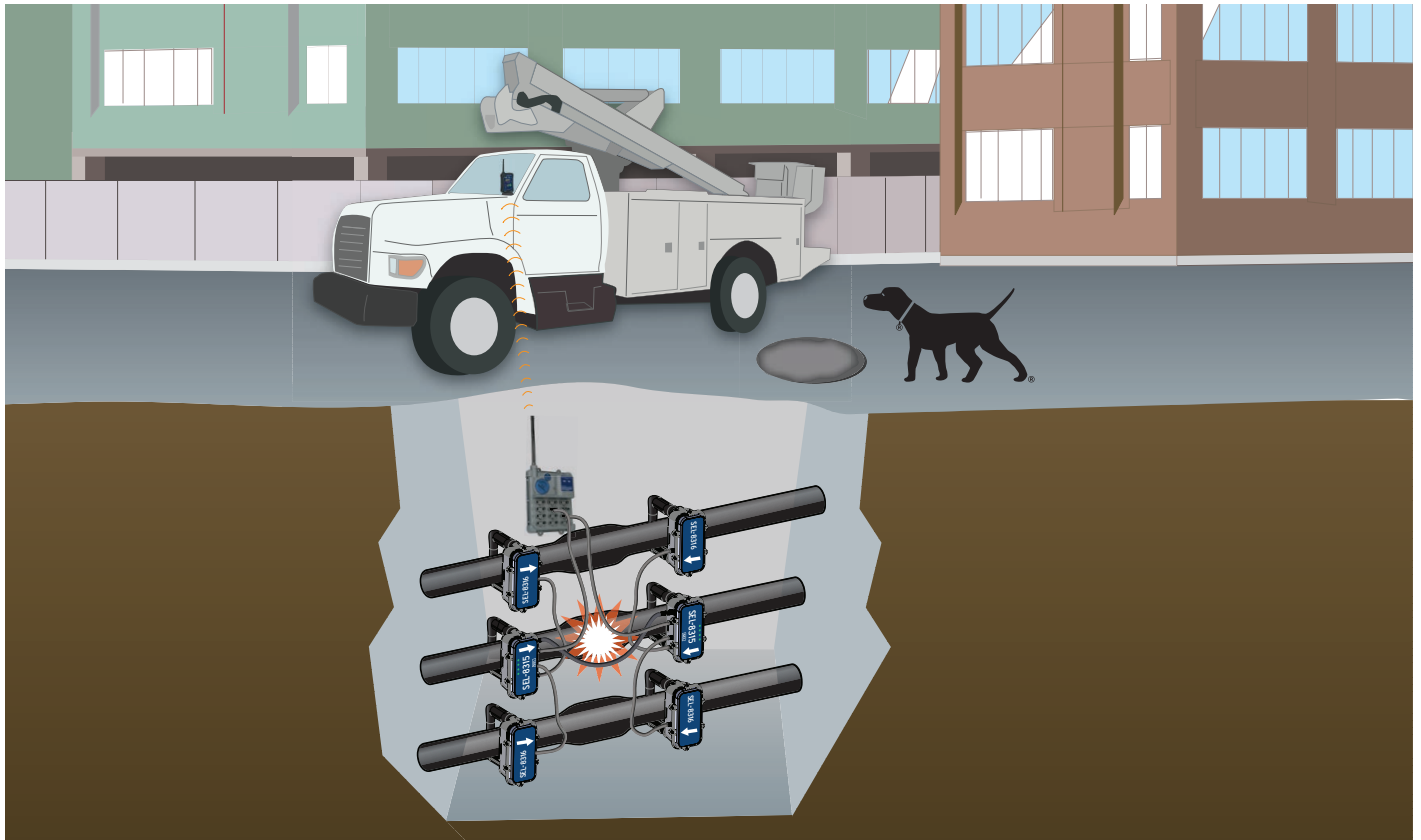


SEL-8315



Phase Comparison Faulted Circuit Indicator (PC FCI)



Communicates to line crews using the



Features and Benefits

Locates Faulted Cable Sections Quickly

Locate cable failures within and between cable vaults using easy-to-install SEL-8315 Phase Comparison Faulted Circuit Indicators (PC FCIs).

Operates in Harsh Environments

The PC FCIs are submersible to depths as great as 15 feet of water and can operate in extreme temperatures.

Communicates Using Own Power

No external power source required.

Works With Existing RadioRANGER® Installations

The PC FCIs plug into the RadioRANGER SEL-8300 Wireless Interface and report to the interface any out-of-phase condition. You can then use the RadioRANGER SEL-8310 Remote Fault Reader to remotely read the status of the fault indicator.

Making Electric Power Safer, More Reliable, and More Economical®

Phase Comparison Faulted Circuit Indicator (PC FCI) Theory of Operation

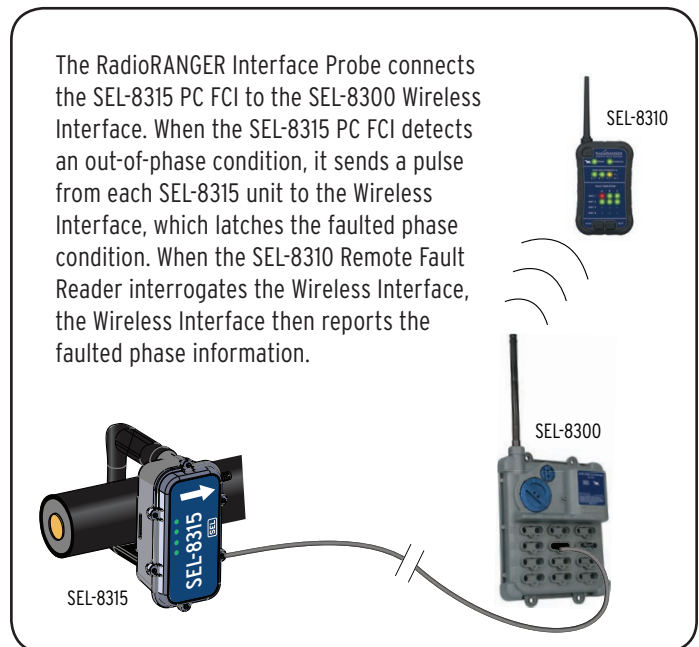
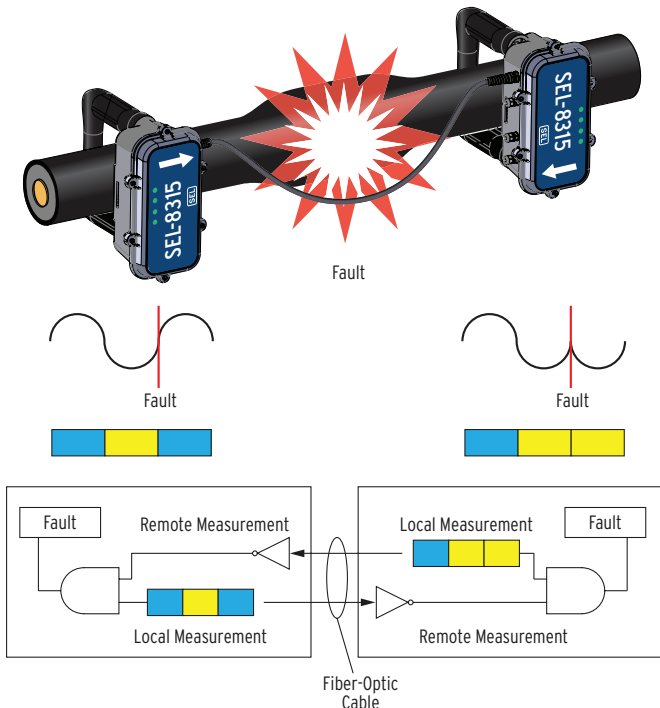
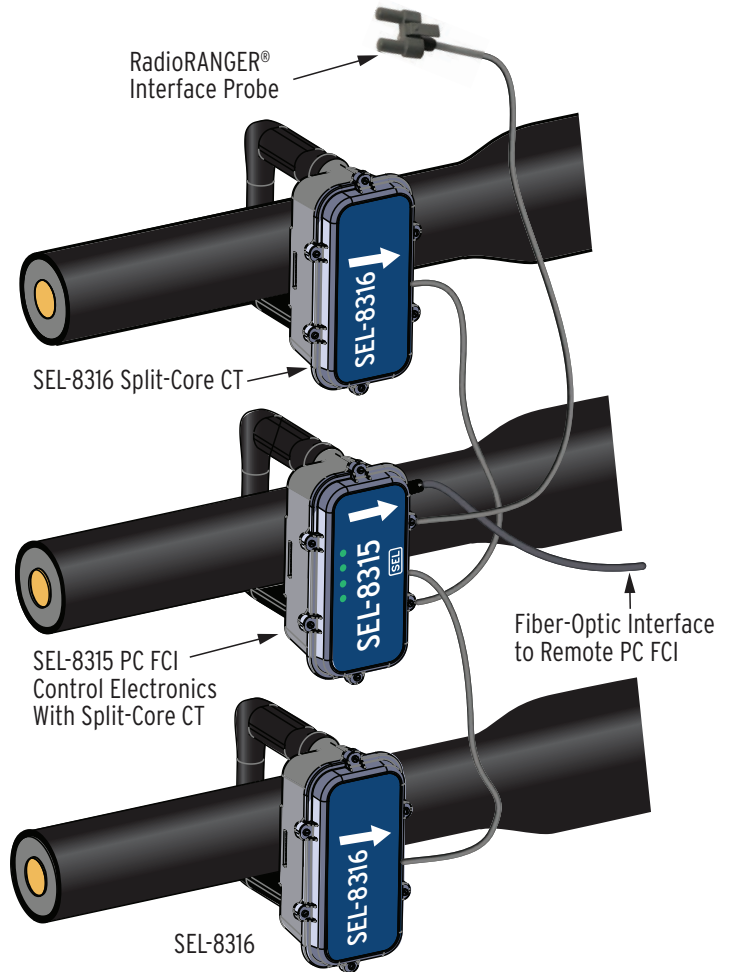
The PC FCI System, used to monitor a three-phase section of cable, consists of the following elements:

- Two SEL-8315 Control Electronics With Split-Core CT
- Four SEL-8316 Split-Core CTs

The figure to the right provides an overview of the SEL-8315 PC FCI components at one end of the monitored cable section. The other end of the monitored cable has a duplicate set of sensors.

The SEL-8315 system measures the current that flows through the cable it is attached to and from the adjacent cables attached to the SEL-8316 Split-Core CTs. Two SEL-8315s are connected together by a fiber-optic cable and exchange three-phase power system information. Local SEL-8315 PC FCIs determine the phase polarity for each cable, and then transmit the phase polarity information for each cable, via the fiber-optic cable, to a remote SEL-8315. The SEL-8315 PC FCIs at both cable ends then compare the local and remote polarities of each cable to determine whether the currents are in-phase, i.e., a no-fault condition, or out-of-phase, i.e., a fault condition.

The figure below depicts the SEL-8315 system phase comparison concept. The blue blocks represent positive polarity, and the yellow blocks represent negative polarity. Under normal conditions, positive and negative polarities of the power system waveform will be aligned in time. Under fault conditions, however, there is a current phase reversal at one end of the monitored cable. In the fault condition, the positive and negative measurements will be out-of-phase when the SEL-8315 System compares the local and remote measurements, i.e., blue and yellow blocks are out-of-phase, indicating a fault condition.

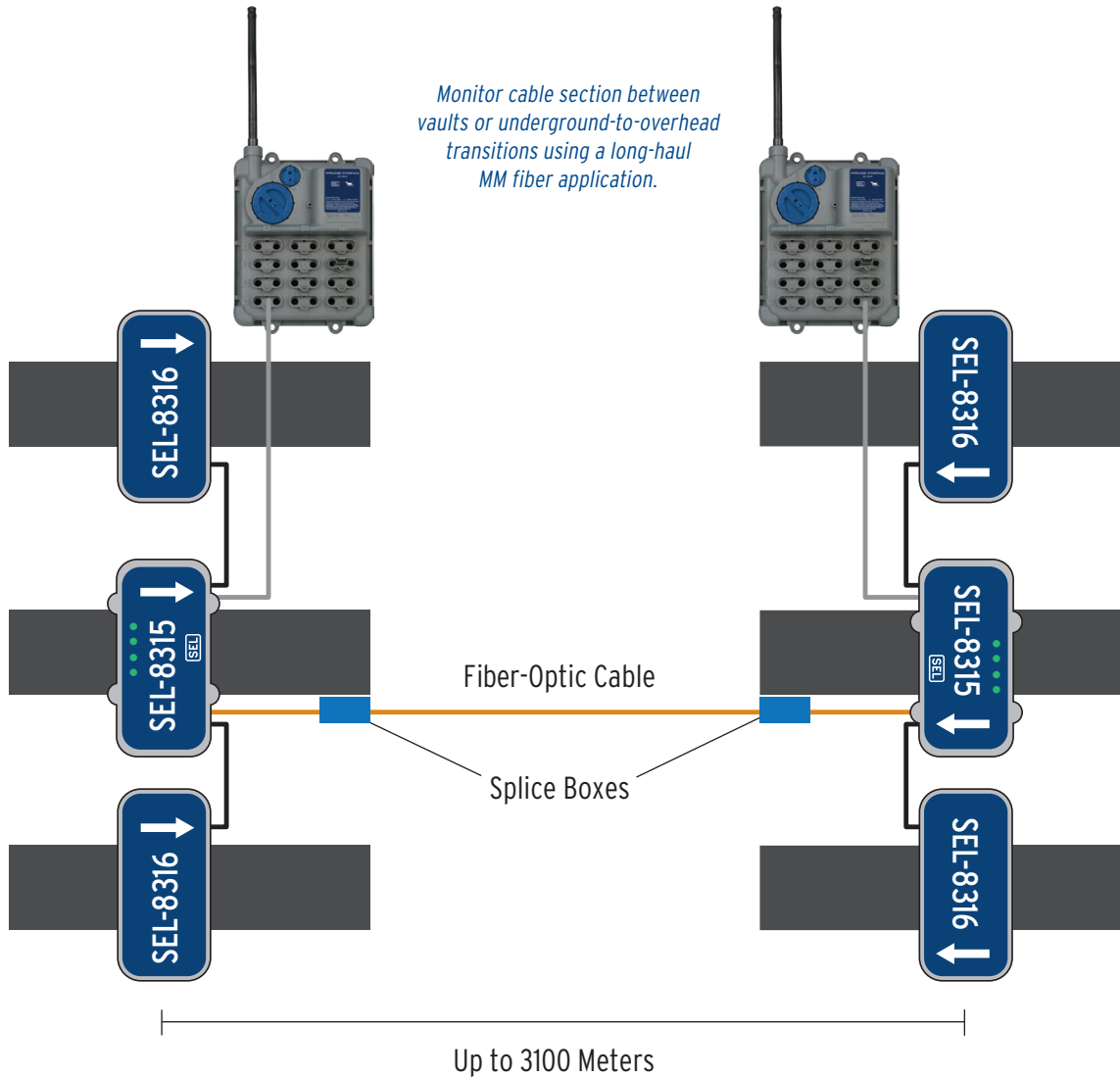


Applications

The PC FCI is designed to detect solid dielectric cable failures. Solid dielectric cables, such as cross-linked polyethylene (XLPE), are predominate in underground transmission cables from 69 to 230 kV. Construction of these systems typically consists of concrete-encased duct banks. Cable runs are limited to a maximum of 2,000 feet to allow for manageable cable spool size and to prevent installers from damaging the cable when they pull it through a conduit. Cable splices are required to connect cable sections and are done in underground splice vaults.

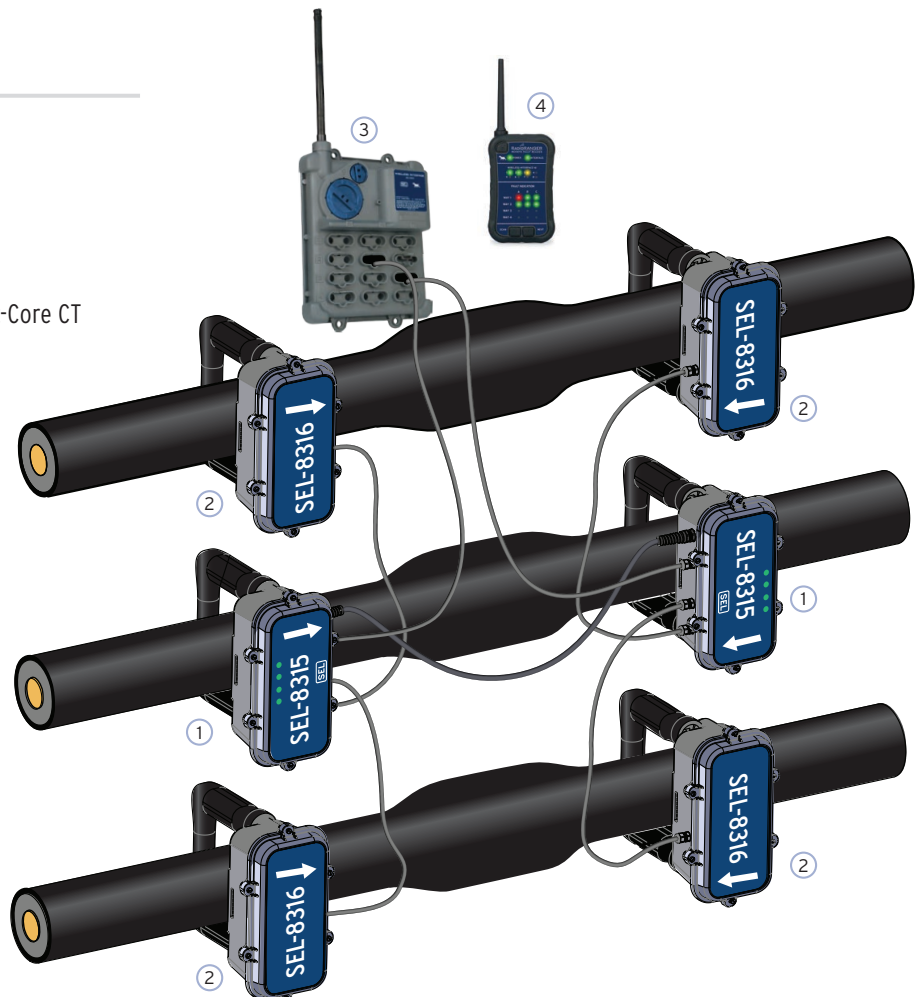


Monitor underground splice applications using a short-haul multimode (MM) fiber application, up to 250 meters.



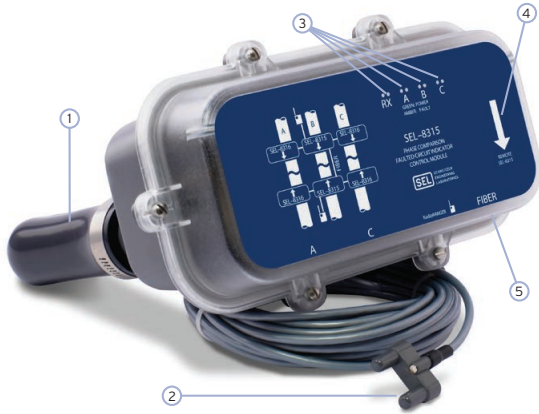
System Components

- ① SEL-8315 Control Electronics With Split-Core CT
 - ② SEL-8316 Split-Core CT
 - ③ SEL-8300 Wireless Interface Module*
 - ④ SEL-8310 Remote Fault Reader*
 - ⑤ Fiber-Optic Cable
 - ⑥ CT Release Tool
 - ⑦ Cable Tie
 - ⑧ Hose Clamp
 - ⑨ ESD Strap
- Instruction Manual (not pictured)



*Note: The SEL-8300 and SEL-8310 are not included as part of the SEL-8315 system.

System Components



SEL-8315 Phase Comparison Faulted Circuit Indicator

Detects an out-of-phase condition and sends fault indication signal to the SEL-8300 Wireless Interface.

- ① Split-Core Current Transformer
- ② RadioRANGER Interface Probe
- ③ LEDs for visual indication of phase condition
- ④ Installation direction
- ⑤ Connection to fiber-optic cable



RadioRANGER SEL-8310 Remote Fault Reader*

Identify the phase and location of underground faults with the handheld Remote Fault Reader.

- ① Flexible antenna
- ② Operates on three alkaline or rechargeable AA batteries
- ③ Display for up to eight unique Wireless Interface IDs
- ④ Easy-to-use keypad
- ⑤ Durable, buoyant case rated to IP54
- ⑥ Wireless Interface health monitor
- ⑦ Communicates fault indicator presence and status:

Red—Tripped fault indicator
Green—Untripped fault indicator
Off—No fault indicator present



RadioRANGER SEL-8300 Wireless Interface*

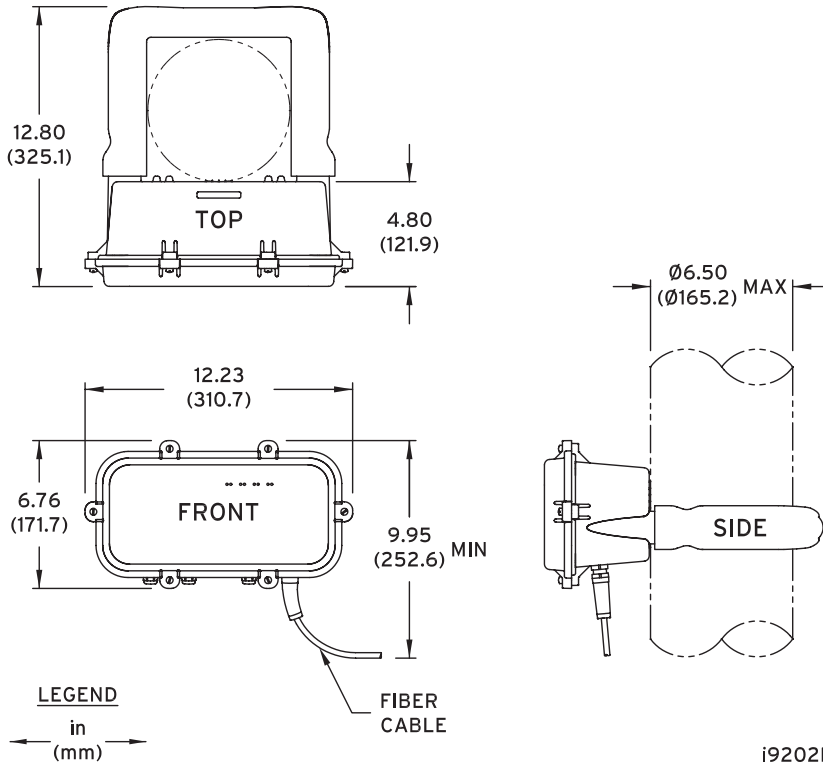
The Wireless Interface communicates fault indicator information to the Remote Fault Reader.

- ① Integral antenna (remote antenna also available)
- ② Eight easy-to-set IDs allow application in dense areas
- ③ Maintenance free: system health monitored remotely via the Remote Fault Reader
- ④ Estimated 15-year product life
- ⑤ Sealed, waterproof, and IP68 rated
- ⑥ Connect up to 12 fault indicators wired with RadioRANGER Interface Probes

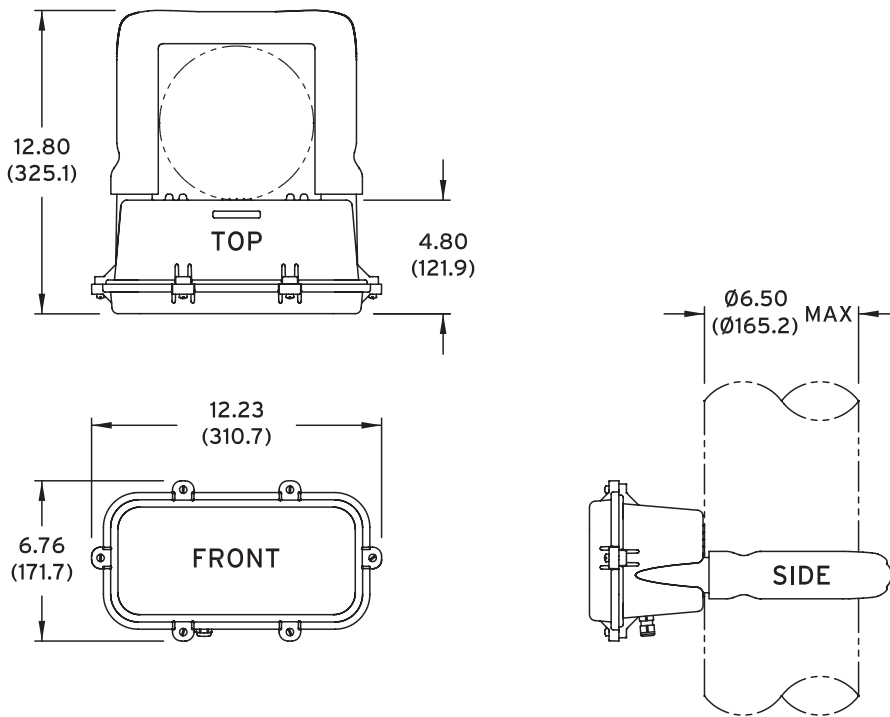
*Note: The SEL-8300 and SEL-8310 are not included as part of the SEL-8315 system.

Dimensions

PC FCI CONTROL ELECTRONICS WITH SPLIT-CORE CT SEL-8315



PC FCI SPLIT-CORE SENSOR SEL-8316



Specifications

General

Phase Comparison Control Electronics

The FCI system can be powered by any one-phase sensor, i.e., the control electronics unit or split-core CT unit, in a three-phase set.

Operation Ranges

Minimum Operating Current 150 A (Note: Any phase measuring more than 150 A will power the three-phase set.)

Maximum Continuous Operating Current 2000 A

Maximum Fault Current 40 kA, symmetrical, 6 cycles

Fault Detection Time

Prefault Current <150 A

150 to 200 A Fault 35 ms max, <25 ms typical

200 to 800 A Fault 30 ms max, <16 ms typical

800 A Fault or Greater 15 ms max, <8 ms typical

Prefault Current >150 A for >30 ms

150 A or Greater 15 ms max, <7 ms typical

Fault Detection Reset

The FCI automatically resets when the following conditions persist for one second:

Current is detected on any one phase.

No fault is detected on any phase.

Fiber Optics

Short Distance

Transmission Distance 250 m

Cable Type Multimode: 200 μ m

Connector Type V-pin

Medium Distance

Transmission Distance 3100 m

Cable Type Multimode: 62.5 μ m

Connector Type ST[®]

Submersion/Water Resistance

Submersible to 4.57 m (15 ft)

Type Tests

Environmental Tests

Temperature Cycling IEEE 495-2007
Test 4.4.1; -40° to +85°C, 5 cycles

Trip Current IEEE 495-2007
Test 4.4.9; -40°, +20°, and +85°C

Reset IEEE 495-2007
Test 4.4.10; -40°, +20°, and +85°C

Water Submersion IEEE 495-2007
Test 4.4.2; Submerged 15 ft, +5°, +25°, and +70°C

Electrostatic Discharge Test

ESD IEC 61000-4-2:2003 Level 4

RFI and Interference Tests

Radiated, Radio Frequency, Electromagnetic Field Immunity:
IEC 61000-4-3-2008 10 V/m

Immunity to Conducted Disturbance, Induced by Radio Frequency
Fields: IEC 61000-4-6 (2006) 10 V

High-Current Tests

Short-Time Current IEEE 495-2007
Test 4.4.7; 10 kA X/R = 6

Effect of Current From Adjacent Conductors IEEE 495-2007
Test 4.4.8; 25 kA X/R = 20,
Conductor 18 inches from FCI

Vibration and Shock Tests

Shock and Bump IEC 255-21-2 (T) Class 1 (bump test, shock withstand), Class 2 (shock response)

Sinusoidal Vibration IEC 255-21-1 (T) Class 1 (vibration endurance), Class 2 (vibration response)

Other Mechanical Tests

Electric Cord Pull-Out IEEE 495-2007
Test 4.4.5; 30 lbs, 1 hour

Salt Fog IEEE 495-2007
Test 4.4.4; 5% solution, 96-hour exposure

SEL-8315 Phase Comparison Faulted Circuit Indicator

Ordering Tables

	1	2	3	4	5	6	7	8	9	10	11	12	13
System Part Number	8	3	1	5	S	M		0	0				2
Display Type													
RadioRANGER Probe						M							
Display Lead Length													
25 ft							T						
35 ft							V						
Lead Length Between Phases													
4 ft										L			
6 ft										G			
12 ft										P			
20 ft										Q			
50 ft										T			
Fiber													
MM Short-Haul (250 meters maximum)											1		
MM Long-Haul (3100 meters maximum)											2		
Fiber Lead Length													
12 ft												P	
25 ft												T	
35 ft												V	
50 ft												H	
None												X	
Splice Boxes With 50-Foot Cable Stubs											2	B	
Factory Code								0	0				2

List of Items Related to the SEL-8315 Phase Comparison Faulted Circuit Indicator

Item	SEL Catalog Number
RadioRANGER Wireless Interface, Integral Antenna*	8300
RadioRANGER Wireless Interface, Remote Antenna*	8300A
RadioRANGER Remote Fault Reader*	8310
Fiber-Optic Cable for Long-Haul MM Applications*	C805G020000X####
Current Sensing Core Release Tool for SEL-8315/6	CTUSRT
Pole-Mounting Bracket Kit for SEL-8300(A)*	915990002
SEL-8315 System Instruction Manual	PMFCI-01
Fiber Splice Enclosure Installation Instructions**	PLSFCI-01

* Not included with the SEL-8315SM system.

Length of cable in meters. (Example: "0209" means 209 meters long. "2090" means 2090 meters long.)
Note: Maximum valid number for cable length in meters is "3100."

** For use with long-haul MM fiber applications only.

