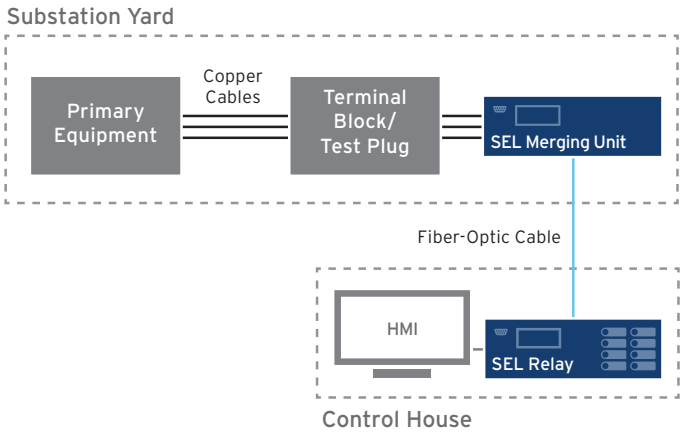
SEL Digital Secondary System Solutions

Advance how you protect and control your substation primary equipment

- Increase safety by removing high-energy copper cables from areas where personnel work.
- Reduce costs by decreasing materials and the labor required for wiring installation, commissioning, and documentation.
- Minimize misoperations due to wiring errors by reducing the number of physical routing paths and connections.
- Achieve simplicity and eliminate complex Ethernet network design by implementing SEL Time-Domain Link (TiDL®) technology.
- Share information over a network in an IEC 61850-9-2 Sampled Values (SV) solution that uses merging units with built-in protection.

Solutions Overview

SEL digital secondary system solutions advance how you protect and control the primary equipment in your substation by using digital devices in the secondary system to transport data via fiber rather than copper. These solutions reduce substation construction and expansion costs, increase reliability, improve personnel safety, and increase flexibility.



Key Benefits

Increase Safety

Moving high-energy copper cables away from the control house decreases the potential for electrical safety hazards, such as open CT connections.

Reduce Costs

Eliminating a significant quantity of copper cables in a substation yard and replacing it with fiber helps save money. Along with reducing the associated material and space expenses, it also reduces the labor required for cable routing, installation, commissioning, and documentation.

Simplify Installation

Having fewer copper cables reduces the number of physical routing paths and connections needed, thereby reducing wiring errors and missed connections. Fewer wiring errors reduces time spent rewiring and lowers the chance of inadvertently causing a misoperation.

Pick the SEL Solution That Fits Your Needs

Choose one of SEL's digital secondary system solutions when modernizing your substation:

- TiDL Technology—A point-to-point solution that eliminates complex Ethernet network design and the need for external time synchronization.
- SV Technology—A network-based solution that combines protection in the merging unit with the flexibility of IEC 61850-9-2.

TiDL and SV are based on the proven protection of the SEL-400 series relays, providing consistency for relay settings, algorithms, schemes, and configurations in the control house. Settings management is simplified using SEL Grid Configurator, a new software tool that features a spreadsheet-style editor, powerful protection visualization, comprehensive reporting, custom filters, and multiple-device settings management.

	TiDL	SV
Merging Units Located in Substation Yard	SEL-TMU	SEL-401 SEL-421
Devices Placed in Control House	SEL-421, SEL-451, SEL-487B, SEL-487E, and SEL-411L	SEL-421, SEL-451, SEL-487B, SEL-487E, and SEL-411L Ethernet switch (e.g., SEL-2740S) Satellite-synchronized clock (e.g., SEL-2488)
Transport Protocols	SEL T-Protocol	IEC 61850-9-2, GOOSE
Communications Configuration	Point-to-point	Networked
Sampling Rate	10 kHz	4.8 kHz in 60 Hz system 4.0 kHz in 50 Hz system

SEL TiDL Technology

TiDL technology is a point-to-point solution engineered with simplicity in mind. This technology requires no external time source, has a strong cybersecurity posture, and is easy to implement, with no network engineering required.

Simple Architecture

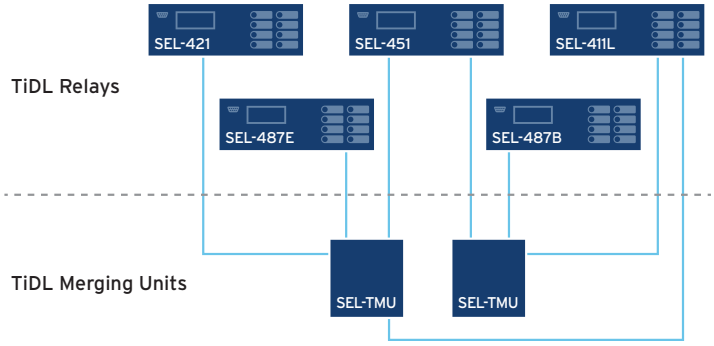
SEL-TMU TiDL Merging Units are placed in the yard close to the primary equipment and digitize discrete I/O signals and analog data, such as voltages and currents. These data are then transported over fiber-optic cables to a TiDL relay in the control house. With this point-to-point architecture, implementation is simple and requires zero network engineering.

Data-Sharing Capabilities

Each SEL-TMU can be paired with up to four SEL-400 series TiDL relays. This new data-sharing capability gives you flexibility on how to best design protection for your system and makes installations more economical by reducing the device count. In addition, the point-to-point connections make expansion easy.

Built-In Time Synchronization

TiDL maintains relative time; therefore, it does not rely on an external time reference for protection. All data from the SEL-TMU devices are synchronized with each other regardless of the number of devices connected to the relay or the length of the fiber.



Strong Cybersecurity Posture

The dedicated, deterministic TiDL system helps secure mission-critical applications. The isolated point-to-point connections and the absence of switches and routers reduce the electronic security perimeter and limit attack points. This security-minded architecture prevents remote access, and its simplicity eliminates the need for managing port access.

Custom Topologies and Aliases

Use Grid Configurator to configure and commission custom TiDL topologies to fit each application. The software maps the merging unit's I/O to the local I/O of the relay and verifies all connections and hardware, making commissioning quick and easy. While programming your topologies, you can give customized names to the merging unit's I/O quantities (e.g., the physical location of the unit or company nomenclature) to make the mapping configuration more intuitive.

SV Technology

SEL SV combines protection in the merging unit with the flexibility of IEC 61850-9-2. The merging unit digitizes analog signals from primary equipment and then transmits them to an SV relay in the control house via an Ethernet network.

Merging Units With Built-In Protection

In an SEL SV solution, the SEL-401 Protection, Automation, and Control Merging Unit provides overcurrent and breaker failure protection and the SEL-421 Protection, Automation, and Control Merging Unit provides complete line protection, including five zones of subcycle mho and quadrilateral distance elements. If IEC 61850 network communications are lost, the SEL merging units provide backup standalone protection.

Interoperability

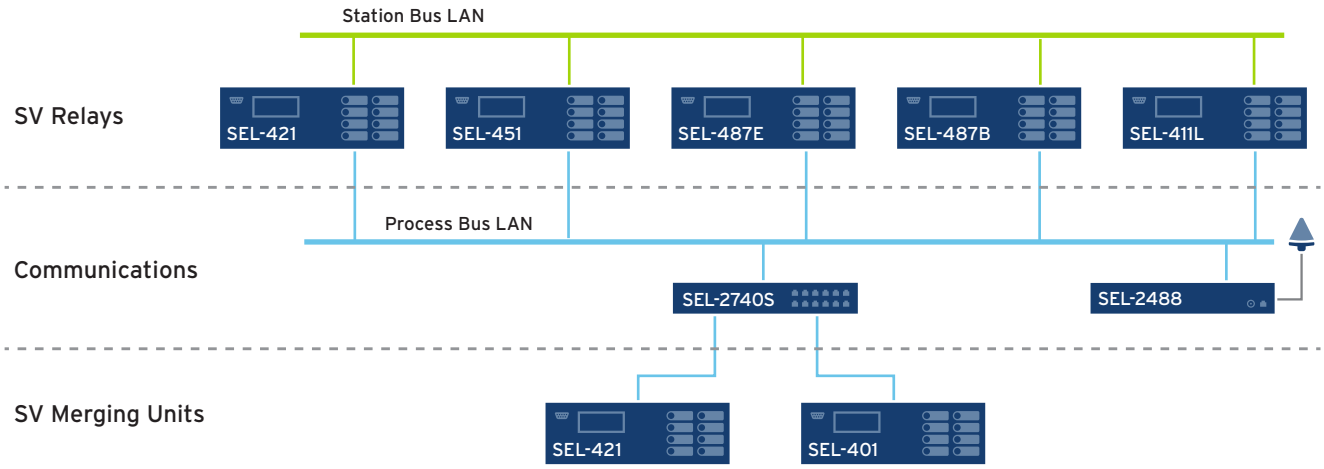
SEL SV devices are implemented with IEC 61850-9-2 and the UCA 61850-9-2LE guideline. You can use them with primary equipment that generates SV streams or with other manufacturers' SV-compliant units.

Unique Testing and Troubleshooting Tools

The COM SV command in SEL merging units provides you with information about your SV configuration, including warning and error codes that detail why a relay rejected an SV stream, which aids troubleshooting. The TEST SV command allows you to check the network connectivity and the CT and PT ratios between publisher and subscriber devices.

Flexible Ethernet Network

SV technology allows you to create a flexible Ethernet-based point-to-multipoint network using tools such as software-defined networks or VLANs to fit your application needs. You can use the SEL-2740S Software-Defined Network Switch to provide centralized traffic engineering and improve Ethernet performance. The switch acts as a transparent Precision Time Protocol clock that supports the IEEE C37.238 power system profile, ensuring submicrosecond time synchronization of the end devices.



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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