Secure Communications and Control Solutions

Secure and protect critical communications and control networks

- Security controls and encryption solutions maintain confidentiality, integrity, and availability of critical data.

- Comprehensive management and event-logging tools provide centralized monitoring and system-wide awareness of physical infrastructure and networking assets.

- Broad product line with flexible interface formats provides support for serial and Ethernet networks using both wired and wireless communications.

SEL

Secure, Dependable Communications for Critical Infrastructure

SEL designs, manufactures, and supports information technology (IT) and operational technology (OT) solutions for data networks requiring maximum security and reliability. SEL equipment comes with a ten-year no-questions-asked warranty covering labor and materials. Our solutions integrate with existing IT infrastructure and operate with efficient, secure, highly robust software that simplifies installation, operations, and support. SEL solutions are so reliable that equipment and software are supported without annual subscriptions or maintenance contracts. When needed, SEL field application engineers provide prompt, local, highly skilled technical assistance, and there is never a fee for their services.

Government organizations rely on SEL for data encryption and communications security for their most sensitive information. Businesses around the world trust SEL to speed up, secure, and strengthen networks that control physical security, energy infrastructure, manufacturing processes, building automation, and more.

Confidence

SEL provides innovative, technologically advanced secure communications solutions for such companies as:

- Argonne National Laboratory
- Cisco Systems
- Chevron USA
- Connecticut Mutual Insurance Company
- Consolidated Edison
- Oak Ridge National Laboratory
- Port of Oakland, California
- Southern California Edison
- United States Department of Defense
- United States Department of Energy

Trusted Technologies

SEL data processing, communications, and control solutions are available with:

- Internet Protocol Security (IPsec)
- Virtual private network (VPN)
- Online Certificate Status Protocol (OCSP)
- Deny-by-default firewall protection
- User-based access control
- Advanced Encryption Standard (AES-128 and AES-256)
- NIST-approved Federal Information Processing Standards (FIPS 197 and FIPS 140-2 Level 2 historical—see Certificate 1564)
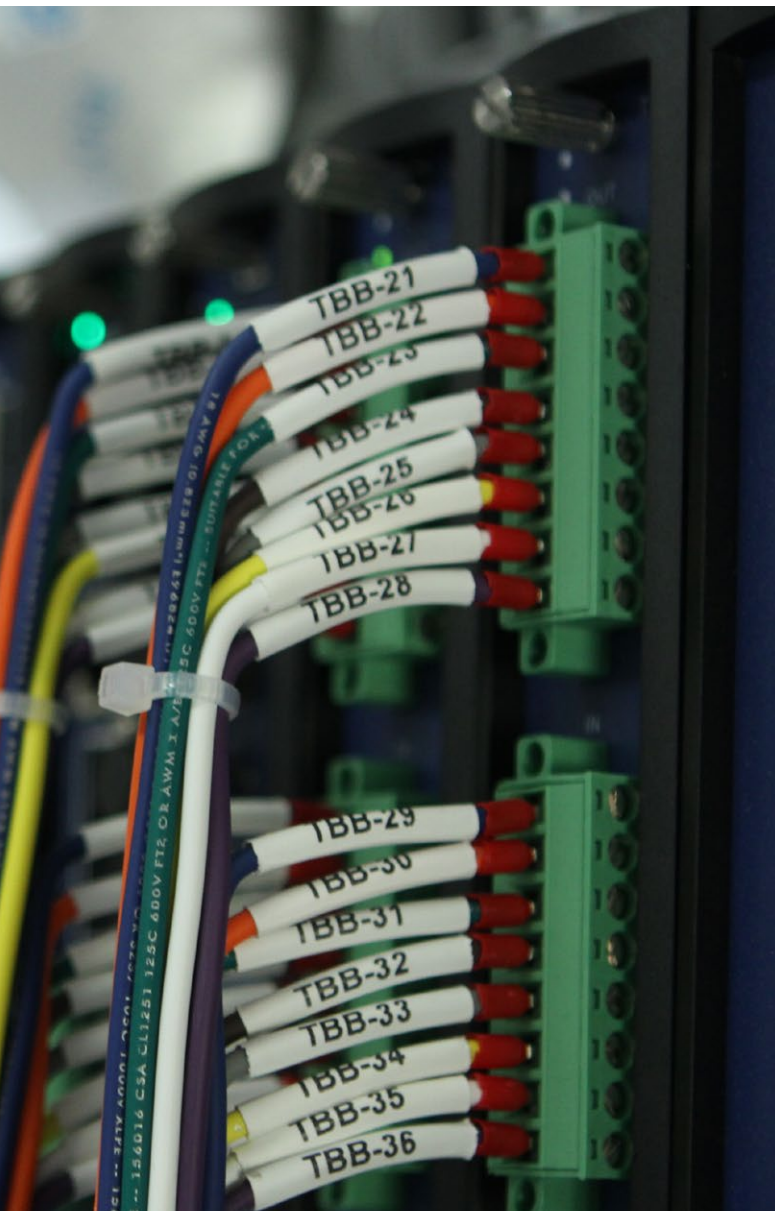
Learn more by visiting us online at **selinc.com**.

SEL Secure Communications and Control Solutions

Personnel, buildings, networks, and sensitive data are made more secure when SEL communications, data-processing, and control equipment are integrated with existing IT infrastructure. SEL's robust, field-proven solutions enhance reliability, security, and ease of use.

Ethernet security solutions transform public and intracompany data networks into secure, private networks that provide managed access, critical information, and control capabilities to almost any location.

Integrated communications solutions bring time-division multiplexing (TDM) and Ethernet traffic together within highly reliable SEL networks that operate with extremely low data latencies and AES-256 encryption.

Computing solutions extend the usability of Microsoft® Windows® and Linux® applications when operated on SEL computers that are manufactured to withstand vibration, electrical surges, fast transients, and extreme temperatures. In addition, McAfee® Embedded Control provides protection from viruses and other malicious attacks.

Annunciator and alarm solutions include embedded logic, control, and communications features for distributed intelligence throughout your facilities and beyond. SEL solutions include voice-to-telephone alarm notification.

Secure control solutions automate and safeguard building security and control processes. Flexible, scalable designs bring secure, distributed control to any facility, site, or campus.

Wireless communications solutions bring data encryption, secure communications, and control capabilities to remote locations and mobile workers.

Data encryption solutions protect existing computers and equipment from unauthorized access or malicious attacks. SEL encrypting transceivers are very cost-effective and operate through a simple onboard web server interface.

Interface solutions connect legacy monitoring and control equipment into a secure IP-based network environment by creating point-to-point tunnels between Ethernet-connected devices.

Satellite-synchronized time solutions synchronize monitoring and control equipment on the SEL network to ensure events are coordinated and recorded with microsecond precision. Using both satellite and terrestrial time distribution methods with antispoofing capabilities ensures the availability of authenticated precise time.
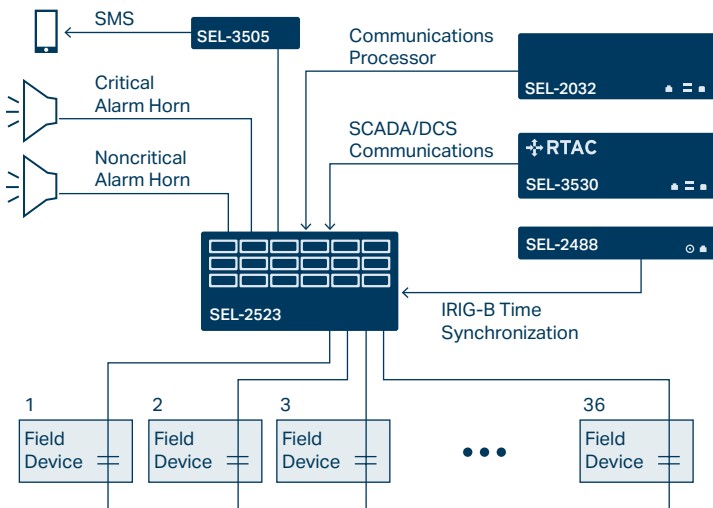
Example Applications
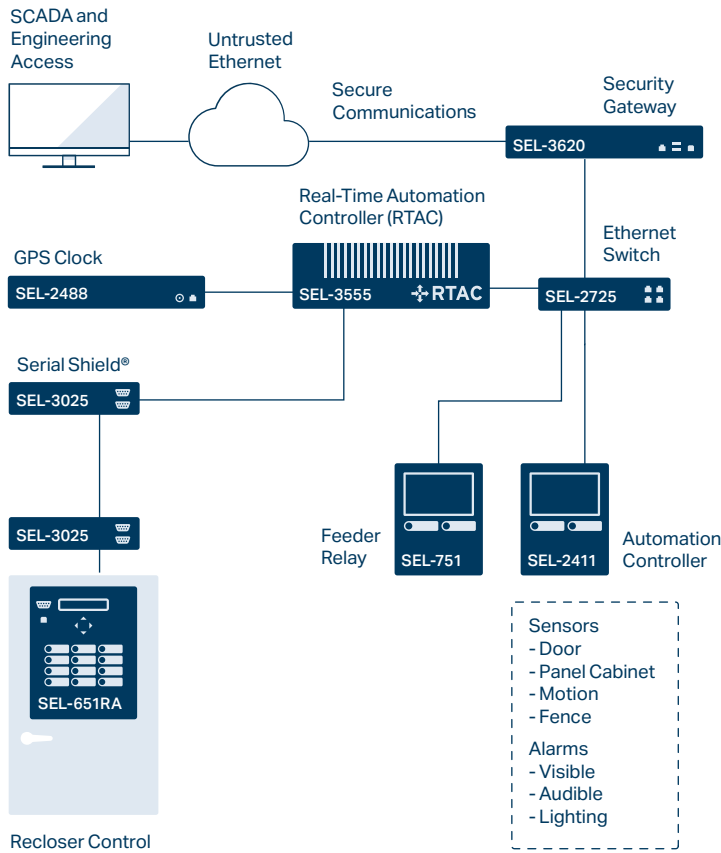
Secure Communications and User Management

Employ the SEL Real-Time Automation Controller (RTAC), SEL-3620 Ethernet Security Gateway, and SEL accessories to secure your automation network. Per-user security profiles provide compliance with role-based requirements. The system supports intrusion detection, notification, and logging to help maintain perimeter integrity. Secure Shell (SSH) provides encrypted engineering access through the RTAC.

Diagram 1 labels:

- SCADA and Engineering Access
- Untrusted Ethernet
- Secure Communications
- Security Gateway
- SEL-3620
- Real-Time Automation Controller (RTAC)
- GPS Clock
- SEL-2488
- SEL-3555 ✛ RTAC
- Ethernet Switch
- SEL-2725
- Serial Shield®
- SEL-3025
- SEL-3025
- SEL-651RA
- Recloser Control
- Feeder Relay
- SEL-751
- SEL-2411
- Automation Controller
- Sensors
  - Door
  - Panel Cabinet
  - Motion
  - Fence
- Alarms
  - Visible
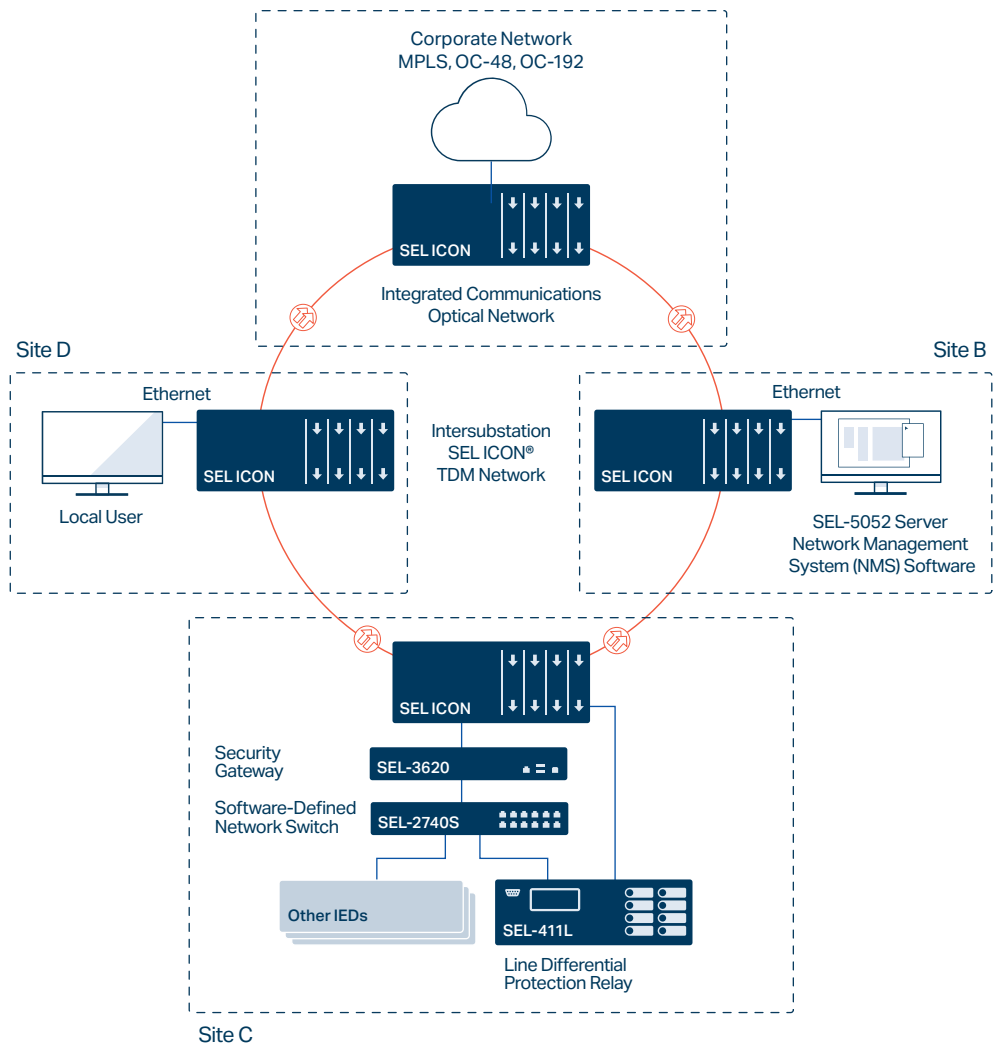 - Audible
  - Lighting

System Monitoring

Receive station equipment status information through hardwired contacts or communications devices to provide a single-point alarm station. Monitor equipment, report on the status of any equipment that has failed or been taken out of service, and notify local and remote personnel of equipment status and potential physical security threats.

Diagram 2 labels:

- SMS
- SEL-3505
- Communications Processor
- SEL-2032
- Critical Alarm Horn
- Noncritical Alarm Horn
- SCADA/DCS Communications
- ✛ RTAC
- SEL-3530
- SEL-2488
- SEL-2523
- IRIG-B Time Synchronization
- 1 Field Device
- 2 Field Device
- 3 Field Device
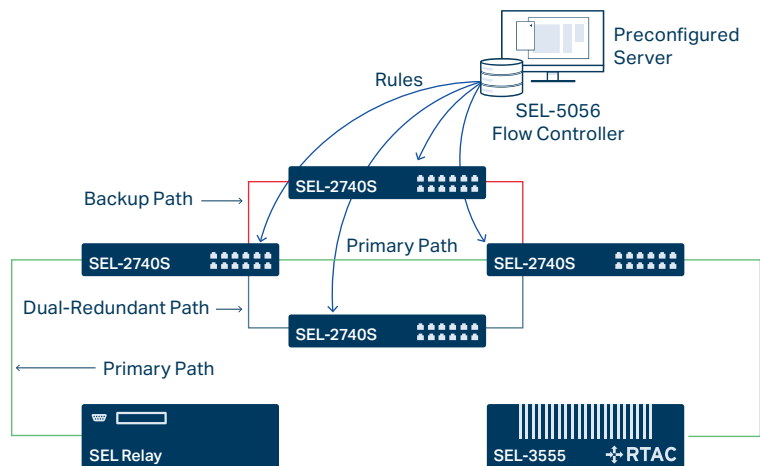- 36 Field Device

Maintaining Critical Services Between Sites

Install the SEL ICON® Integrated Communications Optical Network to maintain critical services between sites by quickly restoring traffic when an infrastructure disruption, like fiber failure, occurs. The ICON supports single or multiple ring network topologies with single or dual interconnection ties between rings. If a fiber fails in a ring network, traffic switches in less than 5 milliseconds. In addition to ring network topologies, the ICON also supports point-to-point, linear-spur, and subtended-ring configurations.

Corporate Network
MPLS, OC-48, OC-192

SEL ICON

Integrated Communications
Optical Network

Site D

Ethernet

SEL ICON

Local User

Intersubstation
SEL ICON®
TDM Network

Site B

Ethernet

SEL ICON

SEL-5052 Server
Network Management
System (NMS) Software

SEL ICON

Security Gateway — SEL-3620

Software-Defined Network Switch — SEL-2740S

Other IEDs

SEL-411L

Line Differential
Protection Relay

Site C

Guaranteeing Mission-Critical Ethernet Performance

The breakthrough software-defined networking (SDN) technology in the SEL-2740S Software-Defined Network Switch solves the inherent limitations of Ethernet networks. Every network path is predefined by the user, enabling precise control over how the system responds to network failures. The SEL-2740S fails over in less than 100 μs, ensuring the performance of mission-critical applications under all conditions. This means no more waiting for discovery or convergence times.

Preconfigured
Server

Rules

SEL-5056
Flow Controller

Backup Path

SEL-2740S

Primary Path

SEL-2740S

SEL-2740S

Dual-Redundant Path

SEL-2740S

Primary Path

SEL Relay

SEL-3555 ⊹RTAC

SEL Secure Communications and Control Products

SEL-3620 Ethernet Security Gateway

Ethernet Security Gateways

The SEL-3620 Ethernet Security Gateway and SEL-3622 Security Gateway are interoperable with Cisco® routers and OPSAID-compliant devices. Site-to-site Ethernet communications are protected with an IPsec VPN, and private networks are secured with a stateful firewall, all in a design that can survive harsh environments. The SEL-3620 supports up to 16 VPN connections, provides up to 60,000 security event reports, and applies an IRIG-B clock signal for precise event time tagging. The SEL-3622 is designed to secure remote cabinets and enclosures and integrates physical awareness sensors through an onboard accelerometer, light sensor, and input contact sensor.

SEL ICON Integrated Communications Optical Network

SEL ICON Integrated Communications Optical Network

The SEL ICON is a wide-area-networking multiplexer optimized for industrial and utility applications. By combining TDM and Ethernet with a comprehensive range of data interfaces, the ICON makes it easy to migrate from legacy systems and meet the evolving needs of an organization's communications. With features like real-time latency monitoring, redundant line ports and power supplies, AES-256 line encryption, and 5 ms healing, the ICON maintains vital communications and secures against man-in-the middle attacks. Distribute precise time over the ICON wide-area network (WAN) while maintaining accuracy better than 1 µs. With multiple time references, the ICON network is resilient to localized or wide-area GPS outages, equipment failure, and GPS spoofing.
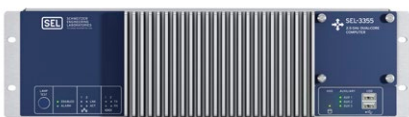
SEL-3355 Rack-Mount Rugged Computer

High-Reliability Computing

Designed as a server-class computer, the tough SEL-3355 Rack-Mount Rugged Computer is built to withstand harsh environments in utility substations and industrial control and automation systems. By eliminating all moving parts, including rotating hard drives and fans, and using error correcting code (ECC) memory technology, SEL computers have over ten times the mean time between failures (MTBF) of typical industrial computers. McAfee Embedded Control provides protection from viruses and other malicious attacks. Designed, manufactured, and tested to the same standards as our protective relays, every SEL-3355 comes with an unprecedented ten-year worldwide SEL warranty, making it an ideal solution for high-security monitoring and control applications.

SEL RTAC Family

Secure Controllers

Our RTAC product line is designed to provide you with simple solutions to full-scale automation. SEL RTACs offer everything from powerful data management solutions to precise, deterministic control in any location. Integrated cybersecurity features facilitate secure, mission-critical monitoring and control while assuring regulatory compliance.

SEL-2523 Annunciator Panel

Alarm and Annunciation

Improve local situational awareness, efficiency, and safety with SEL annunciators by providing local indication of equipment failures and physical security events. The SEL-2523 Annunciator Panel supports programmable logic and DNP3, Modbus®, and SEL protocols to flexibly support the most demanding applications. Connect an SEL-3010 Event Messenger to telephone on-call personnel and provide immediate notification of critical events, including physical security breaches.

Ethernet Switches

SEL Ethernet switches are designed for the harsh environments commonly found in the energy and utility sectors. The SEL-2740S Software-Defined Network Switch is the industry's first SDN-enabled switch and improves Ethernet performance in mission-critical applications. It enables stronger network security through deny-by-default access control, making it a perfect solution for the implementation of secure Ethernet communications. In addition, SEL has a family of standard Ethernet switches that includes the SEL-2730M Managed 24-Port Ethernet Switch, SEL-2730U Unmanaged 24-Port Ethernet Switch, and SEL-2725 Five-Port Ethernet Switch.

SEL-2740S Software-Defined Network Switch, SEL-2730M Managed 24-Port Ethernet Switch, and SEL-2725 Five-Port Ethernet Switch.

Wireless Multiport Transceivers

The SEL-3031 Serial Radio Transceiver and SEL-3060 Ethernet Radio are secure, low-latency multipurpose radios designed for automation, control, and data acquisition applications. Both radios operate in the industrial, scientific, and medical (ISM) band, which is an unlicensed spectrum, enabling fast deployment with minimal cost. Session authentication and AES-256 encryption protect critical data for secure wireless communication. The SEL-3031 has certifications for JF-12 and FIPS 140-2 Level 2 (historical—see Certificate 1564).

SEL-3031 Serial Radio Transceiver and SEL-3060 Ethernet Radio

Encrypting Transceivers

The SEL-3025 Serial Shield® is an easily integrated EIA-232 bump-in-the-wire cryptographic transceiver with centralized management and dial-up access controls. Protect remote devices and computers from unauthorized access and control by authenticating and encrypting all serial data communications.

SEL-3025 Serial Shield

Satellite-Synchronized Time Products

The SEL family of precise time products layers innovative technologies to enable dependable and secure time synchronization. The SEL-2488 Satellite-Synchronized Network Clock can distribute time via IRIG-B, the Network Time Protocol (NTP), and the Precision Time Protocol (PTP) with an accuracy of ±40 nanoseconds. Secure access to the SEL-2488 through X.509 certificates, user-based accounts, Lightweight Directory Access Protocol (LDAP) authentication, and complex passwords. The SEL-2488 supports syslog, a standard for event record logging that integrates with existing log-management systems. With Satellite-Signal Verification, the SEL-2488, when installed with a dual-constellation antenna, uses signals from two satellite constellations to validate GNSS time signals, providing a layer of protection from spoofing attacks. The SEL-2401 and SEL-2407® Satellite-Synchronized Clocks provide IRIG-B timing signals to SEL and third-party devices with ±100 nanosecond (average) UTC accuracy. SEL clocks automatically compensate for daylight-saving time, include alarm features, and are password-protected to maintain security.

SEL-2488 Satellite-Synchronized Network Clock; SEL-2401 and SEL-2407 Satellite-Synchronized Clocks

Services and Support

Engineering Services and Consulting

Today's critical infrastructure systems face a growing number of potential risks varying in scope and complexity.

Our professional services include:

- Automated password management with SEL and other control system devices.
- Deny-by-default firewall configuration.
- IPsec VPNs for site-to-site security.
- Risk and vulnerability assessments.
- Co-op- and municipality-focused security/compliance services.
- NERC CIP and 693 compliance services.
- Secure serial and Ethernet designs.
- System restoration.
  - Patch management and firmware update maintenance.
  - Virus response.

Regional Technical Support

We have regional offices and branch offices located close to customers throughout North America and the world. Implementation of policies, procedures, and standards makes it possible for us to share expert resources, when needed, to meet specialized and growing customer business needs. Geographic diversity and direct access to the larger SEL organization facilitates the sharing of knowledge and skills throughout SEL.

SEL SCHWEITZER ENGINEERING LABORATORIES