Wireless Distribution Fault Indication System

A Complete Wireless Distribution Fault Indication System Designed to Automate the Fault Location Process
Key Benefits

SEL’s wireless distribution fault indication system locates and reports faults in overhead circuits while collecting system statistics, such as load current, outage history, and restoration time—all within one solution. A centralized human-machine interface (HMI) improves situational awareness and helps improve system restoration times by reporting fault locations. SEL Engineering Services can integrate this system as part of an existing SEL DNA™ (Distribution Network Automation) system or into an existing SCADA and OMS infrastructure. This wireless distribution fault indication system also supports systems without SCADA using an SEL-3530 Real-Time Automation Controller (RTAC) and embedded web-based HMI to provide a low-cost HMI for any operator with a network connection.

Scalable
Designed to handle either a small service area or an entire distribution network, this wireless distribution fault indication system scales to start with a pilot program that grows into a utility-wide rollout.

Substation-Ready
Built tough for the substation environment, each component is designed to exceed the industry’s most demanding protective relay standards.

Fast Deployment
Optimized by SEL Engineering Services to meet specific application needs, each system is tested and ready to immediately deploy without the need for field configuration.

Interoperability in Existing Networks
DNP3 communications protocols over IP provide a wide range of compatibility within existing wired and wireless networks.

No Network, No Problem
Access points collect information from fault indicators and forward data to the SEL-3355 Computer through any IP-based networks, including fiber, Ethernet, radio frequency (RF), and cellular. If no network exists, SEL-3060 Ethernet Radios in a point-to-multipoint configuration backhaul fault indicator data through a secure 2.4 GHz or 900 MHz RF link.

Cross-Platform HMI
Access vital faulted circuit indicator (FCI) information from practically anywhere through the web-based HMI. SEL’s RTAC provides outage information to utility personnel when they need it and where they need it.

Easy Integration Within SEL’s DNA Systems
Further improve system performance by applying wireless fault indicators to critical points throughout a distribution system and in the last mile where other IEDs are absent. Fault indicators lead crews closer to the fault location compared to standalone reporting from other IEDs like relays and recloser controls. Wireless fault indicators provide the added benefit of automating the fault location process by facilitating the dispatching of crews to the faulted line section between installation points.
Scalable Solution

The SEL wireless distribution fault indication system transitions easily from a pilot setup to system-wide deployment. Start small to get a feel for the system and how to best use its many features. Develop a plan on where sensors are needed throughout the distribution system, and use the same system to carry out goals. Whether monitoring load current during critical switching scenarios or improving outage indices (like CAIDI, SAIDI, and MAIFI), the same system scales up immediately or over time.

SCALABLE FROM ONE CIRCUIT...

...TO MULTIPLE CIRCUITS...

...EXPAND ACROSS AN ENTIRE DISTRIBUTION SYSTEM
System Components

Vital Tools for Outage Management
SEL Engineering Services provides a total wireless distribution fault indicator solution for overhead electric distribution circuits. The WSO-11 collects distribution system information that transmits via integrated radio to an access point. Access points can connect via any available IP backhaul, including cellular, private radio network, and fiber, back to an SEL-3355 Computer. The SEL-3355 collects sensor data and passes these data to OMS, energy management system (EMS), or SCADA systems. The optional RTAC with a built-in customizable HMI allows visualization of the data that are critical to the application.

WSO-11—Wireless Sensor for Overhead Lines
The WSO-11 is a distribution automation sensor that stores load and temperature data as it monitors the distribution line for loss of current and faults. The sensor transmits data through an integrated radio to an access point on a communications network, helping personnel quickly locate faults.

Wireless Access Point
An On-Ramp Wireless RPMA® Access Point collects data from each WSO-11 and communicates the data through the wide-area communications network to an SEL-3355 Computer for sensor data aggregation.

SEL-2488 Satellite-Synchronized Network Clock
The SEL-2488 distributes data via the Network Time Protocol (NTP) to the SEL-3355 Computer and SEL-3530 RTAC to provide time-stamped fault indicator status information.

SEL-3060 Ethernet Radio
SEL-3060 radios connect wireless access points within remote substations to a centralized SEL-3355 Computer.
SEL-3530 Real-Time Automation Controller (RTAC)

The SEL-3530 provides a DNP3 interface to share sensor data with existing EMS, OMS, or SCADA systems. The RTAC includes a customizable HMI that displays wireless sensor data in an intuitive display designed to mimic the distribution system. The RTAC is ideal for applications without an existing SCADA system. Additional features include text message and email notification to improve response time.

SEL-3355 Computer

The SEL-3355 centralizes data from each WSO-11 Wireless Sensor. Place a single SEL-3355 within one centrally located substation, headquarters, or office. Sensor radio access points at the central and remote substation connect to the SEL-3355 through standard IP-based connections like those present in cellular, fiber, and RF networks.

Example customized HMI.
Applications

The SEL-3060 Ethernet Radios create a long-range Ethernet link between the remote substations and the central substation. Access points collect information from fault indicators and forward data to the SEL-3355 through any IP-based networks, including fiber, Ethernet, RF, and cellular modem networks. If no network exists or getting on those networks is a challenge, apply SEL-3060 Radios in a point-to-multipoint configuration to backhaul sensor information through a secure 2.4 GHz or 900 MHz RF link.

The SEL-3530 RTAC serves as a protocol converter and SCADA HMI, allowing sensor data to be integrated into most systems or displayed right on the RTAC HMI.
Specifications

Sensor Specifications

COMMUNICATIONS
Sensor-to-Access-Point Range
5–8 miles typical (dependent on terrain and presence of other radio networks)
Sensor-to-Access-Point Frequency
2.4 GHz

POWER REQUIREMENTS
Sensor Battery
14- to 20-year suggested maintenance cycle

ENVIRONMENTAL
Exceeds IP 66, tested to driven rain at 40 mph

MAXIMUM NOMINAL SYSTEM VOLTAGE (L-L)
34.5 kV

System Specifications

POINT-TO-MULTIPOINT ETHERNET RADIO BACKHAUL
900 MHz SEL-3060A
Includes certifications for Canada, Mexico, Republic of Trinidad and Tobago, and USA

2.4 GHz SEL-3060B
Includes certifications for Canada, Australia, New Zealand, and USA

POWER REQUIREMENTS
Access Point Primary Power Source
Secondary-sourced 120/240 Vac
Solar (optional)

Access Point Battery Backup (optional)
5-year suggested maintenance cycle

Emergency Backup Power Reserve
1.5 hours
4 hours (optional)

SENSORS PER SYSTEM
Maximum 5,000 (estimated)

INCLUDED FEATURES
RF path study, site survey, over-the-air upgradeable firmware (sensors and access point)

Warranty

SEL Substation Equipment
10 years

SEL Wireless Sensor
5 years

Wireless Access Point (third-party)
5 years
Purchasing Made Easy

Step 1. Work with SEL Field Application Engineers (FAEs) to understand needs and applications. Go to www.selinc.com/support to find a local FAE.

Step 2. Send an inquiry to SEL Engineering Services at info@selengineering.com.

Step 3. Work together with SEL Engineering Services to develop scope of work (radio path study, ability to leverage existing equipment, sensor locations, settings, system part number, etc.).

Step 4. SEL Engineering Services delivers a turnkey preconfigured, tested system.

Step 5. Deploy system. Determine whether installers require hiring SEL Engineering Services support for site acceptance testing and commissioning.