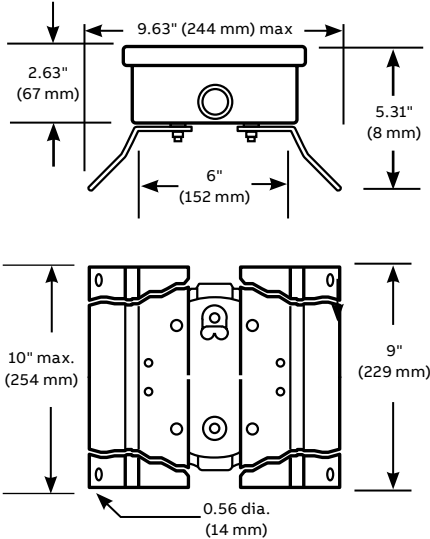
Capacitor controls

Specifications

- Capacity: 100 A, 600 V
- 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



6-Jaw socket with automatic shorting device



The following diagram shows how to construct a catalog number for the series 2101 or 2102 meter docket.

☐ Indicates field that must be filled in to complete order.
Note: Availability of selected configuration will be verified at quotation time.

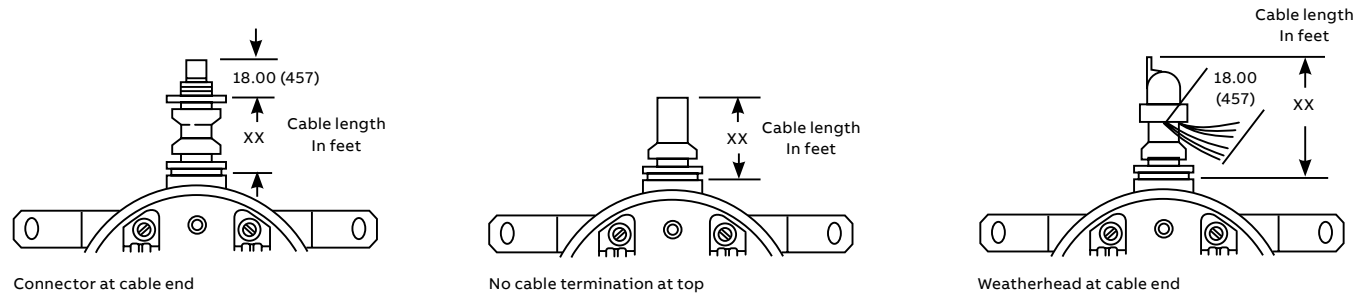
Basic socket Basic meter socket with two 1" hubs 2101 Basic meter socket with two 1" hubs and ground wire 2102	Sealing ring/mounting options Snap-action sealing ring; standard socket only – wall-mount N Snap-action sealing ring; standard pole-/wall-mount bracket A Heavy-duty padlock-type sealing ring; heavy-duty wrap-around pole-mount bracket B Lock sealing ring; no mounting bracket C Lock sealing ring; pole-/wall-mount bracket D Heavy-duty snap-action sealing ring; heavy-duty wrap-around pole-mount bracket G	Number of jaws 4-jaw F 6-jaw S 6-jaw with automatic shorting device T	Hub-plug options None N Male plastic plug top and female plastic plug with hole in bottom A Cable connector on top, 1" plug with hole on bottom, 3/8"-1/2" B 1/2"-5/8" C 5/8"-3/4" D Cable connector on top and bottom, 1/2"-5/8" F 5/8"-3/4" G 3/8"-1/2" H
---	--	---	--



Capacitor controls

Series 2111/2115 cable connector mechanical data

All dimensions in inches with millimeter equivalents in parentheses. XX: Length in feet – Specified by customer.



Wiring for prewired units – 4-jaw wiring

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

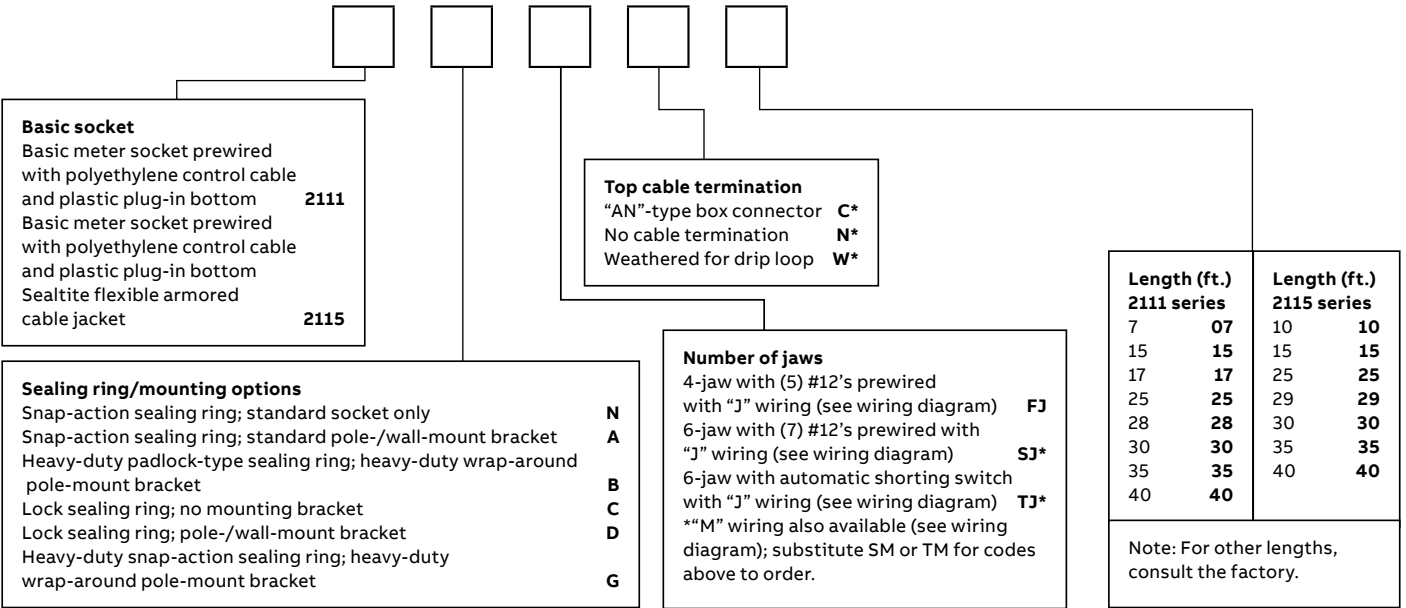
Wiring for prewired units – 6-jaw wiring

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

Specifications subject to change.

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



Appendix

Part number index

Cat. no.	Page
1301-17A	47
1301-27A	47
1301-47A	47
1548FH-ANC3-L-N-A	10
1548FH-BDC3-L-N-A	10
1548FH-BDC3-X-N-A-1	10
1580-10	69
1580-20	69
1580-30	69
1580-45134	69
3175B0126G1	26
A615	10
A615-REP	10
A616	10
A616-REP	10
AT2186-10	10
FO-CABLE06	39
FTT	39
H2403-10	10
JH-1560-1	27
JH-1560-2	27
JH-1560-3	27
JH-1560-4	27
JH-1570-1	27
OLMTL	39
OLMVF	39
OLMVL	39
OLMVOL	39
PD-35	43
TPMTL	38
TPMVF	38
TPMVL	38
TPMVOL	38
UCMTL	33
V2	41
V2-TB	41

Additional information

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