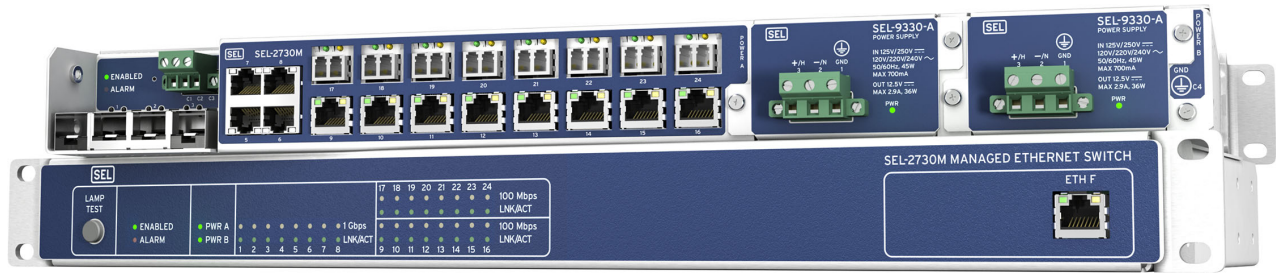




# SEL-2730M 24-Port Managed Ethernet Switch

Reliable Ethernet Communication  
for Substation and Plant Networks



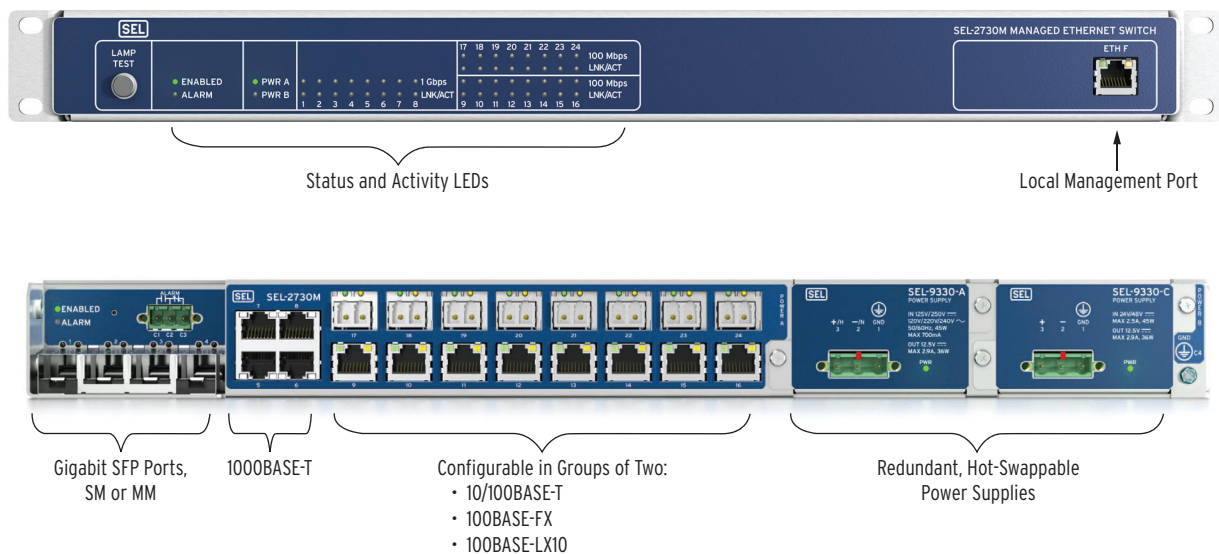
## Major Features and Benefits

The SEL-2730M Managed Ethernet Switch is designed for the harsh environments commonly found in the energy and utility industries. The SEL-2730M supports communications infrastructures built for engineering access, supervisory control and data acquisition (SCADA), and real-time data communication and offers the same reliability found in SEL protective relays.

- **Reliable.** Increase availability with the SEL-2730M, which is designed, built, and tested to function in harsh environments such as substations. Optional hot-swappable, dual power supplies allow connectivity to primary and backup power sources.
- **Flexible.** Maximize flexibility by using SEL-2730M ordering options to meet different network configurations. Order the SEL-2730M with Ethernet ports in combinations of copper, single-mode fiber, and multimode fiber. Add even more flexibility by using the four small form-factor pluggable (SFP) modules to change port configurations when network designs change.
- **Ease-of-Use.** Simplify configuration and maintenance with a secure web interface that allows convenient setup and management. Configure settings offline by using ACSELERATOR QuickSet<sup>®</sup> SEL-5030 Software or through an exported settings file that can be imported later on the switch.
- **Virtual Local Area Networks (VLANs).** Segregate traffic and improve network organization and performance. Take advantage of IEEE 802.1Q-2005 VLANs to separate IEC 61850 GOOSE messages from other traffic with as many as 4094 LANs.
- **Traffic Prioritization.** Support critical substation messaging by classifying and prioritizing traffic into one of four priority levels through VLAN-based 802.1Q-2005 Class of Service (CoS) and IP-based DiffServ Differentiated Services Code Points (DSCP).
- **Rapid Spanning Tree Protocol (RSTP).** Use IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP) to speed network recovery and convergence after a topology change caused by a link or device failure.
- **Bridge Protocol Data Unit (BPDU) Guard.** Improve network robustness by enabling BPDU Guard to disable a port when unexpected BPDUs are received.
- **Port Rate Limiting.** Prevent network storms from disabling your network by configuring maximum allowed rates for ingress (incoming) or egress (outgoing) traffic on each port.
- **Multicast MAC Filtering.** Filter multicast traffic to reduce network load on end devices.

- **Port-Based MAC Security.** Use port-based MAC security to limit network access to authorized devices.
- **Time Synchronization.** Synchronize time by using network time protocol (NTP). Time-align events and user activity across your system.
- **Syslog.** Log events for speedy alerts, consistency, compatibility, and centralized collection. Use the switch to forward Syslog system and security logs to as many as three central servers.
- **Dynamic Host Configuration Protocol (DHCP).** Easily connect a laptop computer during initial setup by using settings that enable the front-panel 10/100BASE-T Ethernet port to function as a DHCP server.
- **Security and Monitoring.** Increase security by taking advantage of SNMPv3 and HTTPS features. 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 system and security events to configurable alarm contact behavior for alarming through an external system, such as an existing SCADA network.
- **Port Mirroring.** Monitor ingress and egress traffic for viewing network statistics and performing troubleshooting.
- **Port Monitoring.** Monitor port health for link flap and frame check sequence cyclic redundancy check (CRC) errors.
- **User-Based Accounts.** Provide user accountability and separate authorization levels for configuration and maintenance. Use LDAP or RADIUS with two-factor authentication for centralized user authentication.

## Functional Overview



**Figure 1 Functional Diagram**

The base-model SEL-2730M has four Gigabit Ethernet copper ports and sixteen 10/100 Mbps copper Ethernet ports, built as 4-port modules. You can order each of the 10/100 Mbps copper port modules as single- or multi-mode 100 Mbps fiber-optic ports to meet the unique requirements of your network. You can also add as many as four fiber-optic Gigabit Ethernet ports via SFP modules, for a total of 24 ports.

- **Four SFP ports.** Ports 1–4 are compatible with the single- or multimode fiber SFP modules orderable from SEL.
- **Four Gigabit Ethernet ports.** Ports 5–8 support 10/100/1000 Mbps copper Gigabit Ethernet.
- **Sixteen Fast Ethernet ports.** Ports 9–24 can be ordered in combinations of 2-port groups of either copper or fiber.

- **Redundant, hot-swappable power supplies.** Optional redundant power supplies provide failover protection. Connect a separate power source to each power supply. If one source fails, the other continues to keep the switch operational. The power supply has an estimated MTBF of 3000 years.
- **Reversible mounting.** The SEL-2730M comes with reversible mounting ears to support both front- and rear-panel installations.

SEL manufactures the SEL-2730M with the same high standards as those for SEL protective relays and backs it with the same 10-year worldwide warranty.

The SEL-2730M meets or exceeds the IEEE 1613 Class 1, IEC 61850-3, and IEC 60255 industry standards for communications devices in electrical substations for vibration, electrical surges, fast transients, extreme temperatures, and electrostatic discharge.

## Front- and Rear-Panel Diagrams

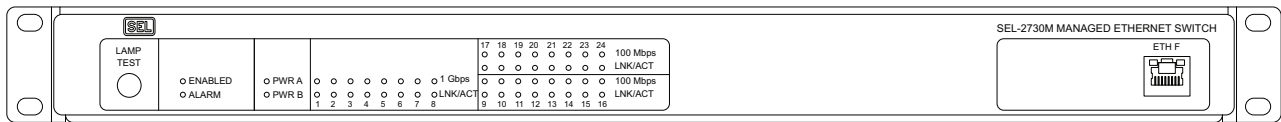


Figure 2 SEL-2730M Front-Panel Diagram

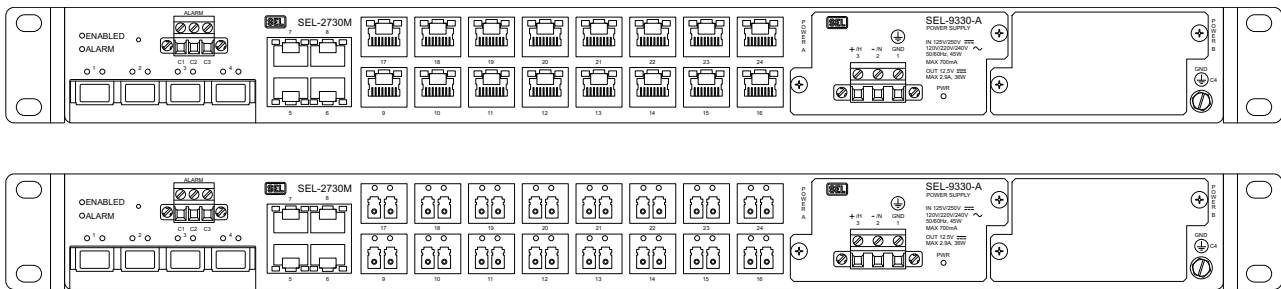


Figure 3 SEL-2730M Rear-Panel Diagrams

## Dimensions

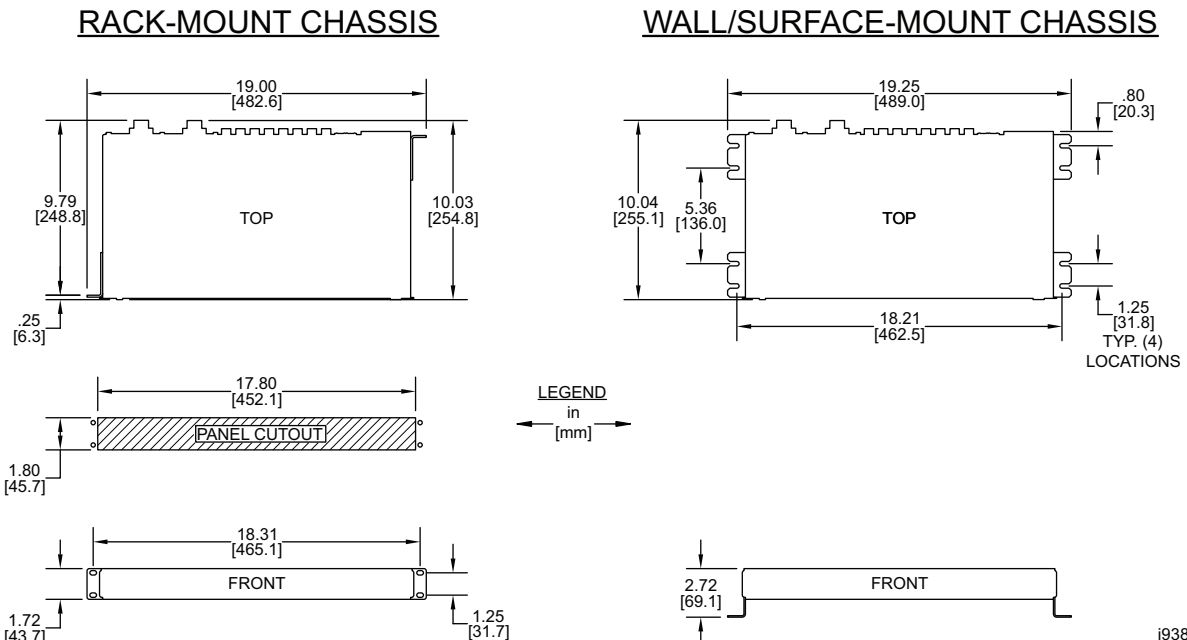


Figure 4 SEL-2730M Dimensions

# Specifications

## Compliance

Designed and manufactured under an ISO 9001 certified quality management system

UL Listed to U.S. and Canadian safety standards (File E220228; NRAQ/NRAQ7)

CE Mark

RCM Mark

## General

### Switching Properties

Switching Method:	Store and Forward
Switching Latency:	<7 $\mu$ s
Switch Fabric Throughput:	19.2 Gbps
Priority Queues:	4
Maximum VLANs:	4094
MAC Learning Architecture:	Shared VLAN Learning (SVL)
VLAN ID Range:	1–4094
MAC Address Table Size:	8192 addresses

### Warranty

10 Years

### Network Management

HTTPS Web User Interface  
 SNMP v1/v2c/v3  
 ACCELERATOR QuickSet SEL-5030 Software  
 Settings Import/Export  
 Third-Party Network Management Systems (NMS)

### User-Based Accounts

Maximum Local Accounts:	256
Password Length:	8–72 characters
Password Set:	All printable ASCII characters
User Roles:	Administrator, Engineer, User Manager, Monitor

### Syslog

Storage for 60,000 local Syslog messages.  
 Support for three remote Syslog destinations.

### Processing and Memory

Processor Speed:	313 MHz
Memory:	512 MB
Storage:	512 MB

### Communications Ports

#### Ethernet Ports

Ports:	24 rear, 1 front
Data Rate:	10, 100, or 1000 Mbps
Front Connector:	RJ45 Female

Rear Connectors:	RJ45 female or LC fiber (single-mode or multimode)
Standard:	IEEE 802.3-2012 IEEE 802.3-2012 excluding 10 Gbps and above IEEE 802.3-2008/Cor 1 IEEE 802.3bd IEEE 802.3bf

### Fiber-Optic Ports

#### Multimode Option (to 2 km)

Maximum TX Power:	–14 dBm
Minimum TX Power:	–19 dBm
RX Sensitivity:	–30 dBm
System Gain:	11 dB
Source:	LED
Wavelength:	1300 nm
Connector Type:	LC (IEC 61754-20)

#### Single-Mode Option (to 15 km)

Maximum TX Power:	–8 dBm
Minimum TX Power:	–15 dBm
RX Sensitivity:	–25 dBm
System Gain:	10 dB
Source:	Laser
Wavelength:	1310 nm
Connector Type:	LC (IEC 61754-20)

### Supported Small Form-Factor Pluggable (SFP) Fiber-Optic Ports

1000BASE-SX (300 m)  
 1000BASE-LX (10 km)  
 1000BASE-LX (20 km)  
 1000BASE-LX (30 km)  
 1000BASE-LX (40 km)  
 1000BASE-XD (50 km)  
 1000BASE-ZX (80 km)

### Supported Small Form-Factor Pluggable (SFP) Copper Ports

10/100/1000 BASE-T

For the most up-to-date list of qualified SFP modules, please contact the SEL application engineer in your region. Other SEL-qualified SFP modules not listed will operate in the SEL-2730M but may have a reduced temperature range.

### Digital Output

Rated Operational Voltage:	24–250 Vdc
Continuous Carry:	2 A

### Power Supply

#### 125/250 Volt Power Supply

Rated Supply Voltage:	125/250 Vdc; 120/220/240 Vac, 50/60 Hz
Input Voltage Range:	88–300 Vdc or 85–264 Vac
Maximum Burden:	AC: <60 VA DC: <45 W
DC Ripple:	<15% rated voltage
Peak Inrush:	8 A
Insulation:	3100 Vdc
Power Factor:	>75%

Isolated from Chassis Ground:	Yes
Input Voltage Interruptions:	50 ms @ 125 Vac/Vdc 100 ms @ 250 Vac/Vdc

**24/48 Volt Power Supply**

Rated Supply Voltage:	24/48 Vdc (polarized)
Input Voltage Range:	19.2–60.0 Vdc
Maximum Burden:	<42 W
DC Ripple:	<15% rated voltage
Peak Inrush:	18 A
Insulation:	3100 Vdc

Isolated from Chassis Ground:	Yes
Input Voltage Interruptions:	50 ms @ 48 Vdc 10 ms @ 24 Vdc

**Recommended External Overcurrent Protection**

Breaker Type:	Standard
Breaker Rating:	15 A at 250 Vdc
Current Breaking Capacity:	10 kA
Grounded Neutral Systems:	Device in series with the HOT or energized conductor
DC and Isolated Systems:	Device in series with both conductors

**Fuse Ratings****Power Supply Fuse**

SEL-9330-A:	2.5 A, 250 Vdc/300 Vac Time-lag T, 250 Vac/1500 A break rating
SEL-9330-C:	4.0 A, 150 Vdc Time-lag T, 250 Vac/1500 A break rating

**Note:** Fuses are not user-serviceable.

**Alarm Contact Output**

Per IEC 255-0-20:1974, Using Simplified Method of Assessment:

Output Type:	Relay, Form C, break-before-make
Power Supply Burden:	<1 W maximum
Mechanical Life:	2000000 operations
Operational Voltage:	250 Vac/Vdc
Make:	30 A at 250 Vdc
Carry:	6 A continuous at 70°C
1 s Rating	50 A
MOV Protection:	270 Vac, 23 J
Insulation Voltage:	300 Vdc
Pickup Time:	<8 ms
Dropout Time:	<8 ms

**Breaking Capacity (10,000 Operations):**

24 V	0.75 A	L/R = 40 ms
48 V	0.50 A	L/R = 40 ms
125 V	0.30 A	L/R = 40 ms
250 V	0.20 A	L/R = 40 ms

**Cyclic Capacity (2.5 Cycles/Second):**

24 V	0.75 A	L/R = 40 ms
48 V	0.50 A	L/R = 40 ms
125 V	0.30 A	L/R = 40 ms
250 V	0.20 A	L/R = 40 ms

**Terminal Connections****Compression Screw Terminals****Power Wiring**

Insulation:	300 V minimum
Size:	12–18 AWG

**Tightening Torque**

Minimum:	0.6 Nm (5 in-lb)
Maximum:	0.8 Nm (7 in-lb)

Crimp Ferrule Recommended

**Alarm Wiring**

Insulation:	300 V minimum
Size:	16–24 AWG

**Tightening Torque**

Minimum:	0.5 Nm (4 in-lb)
Maximum:	0.6 Nm (5 in-lb)

Crimp Ferrule Recommended

**Mounting Ear Tightening Torque**

Minimum:	2 Nm (18 in-lb)
Maximum:	4 Nm (35 in-lb)

**Grounding Screw****Ground Wiring**

Insulation:	300 V minimum
Size:	12 AWG
Length:	<3 m

**Tightening Torque**

Minimum:	0.9 Nm (8 in-lb)
Maximum:	1.4 Nm (12 in-lb)

Ring Terminal Recommended

**Dimensions****1U Rack Mount**

Height:	43.7 mm (1.72 inches)
Depth:	232.1 mm (9.14 inches)
Width:	482.5 mm (19 inches)

**Weight**

1.96 kg (4.3 lb)

**Environmental****Operating Temperature**

–40° to +85°C (–40° to +185°F)

**Relative Humidity**

0% to 95% non-condensing

**Altitude**

2000 m

**Atmospheric Pressure**

80–110 kPa

**Operating Environment**

Pollution Degree:	2
Overvoltage Category:	II
Insulation Class:	I

**Enclosure Protection**

IEC 60529:2001 + A2:2013  
Severity Level: IP20

**Green Product**

Compliant with the European Union's RoHS directive

**Type Tests****Communication Product Testing**

IEEE 1613-2009, KEMA certified  
Class I\*  
IEC 61850-3:2013 KEMA certified  
IEC 61850-90-4 KEMA certified

\* With SEL-C627-R or equivalent cables.

**Electromagnetic Compatibility Emissions**

Generic Emissions: EN 60255-26:2013  
EN 61850-3:2014  
47 CFR Part 15  
ICES-003, Issue 6  
CISPR 11:2009 + A1:2010  
CISPR 22:2008  
EN 55011:2009 + A1:2010  
EN 55022:2010 + AC:2011  
EN 55023:2012 + AC:2013  
Severity Level: Class A

**Electromagnetic Compatibility Immunity**

Conducted RF Immunity: IEC 60255-26:2013  
IEC 61000-4-6:2008  
Severity Level: 10 Vrms

Electrostatic Discharge Immunity: IEC 60255-26:2013  
IEC 61000-4-2:2008  
IEEE C37.90.3-2001  
Severity Level: 2, 4, 8 kV contact;  
4, 8, 15 kV air

Fast Transient/Burst Immunity: IEC 60255-26:2013  
IEC 61000-4-4:2011  
Severity Level: Zone A

Magnetic Field Immunity: IEC 60255-26:2013  
IEC 61000-4-8:2009  
Severity Level: 1000 A/m for 3 seconds,  
100 A/m for 1 minute  
IEC 61000-4-9:2001  
Severity Level: 1000 A/m  
IEC 61000-4-10:2001  
Severity Level: 100 A/m

Power Supply Ripple: IEC 60255-26:2013  
IEC 61000-4-17:2008

Power Supply Dips and Interruptions: IEC 60255-26:2013  
IEC 61000-4-11:2004  
IEC 61000-4-29:2000

Power Supply Gradual Shutdown and Startup: IEC 60255-26:2013

Power Supply Discharge Capacitors: IEC 60255-27:2013

Power Supply Reverse Polarity and Slow Ramp: IEC 60255-27:2013

Radiated RF Immunity: IEC 60255-26:2013  
Severity Level: 10 V/m unmodulated  
80 MHz–1 GHz, 1.4 GHz–2.7 GHz  
IEEE C37.90.2-2004  
Severity Level: 20 V/m 80% AM,  
0.5 s keyed, 80 MHz–1 GHz

Surge Immunity: IEC 60255-26:2013  
IEC 61000-4-5:2005  
Severity Level: Zone A

Surge Withstand Capability: IEC 60255-26:2013  
Severity Level: 2.5 kV peak common  
mode, 1.0 kV peak differential mode  
IEC 61000-4-18:2006  
IEEE C37.90.1-2002  
Severity Level: 2.5 kV oscillatory,  
4 kV fast transient waveform

**Environmental**

Cold: IEC 60255-27:2013  
IEC 60068-2-1:2007  
Severity Level: 16 hours at –40°C

Dry Heat: IEC 60255-27:2013  
IEC 60068-2-2:2007  
Severity Level: 16 hours at +85°C

Damp Heat, Cyclic: IEC 60255-27:2013  
IEC 60068-2-30:2005  
Severity Level: 25°C to 55°C  
Relative Humidity: 93% to 95%  
Duration: 6 cycles, 1 cycle/day

Damp Heat, Steady State: IEC 60255-27:2013  
IEC 60068-2-78:2002  
Severity Level: 40°C  
Relative Humidity: 93%  
Duration: 4 days

Vibration (Front-Panel Mount Only): IEC 60255-27:2013  
IEC 60255-21-1:1988  
Severity Level: Class 1 endurance,  
Class 2 response  
IEC 60255-21-2:1988  
Severity Level: Class 1 - shock withstand,  
bump, and Class 2 - shock response  
IEC 60255-21-3:1993  
Severity Level: Class 2 (quake response)

**Safety**

Dielectric Strength: IEC 60255-27:2013  
IEEE C37.90-2005  
3600 Vdc on power supply and alarm  
contact; 2250 Vdc on Ethernet ports  
Type tested for 1 minute  
IEEE 802.3-2012  
2250 Vdc on electrical Ethernet ports  
Type tested for 1 minute  
Ports 5–8 comply with Environment A  
requirements between ports  
Ports 9–24 comply with Environment B  
requirements between ports

Impulse: IEC 60255-27:2013  
IEEE C37.90-2005  
Severity Level:  
Common Mode  
5 kV power supply, alarm contact  
2.4 kV Ethernet ports  
Common Mode, Port to Port  
5 kV power supply, alarm contact  
Zero-Rated, Ethernet ports

Protective Bonding Resistance: IEC 60255-27:2013  
IEEE C37.90-2005

# Technical Support

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We appreciate your interest in SEL products and services. If you have questions or comments, please contact us at:

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This product is covered by the standard SEL 10-year warranty. For warranty details, visit [selinc.com](http://selinc.com) or contact your customer service representative.

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