

**HEAVY INDUSTRY
SOLUTIONS**





30+ YEARS OF INNOVATION

5,000+ EMPLOYEES WORLDWIDE

100% EMPLOYEE-OWNED

165+ COUNTRIES WITH SEL SOLUTIONS AND SERVICES

100+ OFFICES WORLDWIDE

WE ARE SEL



Schweitzer Engineering Laboratories (SEL) is a trusted provider of complete power protection, automation, communications, and metering solutions for critical industries and utilities worldwide. From oil refineries in deserts to the world's largest water and wastewater facilities, critical operations around the world rely on SEL solutions because they are designed and tested to operate reliably in the harshest environments. And we back that reliability with a ten-year, no-questions-asked warranty.

If you face smaller engineering staffs and increasingly complex regulatory requirements, SEL can help. SEL engineers are industry experts with experience in distribution protection and control, industrial power system management, distributed energy resource integration, and cybersecurity best practices. They can help you meet your operational needs with the following solutions and services.

SOLUTIONS

Protection Systems and Metering

- Feeder protection
- Motor protection
- Arc-flash mitigation
- Generator protection
- Transformer protection
- Special protection schemes
- Power quality and revenue metering

Automation Controllers and Computing

- Real-time automation controllers
- Communications processors
- Programmable automation controllers
- Pump automation controllers
- Industrial computers (compact and rack-mount)

Communications and Cybersecurity

- WAN and LAN networking (wired and wireless)
- Transceivers and adapters
- Cybersecurity

SERVICES

- Power protection and automation (settings, scheme design, communications architecture design and programming, fault and coordination studies, and documentation)
- Arc-flash hazard mitigation
- POWERMAX® Power Management and Control Systems
- Microgrid controls
- MOTORMAX® smart motor control for low-voltage systems
- Model power system testing (hardware-in-the-loop)
- Operation communications and networking solutions
- Cybersecurity
- Coordination studies
- Commissioning services



NORTH AMERICAN UTILITIES CHOSE SEL AS THE BEST-IN-CLASS RELAY MANUFACTURER IN THESE CATEGORIES*

TECHNOLOGY (84%)

SERVICE & SUPPORT (87%)

PRICE (82%)

WHY OUR CUSTOMERS CHOOSE SEL



▲ SEL-751 FEEDER PROTECTION RELAY

Low cost of ownership. SEL devices have the highest mean time between failures (MTBF) in the market (over 500 years), come with no-charge configuration software, and are backed with our ten-year worldwide warranty.

No-charge technical support by experienced local engineers.

Reliable solutions designed, built, and tested for trouble-free operation in extreme conditions and temperatures from -40° to $+85^{\circ}\text{C}$ (-40° to $+185^{\circ}\text{F}$). SEL devices are UL-listed and CSA-certified.

Scalable solutions that allow industrial facilities to grow their systems from basic protection to advanced ultra-fast power management.

Flexible, secure, and robust system solutions.

Advanced diagnostics and reporting capabilities for improved situational awareness, efficient troubleshooting, asset utilization, and early warning of system instability.

Seamless integration into existing systems. Flexible communications ports and protocols allow custom configuration of applications with serial, Ethernet, Modbus, IEC 61850, MIRRORING BITS[®], DNP3, and IEEE C37.118-2011 communications.

Rapid commissioning, testing, and post-fault diagnostics with Sequential Events Recorder (SER) reports and oscillographic event reports. Built-in metering functions eliminate separately mounted metering devices.

WE SERVE THE OIL, GAS, AND PETROCHEMICAL INDUSTRIES



Upstream, midstream, downstream, onshore, and offshore, innovative SEL solutions protect, automate, and control power systems. From platforms in the Gulf of Mexico and refineries in the deserts of Saudi Arabia to chemical plants in the United States and liquified natural gas (LNG) plants in Australia, operations around the world choose SEL for innovative products, superior-quality solutions, and exceptional customer service.

“SEL industrial-grade computers are awesome! The units run flawlessly day in and day out—nice, cool, and quiet! I run the [Honeywell] modular system business for the Americas and use SEL computers for our oil and gas demo systems. **NOT ONE TIME HAVE I HAD AN ISSUE** with either the rack-mount or flush-mount version! To be quite honest, your units have made my demo dreams a reality.”

DAVID GALVAN
CHANNEL BUSINESS MANAGER
HONEYWELL

100% OF THE TOP GLOBAL OIL AND GAS PRODUCERS RELY ON SEL

92% OF THE TOP U.S. REFINERIES

70% OF THE TOP MIDDLE EASTERN OIL REFINERS



▲ SAUDI ARAMCO

► **CUSTOMER**
Saudi Aramco

PROJECT
Shaybah Gas-Oil Separation Plant (GOSP) Expansion, Saudi Arabia

SOLUTION
Complete Power Management
Located in the remote Rub' al Khali desert, this contingency-based system performs load shedding in 12 milliseconds, providing power system reliability and availability.

CUSTOMER
Chevron

PROJECT
Gorgon Natural Gas, Australia

SOLUTION
Complete Power Management
An SEL complete power management solution supports Chevron's Gorgon facility (one of the world's largest natural gas projects) on Barrow Island, about 37 miles (60 km) off the northwest coast of Australia.

CUSTOMER
Tengizchevroil (TCO)

PROJECT
Tengiz Oil Field, Kazakhstan

SOLUTION
Complete Power Management
SEL technology provides integrated protection, monitoring, and control systems for the world's deepest oil field. The system maximizes process uptime, protects personnel, and provides reliable electricity to TCO.

WE ARE DEEP INTO METALS AND MINING



Our power management, process control, and automation solutions are designed for the extreme environmental conditions common in mining and metal-forming industries. SEL products monitor and protect valuable equipment and ensure an uninterrupted supply of electric power in every corner of a site or facility.

“I use SEL not just because of their industry-leading products and technical support...but because **SEL AND ITS PEOPLE ARE COMMITTED TO DOING THE JOB RIGHT** and making the user happy with the end product.”

TIM BURTRAM

PLANT ELECTRICAL ENGINEER & SENIOR PROJECT MANAGER
CASCADE STEEL ROLLING MILLS

85% OF TOP GLOBAL MINING FIRMS RELY ON SEL

100% OF THE TOP GLOBAL COPPER FIRMS

80% OF THE TOP GLOBAL ALUMINUM FIRMS

70% OF THE TOP GLOBAL STEEL FIRMS

LARGEST COAL MINE IN THE WORLD



▲ CITIC PACIFIC MINING

► **CUSTOMER**
CITIC Pacific Mining

PROJECT
Pilbara Sino Iron
Magnetite Mine,
Australia

SOLUTION
Power Protection and
Automation
Solutions

The CITIC Pacific Mining magnetite mine uses an SEL power protection and automation solution for their high- and medium-voltage power systems.

CUSTOMER
Ma'aden Phosphate

PROJECT
Umm Wu'al Facility,
Saudi Arabia

SOLUTION
SCADA and Power
Management and
Control System

SEL's subcycle load-shedding solution protects against power blackouts for the Umm Wu'al plant. This facility is the world's largest fully integrated fertilizer production operation, with 3 million metric tons of annual production.

CUSTOMER
Global Mining Firm

PROJECT
Large Copper Mining
Project, Peru

SOLUTION
POWERMAX Power
Management
Solution

SEL solutions protect the power system at one of the world's largest, open-pit copper and molybdenum mines.

WE KNOW PULP AND PAPER



SEL power system, communications, and automation solutions are ideally suited for pulp and paper plants, especially those with cogeneration assets. By integrating process and power control systems, our products are more efficient than those found in typical single-purpose control networks.

“SEL’s field technical support has been very valuable to me. During our upgrade project, I got fast and reliable technical answers. And **THAT’S SIMPLY HOW GOOD SEL SUPPORT IS.** I know we can count on SEL for that level of support every time.”

DON ELLIOTT
SENIOR ENGINEER/POWER MANAGER
RESOLUTE FOREST PRODUCTS

80% OF THE TOP NORTH AMERICAN PULP
AND PAPER PRODUCERS RELY ON SEL



▲ INTERNATIONAL PAPER

► **CUSTOMER**
International Paper

PROJECT
Georgetown Paper Mill, South Carolina, USA

SOLUTION
Microgrid
SEL designed and implemented a microgrid power management system for International Paper, enabling them to grid-connect or island their power system by shedding excess load.

CUSTOMER
Georgia Pacific

PROJECT
Savannah River Paper Mill, Georgia, USA

SOLUTION
Power System Protection and Load-Shedding Technology
Georgia Pacific's Savannah River Paper Mill runs 24/7, helped by SEL power system protection and load-shedding technology.

CUSTOMER
Verso

PROJECT
Quinnesec Paper Mill, Michigan, USA

SOLUTION
Arc-Flash Mitigation
SEL provided Verso a complete arc-flash mitigation solution with labeled wire harnesses to simplify installation. In addition, SEL Engineering Services provided engineering design, settings, updated drawings, and commissioning.

WE PROTECT WATER AND WASTEWATER OPERATIONS



SEL provides innovative, advanced asset protection and power management solutions for complex water and wastewater applications around the world. Our power protection solutions substantially improve plant uptime by proactively detecting electrical system anomalies before damage occurs. SEL protects feeders from catastrophic arc-flash events, and we extend the life of pump and blower motors by employing thermal models that reduce equipment stress.

“We have found that **IT IS FAR CHEAPER TO RIP OUT ALL OF THE CONTROL WIRING IN OLD PANELS AND INSTALL THE SEL-849 THAN IT IS TO PERFORM A SINGLE PANEL MAINTENANCE.**

Added features, like improved motor life, safety, remote monitoring, network interface, operation log, we are essentially getting for free.”

CLYDE McMORROW
RETIRED WATER UTILITY ENGINEER

LARGEST WATER PLANTS IN THE
WORLD RELY ON SEL

FILTRATION (CHICAGO, ILLINOIS, USA)

DESALINATION (SAUDI ARABIA)

WASTEWATER (CHICAGO, ILLINOIS, USA)



▲ JUBAIL WATER AND POWER COMPANY

► **CUSTOMER**
Jubail Water and Power Company

PROJECT
Al Jubail Desalination Plant, Saudi Arabia

SOLUTION
Power Protection and Industrial Communication
Al Jubail, the world's largest desalination plant, provides drinking water for six million residents in Riyadh, Saudi Arabia. Their system relies on SEL for power protection and communications.

CUSTOMER
Imperial Irrigation District

PROJECT
All-American Canal, California, USA

SOLUTION
Power System Automation and Communication
SEL provides SCADA, cybersecurity, and HMI services for eight hydroelectric power plants located along the All-American Canal. This 80-mile (130 km) aqueduct is the largest in the world.

CUSTOMER
Florida Keys Aqueduct Authority (FKAA)

PROJECT
Florida Keys Water Transmission, Florida, USA

SOLUTION
Energy Metering
FKAA is saving \$600,000 (USD) per year in electrical costs by using the data provided by SEL meters. SEL's accurate power metering solution helps FKAA operators make real-time process decisions that optimize energy usage.



AUTOMATION CONTROLLERS AND COMPUTING



COMMUNICATIONS AND CYBERSECURITY

SEL HAS PROVEN POWER SYSTEM SOLUTIONS

SEL invents, designs, manufactures, and supports a complete line of products for the protection, monitoring, control, automation, and metering of electric power systems. Our products meet the rigorous environmental and operational demands of facilities that must operate flawlessly 24 hours a day, 7 days a week. We are committed to our quality with a worldwide, ten-year, no-questions-asked warranty and unmatched, free technical support and customer service.

FOR A DETAILED LIST OF OUR PRODUCTS AND SOLUTIONS, VISIT selinc.com/solutions.



PROTECTION SYSTEMS AND METERING

▶ READ ON TO LEARN ABOUT TYPICAL APPLICATIONS OF SEL PRODUCTS AND SOLUTIONS AT INDUSTRIAL SITES.

SEL SOLUTIONS

INDUSTRIAL PLANT ONE-LINE DIAGRAM EXAMPLE

MIRRORED BITS Via Fiber Transfer Trip

IEC 61850 MMS

MIRRORED BITS Communications Via Fiber

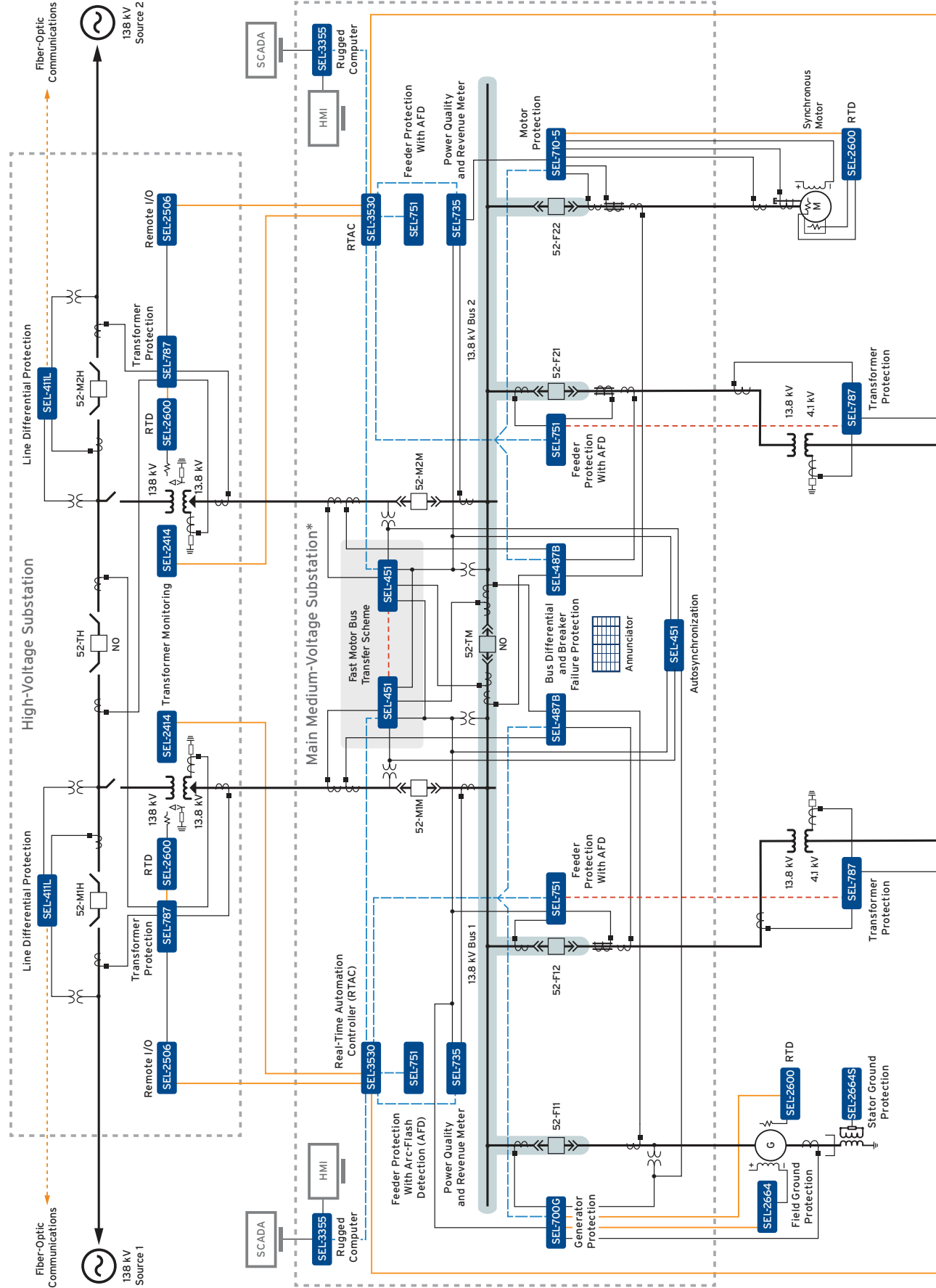
Differential Communications Via Fiber

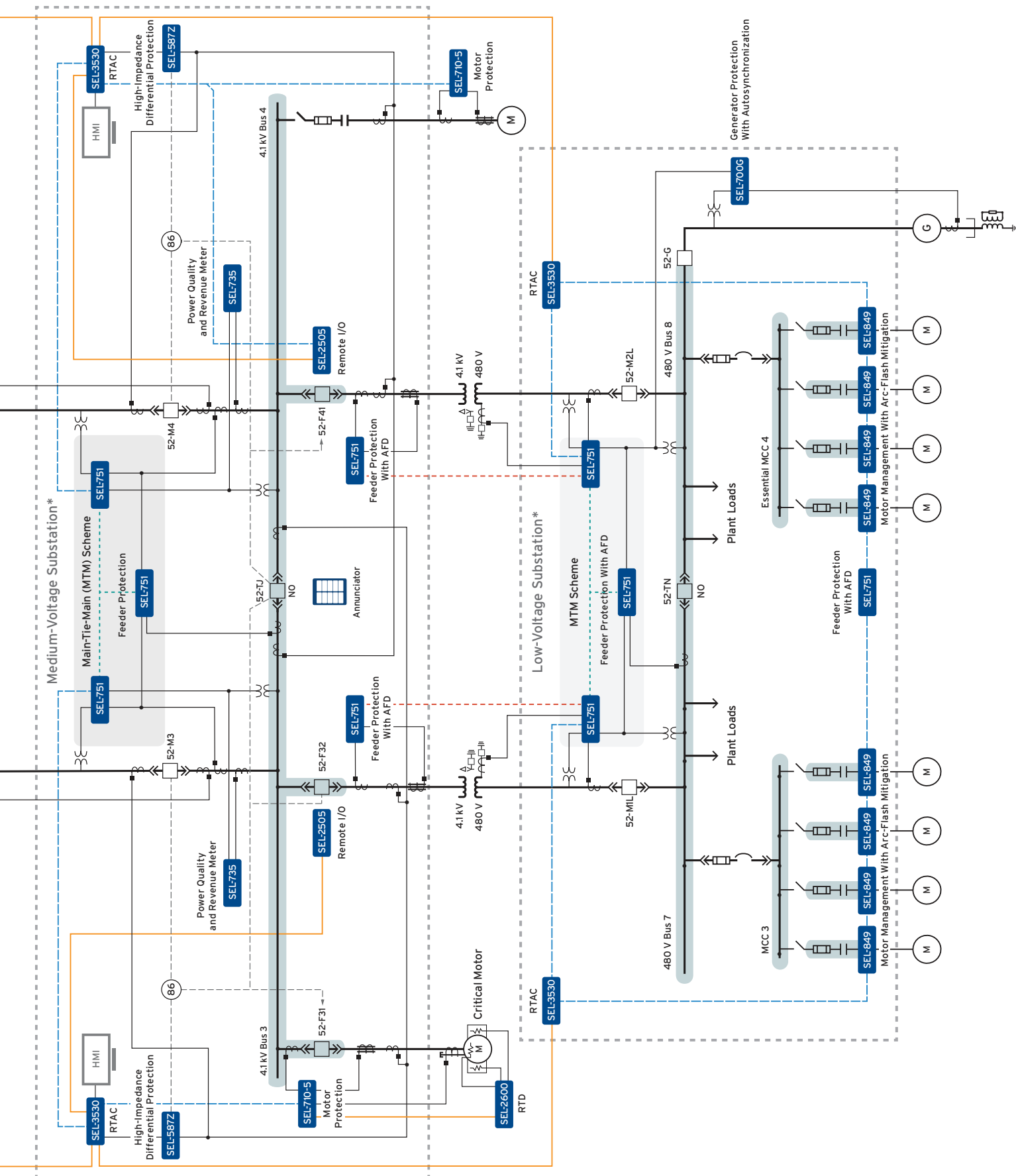
*Local Integration Not Shown

Active Arc-Flash Mitigation

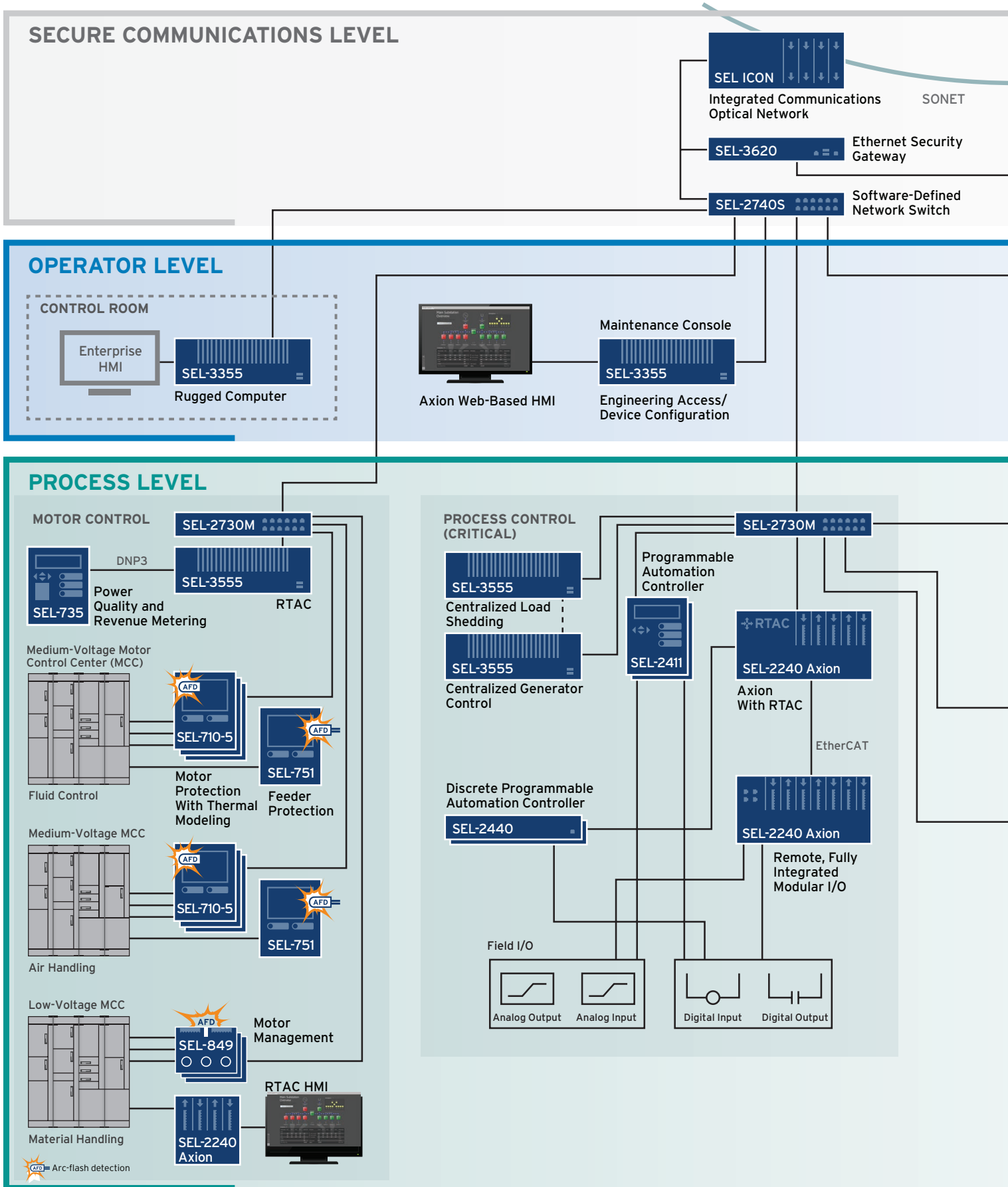
Control Wire Connection

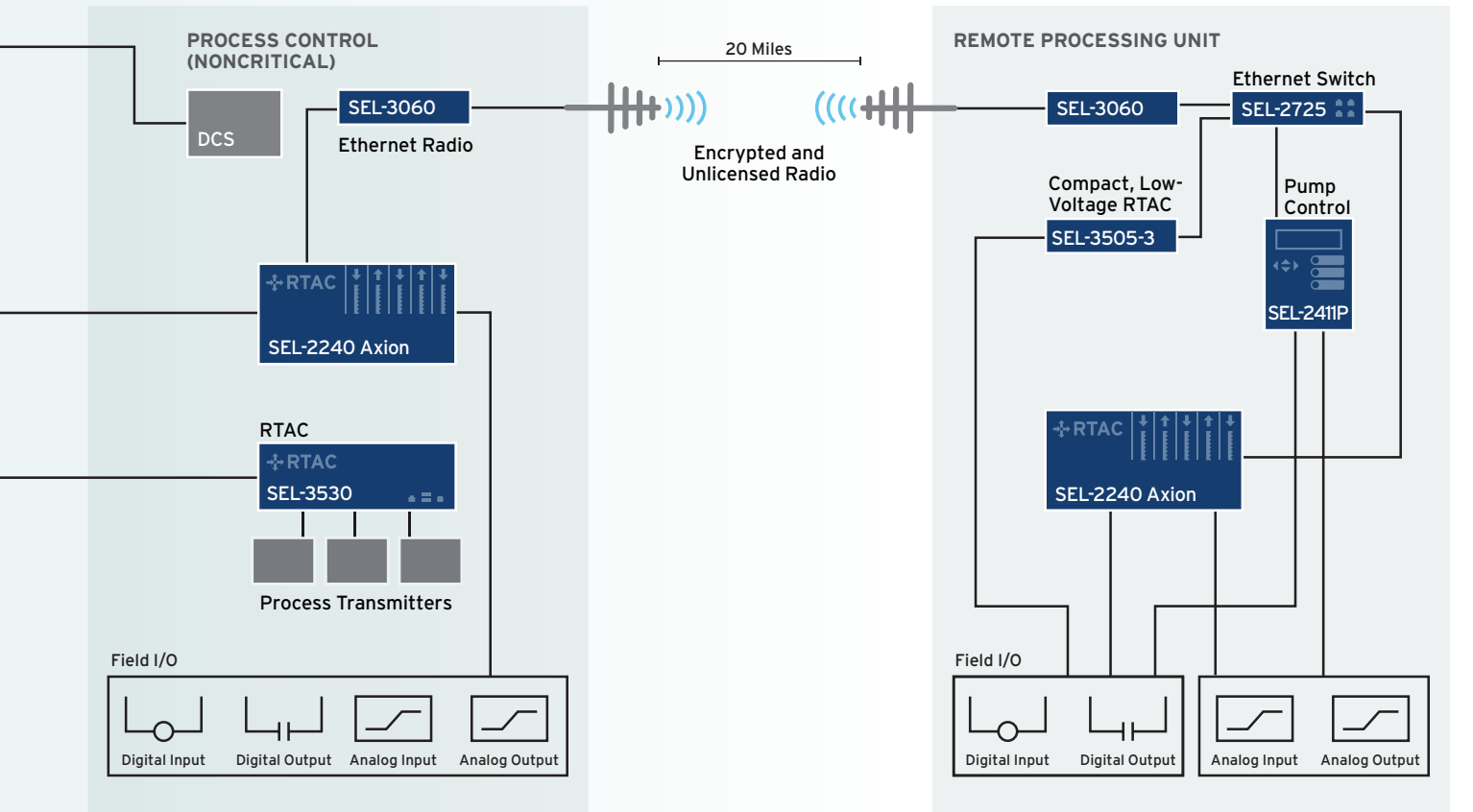
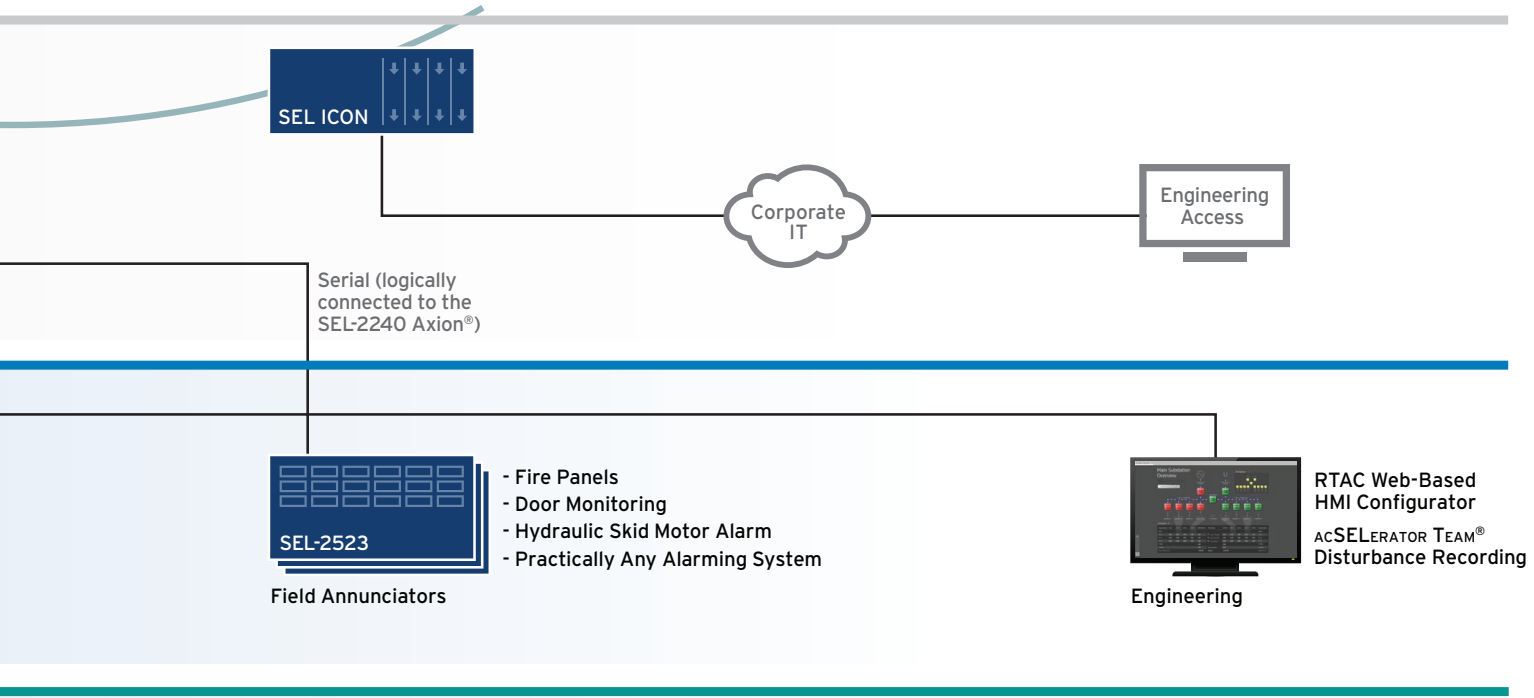
IEC 61850 GOOSE Ethernet



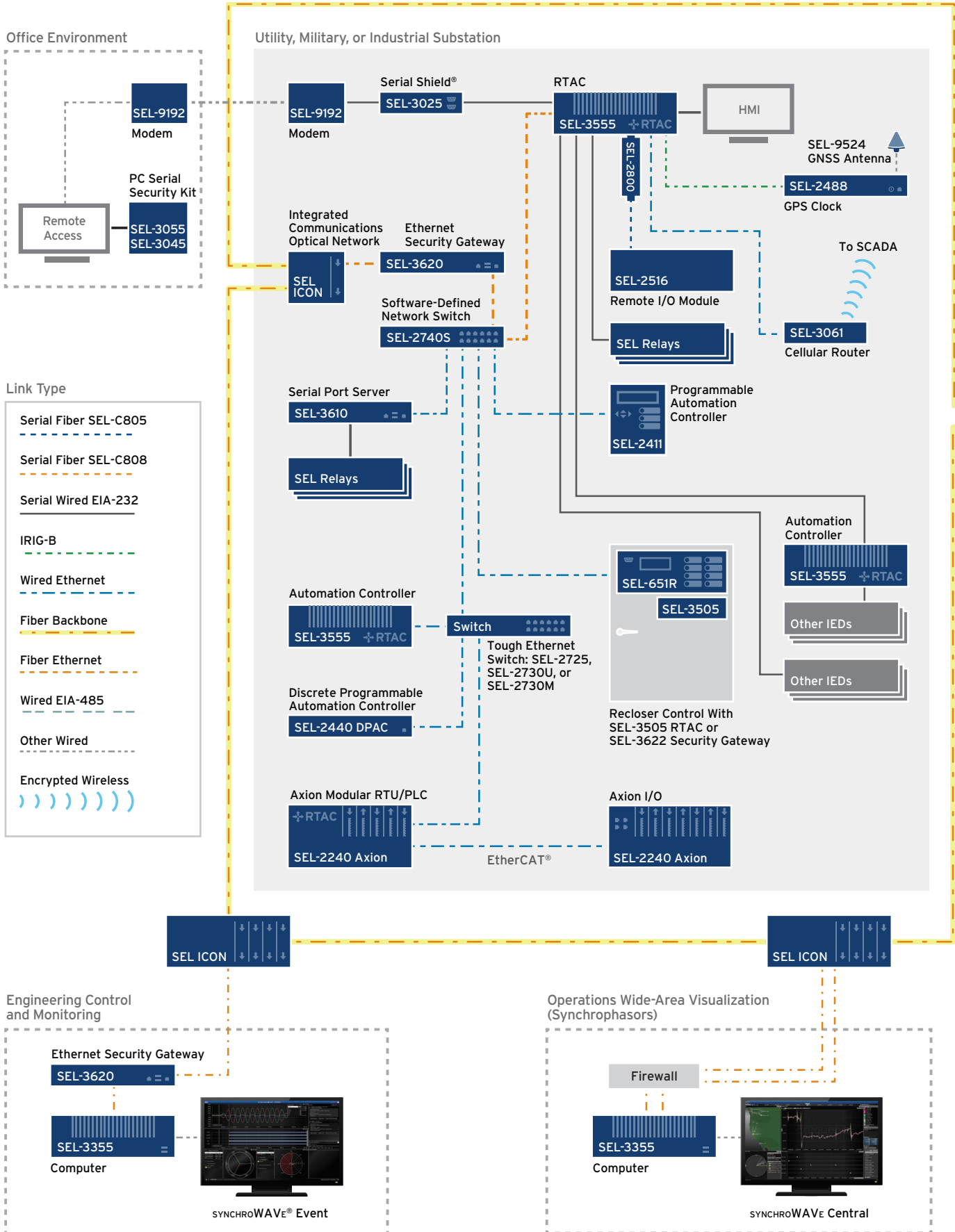


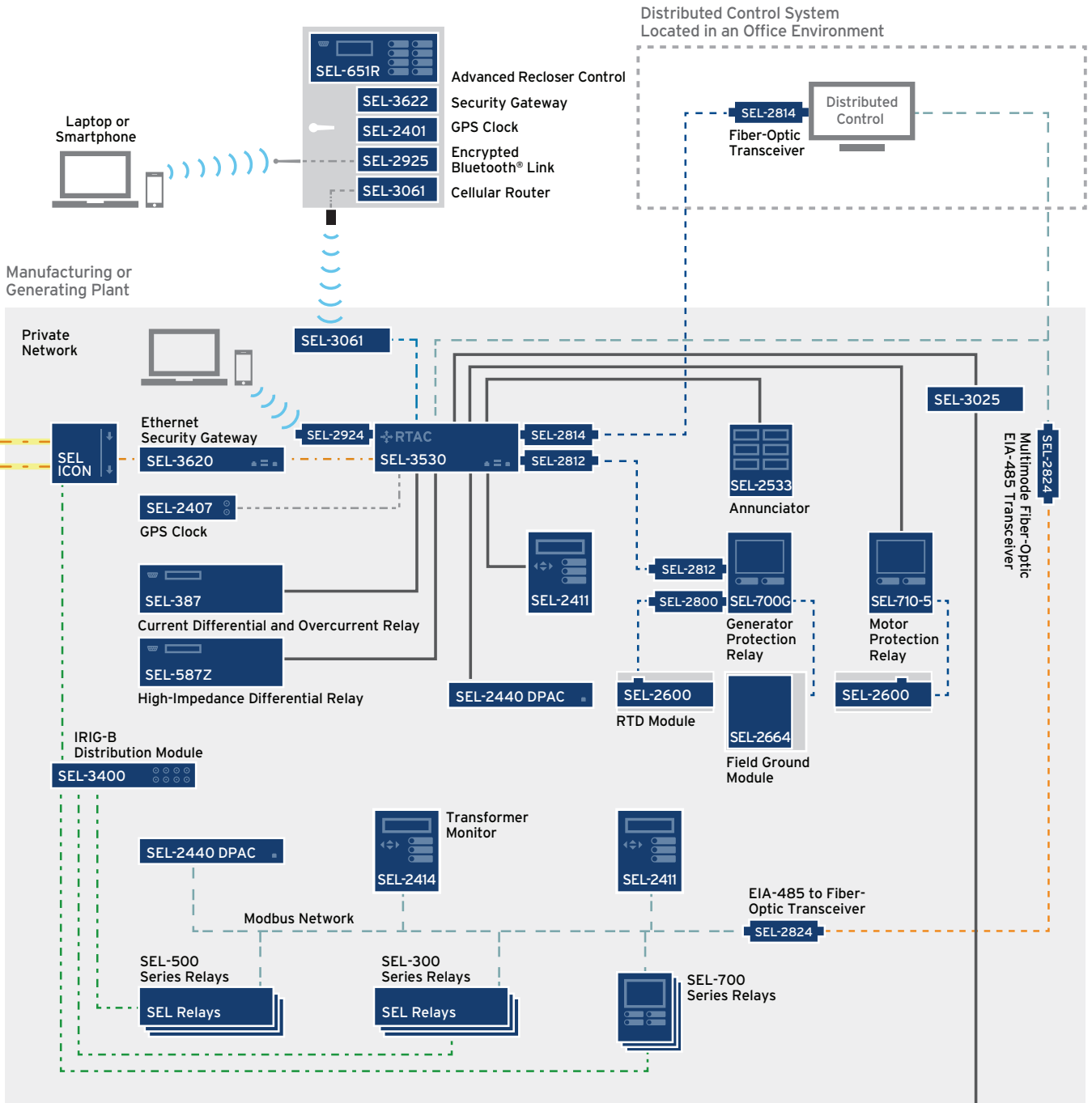
SEL SOLUTIONS INDUSTRIAL AUTOMATION DIAGRAM EXAMPLE





SEL SOLUTIONS NETWORK COMMUNICATIONS DIAGRAM EXAMPLE

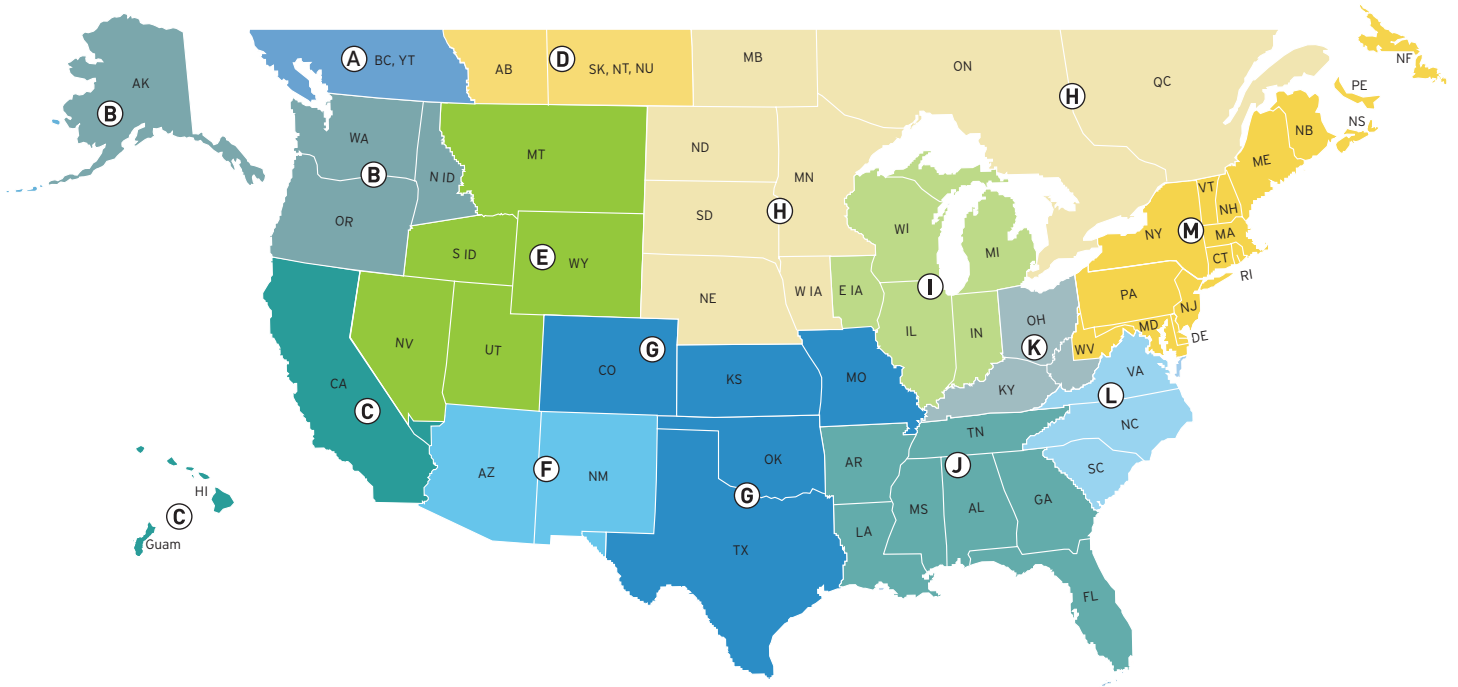




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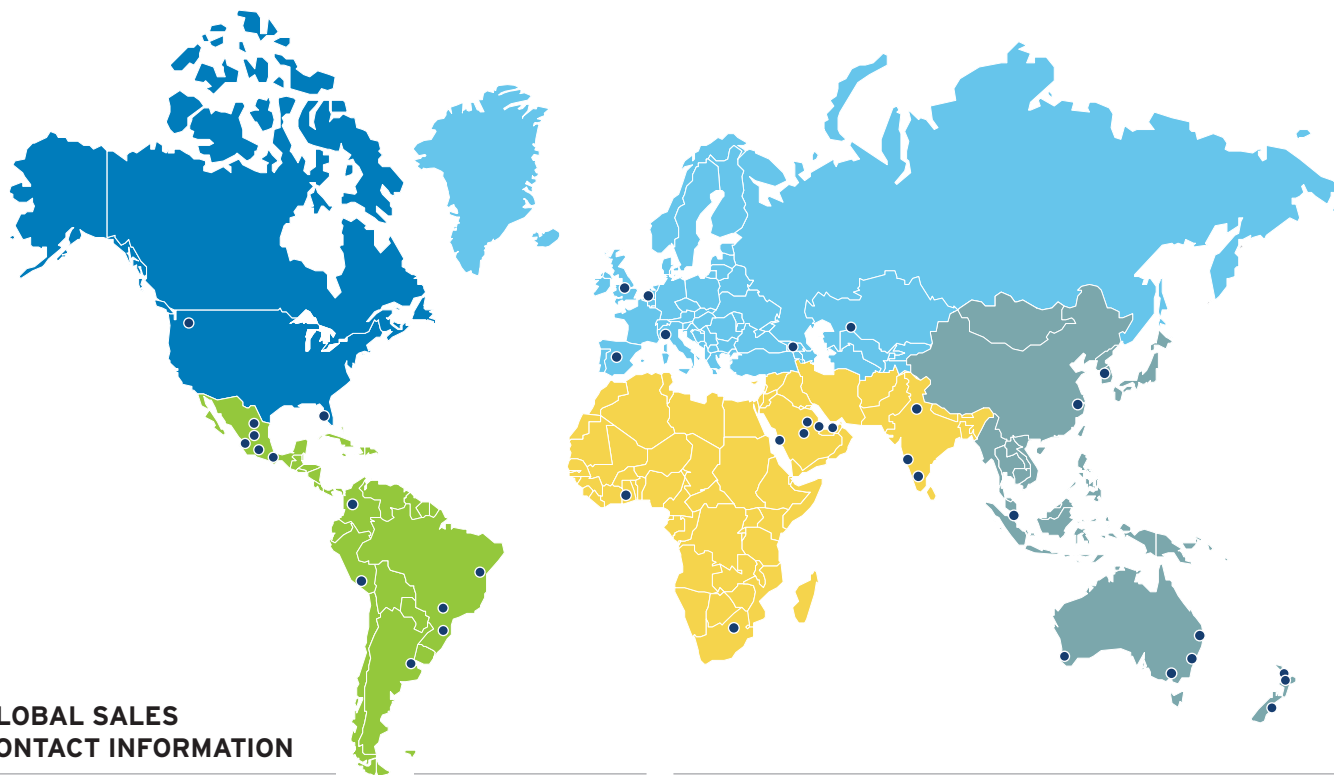
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