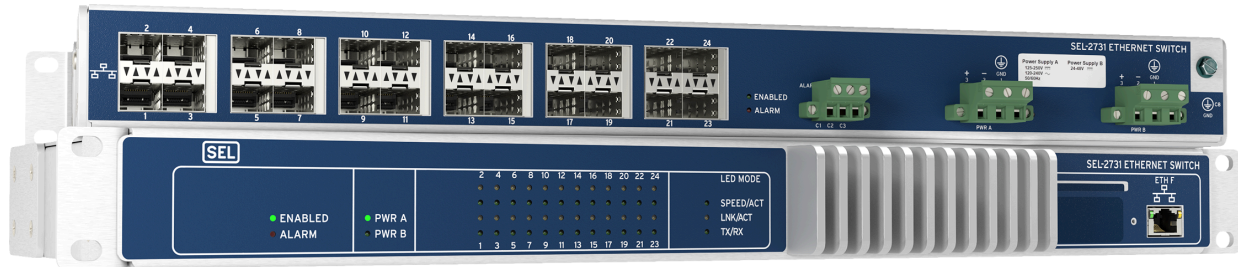




SEL-2731 Ethernet Switch Manual



Features and Benefits

The SEL-2731 24-port, 1U Ethernet Switch is designed for the harsh environments commonly found in the energy and utility industries. The SEL-2731 provides the local area network for critical infrastructures' demanding signal integrity, such as IEC 61850, protection-class Ethernet networks, engineering access, supervisory control and data acquisition (SCADA), and process control systems (PCS). The SEL-2731 is designed for extended product lifecycles demanding very high reliability and is backed by a ten-year warranty.




- **Reliability.** Increase availability with the SEL-2731, which is designed, built, and tested to function in harsh environments, such as substations, and meets IEEE 1613 and IEC 61850-3 standards. Optional dual power supplies allow connectivity to primary and backup power sources.
- **Compact Mounting Depth.** Supports a wide range of installation options with one of the industry's shallowest mounting depths, leaving room for cables and technician access.
- **Fanless design.** No moving parts are used, increasing the reliability and product lifetime.
- **Dual Power Supplies.** Supports one or two integrated configurable power supplies. Select a wide-range high-voltage or low-voltage option or one of each.
- **Switching Capacity.** Supports full bandwidth with 19.2 Gbps full-duplex packet data rate.
- **Hardware-Accelerated Fault Restoration.** Optimized to heal network faults quickly to support control signal applications.
- **Flexible Mounting Options.** Choose from rack-mount, panel-mount, and surface-mount options.
- **Traffic LED Indicators.** Provides clear LED indication for alarms, links, traffic activity, and switch status to support efficient onsite troubleshooting.
- **Customizable Nameplate Labeling.** Professionally and clearly display the customized name for the product in the protected insert window on the faceplate.

- **Selectable Control Plane Technologies.** Designed to support selectable switching technologies. Select from unmanaged switch, RSTP-based managed switch, or OT SDN managed switch technologies.
- **Flexible Port Options.** Order the SEL-2731 with 100/1000BASE-T RJ45 and SFP Ethernet ports (in sets of four).

Safety Information










Dangers, Warnings, and Cautions

This manual uses three kinds of hazard statements, defined as follows:

-  **DANGER**
Indicates a potentially hazardous situation that, if not avoided, **will** result in death or serious injury.
-  **WARNING**
Indicates a potentially hazardous situation that, if not avoided, **could** result in death or serious injury.
-  **CAUTION**
Indicates a potentially hazardous situation that, if not avoided, **may** result in minor or moderate injury or equipment damage.

Safety Symbols

The following symbols are often marked on SEL products.

	 CAUTION Refer to accompanying documents.	 ATTENTION Se reporter à la documentation.
	Earth (ground)	Terre
	Protective earth (ground)	Terre de protection
	Direct current	Courant continu
	Alternating current	Courant alternatif
	Both direct and alternating current	Courant continu et alternatif
	Instruction manual	Manuel d'instructions

Safety Marks

The following statements apply to this device.

Table 1 General Safety Marks

<p>⚠ CAUTION</p> <p>There is danger of explosion if the battery is incorrectly replaced. Replace only with Panasonic BR-1632A/DBN or equivalent recommended by manufacturer. See Owner's Manual for safety instructions. The battery used in this device may present a fire or chemical burn hazard if mis-treated. Do not recharge, disassemble, heat above 100°C or incinerate. Dispose of used batteries according to the manufacturer's instructions. Keep battery out of reach of children.</p>	<p>⚠ ATTENTION</p> <p>Une pile remplacée incorrectement pose des risques d'explosion. Remplacez seulement avec un Panasonic BR-1632A/DBN ou un produit équivalent recommandé par le fabricant. Voir le guide d'utilisateur pour les instructions de sécurité. La pile utilisée dans cet appareil peut présenter un risque d'incendie ou de brûlure chimique si vous en faites mauvais usage. Ne pas recharger, démonter, chauffer à plus de 100°C ou incinérer. Éliminez les vieilles piles suivant les instructions du fabricant. Gardez la pile hors de la portée des enfants.</p>
<p>⚠ CAUTION</p> <p>To ensure proper safety and operation, the equipment ratings, installation instructions, and operating instructions must be checked before commissioning or maintenance of the equipment. The integrity of any protective conductor connection must be checked before carrying out any other actions. It is the responsibility of the user to ensure that the equipment is installed, operated, and used for its intended function in the manner specified in this manual. If misused, any safety protection provided by the equipment may be impaired.</p>	<p>⚠ ATTENTION</p> <p>Pour assurer la sécurité et le bon fonctionnement, il faut vérifier les classements d'équipement ainsi que les instructions d'installation et d'opération avant la mise en service ou l'entretien de l'équipement. Il faut vérifier l'intégrité de toute connexion de conducteur de protection avant de réaliser d'autres actions. L'utilisateur est responsable d'assurer l'installation, l'opération et l'utilisation de l'équipement pour la fonction prévue et de la manière indiquée dans ce manuel. Une mauvaise utilisation pourrait diminuer toute protection de sécurité fournie par l'équipement.</p>
<p>The SEL-2731 battery is the only field-serviceable part (see <i>Battery Change Instructions on page 11</i>). For all other repairs, return the faulty or failed unit to the factory for repair or replacement.</p>	<p>La batterie SEL-2731 est la seule pièce réparable sur site (voir la section Battery Change Instructions). Pour toutes les autres réparations, renvoyez l'unité défectueuse à l'usine pour la réparer ou la remplacer.</p>
<p>For use in Pollution Degree 2 environment.</p>	<p>Pour utilisation dans un environnement de Degré de Pollution 2.</p>
<p>Ambient air temperature shall not exceed 40°C (104°F) in locations where touch temperature safety is required.</p>	<p>La température de l'air ambiant ne doit pas dépasser 40°C (104°F) dans des endroits où la température des surfaces doit être suffisamment basse pour les toucher en toute sécurité.</p>
<p>Overvoltage Category: II</p>	<p>Catégorie de surtension : II</p>
<p>Insulation Class: I</p>	<p>Classe d'isolation : I</p>
<p>Ambient air temperature shall not exceed 85°C (185°F).</p>	<p>La température ambiante de l'air ne doit pas dépasser 85°C (185°F).</p>
<p>For use in a NEMA Type 1 enclosure or greater.</p>	<p>Pour utilisation dans un boîtier de Type 1.</p>
<p>IP Rating Power Inputs: IP2X Front-Reset Button: IP3X Enclosure: IP4X</p>	<p>Indice de protection Entrées d'alimentation : IP2X Bouton de réinitialisation sur le panneau avant : IP3X Boîtier : IP4X</p>

Table 2 Other Safety Marks

<p>⚠ DANGER</p> <p>Disconnect or de-energize all external connections before opening this device. Contact with hazardous voltages and currents inside this device can cause electrical shock resulting in injury or death.</p>	<p>⚠ DANGER</p> <p>Débrancher tous les raccordements externes avant d'ouvrir cet appareil. Tout contact avec des tensions ou courants internes à l'appareil peut causer un choc électrique pouvant entraîner des blessures ou la mort.</p>
<p>⚠ DANGER</p> <p>Contact with instrument terminals can cause electrical shock that can result in injury or death.</p>	<p>⚠ DANGER</p> <p>Tout contact avec les bornes de l'appareil peut causer un choc électrique pouvant entraîner des blessures ou la mort.</p>

4 Safety Information

DANGER

Safety insulation is not provided between output contact terminals. If hazardous live voltage is attached to one terminal, all contact output terminals must be treated as hazardous live. Failing to do so can cause electrical shock that can result in injury or death.

DANGER

L'isolation de sécurité n'est pas fournie entre les bornes de contact de sortie. Si une tension sous tension dangereuse est attachée à une borne, toutes les bornes de sortie de contact doivent être traitées comme sous tension dangereuse. Le non-respect de cette consigne peut provoquer un choc électrique pouvant entraîner des blessures ou la mort.

WARNING

Always use an overcurrent protection device such as a circuit breaker or fuse. The contact output must operate on the load side of the overcurrent protection device. The type and size of the overcurrent protection device must be appropriate for the connected load and wiring.

AVERTISSEMENT

Utiliser toujours un dispositif de protection contre les surintensités tel qu'un disjoncteur ou un fusible. La sortie doit fonctionner du côté de la charge du dispositif de protection contre les surintensités. Le type et la taille du dispositif de protection contre les surintensités doivent être adaptés à la charge et au câblage connectés.

WARNING

Earth connection is essential before making telecommunication network connections.

AVERTISSEMENT

Courant de fuite élevé. Une connexion à la terre est essentielle avant de faire des connexions au réseau de télécommunications.

WARNING

Earth ground connections should not be removed when the equipment is energized.

AVERTISSEMENT

Il ne faut pas enlever les connexions de mise à la terre pendant que l'équipement est sous tension.

WARNING

Use of this equipment in a manner other than specified in this manual can impair operator safety safeguards provided by this equipment.

AVERTISSEMENT

L'utilisation de cet appareil suivant des procédures différentes de celles indiquées dans ce manuel peut désarmer les dispositifs de protection d'opérateur normalement actifs sur cet équipement.

WARNING

Have only qualified personnel service this equipment. If you are not qualified to service this equipment, you can injure yourself or others, or cause equipment damage.

AVERTISSEMENT

Seules des personnes qualifiées peuvent travailler sur cet appareil. Si vous n'êtes pas qualifiés pour ce travail, vous pourriez vous blesser avec d'autres personnes ou endommager l'équipement.

WARNING

Do not perform any procedures or adjustments that this instruction manual does not describe.

AVERTISSEMENT

Ne pas appliquer une procédure ou un ajustement qui n'est pas décrit explicitement dans ce manuel d'instruction.

WARNING

Do not look into the fiber ports/connectors.

AVERTISSEMENT







Ne pas regarder vers les ports ou connecteurs de fibres optiques.

WARNING

Do not look into the end of an optical cable connected to an optical output.

AVERTISSEMENT

Ne pas regarder vers l'extrémité d'un câble optique raccordé à une sortie optique.

<p> WARNING</p> <p>Incorporated components, such as LEDs and transceivers are not user serviceable. Return units to SEL for repair or replacement.</p>	<p> AVERTISSEMENT</p> <p>Les composants internes tels que les leds (diodes électroluminescentes) et émetteurs-récepteurs ne peuvent pas être entretenus par l'utilisateur. Retourner les unités à SEL pour réparation ou remplacement.</p>
<p> CAUTION</p> <p>Equipment components are sensitive to electrostatic discharge (ESD). Undetectable permanent damage can result if you do not use proper ESD procedures. Ground yourself, your work surface, and this equipment before removing any cover from this equipment. If your facility is not equipped to work with these components, contact SEL about returning this device and related SEL equipment for service.</p>	<p> ATTENTION</p> <p>Les composants de cet équipement sont sensibles aux décharges électrostatiques (DES). Des dommages permanents non-décelables peuvent résulter de l'absence de précautions contre les DES. Raccordez-vous correctement à la terre, ainsi que la surface de travail et l'appareil avant d'en retirer un panneau. Si vous n'êtes pas équipés pour travailler avec ce type de composants, contacter SEL afin de retourner l'appareil pour un service en usine.</p>
<p> CAUTION</p> <p>Insufficiently rated insulation can deteriorate under abnormal operating conditions and cause equipment damage. For external circuits, use wiring of sufficiently rated insulation that will not break down under abnormal operating conditions.</p>	<p> ATTENTION</p> <p>Un niveau d'isolation insuffisant peut entraîner une détérioration sous des conditions anormales et causer des dommages à l'équipement. Pour les circuits externes, utiliser des conducteurs avec une isolation suffisante de façon à éviter les claquages durant les conditions anormales d'opération.</p>

General Safety and Care Information

General Safety Notes

The SEL-2731 is designed for restricted access locations. Access should be limited to qualified service personnel.

To ensure proper safety and operation, check the equipment rating, installation instructions, and operating instructions before commissioning or maintaining the equipment. Also check the integrity of any protective conductor connection before taking any other actions. It is the responsibility of the user to ensure that the equipment is installed, operated, and used for its intended function and in the manner this manual specifies. If this equipment is used for anything other than its intended function or in a manner this manual does not specify, any safety protection the equipment provides may be impaired.

For installations requiring additional personnel protection against electrical energy hazards, SEL has connector kits available that cover the metal connector terminals and have cable retention mounts. SEL recommends using these connectors with double insulated cables or approved wire loom for best results. See *Available Ordering Options on page 6* for details.

Cleaning Instructions

The device should be de-energized (by removing the power connection to both the power and alarm connection) before cleaning.

The case can be wiped down with a damp cloth. Solvent-based cleaners should not be used on plastic parts or labels.

Introduction and Hardware Specification

The SEL-2731 is a 24-port Ethernet switch designed for critical infrastructure. The SEL-2731 is ordered with RSTP-based or OT SDN control plane technology. Unmanaged control plane technologies will be available as future ordering options. The SEL-2731 supports conversion between the different control plane technologies.

The SEL-2731 is backed by the SEL worldwide, ten-year product warranty.

Available Ordering Options

The SEL-2731 provides flexible power supply, Ethernet port, and firmware technology ordering options. *Table 3* lists the available ordering choices. All options listed are available with or without conformal coat.

Table 3 Ordering Options

Ordering Option	Value
Conformal Coat	Yes/No
Power Supply	
Position One	Low Voltage 24–48 Vdc or High Voltage 125–250 Vdc/120–240 Vac
Position Two	Low Voltage 24–48 Vdc or High Voltage 125–250 Vdc/120–240 Vac
Communication Ports	
1	4 100/1000BASE SFP ports, 4 100/1000BASE-T copper ports 16 100BASE-T copper ports
2	4 100/1000BASE SFP ports, 4 100/1000BASE-T copper ports 4 100BASE SFP ports, 12 100BASE-T copper ports
3	4 100/1000BASE SFP ports, 4 100/1000BASE-T copper ports 8 100BASE SFP ports, 8 100BASE-T copper ports
4	4 100/1000BASE SFP ports, 4 100/1000BASE-T copper ports 12 100BASE SFP ports, 4 100BASE-T copper ports
5	8 100/1000BASE SFP ports 4 100BASE SFP ports, 12 100BASE-T copper ports
6	8 100/1000BASE SFP ports 8 100BASE SFP ports, 8 100BASE-T copper ports
7	8 100/1000BASE SFP ports 12 100BASE SFP ports, 4 100BASE-T copper ports
8	8 100/1000BASE SFP ports 16 100BASE SFP ports
Ethernet Switching Technology	
RSTP	Standard Optioned: includes PTP transparent clock capabilities
Unmanaged	Available in a future release
OT SDN	Operational Technology Software-Defined Networking using OpenFlow

Ordering Option	Value
Mounting	
Rack Mount	The switch comes with two mounting brackets to fit a standard 19" equipment rack
Panel Mount	The switch comes with a panel collar and mounting brackets
Surface Mount	The switch comes with four metal brackets used to mount the corners of the product to a flat surface
Optional Accessories and Kits	
Covered Connectors	The 915900661 kit comes with connectors that cover the electrical connection points and a cable retention feature.

Power Supply

Redundant power supplies provide uninterrupted failover protection. Each power supply can be connected to a separate source. If one source fails, the other source continues to keep the switch operating. Two power supplies are available: high-voltage (85–264 Vac and 88–300 Vdc) and low-voltage (24–48 Vdc). The SEL-2731 turns on as soon as it receives the required power. To turn off the SEL-2731, remove all sources of power.

Follow the wiring instructions in *Table 4* and confirm that the source voltage range is within the tolerance of the SEL-2731. Power supply inputs are isolated from ground and are polarity-protected. The power supplies have an LED that will turn green when the supply is operating properly and red when it is not operating properly. The power supplies may also be monitored through SNMP using the Entity MIB.

Table 4 Power Supply Connections

Pin	Description
1	GND
2	N (–)
3	H (+)

The power supply connections must be 18 AWG (0.75 mm²) or larger and no longer than 10 m (32.8 ft) to comply with the rated specifications.

SFP Management

The SEL-2731 meets all specifications when using SEL's qualified fiber SFPs listed at <https://selinc.com/products/SFP/>.

The SEL-2731 accepts SEL qualified and third-party SFPs. When using an SFP not qualified by SEL, SEL recommends evaluating the performance. The SEL-2731 meets or exceeds all specifications when sourcing 14.4 W of power for all SFPs. SFPs can be inserted and removed while the unit is turned on. The SEL-2731 accepts 100 Mbps and 1 Gbps SFPs. When using individual SFPs with power ratings greater than 600 mW, place the SFPs in the top row of the switch for best thermal performance.

SEL has recommended SFPs listed and for sale on our website at <https://selinc.com/products/SFP/>.

When doing the power budgets for the switch the below table provides the values to use for each of the most common SFPs.

SEL Part Number	Standard	Max. Distance	Wavelength	Power per SFP
8104-01	100BASE-LX	20 km	1310 nm	0.600 watts
8109-01	100BASE-FX	2 km	1310 nm	0.363 watts
8115-01	100/1000BASE-T	0.1 km	N/A	1.200 watts
8130-01	1000BASE-LX	10 km	1310 nm	0.595 watts
8131-01	1000BASE-SX	0.3 km	850 nm	0.466 watts

SFP changes are monitored by the SEL-2731 and logs are generated any time an SFP is inserted or removed.

LED Status Indicators and Modes

Figure 1 and Figure 2 show the front and rear panels of the SEL-2731, respectively. The SEL-2731 has one LED indicator on the front panel for each power connection, labeled **PWR A** and **PWR B**. Table 5 lists the LED colors and their descriptions.



Figure 1 SEL-2731 Front Panel

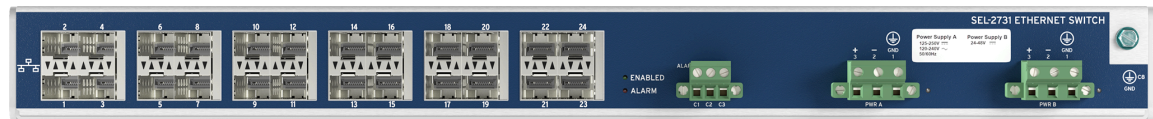


Figure 2 SEL-2731 Rear Panel

Table 5 Front- and Rear-Panel Power Connection LEDs

Status	Description
Off	No power applied
Red	Unacceptable power applied
Green	Acceptable power applied

The SEL-2731 has an LED labeled **ALARM** on both the front and rear panels. Table 6 lists the **ALARM** LED states and their descriptions.

Table 6 Alarm LED States

Status	Description
Off	No alarm conditions
Red	Alarm condition

The **ALARM** LED will turn on when power is first applied and will turn off only when all services in the switch have completed their boot cycle and are operating normally.

The SEL-2731 has an LED labeled **ENABLED** on both the front and rear panels. *Table 7* lists the **ENABLED** LED states and their descriptions.

Table 7 Enabled LED States

Status	Description
Off	Device is not fully functional
Green	Device is fully functional

The port status LEDs located on the front of the SEL-2731 numbered 1–24 and on each port located on the rear of the device operate in three different modes: Speed and Activity (**SPEED/ACT**), Link and Activity (**LNK/ACT**), and Transmit and Receive (**TX/RX**). *Table 8*, *Table 9*, and *Table 10* list the different port status LED states and the descriptions for each mode. You can change the mode of each port by using the SEL-5056 Flow Controller.

Speed and Activity (SPEED/ACT) Mode

Table 8 LED Status Indicators for Speed and Activity (SPEED/ACT) Mode

LED	State	Description
Amber	On	Link at maximum speed for the port
	Blinking	Packet collision has occurred
Green	On	Link up
	Off	Link down
	Blinking	Port is transmitting and/or receiving data

Link and Activity (LNK/ACT) Mode (Available in a Future Release)

Table 9 LED Status Indicators for Link and Activity (LNK/ACT) Mode

LED	State	Description
Amber	Off	No link
	On	Link
Green	Off	No data transmitted or received
	Blinking	Port is transmitting and/or receiving data

Transmit and Receive (TX/RX) Mode (Available in a Future Release)

Table 10 LED Status Indicators for Transmit and Receive (TX/RX) Mode

LED	State	Description
Amber	Off	No data transmitted
	Blinking	Port is transmitting data
Green	Off	No data received
	Blinking	Port is receiving data

Pinhole Reset

The device provides a pinhole reset button on the front of the product near the ETH F port. This button as can used to restore the unit to its factory configuration. You should only use this feature when you decommission the device. The factory-reset function restores all settings to their factory-default state and erases all logs. After a factory reset, you must recommission the device.

Alarm Contact Output

One Form C output mechanical relay contact labeled **ALARM** is provided on the SEL-2731 rear panel. To indicate a minor alarm, the alarm contact pulses for a configurable amount of time. The minor alarm duration is set to 1 s by default, but this duration can be configured for as long as 30 s. This allows the system to capture the status of the alarm before it is cleared. Major alarms latch the contact and operate until the source of the alarm is cleared or the alarm is manually cleared. Alarm contacts are divided into specific categories. You can configure a different severity for each category. Alarms with a severity of Emergency, Alert, and Critical are major alarms. Other severities are minor alarms.

Table 11 Alarm Contact Pinout

Pin	Description
C1	Normally open
C2	Common
C3	Normally closed

Table 12 Alarm Contact Ratings

Maximum voltage	250 Vdc
Contact protection	270 Vdc 23 J MOV-protected
Maximum current	2 A
Pickup time	≤8 ms typical
Dropout time	≤8 ms typical

Labels and Markings

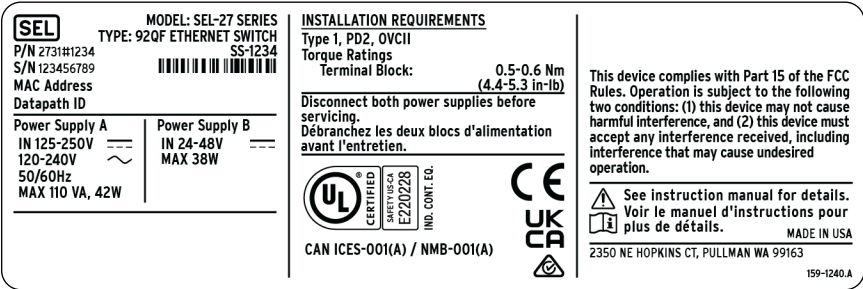


Figure 3 Identification Label

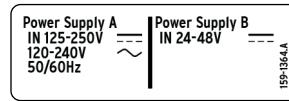


Figure 4 Power Supply Label

The identification label is attached to the unit and provides the following details. The part number, serial number, MAC address and Datapath ID are all located in the top left corner. The power supply details are under these values and represent the power supplies installed in the unit. When one power supply is ordered, only Power Supply A is populated. The middle section of the sticker contains the torque and device ratings for installation, and a safety warning to disconnect power before installing or uninstalling the unit. The remaining markings are compliance markings to various standards, see *Specifications on page 14* for more details. The power supply sticker includes the accepted voltage and power ratings of each power supply. This second sticker is applied on the unit next to the power supply connectors to make it easy to understand the power supply range when connecting a power source to the switch.

The SEL-2731 also has a configurable label slot on the front panel (next to the **ETH F** port) that allows custom device names to be added to the front overlay. You can write on the back of the preprinted labels, use the blank labels included with the device, or print your own customized labels. You can find the configurable label template and instructions for the SEL-2731 on the SEL website (selinc.com/products/2731/docs/).

Battery Change Instructions

The battery in the SEL-2731 maintains power to the real-time clock so that it retains the time through power cycles. The battery is rated to last more than 10 years, but if you need to change the battery, use the following steps:

- Step 1. Disconnect power from the SEL-2731.
- Step 2. Remove all communication, digital input, and alarm contact cabling and remove the unit from its mounting.
- Step 3. Ground yourself, your workstation, and the SEL-2731 to the same ground.
- Step 4. Remove the screws on the top lid of the chassis, and then remove the top lid itself. The battery is located in the top right corner of the main board (when viewing from the rear).
- Step 5. Replace the battery with a Panasonic BR-1632A/DBN.
- Step 6. Reassemble the device and return it to service.
- Step 7. Dispose of the battery to a qualified recycle facility or a facility that supports a hazardous waste disposal program suitable for batteries.

Installation and Configuration

Installation

The SEL-2731 is designed and rated for indoor use or for use in suitable outdoor cabinets. Connectors for power supplies and the alarm contact are rated and evaluated for use in protective enclosures and handled by trained personnel. This switch is suited for use as an Ethernet switch for industrial applications that have

19" rack-mount, panel-mount, or surface-mount installations. The SEL-2731 is a 1U device and comes with 19" rack-mount ears; panel-mount ears and surface-mount ears are available for order. The operation of the device is not dependent on the mounted orientation but does require 1U of space above and below the installation on the rack for ambient heat dissipation to meet all specifications.

Unit Placement and Maintenance

To satisfy safety requirements, the unit shall be installed in a suitable fire/ electrical/mechanical enclosure. To protect against electrical shock hazards, the enclosure shall prevent access to the rear-panel power supply and I/O terminal during normal operation.

User Interface, Settings, Commissioning, Diagnostics, and Configurations Details

See the desired control plane technology user's guide for all these details.

Dimensions

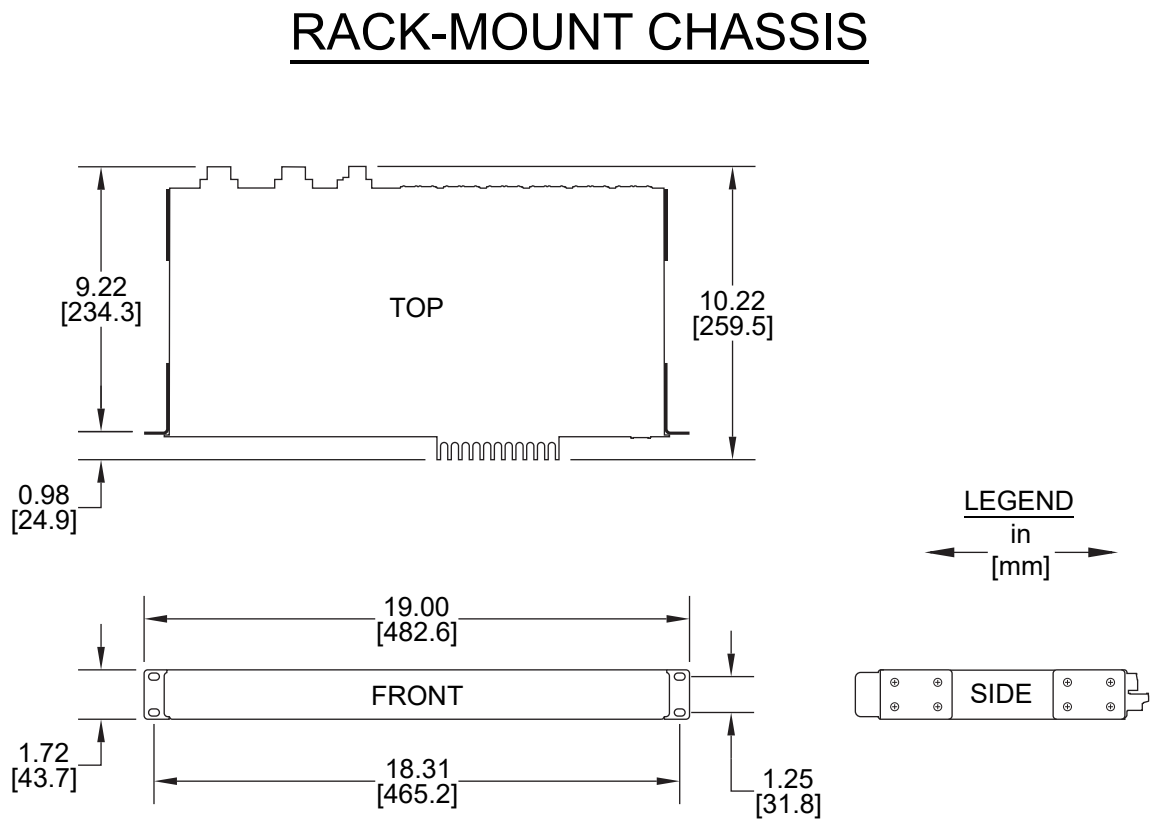


Figure 5 SEL-2731 Rack-Mount Chassis

PANEL MOUNT CHASSIS

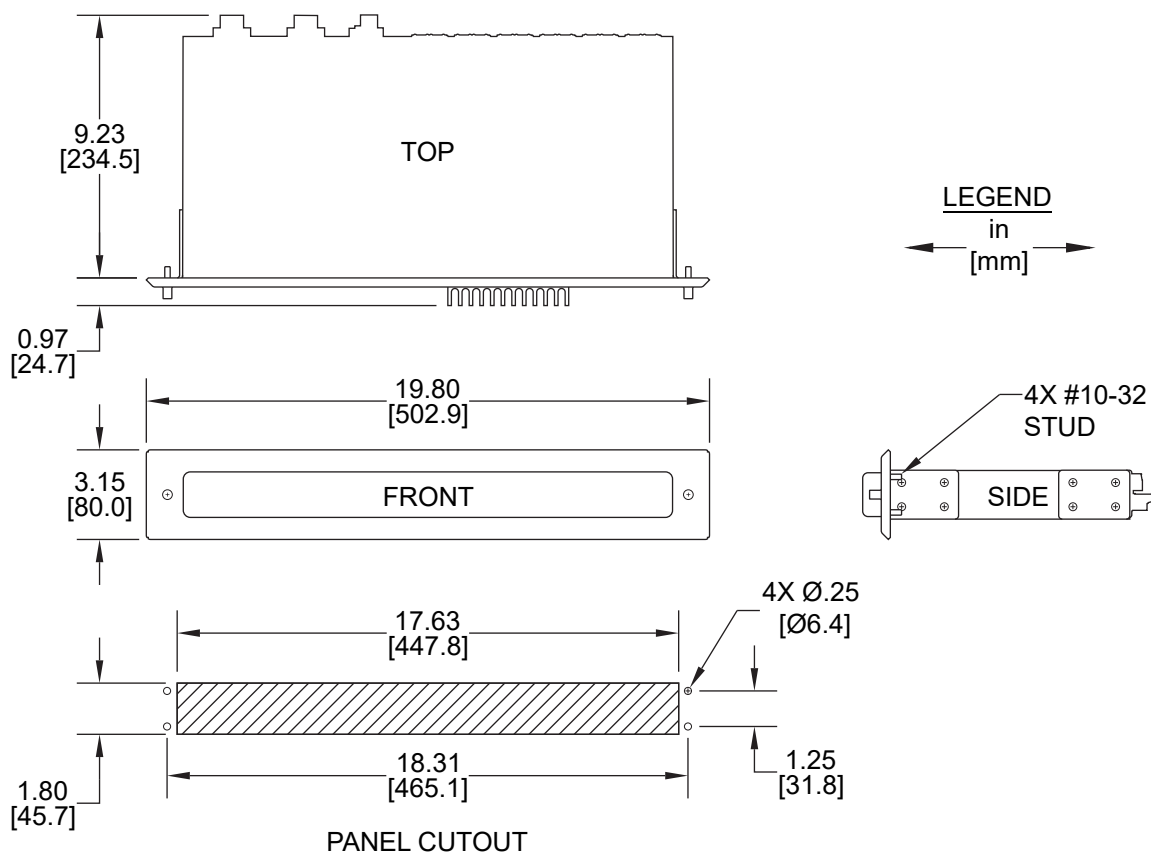


Figure 6 SEL-2731 Panel-Mount Chassis

WALL/SURFACE-MOUNT CHASSIS

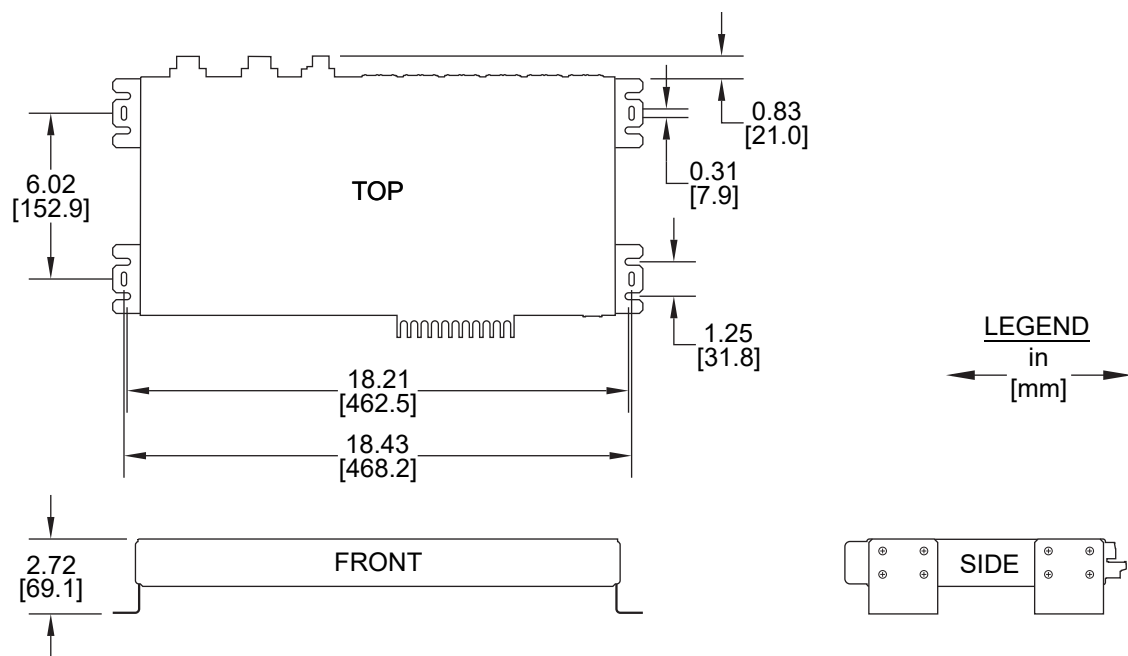


Figure 7 SEL-2731 Wall/Surface-Mount Chassis

Specifications

General	
Switching Properties	
Switching Method:	Store-and-Forward
Priority Queues:	4
Priority Queue Method:	8:4:2:1 weighted round-robin (WRR)
Maximum Transmission Unit (MTU):	1632
Warranty	
10 years	
Communication Ports	
Ethernet Ports:	24 rear 1 front
Data Rate:	8 100/1000BASE 16 100BASE
Maximum throughput:	8 Gbps at 256 byte packets
Duplex:	Full
Front Connector:	RJ45
Rear Connector:	RJ45 or SFP cage slot
SFP Power Budget:	The power dissipation of an installed complement of SFP modules cannot exceed a combined total of 14.4 W, or 600 mW per SFP on average.

SFP Type: Use Class 1 laser products to comply with IEC 60825 and FDA 21 CFR 1040.10 and 1040.11. Operate within the specified temperature and voltage limits. Terminate with an optical connector or a dust plug.

Copper Ethernet Ports: 100/1000BASE-T with auto-negotiate

Power Supply

High-Voltage Supply

Rated Voltage Range: 125–250 Vdc
120–240 Vac, 50/60 Hz

Min/Max Voltage: 88–300 Vdc
85–264 Vac

Maximum Burden: AC: <70 VA
DC: <45 VA

Input Voltage Interruptions: 50 ms @ 125 Vac/Vdc
100 ms @ 250 Vac/Vdc

Fuse Rating: 2.5 A, 250 Vdc/300 Vac time-lag T, 250 Vac/1500 A break rating

Note: Fuses are not user-serviceable.

Recommended External Overcurrent Protection: Standard breaker, Rating 15 A at 250 Vdc

Low-Voltage Supply

Rated Voltage Range: 24–48 Vdc

Min/Max Voltage: 19.2–60.0 Vdc

Maximum Burden: DC: <38 W

Input Voltage Interruptions: 50 ms at 48 Vdc
10 ms at 24 Vdc

Fuse Rating: 4.0 A, 150 Vdc time-lag T, 250 Vac/1500 A break rating

Note: Fuses are not user-serviceable.

Recommended External Overcurrent Protection: Standard breaker, Rating 15 A at 250 Vdc

Alarm Contact Output

Output Type: Relay, Form C, break before make

Pilot Duty Rating^a: B300
R300

Power Supply Burden: <1 W max

Mechanical Life^b: 2,000,000 operations

Operational Voltage^b: 250 Vac/Vdc

Make: 30 A at 250 Vdc

Carry: 2 A continuous at 70°C (158°F)

1 s Rating: 50 A

MOV Protection: 270 Vac, 23 J

Insulation Voltage: 300 Vdc

Pickup Time: <8 ms

Dropout Time: <8 ms

^a Per UL 508.

^b Parameters verified by SEL per IEC 60255-1:2009 and IEEE C37.90-2005.

Terminal Connections—Compression Screw Terminals

Power Supply Wiring^a—Use With Plug P/N 420-0219 (Provided)

Insulation Ratings:	300 V, 90°C (194°F), minimum
Wire Material:	Copper
Size:	12–18 AWG (4.00–0.75 mm ²)
Tightening Torque Min/Max:	0.5–0.6 Nm (4–5 in-lb)

Alarm Contact Wiring^a—Use With Plug P/N 420-0226 (Provided)

Insulation Ratings:	300 V, 90°C (194°F), minimum
Wire Material:	Copper
Size:	16–22 AWG (1.50–0.34 mm ²)
Tightening Torque Min/Max:	0.5–0.6 Nm (4–5 in-lb)

Ground Screw (#6 Crimp Ring Terminal^a Is Recommended)

Insulation Ratings:	300 V, 90°C (194°F), minimum
Wire Material:	Copper
Size:	12–18 AWG (4.00–0.75 mm ²)
Length:	<3.0 m (<9.8 ft)
Tightening Torque Min/Max:	0.90–1.36 Nm (8–12 in-lb)

Mounting Brackets

Tightening Torque Min/Max:	2–4 Nm (18–35 in-lb)
----------------------------	----------------------

^a Warning: When using stranded wire, use crimp ferrules to safely capture all wire strands before assembling and attaching the plug or ground wire.

Dimensions and Weight**1U Rack Mount**

Height:	4.37 cm (1.72 in)
Depth:	23.45 cm (9.23 in)
Width:	48.26 cm (19 in)
Weight:	3 kg (6.5 lb)

Environmental**Temperature, Humidity, and Altitude**

Operating Temperature:	–40°C to +85°C (–40°F to +185°F)
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Note: UL Ambient +40°C (+104°F). See *Safety Information on page 2* for additional details.

Storage ^a Temperature (Non-Operating):	–40°C to +85°C (–40°C to +185°F)
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Relative Humidity:	5% to 95%, noncondensing
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Altitude ^b :	2000 m (6562 ft)
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Atmospheric Pressure:	80–210 kPa
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^a Unit should be stored in a sheltered location in the supplied packaging prior to installation and use.

^b IEEE 1613, 1613.1: Derate per clause 3.3.2, Table 1 and Table 2 when operating at higher altitudes.

Operating Environment

Pollution Degree:	2
Overvoltage Category:	II
Insulation Class:	I
Enclosure Protection:	IEC 60529:2001 + A2:2014—IP20

Compliance

Designed and manufactured under an ISO 9001 certified quality management system.

United States and Canada

FCC 47 CFR Pt 15B, Class A

Canada ICES-001 (A) / NMB-001 (A)

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

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct the interference at his own expense.

European Union

CE Mark

RoHS Compliant

United Kingdom

UKCA Mark

RoHS Compliant

Australia/New Zealand

RCM Mark

Product Standards

Electrical Equipment for Measurement, Control, and Laboratory Use

IEC 61010-1:2010/AMD1:2016/COR:2019

UL 61010-1:2019, C22.2 No. 61010-1:12

IEC 61010-2-201:2017

UL 61010-2-201:2018, C22.2 No. 61010-2-201:14

Communications Equipment in Utility Substations

IEC 61850-3:2013, Performance Class 1^{a, b}

IEEE 1613:2009 + 1613a:2011, Performance Class 1

IEEE 1613.1:2013, Performance Class 1^c

IEC 61850-90-4:2013

KEMA Certified to IEC 61850-3 and IEC 61850-90-4

Measuring Relays and Protection Equipment

IEC 60255-1:2009

IEC 60255-26:2013^c

IEC 60255-27:2013

EMC Standards for Industrial Environments

IEC 61000-6-2:2005 + AC:2005

IEC 61000-6-4:2006 + A1:2010

^a Fully compliant with all levels posed in clause 6.7.3 when used with fiber-optic SFPs and fiber-optic links. Copper Ethernet ports are rated and tested for in-field levels when used with SEL-CA605 Cat 5e or Cat 6 shielded cabling.

^b Fully compliant with all voltage dips and interruption levels posed in clause 6.7.3 when used with both system power supplies (Power A and Power B) installed and energized.

^c Fully compliant with Zone A (switchyard) levels when used with fiber-optic SFPs and fiber-optic links. Copper Ethernet ports are rated and tested for Zone B (control room) levels when used with SEL-CA605 Cat 5e or Cat 6 shielded cabling.

Type Tests

Electromagnetic Compatibility: Emissions

Radiated, Mains Conducted, Telecom Conducted Emissions

Standard	Method	Device Class
EN 60255-26:2013 Clause 7.2.7	EN 55011:2009 + A1:2010 EN 55022:2010 + AC:2011	Class A
IEC 60255-26:2013	CISPR 11:2009 + A1:2010 CISPR 22:2008	Class A
EN 61850-3:2014	EN 55022:2010 + AC:2011	Class A
IEC 61850-3:2013	CISPR 22:2008	Class A
EN 55032:2015 + A11:2020	EN 55032:2015 + A11:2020	Class A
CISPR 32:2015 + A1:2019	CISPR 32:2015 + A1:2019	Class A
KS C 9832:2015	KS C 9832:2015	Class A
47 CFR Part 15.107, 109	ANSI C63.4:2014	Class A
ICES-001, Issue 5	CSA CISPR 11:19	Class A

Harmonic and Flicker Emissions

Standard	Method	Severity Level
EN 61000-3-2:2014	EN 61000-3-2:2-14	230 Vac, 50 Hz
IEC 61000-3-2:2014	IEC 61000-3-2:2014	230 Vac, 50 Hz
EN 61000-3-3:2013	EN 61000-3-3:2013	230 Vac, 50 Hz
IEC 61000-3-3:2013	IEC 61000-3-3:2013	230 Vac, 50 Hz

Electromagnetic Compatibility: Immunity

Conducted RF Immunity

Standard	Method	Severity Level
EN 60255-26:2013 Clause 7.2.8	EN 61000-4-6:2014	10 V 150 kHz to 80 MHz Step Size: 1 percent of previous Dwell Time: 0.5 s Modulation: 1 kHz 10 V 27 MHz, 68 MHz Step Size: 1 percent of previous Dwell Time: 10 s Modulation: 1 kHz
IEC 60255-26:2013 Clause 7.2.8	IEC 61000-4-6:2013	10 V 150 kHz to 80 MHz Step Size: 1 percent of previous Dwell Time: 0.5 s Modulation: 1 kHz 10 V 27 MHz, 68 MHz Step Size: 1 percent of previous Dwell Time: 10 s Modulation: 1 kHz

Radiated RF Immunity

Standard	Method	Severity Level
EN 60255-26:2013 IEC 60255-26:2013	EN 61000-4-3:2005 + A1:2008 + A2:2010	80 MHz to 1 GHz, 1.4 GHz to 2.7 GHz: 10 V/m
EN 61850-3:2014 IEC 61850-3:2013	EN 61000-4-3:2005 + A1:2008 + A2:2010	80 MHz to 1 GHz, 1 GHz to 3 GHz: 10 V/m
IEEE C37.90.2:2004	IEEE C37.90.2:2004	80 MHz to 1 GHz: 20 V/m
IEEE 1613:2009	IEEE 1613:2009 IEEE C37.90.2:2004	80 MHz to 1 GHz: 20 V/m
IEEE 1613.1:2013	IEEE 1613:2009	1 GHz to 2.7 GHz: 10 V/m

Conducted Common-Mode Disturbances (CCMD)

Standard	Method	Severity Level
EN 61850-3:2013 Clause 6.7.3	EN 61000-4-16:2016	Level 4
IEC 61850-3:2013 Clause 6.7.3	EN 61000-4-16:2016	Level 4
IEEE 1613.1:2013 Clause 12	EN 61000-4-16:2016	Level 4

Power Frequency Immunity of Binary Contact Input Ports

Standard	Method	Severity Level
EN 60255-26:2013	EN 61000-4-16:2016	Zone A
EN 60255-26:2013	EN 61000-4-16:2015	Zone A

Electrostatic Discharge (ESD) Immunity

Standard	Method	Severity Level
EN 60255-26:2013 7.2.3	EN 61000-4-2:2009	Air Level 4: 2, 4, 8, 15 kV Contact Level 4: 2, 4, 6, 8 kV
IEC 60255-26:2013 7.2.3	IEC 61000-4-2:2009	Air Level 4: 2, 4, 8, 15 kV Contact Level 4: 2, 4, 6, 8 kV
IEC 61850-3:2013 6.7.3	EN 61000-4-2:2009	Air Level 3: 2, 4, 8, 15 kV Contact Level 3: 2, 4, 6, 8 kV
EN 61850-3:2014 6.7.3	IEC 61000-4-2:2009	Air Level 3: 2, 4, 8, 15 kV Contact Level 3: 2, 4, 6, 8 kV
IEEE 1613:2009 8	IEEE C37.90-3:2001	Air Level 3: 2, 4, 8, 15 kV Contact Level 3: 2, 4, 6, 8 kV

Electrical Fast Transient/Burst (EFTB) Immunity

Standard	Method	Severity Level
EN 60255-26:2014 Clause 7.2.5	EN 61000-4-4:2012	Communication Ports: 2 kV at 5 kHz applied for 1 min. All Other Connectors: 4 kV at 5 kHz applied for 1 min.
IEC 60255-26:2014 Clause 7.2.5	IEC 61000-4-4:2012	Communication Ports: 2 kV at 5 kHz applied for 1 min. All Other Connectors: 4 kV at 5 kHz applied for 1 min.

20 Specifications

Standard	Method	Severity Level
CISPR 35:2016 Clause 4.2.4	EN 61000-4-4:2012	Communication Ports: 2 kV at 5 kHz applied for 1 min. All Other Connectors: 4 kV at 5 kHz applied for 1 min.
EN 55035:2017 Clause 4.2.4 + AC:2019 + A11:2020	EN 61000-4-4:2012	Communication Ports: 2 kV at 5 kHz applied for 1 min. All Other Connectors: 4 kV at 5 kHz applied for 1 min.
EN 61850-3:2014	EN 61000-4-4:2012	Communication Ports: 2 kV at 5 kHz applied for 1 min. All Other Connectors: 4 kV at 5 kHz applied for 1 min.

IEC Surge Immunity

Standard	Method	Severity Level
EN 60255-26:2021	EN 61000-4-5:2014	Zone B for copper Ethernet ports, including front Zone A for power supplies and all other ports and contacts
IEC 60255-26:2021	IEC 61000-4-5:2014	Zone B for copper Ethernet ports, including front Zone A for power supplies and all other ports and contacts
EN 60255-26:2013 Clause 7.2.7	EN 61000-4-5:2006	Zone B for copper Ethernet ports, including front Zone A for power supplies and all other ports and contacts
IEC 60255-26:2013 Clause 7.2.7	IEC 61000-4-5:2005	Zone B for copper Ethernet ports, including front Zone A for power supplies and all other ports and contacts

IEC Damped Oscillatory Wave Immunity

Standard	Method	Severity Level
IEC CDV 60255-26:2021 (Draft)	IEC 61000-4-18:2019	Common Mode: 2.5 kV at 1 MHz Differential Mode: 3 kV at 1 MHz
EN 60255-26:2021 (Draft)	EN 61000-4-18:2019	Common Mode: 2.5 kV at 1 MHz Differential Mode: 3 kV at 1 MHz
IEC 61850-3:2013	IEC 61000-4-18:2006 + A1:2010	Common Mode: 2.5 kV at 1 MHz Differential Mode: 3 kV at 1 MHz
EN 61850-3:2014	EN 61000-4-18:2007 + Corr:2007 + A1:2010	Common Mode: 2.5 kV at 1 MHz Differential Mode: 3 kV at 1 MHz
IEC 60255-26:2013	IEC 61000-4-18:2006 + A1:2010	Common Mode: 2.5 kV at 1 MHz Differential Mode: 3 kV at 1 MHz
EN 60255-16:2013	EN 61000-4-18:2007 + Corr:2007 + A1:2010	Common Mode: 2.5 kV at 1 MHz Differential Mode: 3 kV at 1 MHz

IEEE Surge Withstand Capability

Standard	Method	Severity Level
IEEE C37.90.1:2012	IEEE C37.90.1:2012 + ERTA:2013	3 kV at 1 MHz, 4 kV at 100 kHz
IEEE 1613:2009	IEEE C37.90.1:2012 + ERTA:2013	3 kV at 1 MHz, 4 kV at 100 kHz

Pulsed Magnetic Field Immunity

Standard	Method	Severity Level
EN 61000-4-9:2016	EN 61000-4-9:2016	100, 300, 1000, 1200 A/m
IEC 61000-4-9:2016	IEC 61000-4-9:2016	100, 300, 1000, 1200 A/m
IEEE 1613.1-2013	IEC 61000-4-9:2016	100, 300, 1000, 1200 A/m

Damped Oscillatory Magnetic Field Immunity

Standard	Method	Severity Level
EN 61000-4-10:2017	EN 61000-4-10:2017	Level 5
IEC 61000-4-10:2016	IEC 61000-4-10:2016	Level 5
IEEE 1613.1-2013	IEC 61000-4-10:1993 + A1:2000	Level 5

Power Frequency Magnetic Field Immunity

Standard	Method	Severity Level
EN 60255-26:2013	EN 61000-4-8:2010	Level 5
IEC 60255-26:2013	IEC 61000-4-8:2009	Level 5
EN 61850-3:2014	EN 61000-4-8:2010	Level 5
IEC 61850-3:2013	IEC 61000-4-8:2009	Level 5
IEEE 1613.1-2013	IEC 61000-4-8:1993	Level 5

IEC Power Supply Tests (Discharge of Capacitors; Voltage Disturbances and Interrupts)

Standards	Methods	Severity Levels
IEC 60255-27:2013	IEC 60255-27:2013 Clause 5.1.3 IEC 60255-27:2013 Clause 10.6.6	Various; can request type test report
EN 60255-27:2014	EN 60255-27:2014 Clause 5.1.3 EN 60255-27:2014 Clause 10.6.6	Various; can request type test report
IEC 60255-26:2013	IEC 61000-4-11:2004 + A1:2017 IEC 61000-4-17:1999 + A1:2001 + A2:2008 IEC 61000-4-29:2000 IEC 60255-26:2013 Clause 7.2.13	Various; can request type test report
EN 60255-26:2013	EN 61000-4-11:2004 + A1:2017 EN 61000-4-17:1999 + A1:2004 + A2:2009 EN 61000-4-29:2000 EN 60255-26:2013 Clause 7.2.13	Various; can request type test report

Environmental Conditions

Thermal Environment Testing

Standard	Method	Description and Test Level
EN 60255-27:2013 § 10.6.1.1	EN 60068-2-2:2007	Dry Heat Operational: +85°C (+185°F)
IEC 60255-27:2013 § 10.6.1.1	IEC 60068-2-2:2007	Dry Heat Operational: +85°C (+185°F)
EN 60255-27:2013 § 10.6.1.2	EN 60068-2-1:2007	Cold Operational: –40°C (–40°F)
IEC 60255-27:2013 § 10.6.1.2	IEC 60068-2-1:2007	Cold Operational: –40°C (–40°F)
EN 60255-27:2013 § 10.6.1.3	EN 60068-2-2:2007	Dry Heat Storage: +85°C (+185°F)
IEC 60255-27:2013 § 10.6.1.3	IEC 60068-2-2:2007	Dry Heat Storage: +85°C (+185°F)
EN 60255-27:2013 § 10.6.1.4	EN 60068-2-1:2007	Cold Storage: –40°C (–40°F)
IEC 60255-27:2013 § 10.6.1.4	IEC 60068-2-1:2007	Cold Storage: –40°C (–40°F)
EN 60255-1:2010 § 6.12.3.5	EN 60068-2-14:2009	Change of Temperature: –40° to +85°C (–40° to +185°F)
IEC 60255-1:2009 § 6.12.3.5	IEC 60068-2-14:2009	Change of Temperature: –40° to +85°C (–40° to +185°F)
EN 60255-27:2013 § 10.6.1.6	EN 60068-2-30:2006	Damp Heat Cyclic: +25° to +55°C (+77° to +131°F)
IEC 60255-27:2013 § 10.6.1.6	IEC 60068-2-30:2005	Damp Heat Cyclic: +25° to +55°C (+77° to +131°F)
EN 60255-27:2013 § 10.6.1.5	EN 60068-2-78:2001	Damp Heat Steady State: +40°C (+104°F)
IEC 60255-27:2013 § 10.6.1.5	IEC 60068-2-78:2001	Damp Heat Steady State: +40°C (+104°F)
EN 61850-3:2014 § 6.9.3.1	EN 60068-2-2:2007	Dry Heat Operational: +85°C (+185°F)
IEC 61850-3:2013 § 6.9.3.1	IEC 60068-2-2:2007	Dry Heat Operational: +85°C (+185°F)
EN 61850-3:2014 § 6.9.3.2	EN 60068-2-1:2007	Cold Operational: –40°C (–40°F)
IEC 61850-3:2013 § 6.9.3.2	IEC 60068-2-1:2007	Cold Operational: –40°C (–40°F)
EN 61850-3:2014 § 6.9.3.3	EN 60068-2-2:2007	Dry Heat Storage: +85°C (+185°F)
IEC 61850-3:2013 § 6.9.3.3	IEC 60068-2-2:2007	Dry Heat Storage: +85°C (+185°F)
EN 61850-3:2014 § 6.9.3.4	EN 60068-2-1:2007	Cold Storage: –40°C (–40°F)
IEC 61850-3:2013 § 6.9.3.4	IEC 60068-2-1:2007	Cold Storage: –40°C (–40°F)
EN 61850-3:2014 § 6.9.3.5	EN 60068-2-14:2009	Change of Temperature: –40° to +85°C (–40° to +185°F)
IEC 61850-3:2013 § 6.9.3.5	IEC 60068-2-14:2009	Change of Temperature: –40° to +85°C (–40° to +185°F)
EN 61850-3:2014 § 6.9.3.7	EN 60068-2-30:2006	Damp Heat Cyclic: +25° to +55°C (+77° to +131°F)
IEC 61850-3:2013 § 6.9.3.7	IEC 60068-2-30:2005	Damp Heat Cyclic: +25° to +55°C (+77° to +131°F)
EN 61850-3:2014 § 6.9.3.6	EN 60068-2-78:2001	Damp Heat Steady State: +40°C (+104°F)
IEC 61850-3:2013 § 6.9.3.6	IEC 60068-2-78:2001	Damp Heat Steady State: +40°C (+104°F)

Mechanical Shock & Vibration

Standard	Method	Severity Level
IEC 60255-1:2009	IEC 60255-21-1:1988	Class 2 Endurance Sinusoidal
EN 60255-1:2010	EN 60255-21-1:1995	Class 2 Endurance Sinusoidal
IEC 60255-27:2013	IEC 60255-21-1:1988	Class 2 Endurance Sinusoidal

Standard	Method	Severity Level
EN 60255-27:2014	EN 60255-21-1:1995	Class 2 Endurance Sinusoidal
IEC 61850-3:2013	IEC 60255-21-1:1988	Class 2 Endurance Sinusoidal
EN 61850-3:2014	EN 60255-21-1:1995	Class 2 Endurance Sinusoidal
IEC 60255-1:2009	IEC 60255-21-2:1988	Class 1 Shock and Bump
EN 60255-1:2010	EN 60255-21-2:1995	Class 1 Shock and Bump
IEC 60255-27:2013	IEC 60255-21-2:1988	Class 1 Shock and Bump
EN 60255-27:2014	EN 60255-21-2:1995	Class 1 Shock and Bump
IEC 61850-3:2013	IEC 60255-21-2:1988	Class 1 Shock and Bump
EN 61850-3:2014	EN 60255-21-2:1995	Class 1 Shock and Bump
IEC 60255-1:2009	IEC 60255-21-3:1993	Class 2 Seismic
EN 60255-1:2010	EN 60255-21-3:1995	Class 2 Seismic
IEC 60255-27:2013	IEC 60255-21-3:1993	Class 2 Seismic
EN 60255-27:2014	EN 60255-21-3:1995	Class 2 Seismic
IEC 61850-3:2013	IEC 60255-21-3:1993	Class 2 Seismic
EN 61850-3:2014	EN 60255-21-3:1995	Class 2 Seismic

Appendix A: Firmware and Manual Versions

Firmware

Appendix A in the *Rapid Spanning Tree Protocol for the SEL Managed Ethernet Switch User's Guide* and the *Software-Defined Networking for the SEL Managed Ethernet Switch User's Guide* lists the firmware versions, a description of modifications, and the user's guide date code that corresponds to firmware versions. The firmware identifier in the switch will indicate the technology currently active by indicating the firmware identification (FID) listed as either SEL-2731M for Rapid Spanning Tree Protocol (RSTP) or SEL-2731S for Operational Technology Software-Defined Networking (OT SDN). Review the corresponding user's guide, for the firmware versions and release notes.

Instruction Manual

The date code at the bottom of each page of this manual reflects the creation or revision date.

Table 13 lists the instruction manual date codes and a description of modifications. The most recent instruction manual revisions are listed at the top.

Table 13 Manual Revision History

Date Code	Summary of Revisions
20240930	► Updated <i>Power Supply</i> and <i>SFP Management</i> .
20240913	► Updated <i>General Safety Notes</i> in <i>General Safety and Care Information</i> . ► Added <i>Optional Accessories and Kits</i> to <i>Table 3: Ordering Options</i> .
20240523	► Updated <i>Specifications</i> .

Date Code	Summary of Revisions
20240209	► Updated <i>Introduction and Hardware Specification</i> . ► Updated <i>Table 3: Ordering Options</i> .
20231219	► Updated <i>Labels and Markings</i> .
20231120	► Initial version.

Technical Support

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

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Email: info@selinc.com

Notes

⚠ WARNING

Operator safety may be impaired if the device is used in a manner not specified by SEL.

⚠ AVERTISSEMENT

La sécurité de l'opérateur peut être compromise si l'appareil est utilisé d'une façon non indiquée par SEL.

⚠ CAUTION

Equipment components are sensitive to electrostatic discharge (ESD), undetectable permanent damage can result if you do not use proper ESD procedures. Ground yourself, your work surface, and this equipment before removing any cover from this equipment. If your facility is not equipped to work with these components, contact SEL about returning this device and related SEL equipment for service.

⚠ ATTENTION

Les composants de cet équipement sont sensibles aux décharges électrostatiques (DES). Des dommages permanents non-décelables peuvent résulter de l'absence de précautions contre les DES. Raccordez-vous correctement à la terre, ainsi que la surface de travail et l'appareil avant d'en retirer un panneau. Si vous n'êtes pas équipés pour travailler avec ce type de composants, contacter SEL afin de retourner l'appareil pour un service en usine.

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