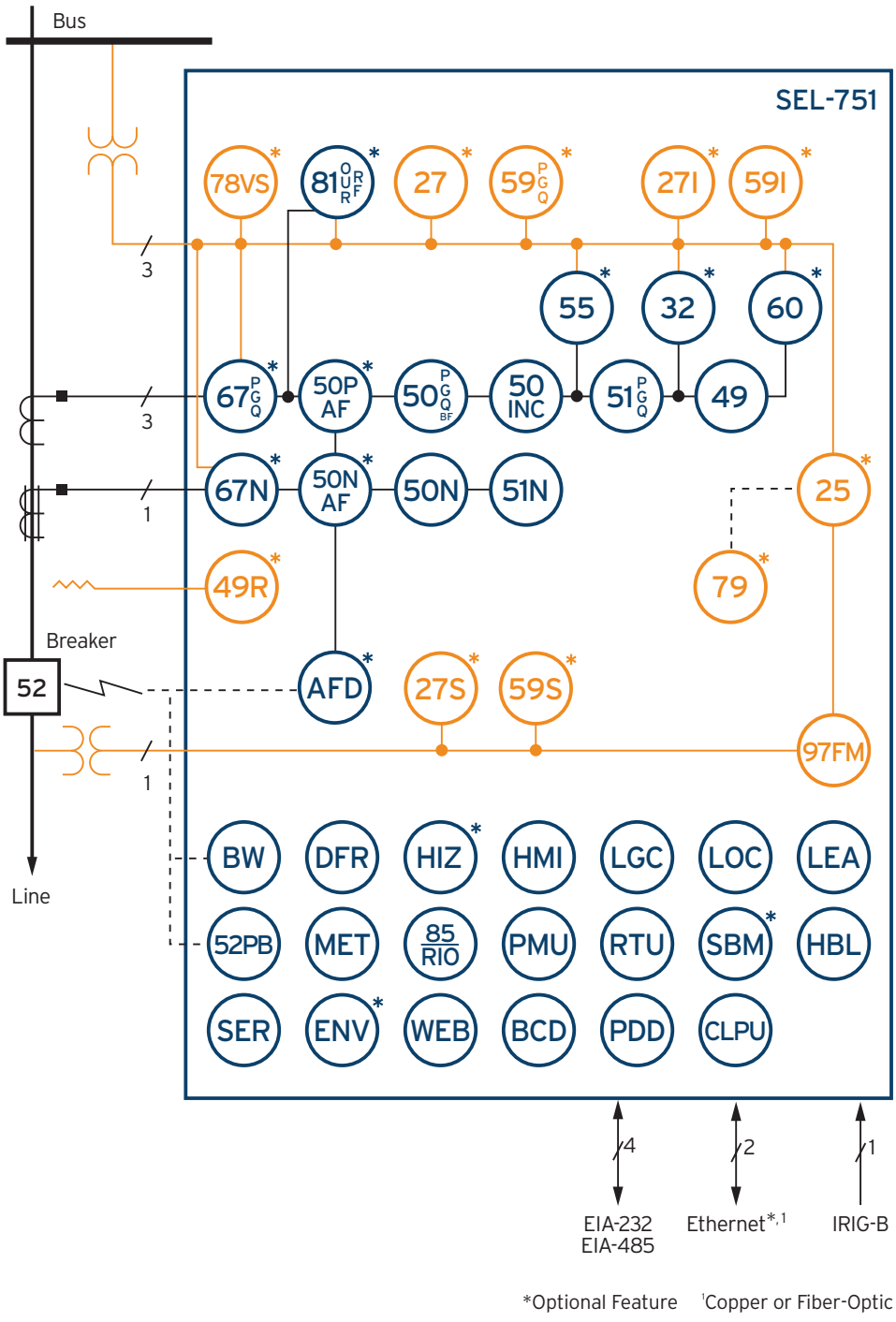
SEL-751

Feeder Protection Relay

2 ms arc-flash protection and feeder relay in one platform

- Support low-energy analog (LEA) voltage sensor inputs and Rogowski coil or low-power current transformer (LPCT) inputs in small-enclosure installations.
- Detect open-phase conditions with phase discontinuity detection logic.
- Prevent faults caused by broken conductors on single-circuit lines using broken-conductor detection, and mitigate possible fire hazards.
- Safely re-energize your system after an extended outage with the cold-load pickup element.
- Improve network recovery via alternate paths in a network with the Rapid Spanning Tree Protocol (RSTP).

Functional Overview



*Optional Feature [1]Copper or Fiber-Optic

ANSI Numbers/Acronyms and Functions	
25	Synchronism Check*
27	Definite-Time Undervoltage*
27I	Phase Undervoltage With Inverse Characteristic*
27S	Synchronism-Check Undervoltage*
32	Directional Power*
49	IEC Cable/Line Thermal
49R	RTD Thermal*
50	Adaptive Overcurrent
50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
50BF	Breaker Failure
50INC	Incipient Cable Fault Detection
50N	Neutral Overcurrent
50N AF	Arc-Flash Neutral Overcurrent*
50P AF	Arc-Flash Phase Overcurrent*
51 (P,G,Q)	Time Overcurrent (Phase, Ground, Negative Sequence)
51N	Neutral Time Overcurrent
52PB	Trip/Close Pushbuttons
55	Power Factor*
59 (P,G,Q)	Definite-Time Overvoltage (Phase, Ground, Negative Sequence)*
59I	Overvoltage With Inverse Characteristic*
59S	Synchronism-Check Overvoltage*
60	Loss of Potential*
67 (P,G,Q)	Directional Overcurrent (Phase, Ground, Negative Sequence)*
67N	Directional Neutral Overcurrent*
78VS	Vector Shift*
79	Autoreclosing*
81 (O,U,R,RF)	Over-/Underfrequency (Rate, Fast Rate)*

Additional Functions	
85 RIO	SEL Mirrored Bits® Communications
97FM	Frequency Component Detection
AFD	Arc-Flash Detector*
BCD	Broken Conductor Detection
BW	Breaker Wear Monitoring
CLPU	Cold-Load Pickup
DFR	Event Reports
ENV	SEL-2600 RTD Module Support*
HBL	Harmonic Blocking
HIZ	SEL Arc Sense™ Technology (AST)*
HMI	Operator Interface
LDE	Load Encroachment
LDP	Load Data Profiling
LEA	Rogowski Coil or LPCT Inputs and LEA AC Voltage Inputs (8 Vac RMS)
LGC	SELogic® Control Equations
LOC	Fault Locator
PDD	Phase Discontinuity Detection
PMU	Synchrophasors
RTD	10 Internal or 12 External (see ENV) RTD Inputs*
RTU	Remote Terminal Unit
SBM	Station Battery Monitor*
SER	Sequential Events Recorder
WEB	Web Server

*Optional Feature

Key Features

Feeder Protection

Protect radial and looped distribution circuits with comprehensive protection capabilities, including time overcurrent, directional overcurrent, autoreclosing, over-/undervoltage, frequency, cable/line thermal, and more.

LEA Sensor Inputs

Apply the SEL-751 in applications that use low-energy current/voltage sensors. LEA sensors for measurement of primary voltages and currents offer excellent linearity, a wide dynamic range, reduced size and weight, and enhanced personnel safety. The LEA current/voltage input card supports three current channels that are either Rogowski coil or low-power current inputs, three LEA voltage sensor inputs, and one 200 mA neutral input. LEA current and voltage channels accept an RJ45 connector input, and the 200 mA neutral channel accepts a terminal block input.

Expanded Arc-Flash Solutions

Improve safety with options for either four or eight arc-flash detection (AFD) inputs to improve arc-flash coverage. The SEL-751 Feeder Protection Relay offers combined light and high-speed overcurrent detection for arc-flash events. This combination provides the ideal solution for speed and security.

Sensitive Earth Fault (SEF) Protection

Improve ground protection with the 200 mA neutral input. You can protect ungrounded, solidly grounded, Petersen coil-grounded, or other impedance-grounded systems with a sensitive 67N or 50N element for directional or nondirectional ground overcurrent, respectively.

High-Impedance Fault Detection

Detect downed conductors, even on poorly conducting surfaces, with Arc Sense technology (AST). AST algorithms detect arcing produced by some high-impedance faults and will send an alarm or trip the breaker. This technology provides an added level of protection over conventional feeder protection methods.

Islanding Protection

Detect islanding conditions using the vector shift function. The SEL-751 quickly identifies waveform changes during islanding operations and provides logic to support a systematic response to changing grid conditions.

Cold-Load Pickup Element

Cold-load pickup is the phenomenon that takes place when a distribution circuit is re-energized following an extended outage of that circuit. Cold-load pickup can result in current levels that are significantly higher than normal peak load levels. This excess amount of current draw could be falsely identified as an overcurrent condition by the relay. The cold-load pickup element identifies possible cold-load pickup events per the settings in a distribution line after an outage.

Incipient Cable Fault Detection

Cable insulation degrades over time. The incipient cable fault detection element can monitor for self-extinguishing, half-cycle overcurrent events that precede typical cable insulation failure. Monitoring the number of incipient faults can provide an early warning of cable insulation breakdown for preventative maintenance.

Automation and Control

Apply the SEL-751 on feeders to provide protection, automation, and control capabilities, all in one package. SELOGIC torque control equations support many automated applications without the need for additional automation controllers. The configurable front-panel pushbuttons can replace conventional panel controls and simplify overall applications and wiring. The 14 digital inputs (DI) card option expands available contact inputs for enhanced automation solutions.

Thermal Protection

Protect cable and feeder insulation against thermal damage using the IEC 49 cable/line thermal element. It extends conductor life and provides backup protection for the overcurrent elements.

Event Analysis

Conduct post-event analysis more efficiently with detailed event records. You can combine oscillographic and digital information to find root cause. Adding a satellite-synchronized time source, like an SEL satellite-synchronized clock (e.g., SEL-2401 or SEL-2407®), provides convenient alignment of event information from multiple devices.

Reliable in Harsh Environments

All SEL relays are designed to operate in harsh environments where other relays may fail. The SEL-751 operates in extreme conditions, with an operating temperature of −40° to +85°C (−40° to +185°F), and is designed and tested to exceed applicable standards, including vibration, electromagnetic compatibility, and adverse environmental conditions. In addition, the SEL-751 is ATEX- and Underwriters Laboratories (UL) Class I, Division 2-certified for use in hazardous and potentially explosive environments.

Open Conductors Detection

Apply the SEL-751 to detect and isolate open conductors. The SEL-751 incorporates phase discontinuity detection and optional broken conductor detection to provide a reliable solution for open-conductor faults that convert to high-impedance faults.

Wildfire Risk Reduction

Identify downed conductors and minimize wildfire risk by detecting high-impedance faults. SEL's unique AST detects and clears faults that might not be detected by traditional overcurrent protection.

Flexible Communications

Advanced protocols support communications using legacy and modern supervisory and control systems. These protocols include IEC 61850 Edition 2.1, RSTP, EtherNet/IP, the IEEE 1588 Precision Time Protocol (PTP) (firmware-based), IEC 60870-5-103, DNP3, Modbus TCP/IP, Telnet, the File Transfer Protocol (FTP), the Simple Network Time Protocol (SNTP), Mirrored Bits communications, and ASCII. In addition, the IEC 61850 test mode in the SEL-751 enables in-service testing, which reduces commissioning time.

Product Overview

Touchscreen Overview

The 5-inch color display with a resolution of 800 × 480 offers direct navigation via a capacitive touchscreen.

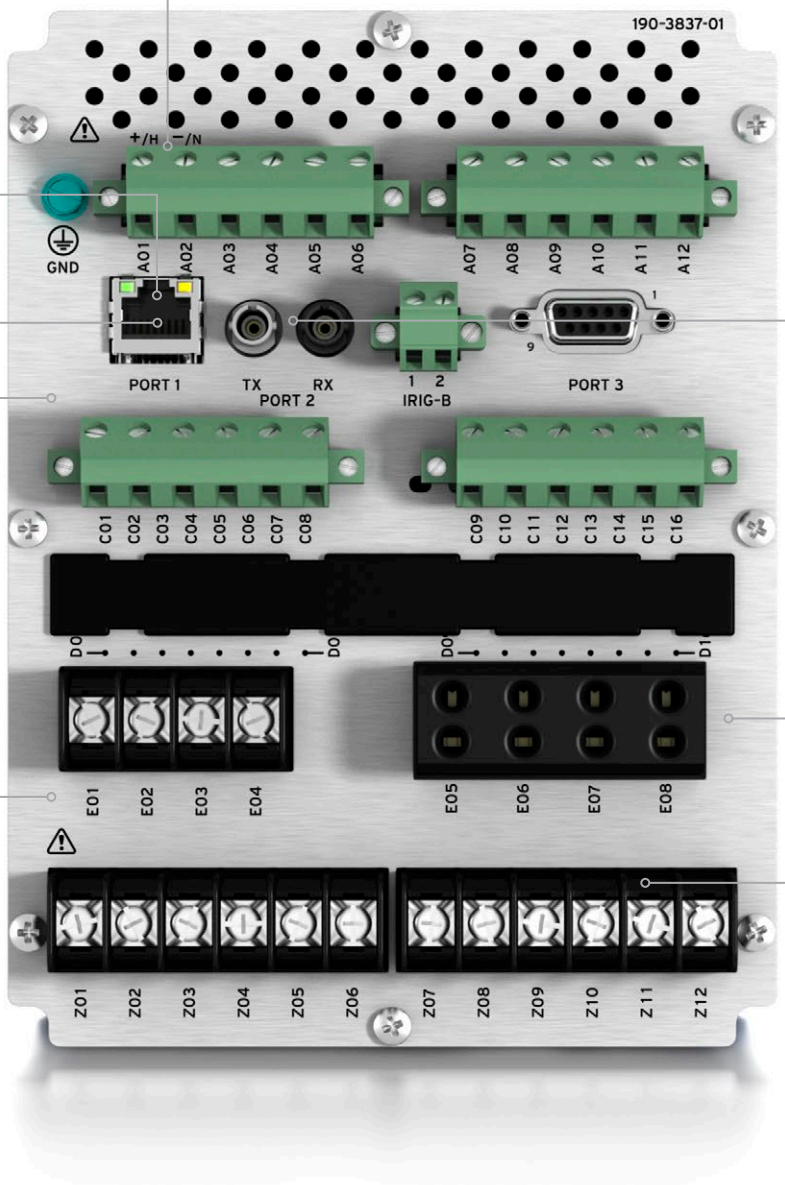
A full onscreen keyboard facilitates easy adjustment of settings.

Folders and applications provide quick access to bay screens, metering and monitoring data, reports, settings, and more.

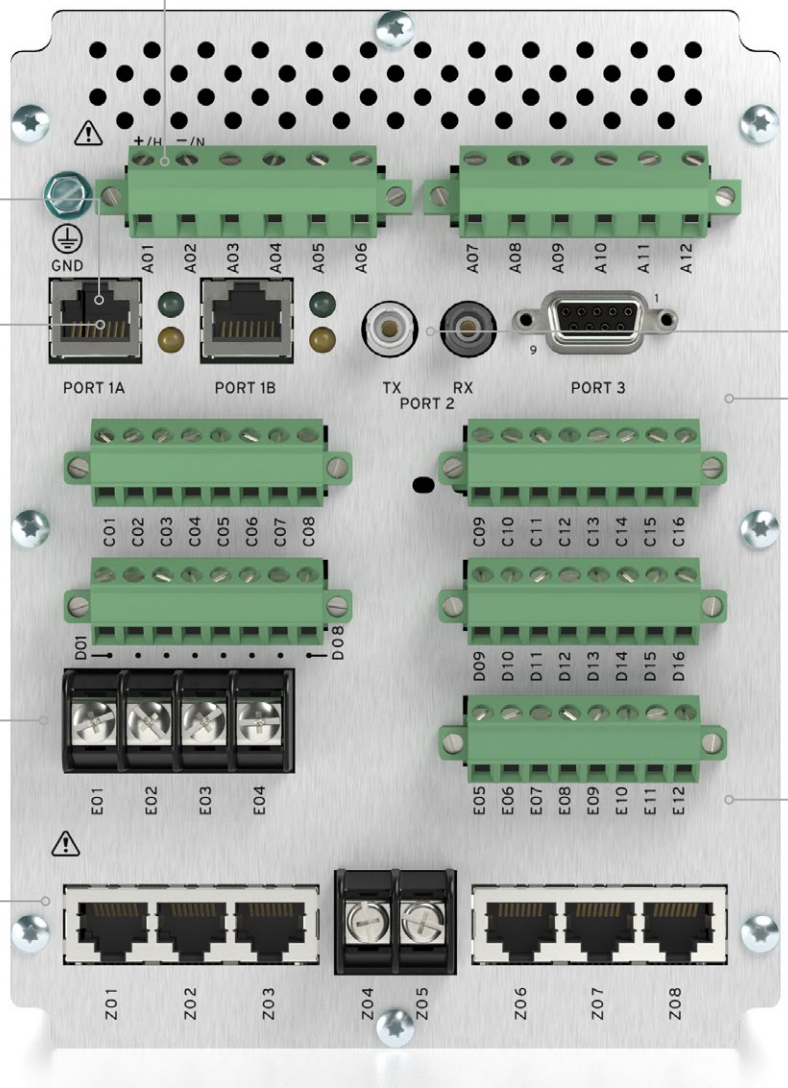
The front panel is available in English or Spanish.

The home pushbutton allows users to easily return to the default home screen.

Conventional CT and PT Input Option



LEA Current and Voltage Inputs Option



*Compliant with IEC 61869-10, -11 standards.

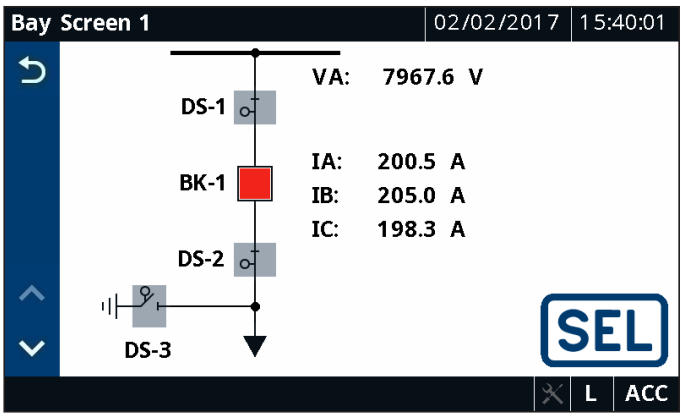
Touchscreen Display Features and Functions

The SEL-751 5-inch, 800 × 480 color touchscreen display mimics a one-line diagram for bay control and monitoring. With it, you can view metered quantities, phasor diagrams, relay settings, event summaries, target statuses, and Sequential Events Recorder (SER) data.

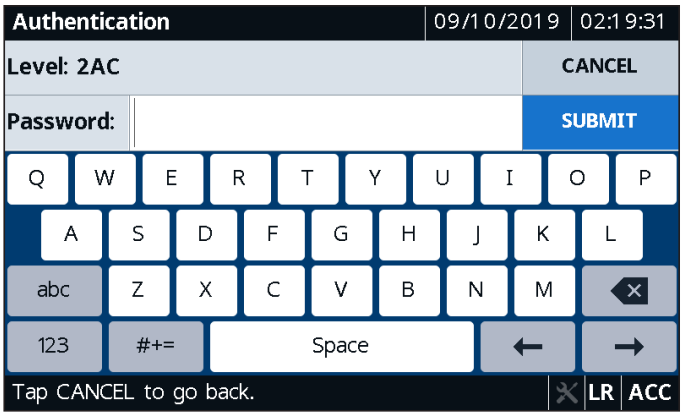
Bay Screens and Bay Control

Select from predefined bay screens, or configure as many as five custom bay screens using the ACSELERATOR® Bay Screen Builder SEL-5036 Software and ACSELERATOR QuickSet® SEL-5030 Software. You can control one breaker, eight two-position disconnects, and two three-position disconnects and can view analog and digital data in a contextual display.

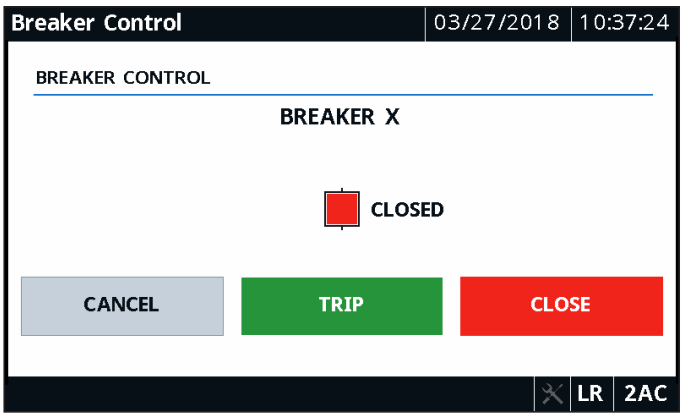
To control a breaker or disconnect, simply tap the Bay Screens application on the home screen and then the breaker or disconnect you want to control.



Next, enter your Level 2 password and tap Submit. The onscreen keyboard allows you to quickly and easily enter passwords, search for Relay Word bits, and enter settings.

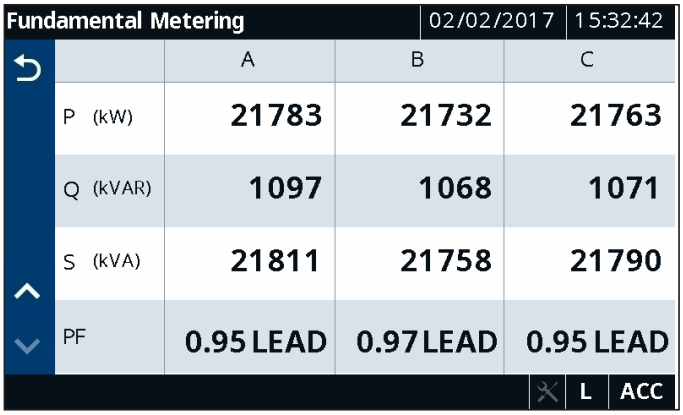


Finally, tap Trip or Close to control the breaker. When asked to confirm the action before the operation is completed, choose Yes or No.



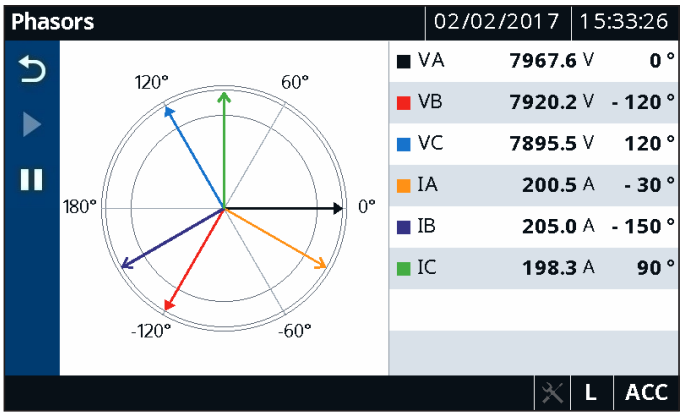
Meter Fundamentals

View the real, reactive, and apparent power of each phase in your system, and monitor the power factor information to determine if the phase current leads or lags the phase voltage.



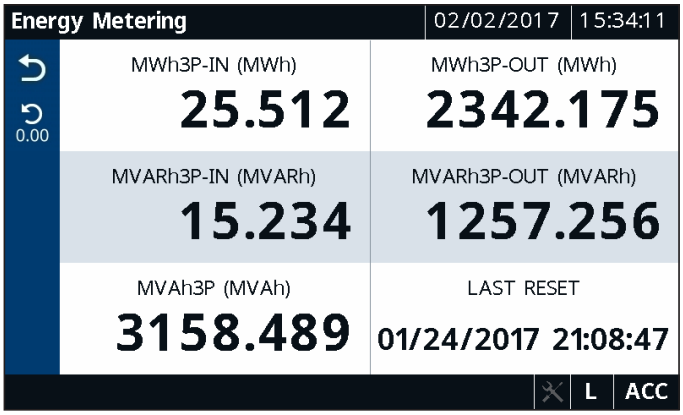
Meter Phasors

View a graphical and textual representation of the real-time voltages and currents in a power system during balanced and unbalanced conditions. By analyzing the phasors, you can determine power system conditions.



Meter Energy

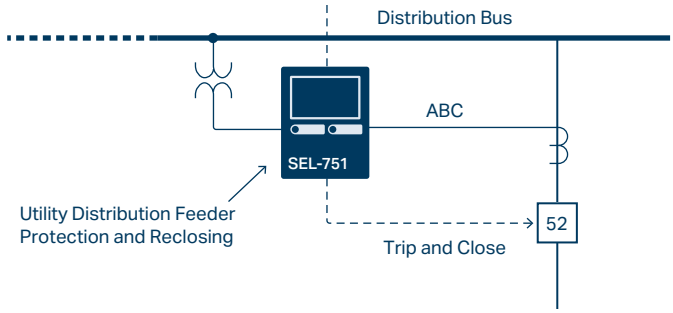
Display the real, reactive, and apparent energy metering quantities imported and exported by your system. You can reset the energy values via the display and record the time and date of reset. Whether your system is a net energy producer or consumer, metered quantities accurately account for the power system energy flow.



Applications

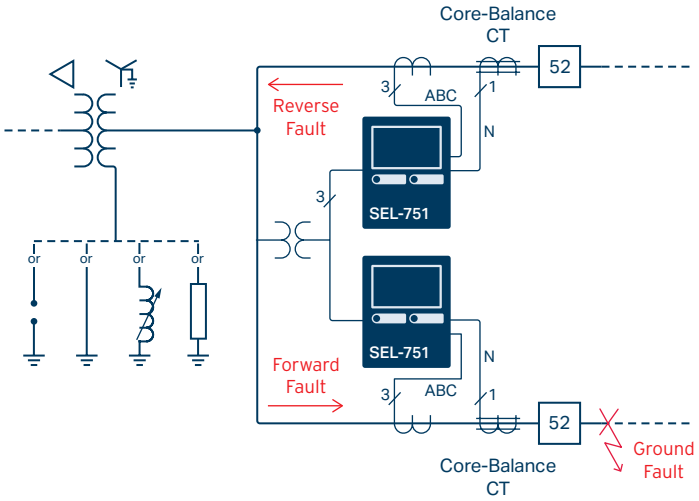
Feeder Protection

Provide comprehensive protection capabilities, including time overcurrent, directional overcurrent, over-/undervoltage, autoreclosing, frequency, and much more.



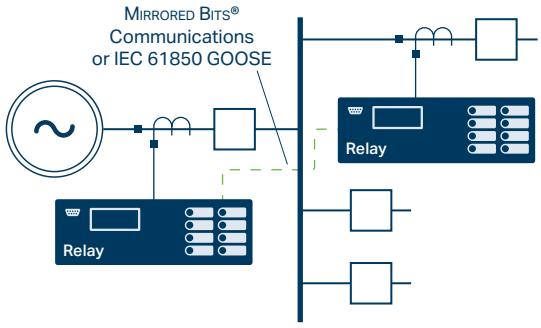
Sensitive 67N or 50N for Grounded Systems

With the 200 mA neutral current input, the SEL-751 is ideal for sensitive-ground directional or nondirectional overcurrent protection applications in systems with a wide variety of grounding configurations. The sensitive neutral element detects ground faults and identifies whether the ground fault is forward or reverse of the protective device.



Coordinate Protection

Use SEL Mirrored Bits or IEC 61850 GOOSE communications to coordinate upstream protection if a fault occurs. Coordination and fast bus trip schemes allow short delays (two or three cycles) for backup protection, reducing arc-flash energy.

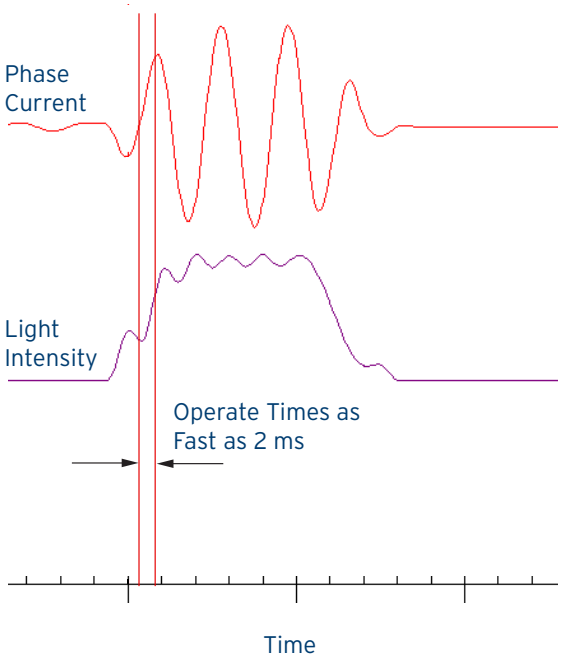


Reduce Arc-Flash Hazards

The SEL-751 combines light-sensing technology with fast overcurrent protection to provide high-speed arc-flash detection as fast as 2 milliseconds without false tripping.

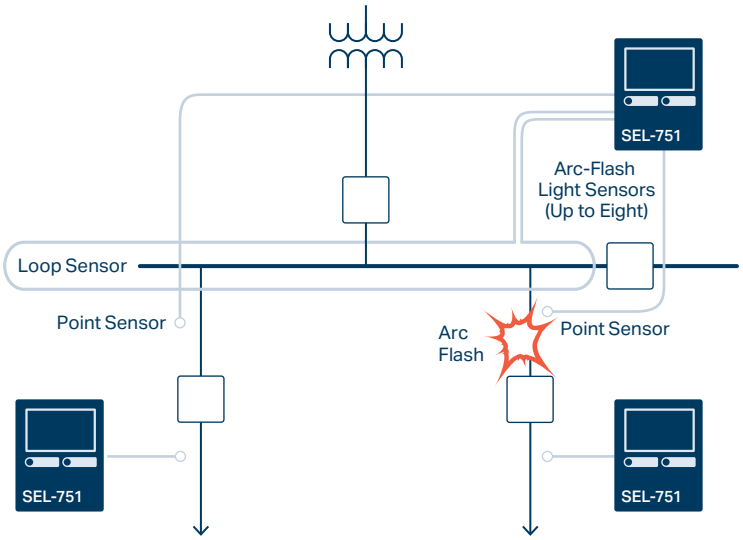
Fast and secure arc-flash mitigation reduces the incident energy of arc-flash events. SEL-751 relays also have integration and communications features for secure remote access to help you keep out of the danger zone while gathering important real-time and historical data from the relays. You can coordinate protection for faster clearing times and stay outside the danger zone completely with wireless or remote communications.

If you must be in the danger zone, know the dangers and wear appropriate personal protective equipment. If you do not know the arc-flash ratings and zones for your gear, the SEL Engineering Services team provides professional arc-flash hazard studies and practical approaches to mitigate arc-flash risks.



Arc-Flash Mitigation

Improve safety and prevent damage with arc-flash detection in the SEL-751. Point sensors, window sensors, loop sensors, or a combination protect a variety of switchgear configurations. You can order either four or eight arc-flash sensor inputs. The high-speed output contacts obtain the fastest response to arcing faults.

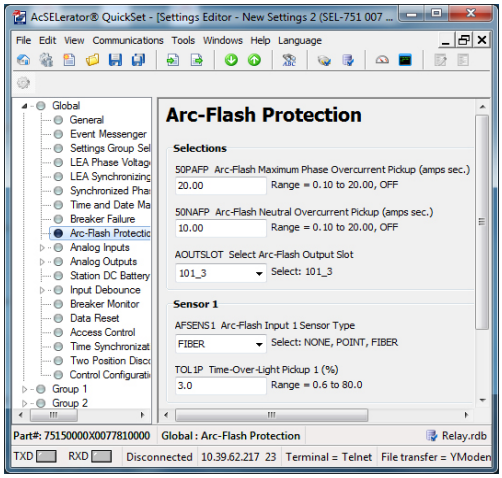


Easy to Set and Use

Use QuickSet Software to Set, Monitor, and Control the SEL-751

With QuickSet, you can:

- Save engineering time while keeping flexibility. Communicate with the SEL-751 through any ASCII terminal, or use the QuickSet graphical user interface.
- Develop settings offline with a menu-driven interface and completely documented help screens. You can speed up installation by copying existing settings files and modifying application-specific items.
- Simplify the setting procedure with the rules-based architecture to automatically check interrelated settings. Out-of-range or conflicting settings are highlighted for correction.



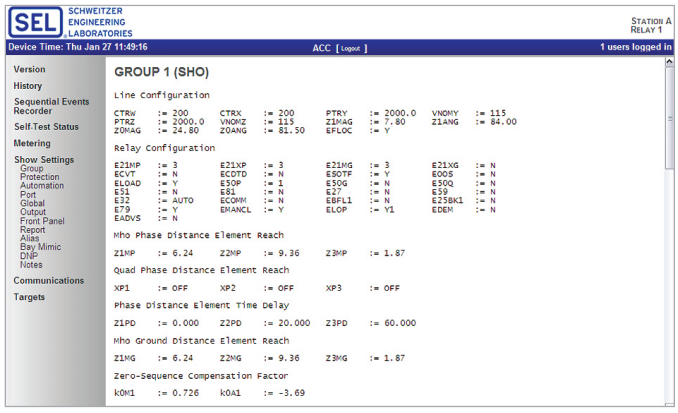
Use SEL-5601-2 SYNCHROWAVE® Event Software to Retrieve and Display Event Reports Recorded by the SEL-751

With SYNCHROWAVE software, you can:

- Display event report oscillograms. You can view each report as a plot of magnitude versus time and select analog and digital points to build a custom display. You can analyze arc-flash events using light intensity and phase current waveforms recorded during the arc fault.
- Display phase and symmetrical component phasors. Displaying the phasor view of electrical data helps you better understand asymmetrical, three-phase faults. You can build a custom plot using per-phase and symmetrical component sequence currents and voltages.
- Retrieve event reports using serial or Ethernet communications links.

Get Information Easily With the Integrated Web Server

Access basic SEL-751 information on a standard Ethernet network with the built-in web server. You can view the relay status, SER data, metering information, and settings with easy access within a local network. For increased security, web server access requires a relay password and the information is limited to a read-only view. You can also upgrade relay firmware through the web server.



SEL-751 Options

Expansion Cards
4 Digital Inputs (DI), 4 Digital Outputs (DO)
4 DI, 4 DO With High-Speed, High-Current DO
4 DI, 3 DO (2 Form C, 1 Form B)
3 DI, 4 DO, 1 Analog Output (AO)
4 Analog Inputs (AI), 4 AO
8 AI
8 DI
14 DI
10 RTD Inputs
8 DO
Three-Phase AC Voltage Inputs (300 Vac)
LEA Voltage Inputs (8 Vac RMS)
LEA Voltage Sensor Inputs, Rogowski Coil/LPCT Inputs, and Conventional 200 mA Sensitive Neutral Input
8 AFD Inputs
Vsync, Vbat, 4 AFD Inputs
Vsync, Vbat, 7 DI

Other Options
Conformal Coating
Configurable Labels
SEL-4520 Arc-Flash Test Module
SEL-C804/SEL-C814 Fiber-Optic AFD Sensors and Accessories

Order either four or eight arc-flash sensor inputs.

Retrofit Replacement Kits

Mount the SEL-751 into multiple locations using our complete line of mounting and enclosure options. You can choose from panel-mount, rack-mount, wall-mount, indoor, or outdoor configurations.

No cutting or drilling is required when you use the optional mounting kits. Replacing existing protection is quick and easy!

Visit **selinc.com/applications/mountingselector** to see the complete selection of mounting and enclosure kits.

SEL-751 Specifications

General

Displays	2 × 16-character LCD 5-inch color touchscreen display, 800 × 480 pixels
AC Current Inputs	5 A or 1 A phase and 5 A, 1 A, or 200 mA neutral
Rogowski Coil-Based AC Current Inputs (RJ45)	30 Vac (phase-to-neutral) continuous, ±185 V_{peak}, 200 Vac for 10 seconds Compliant with IEC 61869-10 standard
LPCT Inputs (RJ45)	4 Vac continuous, ±11.3 V_{peak}, 200 Vac for 10 seconds
AC Voltage Inputs	300 Vac continuous, 600 Vac for 10 seconds
LEA Voltage Inputs	8 Vac (phase-to-neutral), ±12 V_{peak}, 300 Vac for 10 seconds
LEA Voltage Sensor Inputs (RJ45)	8 Vac (phase-to-neutral), ±12 V_{peak}, 200 Vac for 10 seconds Compliant with IEC 61869-11 standard
Output Contacts	The relay supports Form A, B, and C outputs.
Optoisolated Control Inputs	DC/AC control signals: 250, 220, 125, 110, 48, or 24 V As many as 26 inputs are allowed in ambient temperatures of 85°C (185°F) or less. As many as 34 inputs are allowed in ambient temperatures of 75°C (167°F) or less. As many as 44 inputs are allowed in ambient temperatures of 65°C (149°F) or less.
Frequency and Phase Rotation	System frequency: 50, 60 Hz Phase rotation: ABC, ACB Frequency tracking: 15—70 Hz (requires ac voltage inputs)
Arc-Flash Time-Overlight® Elements (TOL1—TOL8)	Pickup time: 2—5 ms Dropout time: 1 cycle
Communications Protocols	SEL (Fast Meter, Fast Operate, and Fast SER), Modbus TCP/IP, Modbus RTU, DNP3, FTP, IRIG-B, Telnet, SNTP, EtherNet/IP, firmware-based IEEE 1588 PTP, IEC 61850 Edition 2.1, IEC 60870-5-103, the Parallel Redundancy Protocol (PRP), RSTP, Mirrored Bits communications, and IEEE C37.118-2005 (synchrophasors).
Language Support	English and Spanish
Power Supply	110—250 Vdc or 110—240 Vac Input voltage range: 85—300 Vdc or 85—264 Vac 24—48 Vdc Input voltage range: 19.2—60 Vdc
Operating Temperature	−40° to +85°C (−40° to +185°F) Note: LCD contrast is impaired for temperatures below −20°C (−4°F) and above +70°C (+158°F).
Certifications	To view certifications for the SEL-751, please visit **selinc.com/company/certifications**.

SEL SCHWEITZER ENGINEERING LABORATORIES

Making Electric Power Safer, More Reliable, and More Economical
+1.509.332.1890 | info@selinc.com | selinc.com

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