

SEL-411L



Advanced Line Differential Protection, Automation, and Control System



Apply the SEL-411L Advanced Line Differential Relays with full-scheme backup for easy-to-apply high-speed line protection.

Features and Benefits

Protect

Apply single-pole or three-pole subcycle current differential protection. Reduce protection system costs by using built-in distance and/or overcurrent backup functions. Five zones of phase- and ground-distance elements as well as directional overcurrent elements and an advanced line current differential system provide subcycle operation and superior security.

Simplify

Innovative operating characteristics make settings easy. No fault studies are required for most differential applications.

Optimize

Use single or dual channels for reliability. Apply on two-, three-, or four-terminal lines and on breaker-and-a-half bus arrangements with or without tapped lines.

Monitor

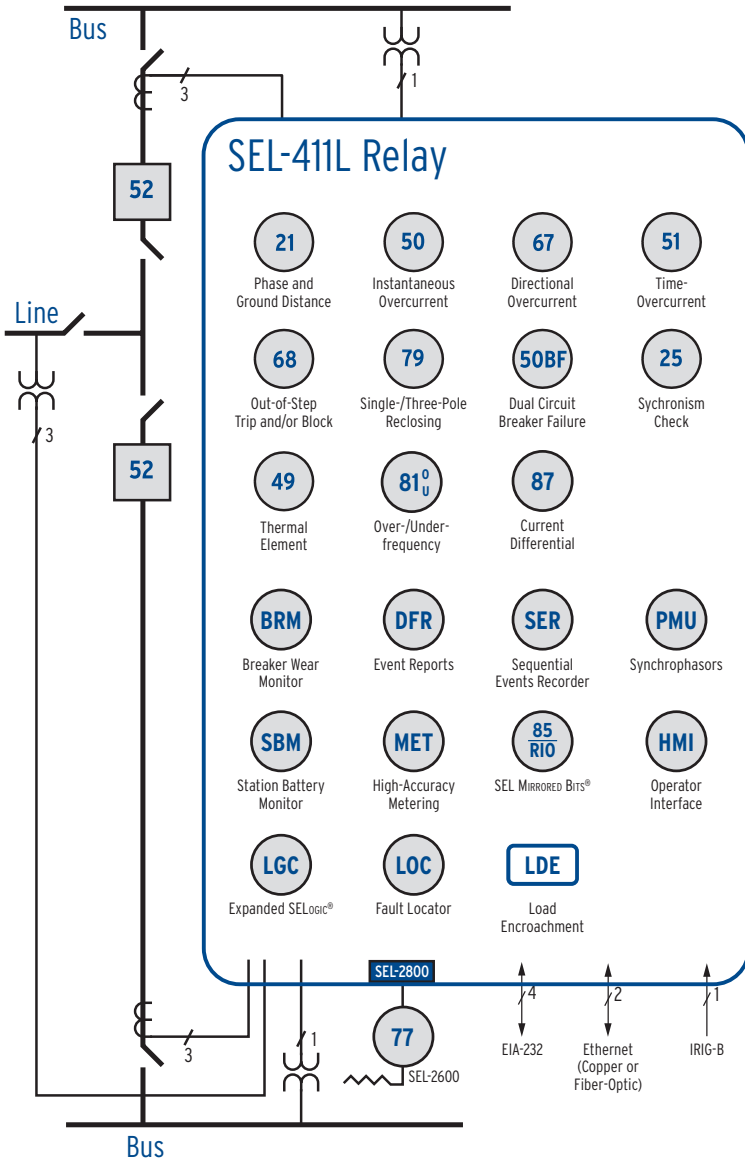
Incorporate IEEE C37.118 synchrophasor measurements into wide-area protection and control systems. Use high-accuracy time correlation to improve event report analysis.

Automate

Reduce total project construction and operation costs by integrating four-shot recloser and relay logic operators into your automation system. Use serial or Ethernet communications to improve station integration.

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

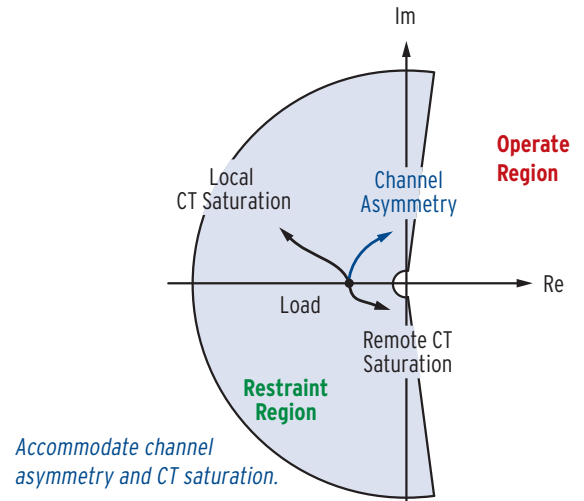
Functional Overview



Superior, Sensitive, and Simple

- The SEL-411L Relay uses a vector ratio of the local and remote phase and sequence currents (Alpha Plane restraint) to provide high-speed protection independent of line loading, CT saturation, or tapped load.
- Proven negative-sequence elements provide sensitivity for unbalanced faults. High-impedance fault detection gives secure operation for faults below load current or line-charging current levels.

Alpha Plane Restraint and Operate Regions



Flexible Channel Selection

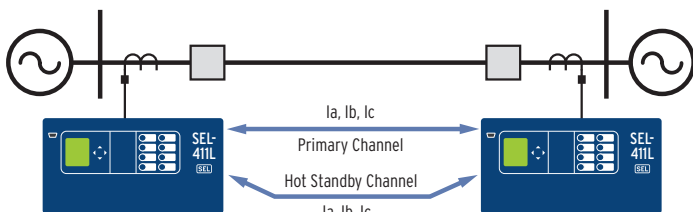
Channel interface:

- Isolated EIA-422
- Isolated ITU-T G.703
- 850 nm or 1300 nm fiber, IEEE C37.94 encoding
- 1300 nm single- or multimode fiber
- 1550 nm single-mode fiber

Ethernet Communications

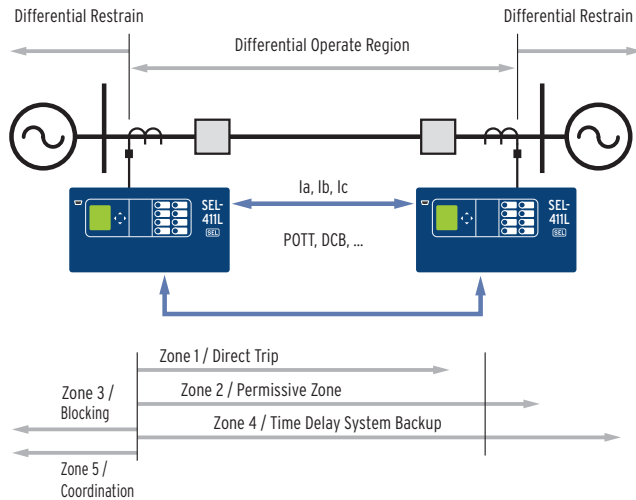
Apply Ethernet for both engineering access and differential communications. An IRIG-B clock input synchronizes the differential signal in cases with asymmetric communications. Choose fiber or copper Ethernet for local and wide-area networks.

- Two, dual 10/100BASE-T connections
- Two, dual 100BASE-FX connections
- Two, 10/100BASE-T and 100BASE-FX connections



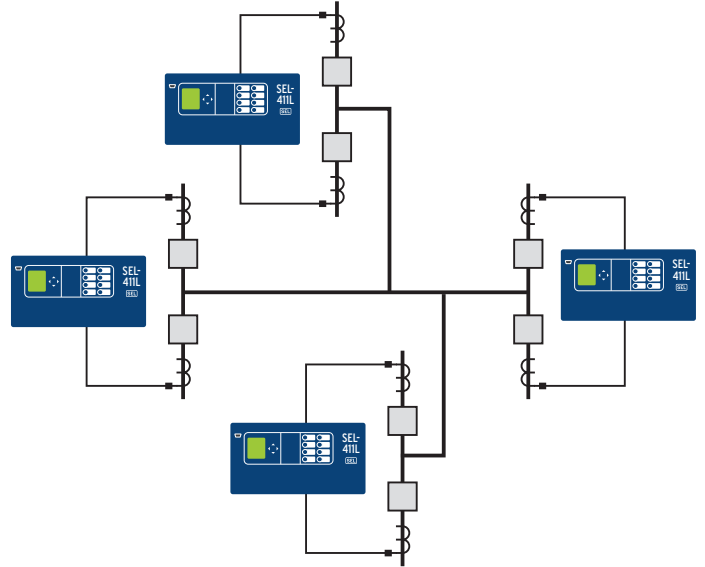
Full Scheme and Overcurrent Backup

- Apply differential and distance protection in one relay.
- Enable distance backup when differential protection is disabled.
- Use MIRRORRED BITS® communications permissive signals sent over the same or different paths from the differential communications.
- Apply and coordinate single- and three-pole tripping for improved stability.



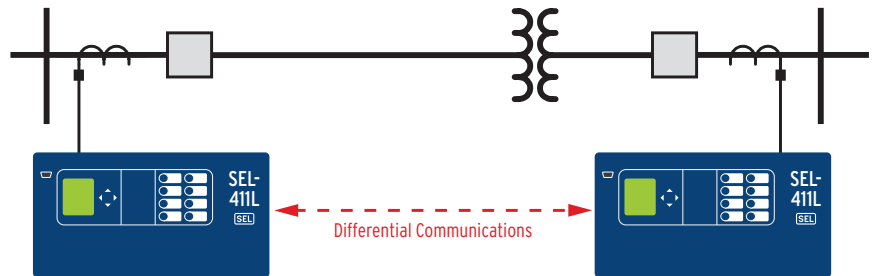
Advanced Protection and Diagnostics

The SEL-411L protects up to four terminal lines and, with dual CT and PT inputs, can be applied on breaker-and-a-half bus configurations. Efficiently dispatch line crews to quickly isolate line problems and restore service faster. The multiterminal fault location system quickly locates faults even on lateral transmission lines.



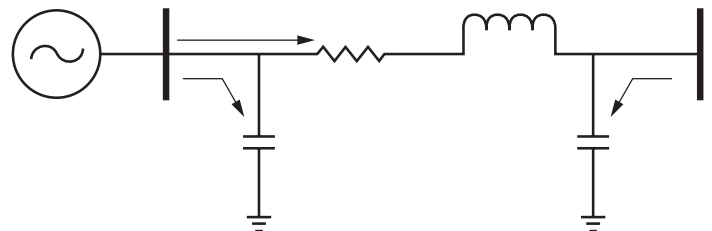
Inline Transformer

The SEL-411L compensates for the effects of in-line transformers, including voltage, current, and phase differences. Provide complete protection of the combined line and transformer without line side CTs and a circuit breaker.



Charging Current Compensation

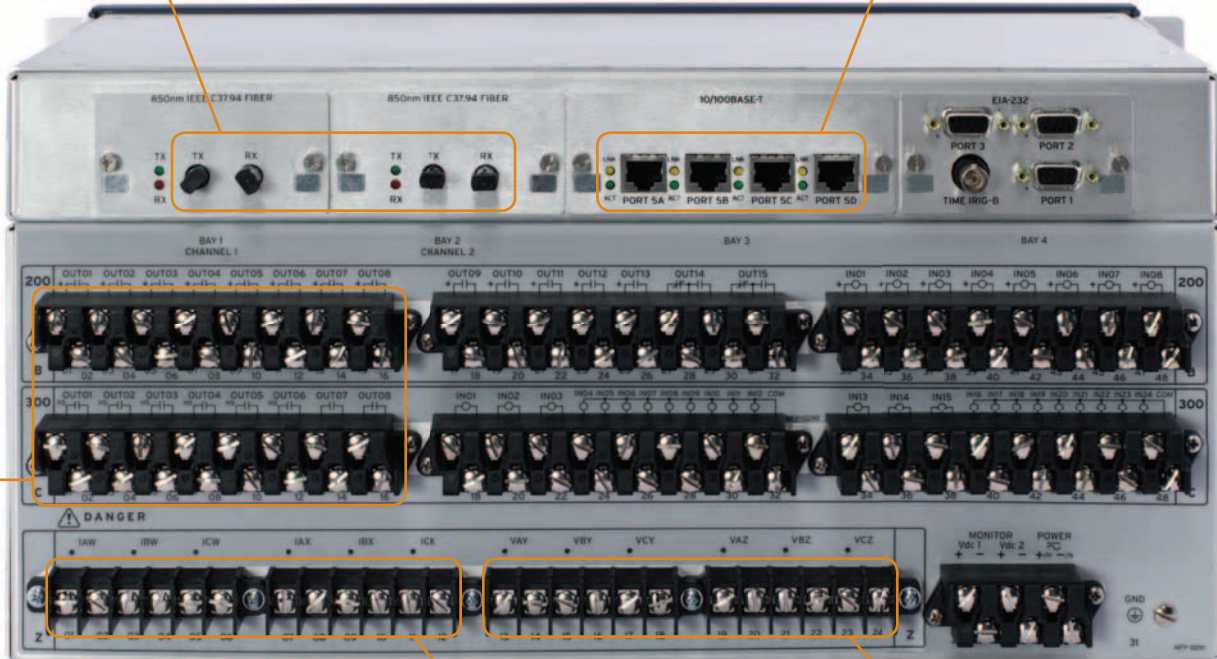
Apply the built-in charging current compensation feature to improve sensitivity and speed of the differential protection.



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Use fiber or electric connections for one or two communications channels. Simple, removable tray and self identification make changing channel types easy.

Communicate using fiber or copper Ethernet for engineering access, SCADA, IEC 61850 GOOSE, or multiterminal differential protection.



Use high-speed contacts for tripping and standard contacts for alarms and interlocking.

Apply six current inputs for double-breaker applications.

Connect six voltage inputs for alternate voltage source or synchronizing.

Wide-Area Measurements

Synchrophasor Measurements

View absolute phase angles from across the power system.

High-Accuracy Timing

Use precise time stamping to improve analysis of wide-area events.

Real-Time Control

Provide local control based on wide-area measurements.



SYNCHROWAVE® Software concentrates and displays data from across the power system.



Pullman, Washington USA
Tel: +1.509.332.1890 • Fax: +1.509.332.7990 • www.selinc.com • info@selinc.com

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