SEL-FLT and SEL-FLR

Fault and Load Transmitter and Receiver System

Improve distribution system reliability

- Locate faults faster to reduce outage durations and improve the average restoration time.
- Use accurate load data for switching decisions, phase balancing, and system planning.
- Identify momentary faults to address system issues and reduce momentary interruptions.
- Rely on strong integrated security that mitigates cyber threats.
- Deploy the system quickly in pole-mount applications using the fully integrated SEL-FLR enclosure.

SEL Fault and Load Transmitter and Receiver System

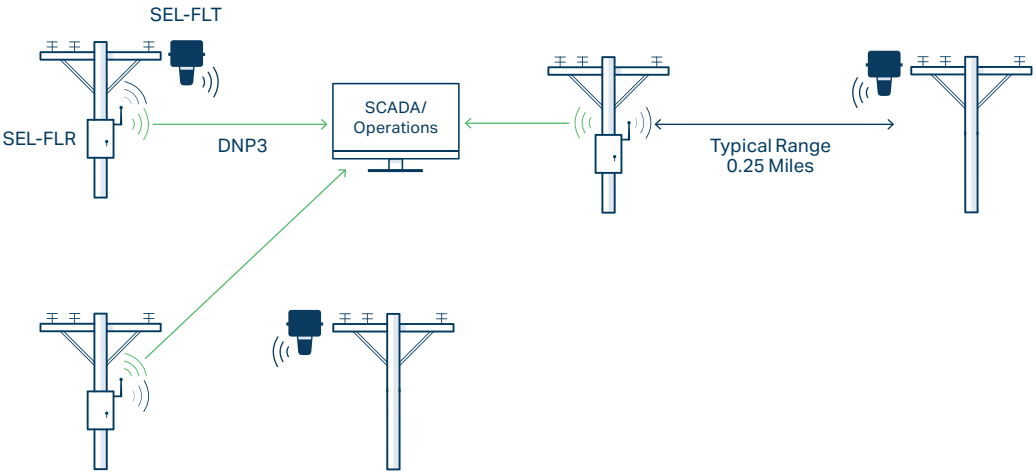
The SEL-FLT Fault and Load Transmitter and the SEL-FLR Fault and Load Receiver work in combination to collect periodic load data and fault status and to send the information to a remote SCADA system via DNP3 messages. The system allows utilities to pinpoint faulted branches on distribution circuits faster and to monitor load fluctuations in a distribution circuit, thereby improving reliability.

SEL-FLT transmitters detect faults with magnitudes from 25 to 25,000 A and use SEL AutoRANGER® technology to maintain optimum trip thresholds as load conditions vary. When a fault occurs, bright LEDs provide indications for different types of events and are visible from as far as 50 m during the day and 100 m at night. The transmitters also provide peak and average load data with 1 percent typical accuracy and selectable reporting intervals as frequent as every 5 minutes.

When a fault occurs, the SEL-FLT wirelessly transmits a fault or outage status to an SEL-FLR. The SEL-FLR receives the fault and load status from several SEL-FLT transmitters located in the receiver's line of sight. It then passes the sensor data through a wired or wireless network to the central SCADA master via the DNP3 protocol. With this type of fault information and load data, utilities can quickly dispatch crews to restore power, locate momentary faults, make better decisions in emergency switching situations, and more.

Quick System Deployment

The SEL-FLR enclosure option makes installing the system in pole-mount applications quick and easy. It has a built-in mounting bracket and prewired connections for power, communications, and antenna circuits. The enclosure contains an SEL-FLR, an uninterruptible power supply, and other related equipment to provide connectivity with SEL-FLT transmitters. An SEL-3061 Cellular Router can be pre-installed to provide secure communications over public cellular networks to SCADA, or you can self-install your own backhaul radio. The enclosure also includes DIN-rail space for mounting additional hardware, such as the SEL-3505-3 Real-Time Automation Controller (RTAC) for local automation schemes.



SEL-FLR Enclosure Overview

Fiberglass enclosure

Optional SEL-3061 Cellular Router for secure communications over public cellular networks to SCADA

Built-in mounting bracket for quick deployment on distribution poles

Four front-facing Ethernet ports for ease of access during setup

SEL-FLR collects fault, load, and heartbeat information from SEL-FLT transmitters

Power supply

Uninterruptible power supply

Backup battery for ride-through during distribution system reconfiguration events and to ensure fault indication messages are sent during permanent outages

Fused ac power input

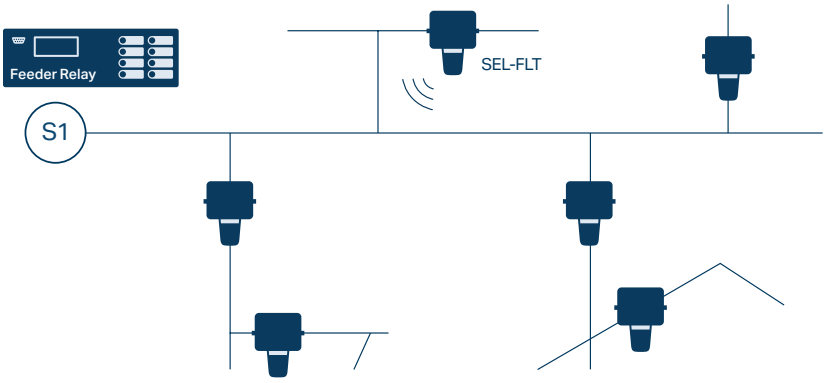
DIN-rail space to self-install an SEL-3505-3 RTAC for local automation schemes (ordered separately)

Three surge-arrested external antenna ports: one for an SEL-FLR antenna and two for backhaul radio antennas

Applications

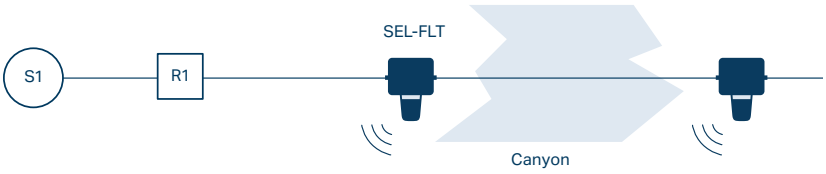
Distribution Taps and Laterals

Installing SEL-FLT transmitters on taps and laterals provides a more granular and extended view of the distribution system.



Difficult-to-Access Terrain

Use SEL-FLT transmitters to monitor lines over terrain that is difficult to access and to eliminate unnecessary patrolling in those areas.



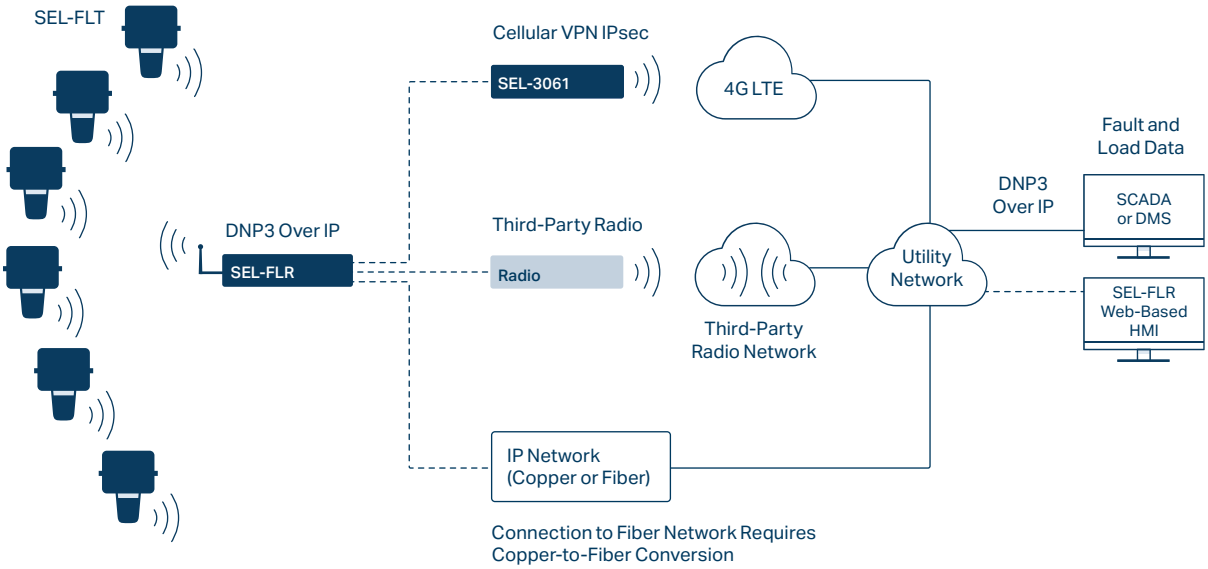
SEL-FLT and SEL-FLR System Integrates With Your Existing System

The SEL-FLR integrates easily into existing networks and centralized SCADA systems with Ethernet ports and DNP3/IP output. Pair the SEL-FLR with a cellular modem or router or an Ethernet radio, or plug the receiver directly into a wired Ethernet network. Once connected, data from the SEL-FLT transmitters can flow into a SCADA system or distribution management system (DMS). You can perform configuration and troubleshooting of the SEL-FLT and SEL-FLR system over the network.

With fault information from the SEL-FLT and SEL-FLR system, utility operations teams can dispatch crews to fault locations faster, speeding up restoration. Flashing LEDs on the SEL-FLT transmitters provide local identification for line crews confirming the fault indication reported through the SCADA system.

The SEL-FLT and SEL-FLR system can also help engineers locate momentary faults. Addressing the causes of these faults, such as overgrown tree limbs or aging insulators, reduces future faults and momentary interruptions.

Highly accurate and timely load data from SEL-FLT transmitters on taps and laterals enables better decision-making in emergency switching situations. Load data are also essential for phase balancing, system planning, and identifying potential power theft.



SEL-FLT Transmitters Offer the Right Balance of Capabilities and Simplicity

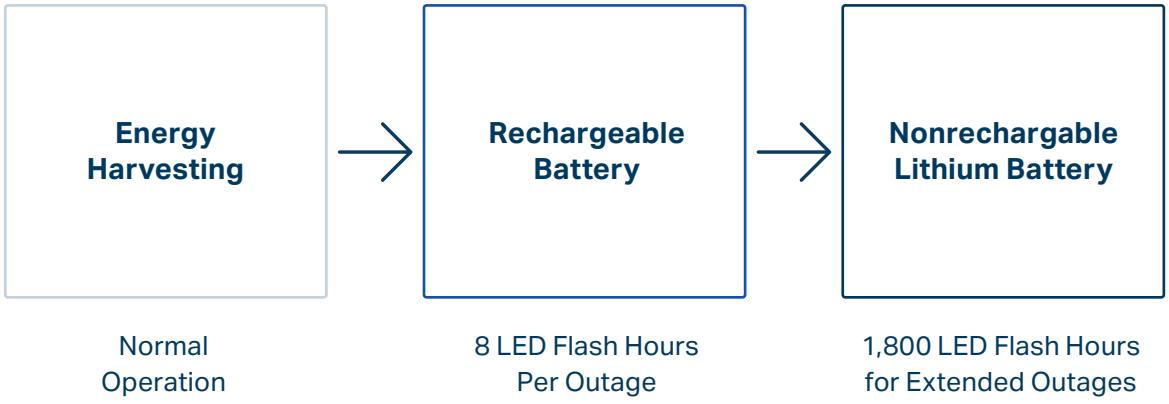
SEL-FLT transmitters improve distribution reliability while reducing ongoing costs and complexity. They weigh 3.6 lb, and you can install them with a single hot stick. The transmitters operate on distribution lines with as little as 3.5 A of continuous current. The lower current requirement means that you can deploy the SEL-FLT transmitters in far more areas of the distribution system.

Accuracy is important when load data are used for real-time switching decisions. The SEL-FLT provides high-accuracy load data reporting as frequently as every 5 minutes. In addition, it uses line powering to eliminate maintenance and ongoing costs associated with replaceable batteries.

The SEL-FLT uses a three-tier system to power its operation:

- Power Harvesting—Requires a minimum of 3.5 A.
- Rechargeable Battery—Provides 8 hours of flashing time and wireless communications.
- Permanent Battery—Provides an additional 1,800 LED flash hours over the life of the product.

Like other SEL products, the SEL-FLT is designed and built for reliable operation in harsh conditions. The SEL-FLT is rated to IP66. Its enclosure protects against wind, rain, and snow and has an operating temperate range of −40° to +85°C. The SEL-FLT is backed by a ten-year warranty and our renowned technical support.



SEL-FLR Receiver Is Secure and Easy to Integrate

The SEL-FLR receiver provides two-way communication with SEL-FLT transmitters. The receiver collects fault, load, and heartbeat information from the transmitters and consolidates it into a single DNP3 map for the SEL-FLT and SEL-FLR system. The receiver also sends settings to the transmitters for configuration.

The SEL-FLR outputs DNP3 over IP, making it easy to integrate into SCADA systems and Ethernet networks. In addition, all the software required to configure and manage the SEL-FLT and SEL-FLR system is built into the SEL-FLR web interface; there is no additional software to purchase, certify with IT, and manage.

The SEL-FLR offers comprehensive security to protect your system from cyber attacks. Wireless communication is protected with 128-bit encryption as well as message and device authentication. Users are authorized using role-based access, and you can lock down unused Ethernet ports. If security events occur, like failed access attempts, the SEL-FLR can send information on these events to Syslog destinations.

Specifications

SEL-FLT

General	Operating temperature range: −40° to +85°C (−40° to +185°F) Storage temperature range: −40° to +85°C (−40° to +185°F) Ingress protection: IP66 Clamp range: 6.4–38.1 mm (0.25–1.5 in) Dimensions: 159 mm × 192 mm × 252 mm (6.3 in × 7.6 in × 9.9 in) Weight: 1.6 kg (3.6 lb) **Operating Environment** Pollution degree: 2 Relative humidity: 5%–95%, noncondensing Maximum altitude: 2,000 m (6,562 ft)
System	Frequency range: 50–60 Hz Current range: 3–600 A Maximum voltage: 69 kV (line to line)
Fault Detection	Trip threshold range: 25–1,600 A Fault detection accuracy: ±2 A + 4% Maximum fault current: 25 kA for 10 cycles Trip response time: 24 ms at 60 Hz (default)
Load Measurement	Current range: 3–600 A **Measurement Accuracy** ±0.25 A + 1% from 5–600 A (typical) ±2.5 A + 2% from 5–600 A (maximum) ±3 A from 3–5 A (maximum)
Power	Minimum continuous operating current: 3.5 A Battery capacity: 19 Ah Battery shelf life: 20 years
Flash Hours	Harvested power flash time: 8 LED flash hours (per outage) Battery flash time: 1,800 LED flash hours for extended outages

SEL-FLR

General	RF connector: TNC **Temperature Range** SEL-FLR: −40° to +85°C (−40° to +185°F) per IEC 60068-2-1 and 60068-2-2 SEL-FLR enclosure With SEL-3061: −25° to +50°C (−13° to +122°F) Maximum loading (SEL-3061 and <10 W of accessories): −25° to +40°C (−13° to +104°F) Without direct sunlight: Increase maximum temperatures by 15°C (27°F) **Dimensions** SEL-FLR (wall mount): 216 × 165.1 × 44.5 mm (8.5 × 6.5 × 1.75 in) SEL-FLR enclosure: 685.8 × 405.7 × 276.5 mm (27 × 15.97 × 10.89 in) **Operating Environment** Pollution degree: 2 Relative humidity: 5%–95%, noncondensing Maximum altitude: 2,000 m (6,562 ft)
Communications (Ethernet)	Ports: 3 (1 front, 2 rear) Data rate: 10/100 Mbps Front and rear connectors: RJ45 Standard: IEEE 802.3
Power Supply	**SEL-FLR** Input voltage range: 12–24 Vdc Power consumption: <10 W **SEL-FLR Enclosure** Input voltage: 120 Vac nominal AC power consumption: <39 W Usable dc load: <25 W

Both SEL-FLT and SEL-FLR

Wireless System	
Frequency Band	902—928 MHz ISM
Occupied Bandwidth	850 kHz
Modulation	Digital modulation, 2-FSK
Operating Mode	Point-to-multipoint
Power Output	26 dBm
Number of Channels	25, nonoverlapping
Sensitivity	—102 dBm ±2 dB at 5% PER
Link Data Rate	62.5 kbps
Typical Effective Line-of-Sight Range	Receiver antenna mounted on a distribution pole: approximately 1 mile* Receiver antenna mounted on a 75 ft communications tower: approximately 3 miles* Radio maximum range with no obstructions: up to 10 miles
Error Detection	16-bit CRC

*Requires flat terrain with clear line of sight and no RF interference. See the SEL-FLT/SEL-FLR System Deployment Guide for details.

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