SEL COMMUNICATIONS AND NETWORKING

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DEPENDABLE COMMUNICATIONS FOR CRITICAL INFRASTRUCTURE

Communications at SEL is based on our understanding of the principles, dynamics, and conditions that today’s devices must be able to meet and endure in order to maintain the safe operation of the power grid. As a company, we are built on the foundation of creating the most secure and reliable solutions for mission-critical systems everywhere, and we’ve expanded this knowledge and experience into a line of communications products that meet or exceed the requirements of the applications they support. From wide- and local-area networking, security, and precise time to radios, transceivers, and cables, we offer you an extensive product line that combines resiliency and security with high-quality protection for reliable communication in today’s critical infrastructure systems.

Each communications product is built to address the real-time, minimal-latency requirements of operational technology systems, including substation and utility applications; industrial automation and process control; oil, gas, and petrochemical operations; and other mission-critical systems. Even through extreme temperatures, weather, or the failure of another device, our communications products will operate continually and without error. They are made to reliably function with redundant subsystems and predictable failover to ensure the highest availability.

By designing security into each product, which incorporates user access controls and advanced data encryption, we make NERC CIP compliance easier to achieve and allow you to create the most secure network possible. In addition, our ten-year, worldwide warranty is the best in the industry, and it comes standard with each device, meaning that no matter where you are or what the issue is, we will be there with the solution and support you need.

With an approach that seeks to bring simplicity to an increasingly complex industry, our communications and networking line provides the reliable and dependable solutions you need for a future of seamless and secure operation.
SECURITY SOLUTIONS FOR CRITICAL INFRASTRUCTURE

Beginning with our first product, released in 1984, cybersecurity has been one of the most integral parts of our company’s foundation. When the industry regarded a single password as sufficient, we had the foresight to incorporate two levels of password protection as well as alarm contacts. Today, that foresight has helped our cybersecurity philosophy evolve into a company-wide culture that we participate in every day and build into each of our products.

Through a combination of teamwork, layered protection, and a security-aware culture, we can help you build the most secure communications solutions and systems that you need to prevent cyber attacks and unauthorized network intrusions.

Our defense-in-depth approach to cybersecurity emphasizes the benefits of multiple layers of protection. This design not only strengthens each individual defense zone, but strengthens your security perimeter overall, minimizing susceptibility and letting only those you authorize into the network.

Creating a secure environment for your organization also means taking the time to plan ahead. Our specialized team of certified security professionals can help you establish the proactive and sustainable plans, policies, and procedures that you need to keep your systems secure. Our solutions can be tailored to fit your unique security needs and even make it easier to meet and address today's regulatory standards, including NERC CIP. With their multidisciplinary experience in substation, control system, and information security design, our cybersecurity team is here to work with you to assess, support, and develop a sensible security approach to protect your assets.

In addition to designing the right plan for your system, we believe that an effective cybersecurity program heavily relies on creating and maintaining awareness among individuals in your organization. That’s why we offer education and training that gives everyone the necessary tools, knowledge, and resources to actively maintain your organization’s security on a daily basis.

Overall, we understand that cybersecurity isn’t something that can be achieved by a single department, individual, product, or technology. It’s a combination of the abilities from each of these areas constantly working to put security first. Whether it’s regulatory compliance, securing power system assets, protecting operational and information technology networks, developing plans and procedures, or building awareness, we work with you to provide the security-focused, preventative solutions that you need for a future of safe and reliable operation.

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<td>SEL 3622</td>
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<td>SEL 3025</td>
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<th>ZONE 2: DATA AGGREGATION</th>
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<tr>
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<tr>
<td>SEL 3530</td>
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<th>ZONE 3: IED OR PROCESS</th>
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<td>SEL RELAY</td>
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The SEL ICON® is designed and built to address demanding communications needs and operate in extreme environments, including utilities, manufacturing, petrochemical plants, pipelines, or anywhere reliable communication is required to support critical applications.

The ICON, with other SEL products, provides end-to-end solutions, including wide-area control using synchrophasors, time distribution, and transmission line protection.

The ICON supports serial, time-division multiplexing (TDM), and Ethernet traffic on a single platform and transports it at 2.4 Gbps over fully protected SONET fiber-optic links. The ICON can distribute highly accurate time data throughout the network, enabling more fault-tolerant, robust industrial applications. The ICON is easy to configure and manage with software that automatically reads the network system configuration and builds a visual network representation.

The ICON is available in a 19-inch shelf-mount package and an 8-inch DIN rail- or panel-mount package.

**ECONOMICALLY DISTRIBUTE PRECISE TIME**
Distribute time over a wide-area network (WAN) with better than 1 µs accuracy so that very accurate relative time is maintained in the event of a GPS failure.

**AGGREGATE YOUR TRAFFIC INTO A SINGLE EASILY MANAGED COMMUNICATIONS RESOURCE**
The ICON supports a wide variety of substation and industrial devices, which use data types such as:
- Async serial
- FXO/FXS
- IEEE C37.94
- Transfer trip
- DS1 sync with groomed DS0s
- DS1 async
- 4-wire analog
- 10/100/1000 Mbps Ethernet

**SECURE INTERNODE SONET LINKS**
Eliminate man-in-the-middle attacks by using the optional SONET Crypto Module on line ports. The Crypto Module supports AES-256 encryption with low latency.

**SUPPORT ROBUST NETWORK ARCHITECTURES, AND BOOST NETWORK RELIABILITY**
Maintain critical services 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 <5 ms. In addition to ring network topologies, point-to-point and linear configurations are also supported.

**EASILY AND SECURELY MANAGE THE ICON NETWORK**
Tailor the network management solution to meet your needs using SEL-5051 Network Management System (NMS) Software or a commercially available Simple Network Management Protocol (SNMP)-based management software package. Features include a graphical network representation, remote provisioning, event reporting, performance monitoring, inventory management, and security management.
SELECT FROM A WIDE RANGE OF INTERFACES
Manage time-sensitive, data-intense, and low-bandwidth applications with the same product. The ICON supports TDM and packet applications. Interface modules include IEEE C37.94, asynchronous data, synchronous data, 2-wire FXO/FXS, 4-wire VF, transfer trip, DS1, and Ethernet.

FLEXIBLE MAPPING OF TRAFFIC INTO TDM STREAMS OR ETHERNET FRAMES
Map traffic from the access modules into TDM streams for point-to-point or point-to-multipoint communication. This flexibility supports better network traffic management and customization to handle a wide range of applications.

OPTIMIZE PACKET DELIVERY TIMES WITH PRIORITY QUEUES
Manage latency on the Ethernet network with eight priority queues on the drop ports.

ISOLATE APPLICATION TRAFFIC
Separate different traffic types using SONET pipes with STS-1 or VT granularity. The Ethernet interfaces support IEEE 802.1Q and port-based virtual local-area networks (VLANs).

OPERATE THE ICON IN HARSH ENVIRONMENTS
Withstands vibration, electrical surges, electrostatic discharge, fast transients, and extreme temperatures. Meets or exceeds IEEE 1613 standards for communications networking devices in electric power substations.

SEL ICON Integrated Communications Optical Network with network management.
SEL ICON MODULES

LINE MODULE
The Line Module provides the SONET transport interface between adjacent nodes. It contains an integrated switch capable of supporting eight 10/100 Mbps Ethernet copper ports and two 1 Gbps fiber-optic ports for local Ethernet traffic. Two IRIG-B output ports provide time distribution to connected IEDs.

- Line Ports A, B, C, and D: SONET OC-48
- Eight 10/100 Mbps copper ports, with Power over Ethernet on four ports
- Two 1 Gbps small form-factor plug-gable (SFP) fiber-optic ports
- IRIG-B outputs: 2 x BNC

BUDGETARY RETAIL
Quantity 1: $2,030
SFP transceivers not included.

PROTECTED LINE MODULE
The Protected Line Module provides a redundant SONET line interface. Users have the option to install two Protected Line Modules in place of the single Line Module. The Protected Line Module provides added reliability by ensuring SONET line communications are maintained in the event of a module failure.

- IRIG-B outputs: 2 x BNC
- Ethernet support provided by separate Ethernet Access Module

BUDGETARY RETAIL
Quantity 1: $1,500
SFP transceivers not included.

SERVER MODULE
The primary role of the Server Module is to provide the interface between the ICON and the SEL-5051 NMS Software or third-party SNMP manager. The Server Module also contains a GPS satellite receiver for network timing and for providing the real-time clock for time distribution to connected IEDs.

- GPS antenna connector: 1 x TNC
- IRIG-B in connector: 1 x BNC
- Network management ports: B-type USB or RJ45
- Contact inputs for NMS alarm information: 3 x Molex
- Contact outputs for major and minor alarms: 2 x Form C

BUDGETARY RETAIL
Quantity 1: $600

ETHERNET ACCESS MODULE
The Ethernet Access Module (EAM) provides eight 10/100 Mbps Ethernet ports on a full-height access module. The EAM is currently only supported by the Protected Line Module.

- Ethernet ports: 8 x 10/100 Mbps
- Power over Ethernet on 4 ports
- Quality of Service (QoS)
- Differentiated services code point (DSCP) support

BUDGETARY RETAIL
Quantity 1: $700
CRYPTO MODULE
The Crypto Module provides strong encryption of the SONET channel between adjacent ICON nodes. It is capable of securing two SONET OC-48 line channels simultaneously with SEL SONET Encryption Protocol (SSEP). This protocol uses AES encryption and is configurable for 128-bit or 256-bit keys.
- Low latency: less than 1 microsecond per encryption module
- FIPS: designed to 140-2 Level 2 requirements
- AES-128 and AES-256 encryption

BUDGETARY RETAIL
Quantity 1: $3,000

TRANSFER TRIP MODULE
The Transfer Trip Module (TTM) provides four contact inputs and four high-speed hybrid contact outputs. The TTM is compatible with all pilot protection schemes requiring transfer of a contact closure. Applications include direct transfer trip (DTT), all permissive transfer trip applications (POTT, PUTT), and directional comparison blocking and unblocking schemes (DCB, BCUB).
- Number of command inputs: 4
- Number of command outputs: 4
- Input voltage options: 24, 48, 125, and 250 Vdc

BUDGETARY RETAIL
Quantity 1: $1,200

ETHERNET BRIDGING ACCESS MODULE
The Ethernet Bridging Access Module (EBAM) provides four copper RJ45 ports operating at either 10/100/1000 Mbps and four SFP cage ports, which provide fiber-optic communications at 100/1000 Mbps. Each port supports IEEE 1588pp messages and can perform the functions of a grandmaster clock per the IEEE 1588 power-profile standard.
- 4 copper 10/100/1000BASE-T(X) ports
- 4 SFP cages supporting 100BASE-FX and/or 1000BASE-FX ports via SFP transceivers
- Support for IEEE 802.1Q VLANs
- IEEE 802.1d Ethernet bridge
- IEEE 802.1p priority queues [a.k.a. “Class of Service”]
- IEEE 802.1Q VLAN tagging
- DCSP (Diffserv) to IEEE 802.1p mapping

BUDGETARY RETAIL
Quantity 1: $1,000
SFP transceivers not included.

DS1 SYNC MODULE
The DS1 Sync Module accepts timing from external DS1 equipment, and when used with the Protected Line Module (8021-01), it allows embedded DS0 signals to be individually groomed and routed throughout the ICON network.
- Supports four independent circuits at a nominal rate of 1.544 Mbps
- Supports GR-253 asynchronous mapping for DS1
- Connectors: 4 x RJ48C

BUDGETARY RETAIL
Quantity 1: $800
**4-WIRE VF MODULE**
The 4-Wire Voice Frequency (VF) Module provides an interface for connecting the ICON to an analog trunk telephone circuit. Many utilities use standard telephony circuits for voice and data communications. The 4-Wire VF Module provides utilities with a migration path to a high-bandwidth WAN transport solution while maintaining their legacy end equipment.

- E&M signaling for types 1, 2, 3, and 5 are supported
- Two RJ45 connectors
- Data rate: 300 bps to 115.2 kbps

**BUDGETARY RETAIL**
Quantity 1: $320

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**2-WIRE FXS/FXO MODULES**
The 2-Wire FXS and FXO Modules provide interfaces for supporting analog telephone circuits.

**BUDGETARY RETAIL**
Quantity 1: $320

**FXS**
- Number of circuits: 1
- Signaling: loop start, Private Line Automatic Ringdown (PLAR)
- Connector: 1 x RJ11

**FXO**
- Number of circuits: 2
- Signaling: loop start
- Connector: 2 x RJ11

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**ASYNCH MODULE**
The Async Module provides a flexible asynchronous data interface that supports the direct connectivity of ICON to intelligent electronic devices (IEDs). Using the Async Module, serial data circuits can be provisioned through the ICON’s WAN optical transport to provide a direct communications path between IEDs.

- EIA-232, EIA-422, and EIA-485 standards are supported
- Two RJ45 connectors
- Data rate: 300 bps to 115.2 kbps

**BUDGETARY RETAIL**
Quantity 1: $204

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**NX64F MODULE**
The Nx64F Module provides an IEEE C37.94 fiber-optic synchronous interface for connectivity to teleprotection equipment. The IEEE C37.94 standard provides plug-and-play transparent communications between different manufacturers’ teleprotection and multiplexer devices using multimode optical fiber. The standard has no restrictions to the content of the data stream.

- IEEE C37.94 standard compliant
- Data rate: 64 to 768 kbps
- Wavelength: 850 nm multimode

**BUDGETARY RETAIL**
Quantity 1: $216

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**DS1 ASYNCH MODULE**
The DS1 Async Module provides a transparent asynchronous DS1 interface.

- Supports four independent circuits at a nominal rate of 1.544 Mbps
- Supports GR-253 asynchronous mapping for DS1
- Connectors: 4 x RJ48C

**BUDGETARY RETAIL**
Quantity 1: $450

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**FXO**
- Number of circuits: 2
- Signaling: loop start
- Connector: 2 x RJ11

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**FXS**
- Number of circuits: 1
- Signaling: loop start, Private Line Automatic Ringdown (PLAR)
- Connector: 1 x RJ11

---

**4-WIRE VF MODULE**
The 4-Wire Voice Frequency (VF) Module provides an interface for connecting the ICON to an analog trunk telephone circuit. Many utilities use standard telephony circuits for voice and data communications. The 4-Wire VF Module provides utilities with a migration path to a high-bandwidth WAN transport solution while maintaining their legacy end equipment.

- E&M signaling for types 1, 2, 3, and 5 are supported
- Two RJ45 connectors

**BUDGETARY RETAIL**
Quantity 1: $320
SEL-5051

NETWORK MANAGEMENT SYSTEM SOFTWARE

SEL-5051 Network Management System (NMS) Software provides a comprehensive tool for the configuration and management of an SEL ICON® Integrated Communications Optical Network.

SEL-5051 NMS Software detects the network and topology, and then presents them graphically. SEL-5051 Software will detect both the ICON and the SEL-2730M Managed 24-Port Ethernet Switch, and represent the complete network topology.

SEL-5051 NMS Software provides:
- SNMPv3 with AES-128 SHA1 for enhanced encryption and authentication
- Graphical network representation
- Network discovery of the ICON and SEL-2730M Managed 24-Port Ethernet Switch
- Remote provisioning
- Event reporting
- Performance monitoring
- Alarm management
- Inventory management
- Security management
- Remote firmware upgrade of ICON units

BUDGETARY RETAIL
Quantity 1: $5,000 plus $750 per ICON node
SEL-2740M

MANAGED ETHERNET SWITCH

MAXIMIZED ETHERNET NETWORK ROBUSTNESS
Designed, built, and tested for trouble-free operation in extreme conditions, the SEL-2740M Managed Ethernet Switch meets or exceeds IEEE 1613 (Class 2) and IEC 61850-3 standards for communications devices in electric power substations.

RELIABILITY IN HARSH ENVIRONMENTS
Connect to primary and backup power sources simultaneously with dual, hot-swappable power supplies. This ensures that there will not be a loss of service due to a single power source failure. The design minimizes interface points on printed circuit boards (PCBs), resulting in greater reliability. With no fans or other moving parts, the SEL-2740M employs the most robust technology available for demanding applications.

EASY NETWORK COMMISSIONING
Easily install and configure the SEL-2740M. Setting up priority messaging via virtual local-area networks (VLANs) is simplified to ensure transmission of IEC 61850 GOOSE messages and current differential traffic to intelligent electronic devices (IEDs) while segmenting protection, control, and automation traffic. Update settings either through a secure web interface or offline for later download to the switch.

FLEXIBLE, MODULAR DESIGN
Accept a wide variety of network interface options with six network interface slots. Choose any six of the ordering options to create your perfect switch.

SECURE NETWORK MANAGEMENT
Increase security with the SNMPv3 and HTTPS features on the SEL-2740M. SNMPv3 provides secure network management and is interoperable with existing network management systems (NMS). An HTTPS web interface provides secure and intuitive switch management. Map configurable system and security events to the alarm contact for alarming through an external system, such as an existing SCADA network.

PRECISION TIME PROTOCOL
Use microsecond-accurate network timing for the most sensitive synchronous applications. The SEL-2740M supports IEEE 1588-2008 with the IEEE C37.238-2011 power profile.

RELIABILITY DESIGNED FOR FLEXIBILITY
The SEL-2740M groups the selectable Ethernet interfaces in groups of four, with a total of six modules that are custom selected. The slim 1U hardware chassis accommodates six modules, offering maximum flexibility developed to the highest industry reliability.

ORDERING OPTIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
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<tbody>
<tr>
<td>4 RJ45 10/100BASE-T</td>
<td>SEL-962001XX0XX</td>
</tr>
<tr>
<td>4 LC 100BASE-FX Multimode (1300 nm, 2 km)</td>
<td>SEL-96200111X0XX</td>
</tr>
<tr>
<td>4 LC 100BASE-LX10 Single-Mode (1310 nm, 15 km)</td>
<td>SEL-96200113X0XX</td>
</tr>
<tr>
<td>4 RJ45 10/100/1000BASE-T</td>
<td>SEL-9620012XX0XX</td>
</tr>
<tr>
<td>4 LC 1000BASE-SX Multimode (850 nm, 500 m)</td>
<td>SEL-96200130X0XX</td>
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<tr>
<td>4 LC 1000BASE-LX Single-Mode (1310 nm, 10 km)</td>
<td>SEL-96200132X0XX</td>
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<td>4 LC 1000BASE-LX Single-Mode (1310 nm, 20 km)</td>
<td>SEL-96200134X0XX</td>
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<td>4 LC 1000BASE-LX Single-Mode (1310 nm, 30 km)</td>
<td>SEL-96200100XX</td>
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<td>4 LC 1000BASE-LX Single-Mode (1310 nm, 40 km)</td>
<td>SEL-96200101XX</td>
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<tr>
<td>4 LC 1000BASE-XD Single-Mode (1310 nm, 50 km)</td>
<td>SEL-96200106XX</td>
</tr>
<tr>
<td>4 LC 1000BASE-ZX Single-Mode (1310 nm, 80 km)</td>
<td>SEL-96200107XX</td>
</tr>
<tr>
<td>1 Alarm Contact, 1 Contact Output, 1 Wetted Input</td>
<td>SEL-9620010XXXX</td>
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Power Supplies

<table>
<thead>
<tr>
<th>RANGE</th>
<th>Part #</th>
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<tbody>
<tr>
<td>100/125/220/250 Vac, 100/125/220/250 Vdc</td>
<td>SEL-9330A</td>
</tr>
<tr>
<td>24/48 Vdc</td>
<td>SEL-9330C</td>
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*Conformal Coating Option
Traffic Engineering

Improve Ethernet communications reliability and ease configuration and management overheads with the SEL-2740S Software-Defined Network Switch. Software-defined networks (SDNs) provide the central configuration and operational monitoring that have been lacking in Ethernet technology. They also simplify the field firmware requirements by abstracting the Ethernet forwarding control intelligence and centralizing it, resulting in smaller firmware requirements in the field device and reducing patch management and field configuration.

Use the SEL-2740S and the SEL-5056 Flow Controller to achieve learn-and-lock technology, which identifies the network topology, host tracking, and best primary and failover circuits for each flow based on the operator’s priority designations. This technology will also report suggested wiring improvements as well as an overall reliability grade of the local-area network (LAN), so even those who are not experts in SDN technology can benefit from its advantages. The SEL-2740S enables accurate time synchronization through IEEE 1588-2008 with the IEEE C37.238-2011 power profile.

Budgetary Retail

Quantity 1: $4,500

Improved Quality and Maximized Operations

Maximize asset utilization with no port-blocking requirements, like those found in the Rapid Spanning Tree protocol (RSTP). An SDN evaporates the network cloud by enabling the system owner to pre-engineer and test the Ethernet circuits the same way they do their power circuits, predetermining the exact primary and failover communications flow circuits. This results in more deterministic latency and less disruption during faults, due to almost immediate failover times. Engineer communications flows just like power flows, with fault tree analysis and N-1 redundancy, and validate communications performance before deployment with simple and repeatable acceptance testing of all fault conditions.

Deploy SDNs to take advantage of the ability to engineer network traffic with predetermined primary and backup paths.
SEL-2730M/2730U

24-PORT ETHERNET SWITCHES

MAXIMIZED ETHERNET NETWORK ROBUSTNESS
Designed, built, and tested for trouble-free operation in extreme conditions, the SEL-2730M Managed 24-Port Ethernet Switch and SEL-2730U Unmanaged 24-Port Ethernet Switch meet or exceed IEEE 1613 (Class 2) and IEC 61850-3 standards for communications devices in electric power substations.

RELIABILITY IN HARSH ENVIRONMENTS
Connect to primary and backup power sources simultaneously with dual, hot-swappable power supplies. This ensures that there will not be a loss of service due to a single power source failure. The design minimizes interface points on printed circuit boards (PCBs), resulting in greater reliability. With no fans or other moving parts, the SEL-2730M and SEL-2730U employ the most robust technology available for demanding applications.

EASY NETWORK COMMISSIONING
Easily install and configure the SEL-2730M. Setting up priority messaging via virtual local-area networks (VLANs) is simplified to ensure transmission of IEC 61850 GOOSE messages and current differential traffic to intelligent electronic devices (IEDs) while segmenting protection, control, and automation traffic. Update settings either through a secure web interface or acSELErator QuickSet® SEL-5030 Software. Use the configuration file for easy backups and restoration.

FLEXIBLE, MODULAR DESIGN
Upgrade existing sites with 4 Gigabit Ethernet copper ports and sixteen 10/100 Mbps copper Ethernet ports, built as 4-port modules. Each of the 10/100 Mbps copper port modules can be ordered with single- or multimode fiber-optic ports to meet your network’s unique requirements. In addition, you can add up to 4 fiber-optic Gigabit Ethernet ports via small form-factor pluggable (SFP) transceivers for a total of 24 ports.

SECURE NETWORK MANAGEMENT
Increase security with the SNMPv3 and HTTPS features on the SEL-2730M. SNMPv3 provides secure network management and is interoperable with existing network management systems (NMS). An HTTPS web interface provides secure and intuitive switch management. Map configurable system and security events to the alarm contact for alarming through an external system, such as an existing SCADA network.

LOWER MAINTENANCE NEED
Easily integrate the SEL-2730U into an existing network. The SEL-2730U has no settings or configurations to apply. Just connect power, Ethernet devices, and the fiber-optic Ethernet network. LED indicators simplify commissioning and solving network problems. Copper Ethernet ports automatically configure for crossover cables, speed, and half- or full-duplex operation.

NETWORK INTEGRITY PROTECTION

NETWORK TOPOLOGY CONFIGURATION
Use any of the available 4094 VLANs for switch-to-switch connections with the SEL-2730M. Monitor VLAN configurations with easy-to-read graphics. Monitor the status through Syslog and the Simple Network Management Protocol (SNMP).

<table>
<thead>
<tr>
<th>SEL-2730M/2730U Description</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Hot-Swappable Power Supplies</td>
<td>Voltage Range</td>
</tr>
<tr>
<td>125/250 Vdc, 50/60 Hz</td>
<td>85–330 Vdc or 85–264 Vac</td>
</tr>
<tr>
<td>24/48 Vdc</td>
<td>18–60 Vdc</td>
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<tr>
<td>Power Consumption</td>
<td>&lt;45 W</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-40° to +85°C [-40° to +185°F]</td>
</tr>
</tbody>
</table>

For complete information, visit selinc.com/SEL-2730M
SEL-2725

FIVE-PORT ETHERNET SWITCH

BUDGETARY RETAIL
Quantity 1: $450

FLEXIBLE NETWORK EXPANSION
Apply as an unmanaged “no-settings” switch/media converter. LED indicators simplify commissioning and solve network problems. Convert Ethernet links to fiber-optic Ethernet link[s]. Ports 1–4 automatically configure for crossover cables, speed, and half- or full-duplex operation.

STABILITY IN TOUGH ENVIRONMENTS
Install in harsh environments. The SEL-2725 Five-Port Ethernet Switch withstands vibration, electrical surges, electrostatic discharge, fast transients, and extreme temperatures. It meets or exceeds IEEE 1613 and IEC 61850-3 standards for communications networking devices in electric power substations.

SYSTEM RELIABILITY
Compare our superior specification compliance, lower price, and worldwide, ten-year warranty to alternatives. Directly power the SEL-2725 from 12 Vdc, 24/48 Vdc, or 125/250 Vdc or 110/240 Vac sources; the SEL-2725 power supply mean time between failures (MTBF) exceeds 3,000 years.

ENVIRONMENTAL-CONDITIONING SPECIFICATIONS
Temperature range of −40° to +85°C [−40° to +185°F]; good for critical utility and industrial environments.

<table>
<thead>
<tr>
<th>SEL-2725 Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply Options</td>
<td>Voltage Range</td>
</tr>
<tr>
<td>12 Vdc</td>
<td>9–30 Vdc</td>
</tr>
<tr>
<td>24/48 Vdc</td>
<td>18–60 Vdc</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>&lt;5 W</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>−40° to +85°C [−40° to +185°F]</td>
</tr>
</tbody>
</table>

SEL-2726U

EIGHT-PORT ETHERNET SWITCH

BUDGETARY RETAIL
Quantity 1: $200

SIMPLE, EASY NETWORK CONNECTIVITY
Easily install the unmanaged, all-copper Ethernet switch, which requires no software. All eight ports autoconfigure themselves for speed and duplex operation. No settings to manage or store means greater ease of control and fewer chances for human error.

FAST CONNECTIVITY FOR TROUBLESHOOTING
Quickly place the eight-port switch into testing or troubleshooting environments. The low requirements for power and operating voltage mean easy copper Ethernet connectivity is there when you need it.

DURABLE ETHERNET EXPANSION
Use the eight-port switch to expand network connectivity for building management systems, alarm closets, or other temperature-regulated environments where important control needs exist.

ENVIRONMENTAL-CONDITIONING SPECIFICATIONS
Temperature range of 0° to +40°C (+32° to +104°F); good for critical utility and industrial environments.
SEL-3610
PORT SERVER

BUDGETARY RETAIL
Quantity 1: $1,800

SERIAL PORT EXPANSION
Add 17 EIA-232/-422/-485 remote serial ports to computers and SEL-3530 Real-Time Automation Controllers (RTACs) via Ethernet connections. Restrict all access to unconfigured logical and physical ports.

MODBUS® CONVERSION
Configure the SEL-3610 Port Server to act as a Modbus protocol transceiver, and allow Modbus serial devices to communicate with Modbus TCP products. Modbus conversions are applicable in one-to-one and one-to-many architectures.

HIGHLY CONFIGURABLE SERIAL MAPPINGS
Provide highly granular network configurations with a variety of serial-to-serial, serial-to-Ethernet (UDP or TCP), point-to-point, and point-to-multipoint mappings. Filter data based on which connections listen or transmit.

SECURE ACCESS TO INTELLIGENT ELECTRONIC DEVICES (IEDS)
Configure a serial or Ethernet port as a master port for secured and authenticated transparent access to devices connected to the SEL-3610. The SEL-3610 logs user access to connected devices for greater security and accountability.

EMBEDDED WHITELIST ANTIVIRUS
Resist known and unknown malware attacks against SEL Security Gateways with exe-GUARD™ embedded antivirus. Powerful rootkit resistance technology, embedded Linux® mandatory access controls, and process whitelisting help mitigate attacks against the gateways themselves without additional settings or patch management requirements.

CENTRALIZED SECURITY
Manage user accounts and group memberships centrally using Lightweight Directory Access Protocol (LDAP)-accessible systems, such as the Microsoft® Active Directory® service, or by using the Remote Access Dial-In User Service (RADIUS) functionality to enable multifactor authentication technology, such as RSA tokens.

CENTRALIZED LOGGING
Track actual or attempted access to the SEL-3610. Log and store up to 60,000 configuration settings, changes, and events locally, or send unlimited logs remotely with Syslog.

ACCURATE TIME SYNCHRONIZATION
Synchronize timing information from the SEL-3610 using IRIG-B for nanosecond-accurate timing, and Network Time Protocol (NTP) over Ethernet for granular logging and event timing.

LOCAL-AREA NETWORKS
SEL-3610
SEL-3620

ETHERNET SECURITY GATEWAY

CENTRALIZED ACCESS TO RELAYS AND INTELLIGENT ELECTRONIC DEVICES (IEDs)

Provide a central point of entry to critical cyber assets with user-based access controls and detailed activity logs. Log onto the SEL-3620 Ethernet Security Gateway, not individual IEDs. Manage user accounts and group memberships centrally using Lightweight Directory Access Protocol (LDAP)-accessible systems, such as Microsoft® Active Directory®. Remote Authentication Dial-In User Service (RADIUS) functionality enables the use of multifactor authentication systems, such as RSA tokens.

IED PASSWORD MANAGEMENT

Enforce strong passwords on IEDs, and change the passwords automatically on a configurable schedule. Satisfy regulatory password requirements, and ensure that no weak or default passwords are in use. Manage passwords on IEDs that use command-line interfaces and on devices that use the Modbus® protocol, such as GE UR series relays.

SUBSTATION FIREWALL AND IPSEC VPN ENDPOINT


ACCURATE TIME SYNCHRONIZATION

Synchronize timing information even if a GPS satellite signal is temporarily unavailable. Sync with local communications processors, computers, and security devices using IRIG-B for synchrophasor-accurate timing and Network Time Protocol (NTP) over Ethernet for granular logging and event timing.

VIRTUAL SOFTWARE CLIENT SUPPORT

Transform unsecure serial or legacy Ethernet communications on Windows® computers to cryptographically secure channels by using SEL-5827 Virtual Connect Client or SEL-5828 Virtual Port Service Software. These applications are provided free by SEL to make remote Security Gateway ports available for existing software and terminal applications on your PC, including those using Modbus TCP/RTU. Data are secured using Secure Shell (SSH) with remote port groups, master ports, and serial ports.

STRONG AUDITABILITY SUPPORTS NERC CIP REQUIREMENTS

Log and time-stamp user access and all commands entered on critical IEDs. Integrate event records into existing log management systems using Syslog. Protect IEDs with strong passwords, and block shared or default accounts. Granular access controls limit users’ access to their assigned roles on individual IEDs. Generate specific reports for user activity, users accounts on the device, network ports and services, IED password updates, and password updates.

EMBEDDED WHITELIST ANTIVIRUS

Resist known and unknown malware attacks against SEL Security Gateways with exe-GUARD™ embedded antivirus. Powerful rootkit resistance technology, embedded Linux® mandatory access controls, and process whitelisting help mitigate attacks against the gateways themselves without additional settings or patch management requirements.

Manage IED passwords quickly and efficiently with the SEL-3620. Ensure only strong passwords are in use on critical networks.
 evidently

provide a central point of entry to several critical cyber assets with user-based access controls and detailed activity logs. Log onto the SEL-3622 Ethernet Security Gateway, not individual intelligent electronic devices (IEDs). Manage user accounts and group memberships centrally using Lightweight Directory Access Protocol (LDAP)-accessible systems, such as Microsoft® Active Directory®. Remote Authentication Dial-In User Service (RADIUS) functionality enables the use of multifactor authentication systems, such as RSA tokens.

IE D PASSWORD MANAGEMENT
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EMBEDDED WHITELIST ANTIVIRUS
Resist known and unknown malware attacks against SEL Security Gateways with exe-GUARD™ embedded antivirus. Powerful rootkit resistance technology, embedded Linux® mandatory access controls, and process whitelisting help mitigate attacks against the gateways themselves without additional settings or patch management requirements.

PHYSICAL SECURITY PROTECTIONS
Alert on possible malicious physical activity with physical sensor components on the SEL-3622 Security Gateway. The SEL-3622 can detect sudden movement (through an embedded accelerometer), sudden changes in visible light (through an embedded light sensor), the opening of cabinet doors (through an input sensor), and the connection and disconnection of Ethernet cables.

SMALL FORM FACTOR WITH LOW POWER DRAW
The small form factor with an IRIG-B input fits into field cabinets or other confined spaces. The SEL-3622 supports 12–30 Vdc inputs and draws less than 5 watts of power (for dual copper configuration). Two Ethernet ports and four serial ports support a wide variety of Ethernet and serial-to-Ethernet communications configurations.

BUDGETARY RETAIL
Quantity 1: $799

LOC A-LA REA NET W ORKS

SEL-3622
SECURITY GATEWAY
### SEL-3025

**SERIAL SHIELD®**

**BUDGETARY RETAIL**
Quantity 1: $900

**SECURE SERIAL COMMUNICATIONS**
Secure serial communications with strong AES-128/256 SHA 1/256 cryptography for engineering access, SCADA, and time-sensitive process automation data at speeds up to 57600 bps.

**TWO PROVEN, VALIDATED SECURITY PROTOCOLS**
- Protect dial-up engineering access links with the Secure SCADA Communications Protocol (SSCP).
- Protect time-sensitive serial data with low-latency Streaming Encryption Protocol (SEP). SEP adds just 7.5 ms of latency to DNP3 at 9600 bps.

**CENTRALIZED REMOTE MANAGEMENT**
Use any web browser with HTTPS to change configurations on the device through the Ethernet management port, or manage remote units through the secured serial channel. Securely manage the SEL-3025 Serial Shield remotely from any location with SEL acSELErator® Software.

**EASILY INTEGRATE INTO EXISTING SYSTEMS**
Requires minimal equipment settings changes with bump-in-the-wire installation.

**WIDE NETWORK TOPOLOGY AND PROTOCOL SUPPORT**
Use the SEL-3025 in a wide variety of serial architectures, including point-to-point, point-to-multipoint, and many-to-many. The SEL-3025 supports all byte-oriented and most bit-oriented serial protocols.

**PC SERIAL SECURITY**
Add a PC Serial Security Kit to communicate securely over remote serial links such as a dial-up connection protected by the SEL-3025. Simply plug in the SEL-3055 USB card dock with the SEL-3045 Secure SCADA Card, and install the virtual port software to create a secured serial port with your existing software and terminal applications.

### SEL-2890

**ETHERNET TRANSCEIVER**

**BUDGETARY RETAIL**
Quantity 1: $200

** SERIAL LINK REPLACEMENT**
Replace leased or dial-up communications lines, or add Ethernet communications to sites where other communication types are prohibitive. Use serial tunneling for a virtual serial link through the network.

**ETHERNET ACCESS TO SERIAL DEVICES**
Access devices with serial ports via Internet protocols over a standard Ethernet network. Streamline terminal access and save engineering time by using Telnet for ASCII terminal dialogs. Simplify and control data access with a webpage on your private network.

**AUTOMATIC EMAIL EVENT REPORTS**
Send email alerts based on automatic messages from an SEL relay host device to improve customer service. Configure the transceiver to automatically communicate with a Simple Mail Transfer Protocol (SMTP) server available on an operations network.

**DNP3 TUNNELING**
Inexpensively tunnel serial-based DNP3 traffic over an existing Ethernet network. Simply connect a transceiver to the DNP3 serial master and DNP3 serial clients, and configure the DNP3 settings.

**TOUGH**
Operates trouble-free in extreme environments and is tested in extreme temperatures of −40° to +85°C (−40° to +185°F), RFI, shock, and vibration conditions.
VERSATELL: THREE SERIAL CHANNELS
In point-to-point mode, allows up to three different connections and protocols to operate simultaneously. Transfers control commands with only 4.8 milliseconds of latency for a 38400 bps SEL MirrorEd Bits® channel.

FLEXIBLE: POINT-TO-MULTIPOINT
In point-to-multipoint mode, a single master radio can communicate with multiple remote radios supporting SCADA data gathering.

LICENSE FREE
The radio transmits data in the license-free, 915 MHz ISM band up to 20 miles, providing an economical communications path or backup communications system.

RELIABLE AND SECURE
Protects critical data and thwarts malicious attacks with the optional encryption card, using session authentication and strong 256-bit Advanced Encryption Standard (AES) encryption.

RADIO ACCESSORIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Encryption Card</td>
<td>915900172</td>
<td>$300</td>
</tr>
<tr>
<td>Gas Tube Surge Protector TNC</td>
<td>915900139</td>
<td>$100</td>
</tr>
<tr>
<td>Hop-Sync Cable</td>
<td>SEL-C576</td>
<td>$32</td>
</tr>
<tr>
<td>Indoor 8” Omni Antenna TNC</td>
<td>235-0108</td>
<td>$21</td>
</tr>
</tbody>
</table>

TOUGH
Operates trouble-free in extreme environments and is tested in extreme temperatures of –40°C to +85°C (~–40°F to +185°F), RFI, shock, and vibration conditions.

FLEXIBLE INSTALLATION AND EASY SETUP
Select from multiple styles of cases and power supplies, including rack-mount, wall-mount, and NEMA 3R enclosures, to meet specific applications. NEMA 3R cabinet versions may be customized to meet your needs. Order one of the serial ports with an EIA-232, EIA-485, or SEL-2812 compatible fiber-optic connection. Quickly and easily set up the radio with minimum settings using acSELErator QuickSet® SEL-5030 Software.

OPTIMIZED COLLOCATED ANTENNA PERFORMANCE
When there are multiple radios at the same site, the transmission from one radio can easily overpower the weaker signals (from up to 20 miles away) that a nearby radio is trying to receive. With SEL Hop-Sync™ technology, collocated radios can all be synchronized to hop frequencies, transmit, and receive at the same times, so none of the local radios will transmit while any are receiving signals.

WEATHERPROOF, OUTDOOR ANTENNAS WITH N CONNECTORS

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directional Yagi 8.5 dBi</td>
<td>235-0221</td>
<td>$122</td>
</tr>
<tr>
<td>Directional Yagi 11.1 dBi</td>
<td>235-0220</td>
<td>$129</td>
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<tr>
<td>Directional Yagi 14.15 dBi</td>
<td>235-0222</td>
<td>$205</td>
</tr>
<tr>
<td>Directional Panel 10 dBi</td>
<td>235-0240</td>
<td>$154</td>
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<tr>
<td>Omnidirectional 2.15 dBi</td>
<td>235-0231</td>
<td>$74</td>
</tr>
<tr>
<td>Omnidirectional 7.15 dBi</td>
<td>235-0232</td>
<td>$149</td>
</tr>
<tr>
<td>Omnidirectional 9.15 dBi</td>
<td>235-0233</td>
<td>$166</td>
</tr>
</tbody>
</table>
SEL-3060
ETHERNET RADIO

LICENSE FREE
Operates in 900 MHz ISM band (SEL-3060A) and 2.4 GHz ISM band (SEL-3060B).

FLEXIBLE
Operates point-to-point or point-to-multipoint with up to 63 nodes. Apply the SEL-3060 Ethernet Radio for:
- Distribution automation
- Data acquisition
- SCADA
- Engineering access

POWERFUL
Communicate 15 miles point-to-point or 10 miles point-to-multipoint using 12 channels with the SEL-3060A. With the SEL-3060B, point-to-point links can stretch 10 miles and point-to-multipoint links can span 7 miles. The SEL-3060B communicates using 26 channels.

FAST
Transfer data up to 1 Mbps, with 6–12 ms latency for IEC 61850 GOOSE messages using point-to-point operation.

LOW POWER REQUIREMENTS
Consuming less than 4 watts, the SEL-3060 is well suited for battery backup in remote locations.

SECURE
Supports AES 128-bit encryption.

RELIABLE
Operates from −40° to +85°C (−40° to +185°F) and is certified to IEEE 1613, IEEE C37.90, and IEC 60255 standards. Backed by a ten-year warranty.

EASY
Configure through a web interface.

RADIO ACCESSORIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>900 MHz Antennas</td>
<td></td>
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<tr>
<td>5-Element 11.1 dBi Yagi, N Connector</td>
<td>235-0220</td>
<td>$129</td>
</tr>
<tr>
<td>11-Element 14.15 dBi Yagi, N Connector</td>
<td>235-0222</td>
<td>$205</td>
</tr>
<tr>
<td>Vertical 7.15 dBi N Connector</td>
<td>235-0232</td>
<td>$149</td>
</tr>
<tr>
<td>Vertical 9.15 dBi, N Connector</td>
<td>235-0233</td>
<td>$166</td>
</tr>
<tr>
<td>2.4 GHz Antennas</td>
<td></td>
<td></td>
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<tr>
<td>15 dBi Enclosed Yagi, N Connector</td>
<td>235-0225</td>
<td>$111</td>
</tr>
<tr>
<td>Vertical 10 dBi Gain Omni-Directional, N Connector</td>
<td>235-0227</td>
<td>$174</td>
</tr>
<tr>
<td>19 dBi Panel, N Connector</td>
<td>235-0228</td>
<td>$78</td>
</tr>
<tr>
<td>N Female-to-TNC-Male Adapter</td>
<td>240-1809</td>
<td>$16</td>
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</tbody>
</table>
SEL-2924

PORTABLE BLUETOOTH® SERIAL ADAPTER

CARRY AN SEL-2924 PORTABLE BLUETOOTH SERIAL ADAPTER TO CONNECT TO AN EIA-232 PORT ON A RELAY, METER, CONTROLLER, OR OTHER DEVICE. USE THE BUILT-IN BLUETOOTH COMMUNICATIONS CAPABILITY OF LAPTOP COMPUTERS, SMARTPHONES, OR OTHER DEVICES TO COMMUNICATE OVER 10 METERS (32 FEET) VIA A SECURE WIRELESS LINK.

IMPROVE WORKING CONDITIONS AND SAFETY
- Work in safe locations away from switchboards and panels.
- Use a desk or workstation with power and work surfaces away from the traffic near panels during commissioning and outages.
- Eliminate tripping hazards from cables.
- Limit time spent in dangerous or unpleasant areas to the short duration tasks of plugging the SEL-2924 into a field device and retrieving it when you are done.

APPLY EASILY WITH LOW IMPACT AND COST
- Use the BLUETOOTH wireless interface in your laptop, handheld PC, tablet, or smartphone.
- Connect the SEL-2924 BLUETOOTH Serial Adapter to an EIA-232 port on the equipment, with no change to the device firmware or software.

LOCK OUT INTRUDERS
- Depend on security that is always enabled with an 8- to 16-character key.
- Communicate securely with BLUETOOTH v2.1 + EDR security.

BUDGETARY RETAIL
Quantity 1: $129 (includes power supply)

SEL-2924 ACCESSORIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>(SEL-2924 and SEL-2925) USA Power Supply With USB Micro-B Cable</td>
<td>915900287</td>
<td>$15</td>
</tr>
<tr>
<td>(SEL-2924 and SEL-2925) EIA-232 Adapter, Converts to Female Connector</td>
<td>240-1550</td>
<td>$10</td>
</tr>
<tr>
<td>(SEL-2924 only) Replacement NiMh Batteries (2)</td>
<td>915900266</td>
<td>$8</td>
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</tbody>
</table>

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## SEL-2925

**BLUETOOTH® SERIAL ADAPTER**

**BUDGETARY RETAIL**
- Quantity 1: $129 [includes USB cable and indoor antenna]
- Quantity 1: $159 [includes USB cable and outdoor antenna with 3-foot cable]

Permanently install an SEL-2925 BLUETOOTH Serial Adapter on the serial port of a recloser control, protective relay, or other device. Communicate securely from over 100 meters (328 feet) away to avoid entering hazardous areas or opening doors that allow precipitation or contaminants to enter equipment enclosures.

**PROTECT PERSONNEL AND EQUIPMENT**
- Avoid exposing personnel to hazardous conditions by enabling them to control and monitor equipment from their vehicles or other safe locations.
- Keep enclosure and control house doors shut to protect equipment from weather and contaminants.
- Use for engineering access or for point-to-point connections.

**APPLY EASILY WITH LOW IMPACT AND COST**
- Use the SEL-2925 with your laptop, tablet, or Android™ or BlackBerry® smartphone.
- Connect the SEL-2925 to an EIA-232 port on the equipment, with no change to the device firmware or software.

**LOCK OUT INTRUDERS**
- Locate equipment where vandals cannot reach it.
- Keep gates and control house doors locked.
- Depend on security that is always enabled with an 8- to 16-character key.
- Communicate securely with BLUETOOTH v2.1 + EDR security.

### SEL-2925 ACCESSORIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement Indoor Antenna</td>
<td>235-0301</td>
<td>$10.75</td>
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<tr>
<td>Replacement Outdoor Antenna With 3’ Cable and SMA Connector</td>
<td>235-0300</td>
<td>$29.75</td>
</tr>
<tr>
<td>USA Power Supply With USB Micro-B Cable</td>
<td>915900287</td>
<td>$15</td>
</tr>
<tr>
<td>EIA-232 Adapter; Converts to Female Connector</td>
<td>240-1550</td>
<td>$11</td>
</tr>
<tr>
<td>Adapter to SEL-3022 Antenna Cable</td>
<td>235-0302</td>
<td>$10.75</td>
</tr>
<tr>
<td>Extension Cable for Outdoor Antenna</td>
<td>C970</td>
<td>$18 for 8’ or less</td>
</tr>
<tr>
<td>USB Micro-B Power Cable With Plain Wires, 2 Meters (6.56 Feet)</td>
<td>C580</td>
<td>$10</td>
</tr>
<tr>
<td>EIA-232 Extension Ribbon Cable</td>
<td>C780</td>
<td>$22</td>
</tr>
<tr>
<td>EIA-232 Extension Cable to Mount on a Plate or Shelf</td>
<td>C641P</td>
<td>$63 for 8’ or less</td>
</tr>
</tbody>
</table>

**SEL RXTX BLUETOOTH APPLICATION FOR MOBILE DEVICES**

Download the SEL RxTx app from the SEL website. The app allows mobile devices to use BLUETOOTH communications technology to communicate with BLUETOOTH serial adapters, which are in turn connected to the serial ports of host devices. It operates on Android 2.1 operating systems (OS) and higher, or BlackBerry 7.x OS and higher.

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SEL-2488
SATellite-SYNchronized NETWORK CLOCKS

BUDGETARY RETAIL
Quantity 1: $2,450

ACCURATE
Synchronize with precise-time accuracy to within ±40 ns for power protection applications. If GPS time signals become unavailable, the clock switches to the TCXO holdover, with 36 μs/day accuracy, or to the optional OCXO holdover, with 5 μs/day accuracy. The SEL-2488 Satellite-Synchronized Network Clock also provides time delay compensation for antenna cables and output cables on a per-port basis to preserve accuracy.

FLEXIBLE
Distribute time from eight time outputs that are configurable for IRIG-B or time pulse outputs. The SEL-2488 also includes four standard Ethernet ports, which provide NTPv4 and are available in copper as well as single- or multimode fiber. The Precision Time Protocol (PTP) for power systems, as defined by IEEE 1588, will be supported with an optional upgrade.

SECURE
The SEL-2488 supports Syslog and provides secure user authentication through the Lightweight Directory Access Protocol (LDAP).

EASY
The SEL-2488 supports DHCP with a captive portal, an HTTPS device webpage, and acSELErator QuickSet® SEL-5030 Software for easy and secure configuration.

DEPENDABLE
The SEL-2488 provides an option for a second, redundant power supply; operates from −40°C to +85°C (−40°F to +185°F); is certified to IEEE 1613 Class 1, IEC 61850-3, and IEC 60255; and is backed by our ten-year, worldwide product warranty.

Clock Options and Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second Power Supply</td>
<td>Ordering Option or SEL-9330A/C</td>
<td>$250</td>
</tr>
<tr>
<td>OCXO Holdover</td>
<td>Ordering Option</td>
<td>$500</td>
</tr>
<tr>
<td>Dual Constellation Antenna</td>
<td>235-0304</td>
<td>$250</td>
</tr>
<tr>
<td>Two Multimode Ethernet Ports</td>
<td>Ordering Option</td>
<td>$200</td>
</tr>
<tr>
<td>Two Single-Mode Ethernet Ports</td>
<td>Ordering Option</td>
<td>$500</td>
</tr>
<tr>
<td>Conformal Coating</td>
<td>Ordering Option</td>
<td>$150</td>
</tr>
<tr>
<td>N to TNC Jack</td>
<td>240-1808</td>
<td>$16</td>
</tr>
<tr>
<td>PTP Upgrade</td>
<td>Ordering Option</td>
<td>$1,750</td>
</tr>
</tbody>
</table>
SEL-2401

SATellite-SYNCHRONIZED CLOCK

Compact, precision time device for limited spaces and high-accuracy timing to ±100 nanoseconds.

IRIG-B000 EXTENDED TIME CODE
IEEE 1344 extensions of year, leap second, daylight-saving time, UTC offset, and parity bit.

HIGH ACCURACY
±100 ns

TEMPERATURE RANGE
–40° to +80°C (–40° to +176°F)

BUDGETARY RETAIL
Quantity 1: $548 (includes antenna)

SEL-2404

SATellite-SYNCHRONIZED CLOCK

Provides large time display, reliability, durability, and high-accuracy timing to ±100 nanoseconds.

ACCURATE
Demodulated IRIG-B outputs with ±100 ns accuracy.

TOUGH
Apply in harsh environments for accurate operation from –40° to +80°C (–40° to +176°F).

SIMPLE OPERATION
Program time offsets and output formats with easy-to-operate control DIP switches mounted on the rear panel. Change settings without removing the SEL-2404 Satellite-Synchronized Clock from its mounting location.

BUDGETARY RETAIL
Quantity 1: $1,250 (includes antenna)
The SEL-2407 Satellite-Synchronized Clock provides a large time display, reliability, durability, and high-accuracy timing to ±100 nanoseconds.

**ACCURATE**
Demodulated IRIG-B outputs with ±100 ns accuracy.

**TOUGH**
Apply in harsh environments for accurate operation from –40° to +80°C (–40° to +176°F).

**SIMPLE OPERATION**
Program time offsets and output formats with easy-to-operate control DIP switches mounted on the rear panel. Change settings without removing the SEL-2407 from its mounting location.

**FLEXIBLE OUTPUT CHOICES**
One modulated and six demodulated IRIG-B outputs on BNC connectors, plus ASCII time output on one serial port and an optional fiber-optic port, provide time signals for most applications. All clock outputs are user-programmable for extended IEEE 1344/IEEE C37.118 IRIG-B formats, 1 PPS, 1 kPPS, or alarm functionality. Outputs configured as alarms can be used for control applications, such as double-ended power transmission line tests. The alarm contact output can close for loss-of-timing/loss-of-satellite conditions or provide one pulse per 30 seconds, per minute, or per hour.

---

**TIME ACQUISITION ACCESSORIES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Profile GPS Antenna</td>
<td>235-0209</td>
<td>$75</td>
</tr>
<tr>
<td>Low-Profile GPS Antenna Mounting Kit</td>
<td>915900044</td>
<td>$10</td>
</tr>
<tr>
<td>Dual-Constellation GPS Antenna, 5 V, 40 dB Gain, N Connector</td>
<td>235-0304</td>
<td>$250</td>
</tr>
<tr>
<td>GPS Bullet Antenna, 5 V 40 dB Gain</td>
<td>235-0113</td>
<td>$250</td>
</tr>
<tr>
<td>Bullet and Dual-Constellation GPS Antenna Mounting Kit</td>
<td>925900043</td>
<td>$125</td>
</tr>
<tr>
<td>Gas Tube Coaxial Surge Protector Kit</td>
<td>915900139</td>
<td>$106</td>
</tr>
<tr>
<td>N Plug to TNC Jack (male to female)</td>
<td>240-1808</td>
<td>$16</td>
</tr>
<tr>
<td>Two-Port Active GPS Splitter</td>
<td>240-0109</td>
<td>$450</td>
</tr>
</tbody>
</table>

**TIME-DISTRIBUTION ACCESSORIES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNC Connector T (female-male-female)</td>
<td>240-1799</td>
<td>$7.50</td>
</tr>
<tr>
<td>BNC 50 Ohm Terminating Resistor</td>
<td>240-1800</td>
<td>$4.50</td>
</tr>
<tr>
<td>BNC Connector T (female-female-male)</td>
<td>240-1801</td>
<td>$7.50</td>
</tr>
<tr>
<td>BNC Connector T (female-female-female)</td>
<td>240-1802</td>
<td>$7.50</td>
</tr>
<tr>
<td>BNC/TNC Removal and Installation Tool</td>
<td>240-1850</td>
<td>$50.00</td>
</tr>
</tbody>
</table>
**SEL-3400**

IRIG-B DISTRIBUTION MODULE

TIME DISTRIBUTION
The SEL-3400 IRIG-B Distribution Module has 12 demodulated IRIG-B outputs to provide time synchronization to hundreds of devices and simplify cabling in equipment racks.

DELAY COMPENSATION
Use the SEL-3400 to extend the distance between the clock and devices up to 400 feet. The SEL-3400 is designed to compensate for latency through the device as well as for input and output cable delays.

TWO INPUTS FOR REDUNDANCY
Connect two time sources to an SEL-3400 for redundancy. If the time quality from the primary input source degrades, the SEL-3400 will switch to the second input source.

TIME DISPLAY
Use the SEL-3400 Module’s LED time display to make the time or date easily visible in substations in all lighting conditions.

RELIABLE
Apply in harsh substation environments for accurate operation from -40°C to +85°C (-40°F to +185°F). The SEL-3400 exceeds IEEE C37.90, IEC 60255, and IEEE 1613 standards and is backed by SEL’s ten-year warranty and highly rated technical support.

**SEL-5860**

TIME SERVICE SOFTWARE

BUDGETARY RETAIL
Quantity 1: Free download

PC TIME SYNCHRONIZATION
Synchronize a Microsoft® Windows®-based PC system to an SEL-2401, SEL-2404, or SEL-2407® Satellite-Synchronized Clock.

WINDOWS SUPPORT
SEL-3401
DIGITAL CLOCK

BUDGETARY RETAIL
Quantity 1: $392

Improve productivity using a large time display in control rooms, factories, and other time-critical locations.

HIGH VISIBILITY
Large 76 mm (3.0 in) tall LED display is visible in all lighting conditions, including direct sunlight, as far as 61 m (200 ft). Displays 12- or 24-hour format. Select from red, green, or amber display options.

RELIABLE TIMING
Use the highly accurate internal clock, or display GPS satellitesynchronized IRIG-B demodulated time code to within ±100 nanoseconds (average) of UTC time.

WIDE TEMPERATURE RANGE
The SEL-3401 Digital Clock is tested to operate in temperatures ranging from −40° to +80°C (−40° to +176°F).

HIGH-POWERED OPTIONAL OUTPUTS
The wall-/panel-mount digital clock has an optional single output to drive downstream clocks and other devices with one high-drive demodulated IRIG-B output. The rack-mount version has an option for four high-drive demodulated IRIG-B outputs.

EASY TO USE
Save money with simple mounting, minimal initial settings, and low installation cost.

<table>
<thead>
<tr>
<th>Mounting Version</th>
<th>Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Mount/Wall Mount</td>
<td>Voltage 15 Vdc</td>
</tr>
<tr>
<td>(AC Adapter 230-0604 included)</td>
<td>Burden 8 W</td>
</tr>
<tr>
<td>Rack Mount</td>
<td>Voltage 125 Vdc or Vac</td>
</tr>
<tr>
<td></td>
<td>Range 75–250 Vdc or Vac</td>
</tr>
<tr>
<td></td>
<td>Burden &lt;10 W</td>
</tr>
</tbody>
</table>
SEL-3355

**COMPUTER**

**POWERFUL**
Intel® Core™ i7 2.5 GHz dual-core or 2.1 GHz quad-core processors with up to 16 GB of RAM provide a very powerful computing platform.

**RUGGED**
Built to withstand harsh environments in utility substations and industrial control and automation systems that include wide temperature swings, humidity, vibration, shock, and EMI interference.

**BUDGETARY RETAIL**
Quantity 1: $3,250

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SEL-3360S

**INDUSTRIAL WALL-MOUNT COMPUTER**

**BUDGETARY RETAIL**
Quantity 1: $2,850

The same performance as the SEL-3355 Computer in a compact, surface-mount package.

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SEL-3390

**PCle EXPANSION CARDS**

**BUDGETARY RETAIL**
Quantity 1: $450

**SEL-3390E4 4-PORT GB ETHERNET EXPANSION CARD**
Provides four independent 10/100/1000 MB Ethernet ports with copper and/or SFP fiber-optic connections.

**SEL-3390S8 6-PORT SERIAL EXPANSION CARD**
Provides six software-configurable EIA-232/-422/-485 ports using RJ45 connector format.

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**RELIABLE**
With no fans or spinning hard drives, there are no moving parts that will wear out. Industrial-grade parts that include error-correcting code (ECC) RAM and single-level cell (SLC) solid-state drives (SSDs) provide maximum uptime. Optional dual power supplies and RAID-configurable SSDs further improve uptime.

**EXPANDABLE**
Add up to four 250 GB SSD drives and five standard half-length PCIe cards.
### SEL-2800/2810

**MULTIMODE FIBER-OPTIC TRANSCEIVERS**

**SERIAL FIBER-OPTIC LINKS UP TO 500 METERS**

Install fiber-optic connections to isolate communications and increase safety from ground potential rise and electrical interference. Both the SEL-2800 and the SEL-2810 alarm with a visible red light (650 nm), allowing simple visual troubleshooting. Compatible with V-pin-terminated SEL-C805 200 μm Core Fiber-Optic Cables.

<table>
<thead>
<tr>
<th>Description</th>
<th>IRIG-B</th>
<th>EIA-232</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL-2800 Transceivers</td>
<td>None</td>
<td>Male 9-Pin</td>
<td>2800M1</td>
<td>$102</td>
</tr>
<tr>
<td>SEL-2810 Fiber-Optic Transceivers with IRIG-B</td>
<td>Transmits</td>
<td>Male 9-Pin</td>
<td>2810MT</td>
<td>$120</td>
</tr>
<tr>
<td></td>
<td>Receives</td>
<td>Male 9-Pin</td>
<td>2810MR</td>
<td>$120</td>
</tr>
<tr>
<td>BNC Cable Adapter for SEL-2810 IRIG-B Connector</td>
<td>C651</td>
<td></td>
<td></td>
<td>$30</td>
</tr>
</tbody>
</table>

### SEL-2812/2814/2815

**MULTIMODE FIBER-OPTIC TRANSCEIVERS**

**SERIAL FIBER-OPTIC LINKS UP TO 15 KILOMETERS**

Install fiber-optic connections to isolate communications and increase safety from ground potential rise and electrical interference. The SEL-2812 and SEL-2814 have an option for conformal coating*, which provides extra protection from the effects of chemical contaminants in the air to printed circuit boards. Compatible with ST-terminated SEL-C808 Multimode 62.5/125 μm Core Fiber-Optic Cables.

<table>
<thead>
<tr>
<th>Description</th>
<th>IRIG-B</th>
<th>EIA-232</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL-2812 Fiber-Optic Transceivers with IRIG-B</td>
<td>Transmits</td>
<td>Male 9-Pin</td>
<td>2812MTXO</td>
<td>$129</td>
</tr>
<tr>
<td></td>
<td>Transmits</td>
<td>Male 9-Pin</td>
<td>2812MTX1*</td>
<td>$179</td>
</tr>
<tr>
<td></td>
<td>Receives</td>
<td>Male 9-Pin</td>
<td>2812MRXO</td>
<td>$129</td>
</tr>
<tr>
<td></td>
<td>Receives</td>
<td>Male 9-Pin</td>
<td>2812MRX1*</td>
<td>$179</td>
</tr>
<tr>
<td>BNC Cable Adapter for SEL-2812 IRIG-B Monoplug</td>
<td>C654</td>
<td></td>
<td></td>
<td>$20</td>
</tr>
<tr>
<td>SEL-2814 Fiber-Optic Transceivers with Hardware Handshaking</td>
<td>None</td>
<td>Male 9-Pin</td>
<td>2814M0</td>
<td>$129</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Male 9-Pin</td>
<td>2814M1*</td>
<td>$179</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Female 9-Pin</td>
<td>2814F0</td>
<td>$129</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Female 9-Pin</td>
<td>2814F1*</td>
<td>$179</td>
</tr>
<tr>
<td>Optional AC Power Supply if EIA-232 Port Has No Control Output Lines</td>
<td></td>
<td></td>
<td>230-0601</td>
<td>$40</td>
</tr>
<tr>
<td>SEL-2815 Fiber-Optic Transceivers</td>
<td>None</td>
<td>Male 9-Pin</td>
<td>2815M</td>
<td>$183</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Female 9-Pin</td>
<td>2815F</td>
<td>$183</td>
</tr>
</tbody>
</table>

*Additional Price for Conformal Coating Option
**SEL-2829/2830/2831**

**SINGLE-MODE FIBER-OPTIC TRANSCEIVERS**

SERIAL FIBER-OPTIC LINKS UP TO 110 KILOMETERS

Install fiber-optic connections to isolate communications and increase safety from ground potential rise and electrical interference. The SEL-2829, SEL-2830, and SEL-2831 have an option for conformal coating*, which provides extra protection from the effects of chemical contaminants in the air to printed circuit boards. Compatible with ST-terminated SEL-C809 Single-Mode Fiber-Optic Cables.

<table>
<thead>
<tr>
<th>Description</th>
<th>Distance</th>
<th>EIA-232</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL-2829 Fiber-Optic Transceivers</td>
<td>Min 0 km, Max 23 km (14 mi)</td>
<td>Male 9-Pin</td>
<td>2829MX0</td>
<td>$351</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female 9-Pin</td>
<td>2829FX0</td>
<td>$351</td>
</tr>
<tr>
<td>SEL-2830 Fiber-Optic Transceivers</td>
<td>16 km (10 mi), 80 km (50 mi)</td>
<td>Male 9-Pin</td>
<td>2830MX0</td>
<td>$300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female 9-Pin</td>
<td>2830FX0</td>
<td>$300</td>
</tr>
<tr>
<td>SEL-2831 Fiber-Optic Transceivers</td>
<td>16 km (10 mi), 110 km (68 mi)</td>
<td>Male 9-Pin</td>
<td>2831MX0</td>
<td>$375</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female 9-Pin</td>
<td>2831FX0</td>
<td>$375</td>
</tr>
</tbody>
</table>

*Additional Price for Conformal Coating Option

**SEL-2820/2824**

**MULTIMODE FIBER-OPTIC TRANSCEIVERS**

SERIAL FIBER-OPTIC LINKS ON EIA-485 NETWORKS UP TO 4 KILOMETERS

Apply to add a remote segment to a multidrop EIA-485 network. Or, use with a compatible EIA-232 transceiver on an EIA-232 port for isolation and conversion from EIA-232 to EIA-485. Both the SEL-2820 and SEL-2824 Serial Fiber-Optic Transceivers use control DIP switches to key the transmit line off, based on the data rate. You can also set the SEL-2824 to key the transmit lines on and off via the SEL-2814 EIA-232 CTS control line.

<table>
<thead>
<tr>
<th>Transceiver</th>
<th>Fiber Conn.</th>
<th>Compatible Optical Fiber</th>
<th>Distance</th>
<th>EIA-232 Fiber-Optic Transceiver</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL-2820</td>
<td>Y-Pin</td>
<td>SEL-C805 200 µm</td>
<td>0.5 km (0.31 mi)</td>
<td>SEL-2800</td>
<td>$150</td>
</tr>
<tr>
<td>SEL-2824</td>
<td>ST®</td>
<td>SEL-C808 62.5/125 µm</td>
<td>4 km (2.48 mi)</td>
<td>SEL-2814</td>
<td>$300</td>
</tr>
</tbody>
</table>

SEL-2820 and SEL-2824 operate on +5 to +30 Vdc at under 1 watt. SEL offers several compatible power supplies.

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Input Voltage</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL-9321 31X</td>
<td>36–200 Vdc</td>
<td>$196</td>
</tr>
<tr>
<td></td>
<td>85–160 Vac (47–63 Hz)</td>
<td></td>
</tr>
<tr>
<td>SEL-9321 61X</td>
<td>85–350 Vdc</td>
<td>$217</td>
</tr>
<tr>
<td></td>
<td>85–264 Vac (47–63 Hz)</td>
<td></td>
</tr>
<tr>
<td>230-0604 Wall AC</td>
<td>90–264 Vac (47–63 Hz)</td>
<td>$25</td>
</tr>
</tbody>
</table>
IEEE C37.94 LINKS
Link older relays with ITU-T G.703, EIA-422, EIA-485, or EIA-232 electrical interfaces to IEEE C37.94 compliant multiplexers or transfer switches. The SEL-3094 Interface Converter features 850 nm wavelength optics.

NONCOMPLIANT DEVICES
Link an IEEE C37.94 compliant relay, like the SEL-311L Line Current Differential System, to a noncompliant multiplexer through an SEL-3094. Or, connect a noncompliant relay to a noncompliant multiplexer with two SEL-3094 Interface Converters.

SAFE AND SECURE COMMUNICATIONS
Install fiber-optic connections to isolate communications from ground potential rise and electrical interference.

IEEE C37.94 OPTICAL INTERFACE STANDARD
The IEEE C37.94 standard provides plug-and-play transparent communications between different manufacturers’ teleprotection and multiplexer devices using multimode optical fiber. The standard defines clock recovery, jitter tolerances, the physical connection method, and the equipment failure actions for all communications link failures.

Historically, interface standards between teleprotection equipment and multiplexers have been solely electrical. Those high-speed (56–64 kbps), low-energy signal interfaces are vulnerable to intrasubstation electromagnetic and radio frequency interference (EMI/RFI), signal ground loops, and ground potential rise, which considerably reduce the reliability of communications during electrical faults. The safest and most reliable protection communications schemes in the industry dedicate optical fibers for communications between protection (digital relays) and telecommunications (multiplexers) devices. Optical fibers do not have ground paths and are immune to noise interference, which eliminates data errors common to electrical connections.

SEL-3094 INTERFACE CONVERTER

BUDGETARY RETAIL
Quantity 1: $685

IEEE C37.94 INTERFACE CONVERTER

SEL-2894 INTERFACE CONVERTER

BUDGETARY RETAIL
Quantity 1: $350

EIA-232 TO FIBER-OPTIC INTERFACE
Interface asynchronous EIA-232 devices with synchronous networks through IEEE C37.94 compliant multiplexers or transfer switches. The SEL-2894 uses 850 nm wavelength optics.

SEL MIRRORED BITS® COMMUNICATIONS
Connect the SEL-2894 to any relay with MIRRORED BITS communications, and transport at data rates from 300 to 19200 bps with less than 375 μs delay, back-to-back.

SAFETY AND SECURITY
Install fiber-optic connections to isolate communications from ground potential rise and electrical interference.
USB SERIAL

CABLES AND CONVERTERS

Easily adapt and connect USB ports using SEL cables and converters to talk to all of your SEL products.

USB TO EIA-232
Interact with SEL relays and other devices by connecting the USB Standard-A plug to a 9-pin male [SEL-C662] or female [SEL-C663] serial port.

USB TO OPTICAL
Communicate with ANSI meters from a PC USB port by connecting the USB Standard-A plug to an ANSI Type 2 optical port (SEL-C661).

USB STANDARD-A TO STANDARD-B
Connect to SEL products with a USB-B port by using the USB Standard-A to USB Standard-B cable (SEL-C664).

USB EXTENSION
Extend any USB cable an additional 16 feet with a USB Standard-A plug to female USB Standard-A plug active extension cable [SEL-C668].

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Starting Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB to EIA-232 Converter, 9-Pin Male, 6’ Length</td>
<td>C662-6</td>
<td>$63</td>
</tr>
<tr>
<td>USB to EIA-232 Converter, 9-Pin Male, 15’ Length</td>
<td>C662-15</td>
<td>$73</td>
</tr>
<tr>
<td>USB to EIA-232 Converter, 9-Pin Female, 6’ Length</td>
<td>C663-6</td>
<td>$68</td>
</tr>
<tr>
<td>USB to EIA-232 Converter, 9-Pin Female, 15’ Length</td>
<td>C663-15</td>
<td>$78</td>
</tr>
<tr>
<td>USB Cable, USB Standard-A to USB Standard-B, 6’ Length</td>
<td>C664</td>
<td>$15</td>
</tr>
<tr>
<td>USB Active Extension Cable, USB Standard-A Plug to Female USB Standard-A, 16’ Length</td>
<td>C668</td>
<td>$24</td>
</tr>
<tr>
<td>USB to EIA-232 Converter, ANSI Type 2 Optical Probe, 6’ Length</td>
<td>C661</td>
<td>$370</td>
</tr>
</tbody>
</table>

SEL-2886

EIA-232 TO EIA-485 INTERFACE CONVERTER

Connect a device that has an EIA-232 port to an EIA-485 network to communicate with DNP3, Modbus®, or SEL LMD (Distributed Port Switch) protocols.

FLEXIBLE POWER OPTIONS
Accepts 5 Vdc power from the SEL host device EIA-232 port or through a 0.7 mm power jack.

IMPROVED SAFETY
Isolation to 1500 Vrms.

COMPACT
Plugs directly onto a DB-9 connector.

EASY APPLICATION
Use control DIP switches to select operating modes to key the transmitter on and off, and to control the echo mode.

TOUGH
Operates trouble-free in extreme environments and is tested in extreme temperatures of –40° to +85°C (~–40° to +185°F), RFI, shock, and vibration conditions.

The SEL-2886 operates on +5 Vdc. SEL offers several compatible power supplies.

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Input Voltage</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL-9321 12X</td>
<td>16–36 Vdc</td>
<td>$196</td>
</tr>
<tr>
<td>SEL-9321 32X</td>
<td>36–200 Vdc</td>
<td>$196</td>
</tr>
<tr>
<td>SEL-9321 62X</td>
<td>85–350 Vdc</td>
<td>$217</td>
</tr>
<tr>
<td>230-0601 Wall AC</td>
<td>100–240 Vac [47–63 Hz]</td>
<td>$39</td>
</tr>
</tbody>
</table>
SEL-C805

MULTIMODE 200 µm CORE FIBER-OPTIC CABLES

All SEL-C805 Cables are built with HCS 200 µm low-loss silica-core fiber, clad with high-strength polymer coating.

- Order finished cables built to your length specifications with either V-pin or ST® connectors.
- Use 1- or 2-fiber zipcord for indoor risers (C805Z01/Z02) and 2- or 4-fiber heavy-duty PVC-jacketed cable for indoor risers and outdoors (C805D02/D04) as well as 2- or 4-fiber rugged water-blocked cable for outdoors (C805G02/G04).
- Build cables onsite using the SEL V-pin (T800) or ST (240-1501) Termination Tool Kit.

<table>
<thead>
<tr>
<th>Fiber Count</th>
<th>Cable Type</th>
<th>Ratings</th>
<th>Part #</th>
<th>Price for 8 m or Less</th>
<th>Additional Price/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simplex</td>
<td>Indoor, Riser</td>
<td>C805Z01</td>
<td>$46</td>
<td>$1.05</td>
</tr>
<tr>
<td>2</td>
<td>Zipcord</td>
<td>Indoor, Riser</td>
<td>C805Z02</td>
<td>$62</td>
<td>$1.60</td>
</tr>
<tr>
<td>2</td>
<td>Heavy-Duty, PVC</td>
<td>Indoor/Outdoor, Riser</td>
<td>C805D02</td>
<td>$146</td>
<td>$5.25</td>
</tr>
<tr>
<td>4</td>
<td>Heavy-Duty, PVC</td>
<td>Indoor/Outdoor, Riser</td>
<td>C805D04</td>
<td>$234</td>
<td>$7.00</td>
</tr>
<tr>
<td>2</td>
<td>Heavy-Duty, PE</td>
<td>Outdoor Only</td>
<td>C805G02</td>
<td>$157</td>
<td>$5.80</td>
</tr>
<tr>
<td>4</td>
<td>Heavy-Duty, PE</td>
<td>Outdoor Only</td>
<td>C805G04</td>
<td>$249</td>
<td>$7.70</td>
</tr>
</tbody>
</table>

SEL-C807

MULTIMODE 62.5/200 µm CORE FIBER-OPTIC CABLES

All SEL-C807 Cables are built with HCS 62.5 µm low-loss silica core fiber, clad with high-strength polymer coating.

- Order finished cables built to your length specifications with ST connectors.
- Use 1- or 2-fiber zipcord for indoor risers (C807Z01/Z02) as well as 2- or 4-fiber rugged water-blocked cable for outdoors (C80G02/G04).
- Build cables onsite using the SEL Fiber-Optic Termination Kits.

<table>
<thead>
<tr>
<th>Fiber Count</th>
<th>Cable Type</th>
<th>Ratings</th>
<th>Part #</th>
<th>Price for 2 m or Less</th>
<th>Additional Price/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simplex</td>
<td>Indoor, Riser</td>
<td>C807Z01</td>
<td>$50</td>
<td>$1.80</td>
</tr>
<tr>
<td>2</td>
<td>Zipcord</td>
<td>Indoor, Riser</td>
<td>C807Z02</td>
<td>$62</td>
<td>$2.61</td>
</tr>
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<td>2</td>
<td>Heavy-Duty, PE</td>
<td>Outdoor Only</td>
<td>C807G02</td>
<td>$220</td>
<td>$5.80</td>
</tr>
<tr>
<td>4</td>
<td>Heavy-Duty, PE</td>
<td>Outdoor Only</td>
<td>C807G04</td>
<td>$365</td>
<td>$7.70</td>
</tr>
</tbody>
</table>

Please visit www.selfiber.com for additional cable options, accessories, and pricing.
**SEL-C808**

**MULTIMODE 62.5/125 µm FIBER-OPTIC CABLES**

<table>
<thead>
<tr>
<th>Fiber Count</th>
<th>Cable Type</th>
<th>Ratings</th>
<th>Part #</th>
<th>Price for 2 m or Less</th>
<th>Additional Price/m</th>
</tr>
</thead>
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<tr>
<td>1</td>
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<td>2</td>
<td>Zipcord</td>
<td>Indoor, Riser</td>
<td>C808Z02</td>
<td>$98</td>
<td>$1.50</td>
</tr>
<tr>
<td>2</td>
<td>Heavy-Duty, PVC</td>
<td>Indoor/Outdoor, Riser</td>
<td>C808G02</td>
<td>$105</td>
<td>$4.01</td>
</tr>
<tr>
<td>4</td>
<td>Heavy-Duty, PVC</td>
<td>Indoor/Outdoor, Riser</td>
<td>C808G04</td>
<td>$220</td>
<td>$4.50</td>
</tr>
<tr>
<td>1</td>
<td>Simplex</td>
<td>Indoor, Plenum</td>
<td>C808P01</td>
<td>$54</td>
<td>$1.60</td>
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<tr>
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<td>C808P02</td>
<td>$101</td>
<td>$2.00</td>
</tr>
</tbody>
</table>

All SEL-C808 Cables are built with high-precision ceramic ferrule connectors, offering best-in-class optical performance.

- Order finished cables built to your length specifications with ST, LC, and SC connectors.
- Use 1- or 2-fiber zipcord for indoor risers (C808Z01/Z02) and indoor plenum spaces (C808Z01/Z02) and 2-fiber PVC-jacketed cable for indoor risers and outdoors (C808G02/G04).
- Build cables onsite using the SEL Termination Kit (240-1540).

---

**SEL-C809**

**SINGLE-MODE 9/125 µm FIBER-OPTIC CABLES**

<table>
<thead>
<tr>
<th>Fiber Count</th>
<th>Cable Type</th>
<th>Ratings</th>
<th>Part #</th>
<th>Price for 2 m or Less</th>
<th>Additional Price/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>C809Z01</td>
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<td>$0.80</td>
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<td>Indoor, Riser</td>
<td>C809Z02</td>
<td>$100</td>
<td>$1.30</td>
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<td>2</td>
<td>Heavy-Duty, PVC</td>
<td>Indoor/Outdoor, Riser</td>
<td>C809G02</td>
<td>$110</td>
<td>$3.50</td>
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<tr>
<td>1</td>
<td>Simplex</td>
<td>Indoor, Plenum</td>
<td>C809P01</td>
<td>$58</td>
<td>$1.50</td>
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<tr>
<td>2</td>
<td>Zipcord</td>
<td>Indoor, Plenum</td>
<td>C809P02</td>
<td>$103</td>
<td>$2.00</td>
</tr>
</tbody>
</table>

All SEL-C809 Cables are built with high-precision ceramic ferrule connectors, offering best-in-class optical performance.

- Order finished cables built to your length specifications with ST, LC, and SC connectors.
- Use 1- or 2-fiber zipcord for indoor risers (C809Z01/Z02) and indoor plenum spaces (C809P01/P02) and 2-fiber PVC-jacketed cable for indoor risers and outdoors (C809G02).

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Please visit www.selfiber.com for additional cable options, accessories, and pricing.
SEL provides a wide variety of high-quality manufactured cables for all your device connection needs.

- SEL manufactures and tests each cable.
- All cables are built to IPC/WHMA-A-620 standards.
- Custom cables can be built to customer specifications.
- Our fiber-optic cables and transceivers provide isolation, noise immunity, and long distance (>100 ft) communications.

**SEL CABLE SELECTOR PROGRAM**
The SEL Cable Selector program is free to all users:

- Quickly and easily select proper SEL cables for your applications with the SEL Cable Selector program.
- Access it free at www.selinc.com/CableSelector.

For copper Ethernet connections, use high-quality, shielded twisted-pair (STP) Category 5e Ethernet cables from SEL.

- SEL manufactures and tests each cable.
- Shielded RJ45 connectors and cable shield provide complete coverage.
- Industrial-rated Ethernet cable provides excellent UV protection, oil and moisture resistance, and tear and abrasion resistance.
- 600 V AWM-rated shielded Ethernet cables for use in motor control center (MCC) and electrical switch gear applications.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price for 8’ or Less</th>
<th>Additional Price/Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Ethernet Patch Cable With a PVC Jacket [CM-rated]</td>
<td>CA605C</td>
<td>$32</td>
<td>$0.31</td>
</tr>
<tr>
<td>Industrial-Rated Ethernet Patch Cable With a Black PE Jacket</td>
<td>CA605R</td>
<td>$40</td>
<td>$0.91</td>
</tr>
<tr>
<td>AWM-Rated Ethernet Patch Cable With a Black TPE Jacket [CMX-outdoor-rated]</td>
<td>CA605M</td>
<td>$40</td>
<td>$0.91</td>
</tr>
</tbody>
</table>

Orderable in lengths up to 330 ft.
SEL manufactures high-quality coaxial cables for connecting a variety of radio frequency devices, antennas, and time-distribution components.

- All cables are built to IPC/WHMA-A-620 standards.
- Free SEL Cable Selector program with point-and-click cable selection is available on the SEL website.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part #</th>
<th>Price</th>
<th>Additional Price/Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG-58 Coaxial Cable, BNC-to-BNC Connectors, 8 Feet or Less</td>
<td>C953</td>
<td>$11</td>
<td>$0.53</td>
</tr>
<tr>
<td>RG-58 Coaxial Cable, BNC Connector-to-Pigtail Wires, 8 Feet or Less</td>
<td>C962</td>
<td>$11</td>
<td>$0.53</td>
</tr>
<tr>
<td>RG-6 Coaxial Cable, TNC-to-TNC Connectors, 8 Feet or Less</td>
<td>C960</td>
<td>$18</td>
<td>$0.42</td>
</tr>
<tr>
<td>RG-8 Coaxial Cable, TNC-to-N Connectors, 8 Feet or Less</td>
<td>C964</td>
<td>$32</td>
<td>$1.20</td>
</tr>
<tr>
<td>RG-8 Coaxial Cable, TNC-to-TNC Connectors, 8 Feet or Less</td>
<td>C965</td>
<td>$36</td>
<td>$1.20</td>
</tr>
<tr>
<td>LMR-400 Coaxial Cable, TNC-to-TNC Connectors, 50 Feet or Less</td>
<td>C961</td>
<td>$79</td>
<td>$1.58</td>
</tr>
<tr>
<td>LMR-400 Coaxial Cable, TNC-to-TNC Connectors, 20 Feet or Less</td>
<td>C966</td>
<td>$50</td>
<td>$1.58</td>
</tr>
<tr>
<td>7/8&quot; Coaxial Cable, N-to-N Connectors, 100 Feet or Greater</td>
<td>C978</td>
<td>$345</td>
<td>$2.85</td>
</tr>
</tbody>
</table>
**SFP TRANSCIEVERS**

**SMALL FORM-FACTOR PLUGGABLE (SFP) TRANSCIEVERS**

Several SEL communications products use SFP transceivers for fiber-optic communication. SEL has qualified a range of SFP transceivers that meet the required temperature and environmental specifications of the ICON, SEL-2730M, and SEL-3355.

### FAST ETHERNET DUAL-FIBER SFP TRANSCIEVERS (FOR SEL-3390E4 ONLY)

<table>
<thead>
<tr>
<th>Interface</th>
<th>Mode</th>
<th>Distance (km)</th>
<th>Wavelength (nm)</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>100BASE-LX</td>
<td>SMF</td>
<td>20</td>
<td>1310</td>
<td>8104-01</td>
</tr>
<tr>
<td>100BASE-LX</td>
<td>SMF</td>
<td>50</td>
<td>1310</td>
<td>8104-02</td>
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<tr>
<td>100BASE-LX10</td>
<td>SMF</td>
<td>80</td>
<td>1310</td>
<td>8104-03</td>
</tr>
<tr>
<td>100BASE-LX10</td>
<td>SMF</td>
<td>120</td>
<td>1550</td>
<td>8104-04</td>
</tr>
<tr>
<td>100BASE-LX10</td>
<td>SMF</td>
<td>160</td>
<td>1550</td>
<td>8104-05</td>
</tr>
<tr>
<td>100BASE-FX</td>
<td>MMF</td>
<td>2</td>
<td>1310</td>
<td>8109-01</td>
</tr>
</tbody>
</table>

### FAST ETHERNET/OC-1/OC-3 DUAL-FIBER SFP TRANSCIEVERS (FOR ICON)

<table>
<thead>
<tr>
<th>Bit Rate (Mbps)</th>
<th>Mode</th>
<th>Distance (km)</th>
<th>Wavelength (nm)</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>155.52</td>
<td>SMF</td>
<td>20</td>
<td>1310</td>
<td>8105-01</td>
</tr>
<tr>
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<td>155.52</td>
<td>SMF</td>
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<td>1550</td>
<td>8105-03</td>
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<tr>
<td>155.52</td>
<td>SMF</td>
<td>120</td>
<td>1550</td>
<td>8105-04</td>
</tr>
<tr>
<td>155.52</td>
<td>SMF</td>
<td>160</td>
<td>1550</td>
<td>8105-05</td>
</tr>
<tr>
<td>155.52</td>
<td>MMF</td>
<td>2</td>
<td>1310</td>
<td>8106-01</td>
</tr>
</tbody>
</table>

### OC-12 DUAL-FIBER SFP TRANSCIEVERS (FOR ICON)

<table>
<thead>
<tr>
<th>Bit Rate (Mbps)</th>
<th>Mode</th>
<th>Distance (km)</th>
<th>Wavelength (nm)</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>622.08</td>
<td>SMF</td>
<td>20</td>
<td>1310</td>
<td>8110-01</td>
</tr>
<tr>
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<td>8110-02</td>
</tr>
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<td>622.08</td>
<td>SMF</td>
<td>80</td>
<td>1550</td>
<td>8110-03</td>
</tr>
<tr>
<td>622.08</td>
<td>SMF</td>
<td>120</td>
<td>1550</td>
<td>8110-04</td>
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<tr>
<td>622.08</td>
<td>MMF</td>
<td>1</td>
<td>1310</td>
<td>8111-01</td>
</tr>
</tbody>
</table>

### OC-48 DUAL-FIBER SFP TRANSCIEVERS (FOR ICON)

<table>
<thead>
<tr>
<th>Bit Rate (Mbps)</th>
<th>Mode</th>
<th>Distance (km)</th>
<th>Wavelength (nm)</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
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<td>SMF</td>
<td>2</td>
<td>1310</td>
<td>8120-00</td>
</tr>
<tr>
<td>2.488</td>
<td>SMF</td>
<td>15</td>
<td>1310</td>
<td>8121-00</td>
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<tr>
<td>2.488</td>
<td>SMF</td>
<td>40</td>
<td>1310</td>
<td>8122-00</td>
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<tr>
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<td>8124-00</td>
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<tr>
<td>2.488</td>
<td>SMF</td>
<td>120</td>
<td>1550</td>
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</tr>
<tr>
<td>2.488</td>
<td>SMF</td>
<td>160</td>
<td>1550</td>
<td>8125-02</td>
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<tr>
<td>2.488</td>
<td>SMF</td>
<td>160</td>
<td>1550</td>
<td>8125-02</td>
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</tbody>
</table>

### OC-48 SINGLE-FIBER SFP TRANSCIEVERS (FOR ICON)

<table>
<thead>
<tr>
<th>Bit Rate (Gbps)</th>
<th>Mode</th>
<th>Distance (km)</th>
<th>Wavelength (nm)</th>
<th>Part #</th>
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</thead>
<tbody>
<tr>
<td>2.488</td>
<td>SMF</td>
<td>5</td>
<td>1310</td>
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<tr>
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<td>SMF</td>
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<td>1550</td>
<td>8127-13</td>
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<td>SMF</td>
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<td>1510</td>
<td>8127-04</td>
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### GIGABIT ETHERNET DUAL-FIBER SFP TRANSCIEVERS (FOR ICON)

<table>
<thead>
<tr>
<th>Interface</th>
<th>Mode</th>
<th>Distance (km)</th>
<th>Wavelength (nm)</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
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<td>8130-01</td>
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<td>8130-05</td>
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<td>SMF</td>
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<td>1550</td>
<td>8130-06</td>
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<tr>
<td>100BASE-SX</td>
<td>MMF</td>
<td>300 m for</td>
<td>850</td>
<td>8131-01</td>
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<tr>
<td></td>
<td></td>
<td>62.5/125 µm Fiber</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>500 m for</td>
<td>850</td>
<td>8131-01</td>
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<tr>
<td></td>
<td></td>
<td>50/125 µm Fiber</td>
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</tbody>
</table>

### GIGABIT ETHERNET DUAL-FIBER SFP TRANSCIEVERS (FOR ICON)

<table>
<thead>
<tr>
<th>Interface</th>
<th>Mode</th>
<th>Distance (km)</th>
<th>Wavelength (nm)</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>100BASE-LX</td>
<td>SMF</td>
<td>10</td>
<td>1310</td>
<td>8135-01</td>
</tr>
<tr>
<td>100BASE-LX</td>
<td>SMF</td>
<td>20</td>
<td>1310</td>
<td>8135-02</td>
</tr>
<tr>
<td>100BASE-XD</td>
<td>SMF</td>
<td>30</td>
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<td>100BASE-ZX</td>
<td>SMF</td>
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<tr>
<td>100BASE-SX</td>
<td>MMF</td>
<td>0.3</td>
<td>850</td>
<td>8136-01</td>
</tr>
</tbody>
</table>
**SEL-9192**

**UTILITY-GRADE USB MODEM**

**BUDGETARY RETAIL**

Quantity 1: $250

**DIAL-UP ACCESS**

Add dial-up or dial-out communications via the USB Standard-B connector or EIA-232 port. Integrate the SEL-9192 Utility-Grade USB Modem to provide dial-out SCADA communications, dial-up engineering access through an information processor, and direct access or polling to intelligent electronic devices (IEDs), remote terminal units (RTUs), industrial equipment, or field devices.

---

**SEL-9321**

**LOW-VOLTAGE DC POWER SUPPLY**

**RELIABLE POWER**

Use the SEL-9321 Low-Voltage DC Power Supply as an inexpensive, robust means to convert high-voltage dc battery sources for use with communications or instrumentation devices. Provide +5 Vdc and ±10 Vdc power for communications devices and accessories, from a station battery or ac source.

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Output</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 to 36 Vdc</td>
<td>+5 Vdc 4.75 V to 5.25 V @ 100 mA to 1.0 A ±10 Vdc 8.5 V to 11.5 V @ 10 mA to 100 mA</td>
<td>SEL-93211</td>
<td>$190</td>
</tr>
<tr>
<td>36 to 200 Vdc</td>
<td>+5 Vdc 4.75 V to 5.25 V @ 100 mA to 1.0 A ±10 Vdc 8.5 V to 11.5 V @ 10 mA to 100 mA</td>
<td>SEL-93213</td>
<td>$190</td>
</tr>
<tr>
<td>85 to 140 Vac</td>
<td>+5 Vdc 4.75 V to 5.25 V @ 100 mA to 1.0 A ±10 Vdc 8.5 V to 11.5 V @ 10 mA to 100 mA</td>
<td>SEL-93213</td>
<td>$190</td>
</tr>
<tr>
<td>85 to 350 Vdc</td>
<td>+5 Vdc 4.75 V to 5.25 V @ 100 mA to 1.0 A ±10 Vdc 8.5 V to 11.5 V @ 10 mA to 100 mA</td>
<td>SEL-93216</td>
<td>$211</td>
</tr>
<tr>
<td>85 to 264 Vac</td>
<td>+5 Vdc 4.75 V to 5.25 V @ 100 mA to 1.0 A ±10 Vdc 8.5 V to 11.5 V @ 10 mA to 100 mA</td>
<td>SEL-93216</td>
<td>$211</td>
</tr>
</tbody>
</table>

All Vac are 47 to 63 Hz.
**SEL-9322**

**15 VDC POWER SUPPLY**

**ROBUST**

The SEL-9322 provides a nominal +15 Vdc at up to 1 A to power communications or instrumentation devices.

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Output</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 to 200 Vdc</td>
<td>+15 Vdc 14.25 to 15.75 V @ 1.0 A</td>
<td>SEL-93223</td>
<td>$260</td>
</tr>
<tr>
<td>85 to 140 Vac</td>
<td>+15 Vdc 14.25 to 15.75 V @ 1.0 A</td>
<td>SEL-93226</td>
<td>$281</td>
</tr>
</tbody>
</table>

All Vac are 47 to 63 Hz.

**AC POWER SUPPLIES**

**WALL-MOUNT AC POWER SUPPLIES**

**TESTING AND OFFICE ENVIRONMENTS**

The 230-0600, 230-06010, and 230-0604 Power Supplies are commercial-temperature-rated ac power supplies appropriate for testing and office environments. SEL AC Power Supplies have a temperature rating of 0° to +40°C (+32° to +104°F).

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Output</th>
<th>Part #</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 to 254 Vac</td>
<td>5 Vdc @ 3 W; USB Micro-B Plug</td>
<td>915900287</td>
<td>$15</td>
</tr>
<tr>
<td>90 to 264 Vac</td>
<td>5 Vdc @ 1 A; USB Standard-A Jack</td>
<td>915900290*</td>
<td></td>
</tr>
<tr>
<td>100 to 120 Vac</td>
<td>5 Vdc @ 2 A; 2.5 mm Barrel Plug</td>
<td>230-0400</td>
<td>$40</td>
</tr>
<tr>
<td>100 to 240 Vac</td>
<td>5 Vdc @ 1.2 A; 0.7 mm Barrel Plug</td>
<td>230-0401</td>
<td>$40</td>
</tr>
<tr>
<td>90 to 264 Vac</td>
<td>15 Vdc @ 2 A; Stripped Wires</td>
<td>230-0404</td>
<td>$25</td>
</tr>
<tr>
<td></td>
<td>International Plug Adapter for UK, EU [&quot;Shuko&quot;], or Australian Style Connections</td>
<td>240-1651</td>
<td>$15</td>
</tr>
</tbody>
</table>

All Vac are 47 to 63 Hz.

*Worldwide AC Power Supply; contains ac blades for North America, Europe, United Kingdom, and Australia.

**BUDGETARY RETAIL**

Quantity 10: $60

- Designed to keep wiring, cables, and optical fiber secure inside enclosures and cabinet walls.
- Magnet strength is great enough to hold 1000 g when placed on a smooth surface.

**MCG**

**MAGNETIC CABLE GUIDE**

**BUDGETARY RETAIL**

Quantity 10: $60

- Designed to keep wiring, cables, and optical fiber secure inside enclosures and cabinet walls.
- Magnet strength is great enough to hold 1000 g when placed on a smooth surface.
PANELS

SEL PANEL AND SYSTEM MANUFACTURING ADHERES TO STRICT QUALITY CONTROLS FOR DESIGN, MANUFACTURING, TESTING, AND COMMISSIONING

SEL designs, manufactures, tests, and delivers custom protection, control, and metering panels as well as control cabinets and retrofit doors. SEL panels are supported by an unmatched warranty and extraordinary customer service. Panels, cabinets, and doors are built to match customer specifications and needs.

SEL tests the final implementation of every manufactured system before shipping, reducing overall project costs and engineering time. SEL’s testing contributes to easier and faster commissioning.

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- Panel manufacturing and testing
- Protection, automation, and control equipment manufacturing
- Field service
- Standard cabinet design
- Indoor and outdoor design
- Submersible cabinets for underground distribution and automation
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Take an instructor-led web-based training course, an on-demand course, or a regularly scheduled course, or even take a course on your own in a computer-based training course. SELU can also tailor materials and combine courses to fit your company’s needs. SELU offers courses from hands-on application, systems, and testing to fundamentals and communications. The quality of our courses is the same that you have come to expect from our products. Employ MySELU to view your transcript, completion status, course enrollment, and precourse materials.

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COMMUNICATIONS COURSES

<table>
<thead>
<tr>
<th>COURSE</th>
<th>DAYS</th>
<th>CEUs</th>
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</thead>
<tbody>
<tr>
<td>COM 201: Multiplexing and TDM Communications</td>
<td>1</td>
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<tr>
<td>COM 203: SEL Cybersecurity Best Practices for Critical Infrastructure</td>
<td>1</td>
<td>0.7</td>
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<tr>
<td>APP ICON: SEL ICON® Integrated Communications Optical Network</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>APP 2032: SEL-2032 Communications Processor</td>
<td>3</td>
<td>2.1</td>
</tr>
</tbody>
</table>

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